

## 2024 Plastic Surgery The Meeting Abstracts

### Aesthetic

#### Connective Tissue Diseases do not Increase Complication Rates for Patients Undergoing Aesthetic Surgery

Abstract Presenter: Fuad Abbas

Abstract Co-Author(s): Ryan Khalaf, Filippo Andrea Giova Perozzo MD, Rommy Obeid, Mazen Al-Malak MD, Diane Jo, R'ay Fodor, Jose Reyes, Antonio Rampazzo MD, Bahar Bassiri Gharb MD, PhD

**Background:** Connective tissue diseases (CTD), such as rheumatoid arthritis, lupus, and scleroderma, may influence wound healing and postoperative outcomes due to autoimmune inflammatory processes. However, the association between CTDs and complications following cosmetic surgery is understudied and lacks consensus. The aim of this study is to compare complications after cosmetic surgery in CTD patients versus healthy controls.

**Methods:** An IRB-approved retrospective review (IRB#22-764) of all patients diagnosed with CTD who underwent cosmetic procedures at our institution from 2003-2022 was conducted. Demographic data, comorbidities, medications, procedures, and postoperative complications were collected. Patients were excluded for missing data or lack of follow-up. Healthy controls were identified for each procedure and matched 1:1 based on propensity scores derived from race, gender, BMI, smoking status, and comorbidities. We estimated a sample size of 229 patients per study group needed to achieve statistical power ( $\alpha = 0.05$ ,  $\beta = 0.20$ ,  $p_1 = 43\%$ ,  $p_2 = 30\%$ ). Statistical analysis included t-tests and chi-squared tests, where appropriate. All data are presented as mean and standard deviation (mean  $\pm$  SD).

**Results:** Six hundred and thirty-eight patients were included, comprising 319 (50%) patients diagnosed with CTD, and 319 (50%) healthy controls. 597 (93.6%) were female and 41 (6.4%) were male, with an average age at surgery of 56.3 years. CTD patients were significantly older than their healthy counterparts ( $59.5 \pm 13.6$  versus  $53.1 \pm 15.3$ ,  $p < 0.0001$ ). Within the CTD group, connective tissue pathologies included rheumatoid arthritis (73.4%), lupus (27.6%), and scleroderma (3.45%). Between the CTD and control groups, there were no differences with respect to sex ( $p = 0.420$ ), race ( $p = 0.671$ ), BMI ( $p = 0.634$ ), smoking status ( $p = 0.797$ ), or comorbidities (diabetes mellitus,  $p = 0.715$ ;

chronic kidney disease,  $p=0.541$ ; heart failure,  $p=0.613$ ; peripheral vascular disease,  $p=0.677$ ; coronary artery disease,  $p=0.501$ ). The predominant procedures were blepharoplasty (340, 53.3%), breast reduction (137, 21.5%), and abdominoplasty (80, 12.5%). The overall complication rate for the study population was 20.2% (129 complications). Predominant complications included wound dehiscence (35, 5.49%), infection (32, 5.02%), and soft tissue necrosis (17, 2.67%). There was no difference between the CTD group and control group in overall complication rate (21.6% versus 18.8%,  $p=0.375$ ), or the rate of complications requiring reoperation (33.3% versus 26.7%,  $p=0.411$ ). Subgroup analysis of individual CTDs showed no difference in complications for patients with rheumatoid arthritis ( $p=0.386$ ), lupus ( $p=0.618$ ), or scleroderma ( $p=0.958$ ) versus controls. 65.2% of CTD patients were prescribed disease modifying therapy including methotrexate, corticosteroids, hydroxychloroquine, and other immunosuppressant biologics at the time of surgery. These patients had no difference in complication rate compared to the control group (24.0% versus 18.8%,  $p=0.148$ ). Subgroup analysis of individual procedures showed no difference in complications between CTD patients and controls who underwent blepharoplasty ( $p=0.384$ ), breast reduction ( $p=0.909$ ), abdominoplasty ( $p=0.459$ ), rhytidectomy ( $p=0.499$ ), or rhinoplasty ( $p=1.00$ ). However, CTD patients who underwent breast augmentation had a significantly higher rate of complications compared to breast augmentation controls (35% versus 5%,  $p=0.0177^*$ ).

**Conclusion:** Most cosmetic procedures are safe in patients with connective tissue diseases including rheumatoid arthritis, lupus, and scleroderma, and do not carry an increased burden of post-operative complications.

## **Determinants of Nasal Tip Projection: Differential Effects of Intraoperative Maneuvers**

Abstract Presenter: R'ay Fodor

Abstract Co-Author(s): Russell Frautschi MD, Anthony Deleonibus MD, Abigail Meyers MD, Viren Patel MD, Rafael Ramos Vecchio MD, Bahman Guyuron MD, Ali Totonchi MD

**Background:** The nasal tip is a complex three-dimensional structure whose projection is supported by several anatomic elements including but not limited to the lateral crura, medial crura, nasal spine, septal angle, alar base, and anterior nasal spine. Modification of tip projection thus requires judicious consideration of its various structural

contributors. However, given that multiple structures may be concomitantly altered during rhinoplasty, it is often difficult to disentangle the contributions of specific maneuvers to postoperative tip projection. This study aims to clarify the distinct effects of intraoperative maneuvers affecting tip projection.

**Materials & Methods:** This is a retrospective study of patients who underwent primary rhinoplasty at a single private practice between 2001 and 2022 with standardized preoperative and postoperative photography. Preoperative and postoperative standardized right profile images were compared. Tip projection was assessed using the Goode ratio. Patients were stratified into one of three categories according to the preoperative Goode ratio: underprojected ( $<0.55$ ), ideally projected ( $>0.55$ ,  $<0.60$ ), or overprojected ( $>0.60$ ). Matched pairs analyses were used to determine significant differences between preoperative and postoperative values. Linear regression and MANOVA were employed to detect intraoperative maneuvers with significant effects on tip projection.

**Results:** A total of 386 patients (310 female, 76 male; mean age:  $31.15 \pm 13.99$  years) underwent primary rhinoplasty with standardized preoperative and postoperative photography. The mean time between surgery and photographic follow-up was  $897.09 \pm 888.79$  days. Preoperatively, 301 patients were overprojected, 13 patients were underprojected, and 72 patients had ideal tip projection. The mean preoperative Goode ratio for overprojected patients was  $0.67 \pm 0.08$ , while the mean postoperative Goode ratio was  $0.62 \pm 0.04$ . For underprojected patients, the preoperative mean was  $0.51 \pm 0.04$  and the postoperative mean was  $0.53 \pm 0.04$ . For both overprojected ( $p < 0.0001$ ) and underprojected patients ( $p = 0.0330$ ), there was a significant projection change in the desired direction. In comparison, the mean preoperative ratio for ideally projected patients was  $0.58 \pm 0.01$  and the postoperative mean was  $0.58 \pm 0.04$ -postoperative projection was not found to be significantly different from preoperative projection ( $p = 0.4891$ ). For overprojected patients, ratio reductions were associated with lateral crural repositioning (difference:  $-0.04$ ,  $p = 0.0007$ ), increased ratios were associated with transdomal sutures (difference:  $+0.02$ ,  $p = 0.0479$ ), membranous septum resections (difference:  $0.03$ ,  $p = 0.0320$ ), columellar strut grafts (difference:  $+0.02$ ,  $p = 0.0286$ ), footplate approximation (difference:  $+0.03$ ,  $p = 0.0021$ ), and subdomal grafts (difference:  $+0.03$ ,  $p = 0.0046$ ). For ideally projected patients, lateral crural onlay grafts were associated with increased projection (difference:  $0.1$ ,  $p = 0.0068$ ). Linear regression revealed subdomal grafts ( $p = 0.0083$ ), tip rotation sutures ( $p = 0.0139$ ), soft triangle grafts ( $p = 0.0376$ ), and lateral crural struts ( $p = 0.0433$ ) as the most significant drivers of tip projection, with subdomal grafts having the largest observed effect.

**Conclusions:** These data highlight several techniques for their significant long-term

influence on nasal tip projection and validate the utility of factors contentiously postulated to drive changes in tip projection, including the columellar strut graft and footplate approximation. Additionally, regression modeling identified the subdomal graft as the most significant driver of increased tip projection.

## **Patient and Injector Perspectives on the Use of the Hyaluron Pen: A Population Based Study**

Abstract Presenter: Kyle Ockerman

Abstract Co-Author(s): Kelly Killeen MD, Vivek Annadata, Sabrina Han MD, Sarah Sorice Virk MD

**Background:** Emerging do-it-yourself (DIY) trends in hyaluronic acid lip fillers have gained traction on most social media platforms. One popular trend involves using a "needle free" device, called the Hyaluron Pen, distributed mostly by non-medical professionals, which employs compressed air pressure to administer hyaluronic acid into the lips. However, plastic surgeons and medical agencies have raised concerns over this product due to the inability to control the depth of penetration and nonsterile methods of refilling the device. Currently, there is a lack of research investigating its usage and potential enduring complications. In this study, we aimed to explore both patient and injector perspectives and outcomes associated with the Hyaluron Pen.

**Methods:** Anonymous surveys were administered via Amazon Mturk in February 2024. Eligible participants were 18 years or older who had used the Hyaluron Pen in the United States. Perspectives on use of Hyaluron Pen were assessed through questions regarding Hyaluron Pen administration, distribution, costs, experiences, complications, and training. Data was analyzed using descriptive statistics.

**Results:** A total of 161 participants indicated using the Hyaluron Pen. A majority of the respondents (53.4%) learned about the Hyaluron Pen from social media. About 43% of participants indicated that licensed health professionals administered their Hyaluron Pen treatments, followed by physicians (36%) and self-administration (18.6%). Participants paid on average \$536.80 per injection session and had about 47 treatments. Almost all participants (98.8%) rated their experience with the Hyaluron Pen as positive and would overwhelmingly (97.5%) recommend it to others. Most started using the Hyaluron Pen because of its ease of use (70.2%), to have fuller lips (53.4%), and its affordability over conventional injectable filler (47.8%). Common side effects

included infection (39.8%), bleeding/bruising/swelling (34.8%), gross asymmetry (31.7%), and scarring (31.7%). Concerningly, 79% developed complications from the Hyaluron Pen that resulted in either hyaluronidase injections (59.1%), corrective surgery (48.8%), emergency room visit (37.8%), or hyperbaric oxygen treatment (24.4%). About 78% of participants with complications reported permanent disfigurement from the Hyaluron Pen and paid an average of \$2493.90 out-of-pocket for corrective treatments. Individuals who administer Hyaluron Pen indicated training from Hyaluron Pen courses (81.9%) and videos on social media (17.2%). Alarming, 15% of injectors do not counsel on any potential complications.

**Discussion:** While the allure of the Hyaluron Pen may be enticing to consumers seeking a quick fix for achieving plump, youthful lips, self reported complications reported in this study justify growing concerns from the medical community. This study highlights the need for further comprehensive research, strict regulatory oversight, and plastic surgeon-led initiatives against its usage and distribution to safeguard the well-being of patients seeking cosmetic enhancements.

## **AI in Cosmetic Surgery - a new look at virtual abdominoplasty and buttock augmentation**

Abstract Presenter: Arsany Yassa

Abstract Co-Author(s): Arya Akhavan MD, Solina Ayad, Olivia Ayad, Kailash Kapadia MD, Anthony Colon MD, Ashley Ignatiuk MSc, MD, FRCSC

**Purpose:** The use of before-and-after images in body contouring is routine, and patients often refer to these photos as a reference for expectations of results. However, recent developments in image-generating artificial intelligence (AI) now allow lifelike 'photos' of nonexistent individuals. Models are directly accessible to patients, who already report using these tools in medical decision-making. Various AI models have been trained on divergent sets of images, and it is unclear if generated images accurately represent human figures, cosmetic defects, or expected surgical results. The authors therefore sought to examine the quality of these generated images.

**Methods:** AI Models, Image Generation, and Criteria for Textual Prompts: Text prompts for abdominoplasty and buttock augmentation were written by the lead author, including desired pre- and postoperative features but excluding patient-specific information. Prompts were fed into ChatGPT-4, which was iteratively used to develop

complex prompts use in image-generation models. After final prompt generation, the same prompt was fed into GetIMG, Leonardo, and Perchance to produce one image each for abdominoplasty and for buttock augmentation.

#### Surgeon Involvement and Validation:

Grading systems from various other literature were adopted to create an 11-item assessment (scale 1-5) of image quality relating to surgically relevant factors, including consistent image presentation, anatomical veracity, appropriate presentation of the aesthetic deformity, and appropriate postoperative result. A panel of two board-certified plastic surgeons and two plastic surgery residents evaluated the images using the 11-item assessment, and provided free text feedback. Results were analyzed by Excel for means and standard deviations. Statistical testing was performed with ANOVA, Kruskal-Wallis H-testing, and Mann-Whitney U-testing where appropriate.

**Results:** When comparing models, GetIMG had the highest mean score ( $3.66 \pm 0.95$ ), followed by Leonardo ( $3.07 \pm 0.84$ ) and Perchance ( $2.45 \pm 0.75$ ). The highest scoring metrics were Correct Simulation of Age ( $3.36 \pm 0.85$ ) and Symmetry Analysis ( $3.45 \pm 0.94$ ), while Healing and Scarring Prediction was rated lowest ( $2.13 \pm 1.14$ ), due in part to the fact that no models were able to generate scar patterns. Metrics for image realism showed significant variation between panelists ( $F=12.51$ ,  $p=0.0034$ ). Conversely, metrics for clinical value demonstrated no significant differences between panelists ( $F=0.77$ ,  $p=0.55$ ). There was consistent performance across the eleven metrics ( $H=16.03$ ,  $p=0.099$ ). When comparing AI models, there were no significant differences in realism metrics ( $F=0.437$ ,  $p=0.663$ ), but significant disparities in clinical value metrics ( $F=10.317$ ,  $p=0.017$ ). However, the paired tests as followed revealed no significant differences between any models: GetIMG vs. Leonardo ( $U=5.5$ ,  $p=0.236$ ), GetIMG vs. Perchance ( $U=6.0$ ,  $p=0.2$ ), and Leonardo vs. Perchance ( $U=9.0$ ,  $p=0.1$ ).

**Conclusion:** While some images demonstrate accuracy in depicting appropriate surgical candidates and expected postoperative results, some were anatomically unrealistic or failed to show appropriate postoperative results. Patients should wait to use AI-generated images in the surgical decision-making process until systems significantly improve, as they may be led to expect impossible results at this time. In addition, surgeons should continue to use photos of actual patients in their surgical consultations rather than generated images. Further planned research includes comparison to 'real' before-and-after imagery and improved image generation.

## **A Clinical Safety Assessment of Hybrid Fractional Laser Use at Increased Depths for Facial Skin Rejuvenation**

Abstract Presenter: Skylar Sirmans

Abstract Co-Author(s): Maheen Akhter MD, Taylor Chishom MD, Rahim Nazerali MD, Alan Durkin MD, Michael Hernandez, Elizabeth Turner

**Background:** Hybrid fractional lasers (HFL) have redefined the landscape of facial laser resurfacing treatments, owing to their dual ablative and non-ablative wavelength technology. While HFL therapy has already shown strong outcomes, the safety of HFL at skin depths beyond 150 $\mu$  is debated, particularly for its non-ablative wavelength. Some suggest that HFL delivery at deeper levels has the potential to further enhance skin remodeling and rejuvenation. As such, we conducted a clinical safety assessment of deep HFL therapy among patients concurrently undergoing rhytidectomy for facial rejuvenation.

**Methods:** A retrospective review was performed at a single site from 2017 to 2022. All patients who underwent rhytidectomy with or without concurrent intraoperative HFL therapy were included in the study. Data was collected on patients' demographics, medical history, the details of HFL therapy, and postoperative complications. Differences between the two groups were determined using descriptive statistics.

**Results:** A total of 169 patients were included, most of whom were female (94.7%) and white (97.0%) with an average age of  $63.3 \pm 7.5$  years and Fitzpatrick score of  $2.7 \pm 0.7$ . All patient characteristics, such as demographics, comorbidities, and relevant surgical history, were similar between the HFL group and the control group. Among those who received HFL therapy at the time of rhytidectomy, the average depth of delivery for the non-ablative laser was  $355\mu \pm 25\mu$  across all areas of the face. The maximum depth observed in the HFL cohort was 425 $\mu$ . In the 12 months following index rhytidectomy, 7.6% of the HFL group experienced postoperative complications, compared to 3.0% in the control group. This difference was not significant ( $p = 0.13$ ). Known complications of HFL, such as burns, skin breakdown, and hypo- and hyperpigmentation were not observed among any of the patients in the HFL group.

**Conclusions:** HFL therapy at depths of up to 425 $\mu$  has been proven to be a safe option for facial skin photorejuvenation. Furthermore, patients with Fitzpatrick skin types I-VI, who are especially susceptible to epidermal injury, did not experience any adverse effects secondary to HFL therapy. Compared to rhytidectomy alone, combining HFL with rhytidectomy is not associated with a greater rate of complications, offering a

promising, multifaceted approach for comprehensive facial rejuvenation. Our findings serve to expand the clinical safety parameters of safe HFL use, which is an instrumental step in optimizing the clinical outcomes and long-term success of laser skin resurfacing.

## **Optimization of Aesthetic Outcomes in Abdominoplasty vs. DIEP via Characterization of Sub- vs. Supra- Scarpa's Fascial Layer Adipose Tissue Volume**

Abstract Presenter: Tyler Dorobek

Abstract Co-Author(s): Ahmed Afifi MD, Katherine Reuter Muñoz MD, Daniel Chu

**Background:** Modern lipoabdominoplasty techniques optimize aesthetic results while minimizing risk of wound healing complications related to malperfusion or ischemia. This descriptive study seeks to characterize the volume of adipose tissue above and below Scarpa's fascial plane spanning the anterior abdominal wall to better understand the potential impact of direct sub-Scarpal fat excision and flank liposuction in lipoabdominoplasty.

**Methods:** Retrospective chart and CT imaging review was performed on 41 Deep Inferior Epigastric Perforator (DIEP) breast reconstruction and 24 lipoabdominoplasty patients between November 2010 to June 2022. Variables collected included demographics, surgical history, BMI at multiple time points and abdominal fat measurements (in millimeters) above and below Scarpa's fascia. Individual measurements were taken at 20 unique sites across the anterior abdominal wall. Statistical analysis was performed to assess potential relationships between supra- and sub- Scarpa's Fascia adipose volume with BMI and age via multivariate analysis. Ratios of adipose volume above and below Scarpa's fascia were calculated using a Mean of Ratios equation. These ratios were compared along the same vertical axis in pre- and post-operative DIEP flap breast reconstruction patients in an attempt to assess how tension at closure may modify adipose anatomy and aesthetic outcomes.

**Results:** No significant statistical difference was found between the two patient cohorts for both age ( $p=0.6461$ ) and BMI ( $p=0.6434$ ). In the DIEP cohort, the average time from preoperative CT imaging to surgery was 1.1 years [2 days-3.8 years], and 2.5 years from surgery to postoperative CT [15 days-10 years]. Age and BMI were found to be unrelated to fat volumes above or below Scarpa's layer in the preoperative DIEP CT measurements. In all three groups (lipoabdominoplasty, pre- and post- operative DIEP) there is a trend toward higher above/below ratios at the lateral-most sites. This trend in ratios is driven by a combination of higher supra-Scarpa's adipose volume laterally and higher sub-Scarpal volume at midline. The inferiormost horizontal axis was analyzed in pre- and post-operative DIEP patients to assess tension at closure site. RL3 and LL3 (lateral-most sites) ratios decrease from pre-op to post-op, while the locations nearing midline (R3, M3 and L3) increase. These differing ratios at the most midline sites are driven by a decrease in supra-Scarpa's adipose volume following lipoabdominoplasty.



**Conclusion:** The results of this study support direct excision of sub-Scarpal fat with flank liposuction in abdominoplasty following our observation that sub-scarpal fat volumes were highest near midline and the supra-scarpal fat volumes were highest laterally. Further, this data indicates that the majority of fat remains in the supra-Scarpal plane following prior abdominoplasty or DIEP, which would be most amenable to liposuction should a patient present seeking further abdominal contouring after one of these procedures. Lastly, the pre- versus post-operative DIEP CT values in the upper abdomen changed insignificantly, suggesting what seems intuitive, that inferiorly directed tension applied to the lower abdomen at the time of closure only minimally affects the upper abdomen.

## **Are Insurance-Based Body Contouring Outcomes Impacted by Perioperative Marijuana Use? A Retrospective Review**

Abstract Presenter: Henry Huson MD

Abstract Co-Author(s): Kiersten Woodyard De Brito MD, Ermina Lee, Tiffany Shi, Ryan Gobble MD

**Background:** Marijuana is the most prevalent recreational drug used in the United States and is available for medicinal prescription in 37 states. Shifts in public acceptance and legal reform coincide with historic highs in reported marijuana use. Health impact of marijuana has been examined in anesthetic and psychiatric disciplines but has not been investigated in association with surgical outcomes. This investigation examines outcomes for insurance-covered body contouring in the setting of Perioperative marijuana use.

**Methods:** A retrospective chart review was performed for patients who received an insurance-covered panniculectomy from 2018-2022. Data collection included demographics, comorbidities, perioperative data, outcomes, and chart documentation of regular marijuana use. Patients were considered to have Perioperative marijuana use if regular inhalation use was clinically documented within a year of surgery. Exclusion criteria included tobacco use, diabetes, edible THC consumption, or lack of insurance approval for panniculectomy. Statistical analysis included descriptive statistics, t-tests, Chi-squared analysis and Odds Ratios (OR) with 95% Confidence Intervals (CI).

**Results:** 192 patients were identified who underwent insurance-based panniculectomy from 2018-2022. 3 had never been screened for marijuana use (1.6%). 25 (13.0%) had regular marijuana use clinically documented within a year of surgery. Patients with documented regular marijuana use were 5.07 times as likely (p-value<0.001, OR 95% CI 2.04-12.58) to develop a complication compared to patients without documented marijuana use. Patients with documented regular marijuana use were 5.02 times as likely (p-value=0.010, OR 95% CI 1.31-19.24) to require a return to the OR to address a complication, and 4.27 times (p-value=0.019, OR 95% CI 1.153-15.83) as likely to develop a complex wound persisting past 30 days when compared to patients without

clinically documented marijuana use. Finally, the marijuana use cohort was found to be 3.17 times (p-value=0.038, OR 95% CI 1.02-9.928) as likely to have an infection requiring treatment with antibiotics compared to the non-marijuana use cohort. There was no difference in average age, BMI, or resection weight between the two cohorts. However, there was also no difference between the marijuana use and non-marijuana use cohorts for wound dehiscence or seromas/hematomas requiring drainage.

**Conclusions:** Patients with regular marijuana use documented within a year of insurance-based panniculectomy had significantly increased risk of developing a complication, requiring a return to the OR, developing a complex wound, as well as increased likelihood of developing an infection that necessitated treatment with antibiotics. With increasingly widespread use in the United States, patients with regular marijuana use will present for plastic surgery at a higher rate. Counseling about inhaled marijuana use in the Perioperative period may mitigate complications. Continued research is needed to further elucidate the relationship between perioperative marijuana use and surgical outcomes.

## **Evaluating the Role of TXA in Reducing Perioperative Bleeding in Rhinoplasty and Septoplasty: a Systematic Review and Meta-Analysis**

Abstract Presenter(s): Kian Daneshi

Abstract Co-Author(s): Hamid Reza Khademi Mansour, Ankur Khajuria MD

**Background:** Perioperative bleeding poses significant challenges to rhinoplasty/septoplasty procedures; tranexamic acid (TXA), an antifibrinolytic, may help reduce this bleeding, though its effectiveness in these specific surgeries is not well-established. This systematic review and meta-analysis aims to evaluate the impact of TXA on perioperative bleeding in rhinoplasty and septoplasty. This review addresses the methodological insufficiencies of similar previous reviews which were assessed using the AMSTAR 2.0 tool

**Methods:** A comprehensive search was made across multiple databases, including PubMed, Embase, Google Scholar, and Web of Science, up to October 2023. Eligible studies were randomized or non-randomized comparative studies focusing on adult patients undergoing rhinoplasty or septoplasty. The primary outcomes assessed were intraoperative blood loss, surgery duration, and surgeon satisfaction, analyzed using RevMan 5.4.1.

**Results:** The search yielded 154 initial results; 12 studies were deemed eligible, covering 1296 participants, 54.7% of whom received TXA. A quality and bias assessment was undertaken using the GRADE, Cochrane RoB 2.0, and ROBINS-I tools which led to the exclusion of a further 2 studies due to poor methodological quality / high risk of bias. The meta-analysis showed a significant reduction in intraoperative blood

loss with TXA (Mean difference -55.50; 95% CI: -87.84 to -23.26,  $P < 0.0007$ ), but no significant changes in surgery duration or surgeon satisfaction, albeit with high heterogeneity across studies ( $I^2 > 90\%$ ).

**Discussion:** The findings support TXA's efficacy in reducing blood loss during rhinoplasty and septoplasty without affecting surgery duration or surgeon satisfaction. The high heterogeneity and concentration of studies in specific regions suggest the need for standardized research methodologies. Future studies should optimize TXA's dosing and administration while exploring its long-term effects and patient-centered outcomes. This review confirms TXA's potential as a valuable surgical adjunct while underscoring the need for further standardized research, which is necessary to elucidate TXA's benefits and inform clinical practice fully.

## **Brachioplasty Wound Complications: A Review of 205 Cases from a Prospective Registry**

Abstract Presenter: Nerone Douglas

Abstract Co-Author(s): Jeffrey Gusenoff MD, J. Peter Rubin MD, Lynn Frydrych MD, Viraj Govani, Kerollos Kamel, Murali Kovvur

**Introduction:** Excess skin following massive weight loss poses both a cosmetic and functional challenge for patients. As the demand for post-bariatric brachioplasty procedures rises, we must understand the incidences of wound complications and best practices for treatment options. This study presents data from a single institution's experience with brachioplasty body contouring surgery and its associated wound complications.

**Methods:** A single-center review of cases was performed for patients undergoing brachioplasty over a 15-year period from July 2008 to October 2023. Patient information was acquired through Electronic Medical Records or paper source documents. Any paper records with missing or unreliable data points were excluded from the final analyses. All patients were analyzed for preoperative clinical data and timelines of post-operative wound complications. Descriptive statistics were conducted, and Fisher Exact tests were used for further statistical analyses; a  $P$  value of 0.05 or less was considered statistically significant.

**Results:** In this study, 205 patients undergoing brachioplasty procedures were analyzed. Of these patients, 10 (5%) patients were male, and 195 (95%) patients were female. The average age of brachioplasty patients was 47, with an average BMI of

30.34 kg/m<sup>2</sup> after weight loss and an average maximum BMI of 52.19 kg/m<sup>2</sup> prior to massive weight loss. Of the three most common wound complications, 57 (27.9%) patients had  $\geq 1$  event of minor wound dehiscence, 33 (16.2%) patients had  $\geq 1$  event of seroma, and 20 (9.8%) had  $\geq 1$  event of suture extrusion. These complications were, in all cases, treated with office-based wound management. Interestingly, there was a positive association between minor wound dehiscence and receiving liposuction within the zone of resection at the same time as brachioplasty, and suture extrusion incidence and liposuction ( $p=0.01$  and  $p=0.01$ , respectively). Additionally, we found that there was no significant association between concurrent liposuction of the posterior arm, away from the site of resection, and wound complications, which mirrors the conclusion of our earlier published work. The average total follow-up time for our cohort was 369.1 days (about 1 year).

**Conclusion:** Minor wound dehiscence and small seromas are commonly observed after brachioplasty, but amenable to office-based care. Our analysis shows concurrent liposuction within the zone of tissue resection may be associated with a higher rate of wound complications.

## **One Profile to Rule Them All? A Neural Network Investigation of the Homogenizing Effect of Primary Rhinoplasty**

Abstract Presenter: Kristina Khaw

Abstract Co-Author: Stephen Lu MD

**Background:** A commonly stated goal of aesthetic rhinoplasty is to improve nasal aesthetics while preserving the patient's individual features for a personalized result. To the contrary, we hypothesized that primary rhinoplasty has a homogenizing effect on a patient's appearance and, furthermore, in a distinct manner for a given rhinoplasty surgeon.

**Purpose:** This study aims to evaluate and measure the homogenizing effects of rhinoplasty.

**Methods:** Standardized and unedited preoperative and postoperative photos, including frontal, lateral, and oblique views, of 100 female-presenting, Caucasian-presenting primary rhinoplasty from the public websites of two independent experienced rhinoplasty surgeons from separate practices were included in this study. Using the Amazon Rekognition API and all 100 patients' photos, similarity between photos were calculated by comparing: all the preoperative photos to each other, all postoperative

photos to each other, each patient to their own postoperative photo. These scores were averaged to provide a similarity score for each comparison type. Next, two cohort subgroups were created, with Surgeon A's 50 patients comprising one and Surgeon B's the other. The comparisons were evaluated, and similarity scores were calculated within and between cohorts. The change in similarity after surgery was calculated as the difference of similarity scores preoperatively and postoperatively. Paired t-tests were used to evaluate the changes in similarities between the before photos of patients and the after photos of patients. A simple t-test was used to evaluate the absolute value of change of the patients' preoperative state with others' postoperative states and between cohorts.

**Results:** As hypothesized, patients were significantly more similar after surgery (1.02%,  $p < 0.001$ ) with the greatest effect in the lateral (1.28%,  $p < 0.001$ ), oblique (0.91%,  $p < 0.001$ ), and then the frontal (0.64%,  $p < 0.001$ ) views. In the cohort subgroup analysis, Surgeon A had a 1.13% (front: 0.78%, lateral: 1.66%, oblique: 1.05%), whereas Surgeon B had a 0.89% increase (front: 0.46%, lateral: 0.90%, oblique: 0.78%), indicating a greater homogenizing effect by Surgeon A than B. Moreover, the inter-cohort similarity increase of 0.61% was significantly less than the intra-cohort similarity increase (1.02%,  $p = 0.003$ ), indicating that the cohorts were more similar to each other in appearance than the other cohort on average. This was supported on the frontal (0.64%,  $p < 0.001$ ), lateral (0.49%, 1.28%,  $p < 0.001$ ), and oblique (0.49%, 0.91%,  $p = 0.002$ ) views.

**Conclusion:** This study demonstrates that primary rhinoplasty patients have an increased similarity of appearance, or homogeneity, postoperatively. Rhinoplasties by both surgeons had this effect, greater for Surgeon A than Surgeon B, and patients within a cohort were more similar to each other than to the other cohort. We believe that this is the first study that measures and quantifies the homogenizing effect of rhinoplasties in general through the use of neural networks, and more surprisingly, the quantifiable "signature" effect of a specific surgeon on the appearance of their patients as a population. This study may impact how surgeons set patients' expectations, affect how patients select surgeons, and ultimately increase patient satisfaction.

# Risks and Complications Rate in Liposuction: A Systematic Review and Meta-Analysis

Abstract Presenter: Alexander Comerci

Abstract Co-Author(s): Jose Antonio Arellano MD, Mario Alessandri Bonetti MD, Joseph Mocharnuk, Paolo Persichetti MD, PhD, J. Peter Rubin MD, Francesco Egro MD, Msc, MRCS

**Background:** Liposuction is a common surgical procedure used to remove excess adipose tissue in targeted regions of the body. According to the 2022 ASPS annual report, liposuction is the most performed cosmetic procedure. Despite its increasing popularity, current literature lacks a unified understanding of the risks associated with this aesthetic procedure. This study represents the first meta-analysis of its kind to explore the risks associated with liposuction and aims to improve current methods by identifying and analyzing complications associated with the procedure.

**Methods:** A systematic review and meta-analysis was reported according to PRISMA guidelines and registered on the PROSPERO database (CRD42023471626). The primary outcome of the study was overall complication rate. Absolute risk for individual complications was also assessed. Ultrasound-assisted, power-assisted, laser-assisted, and radio-assisted liposuction were included in this review, while high-definition liposuction was excluded. Methodological Index for Non-Randomized Studies (MINORS) was utilized for study quality assessment.

**Results:** From 2,957 articles, 39 studies were selected for analysis. In total, 29,368 patients were included, with a mean age of 40.62 years and mean BMI of 26.36 kg/m<sup>2</sup>. Overall, the rate of any complication was 2.62 [95% CI: 1.78; 3.84]. The most common complication was contour deformity, with a prevalence of 2.35% [95% CI: 1.05%; 5.16%]. The prevalence of hyperpigmentation was 1.49% [95% CI: 1.12%; 1.99%], seroma 0.65% [95% CI: 0.33%; 1.24%], hematoma 0.27% [95% CI: 0.12%; 0.60%], superficial burn 0.25% [95% CI: 0.17%; 0.36%], infection 0.20% [95% CI: 0.082%; 0.50%], allergic reaction 0.16% [95% CI: 0.050%; 0.52%], skin necrosis 0.046% [95% CI: 0.013%; 0.16%], generalized edema 0.041% [95% CI: 0.0051%; 0.32%], deep vein thrombosis and thromboembolism 0.017% [95% CI: 0.0055%; 0.053%], and local anesthesia toxicity 0.016% [95% CI: 0.0040%; 0.064%].

**Conclusion:** Liposuction is a safe procedure with an overall low complication rate. When they do occur, contour deformity and hyperpigmentation are among the most prevalent complications. Enhancing awareness of the specific risks associated with

individual complications can contribute to improved physician training and potentially reduce the incidence of costs for patients. Furthermore, these findings help define expectations for liposuction procedures, improving surgical outcomes and patient-physician alliance.

## **Assessing ChatGPT's Performance as an Abdominoplasty Risk Calculator**

Abstract Presenter: Sophia Pressman

Abstract Co-Author(s): Sahar Borna MD; Cesar Abraham Gomez Cabello MD, Syed Ali Haider M.B.B.S., Antonio Forte MD, PhD, MS

**INTRODUCTION:** Accurate risk assessment is paramount in plastic surgery practice, particularly for the abdominoplasty, which is known for increased risks of complications like surgical site infection (SSI). Therefore, abdominoplasty risk calculators can provide insights into patient outcomes and complications. Vu et al. (1) developed an internally validated 30-day risk calculator for abdominoplasty, incorporating factors like age, body mass index, and comorbidities. With the rise of artificial intelligence like OpenAI's ChatGPT (2) in medicine, one may question how these models can be compared to and integrated with existing risk calculators such as that of Vu et al. This study aims to evaluate how accurately ChatGPT-3.5 and ChatGPT-4 can predict complication risks for abdominoplasty when compared to a validated calculator.

**METHODS:** Twenty-five abdominoplasty patient scenarios were presented to both ChatGPT-3.5 and ChatGPT-4, prompting the models to compute the 30-day risk of medical complications, superficial SSIs, deep or organ-space SSIs, dehiscence, and unplanned operations. Each scenario was provided twice to ensure consistency. The Abdominoplasty Risk Calculator developed by Vu et al. served as the benchmark for calculating gold standard values, against which the predictions of ChatGPT were measured. The deviations between the predictions of ChatGPT and the gold standard values were analyzed using descriptive statistics. Differences between models were assessed using a paired, two-tailed t-test.

**RESULTS:** Overall, ChatGPT-3.5 overestimated the risk of abdominoplasty complications by 2.2%, and ChatGPT-4 underestimated by 1.6% (p-value <0.001). When considering the deviation from the actual risks, ChatGPT-3.5 had an average deviation of 4.7% (SD 3.4), whereas ChatGPT-4 had an average deviation of 3.5% (SD 4.5). Both models exhibited their weakest performance in estimating medical

complication risks, with ChatGPT-3.5 and ChatGPT-4 averaging deviations of 6.3% and 6.1%, respectively. Notably, ChatGPT-4 performed best in predicting the risk of dehiscence, with an average deviation of only 1.4%, while ChatGPT-3.5 excelled in predicting deep or organ-space SSI, with an average deviation of 3.5%. ChatGPT-3.5 performed better than ChatGPT-4 only in predicting unplanned reoperation (4.2% vs. 4.5% deviation, p-value 0.015).

**CONCLUSION:** Accurate risk assessment tools are important for preoperative planning, especially for the abdominoplasty with its heightened risk profile compared to other cosmetic surgeries. The integration of LLMs, like ChatGPT, presents an intriguing avenue for potentially enhancing risk prediction accuracy. The evaluation of ChatGPT-3.5 and ChatGPT-4 in this study revealed both models, on average, provided a risk calculation within 5% of the gold standard. However, even minor deviations can have notable implications for patient safety, emphasizing the importance of precise risk estimation tools in medical practice and further refinement of LLMs.

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## **Plastic Surgeon Closure of Lumbar Spinal Surgery: Improving Wound-Related Outcomes**

Abstract Presenter: Daniel Kwon

Abstract Co-Author(s): Reanna Shah, Michael Saturno, Simeret Genet, Esther Kim, Ivory Fu, Olachi Oleru MD, Nargiz Seyidova MD, Jeffrey Russell MD, Peter Taub MD

**Purpose:** Rates of lumbar spine surgery are increasing due to advancements in surgical techniques and an aging population [1]. Due to the potential for large incisions in complex patients, plastic surgeons are often consulted to close lumbar spinal surgeries. The purpose of the present study is to examine if plastic surgeon closures of lumbar spine surgeries as a standard practice result in superior outcomes compared to closures performed by the primary surgeon as documented in the National Surgical Quality Improvement Program (NSQIP) Database.



**Methods:** Patients undergoing lumbar spine surgery at a large academic surgical center who were closed by the senior author (PJT) between January 2016 and June 2023 were included. Patient charts were reviewed for demographics, preoperative risk factors, and operative course including total operation time, incision length, estimated blood loss, and length of stay. The following wound-related complications were collected: superficial surgical site infection (SSI), deep SSI, organ/space SSI, wound dehiscence, seroma, hematoma, and CSF leak. The following medical complications were also collected: acute renal failure, transfusion, pneumonia, unplanned reintubation, failure to wean off ventilator, pulmonary embolism, urinary tract infection, stroke, cardiac arrest, myocardial infarction, deep venous thrombosis (DVT), sepsis, septic shock, and *C. difficile* infection. Rates of unplanned readmission and revision surgeries related to the primary procedure were noted. All included outcomes fell within a 30-day postoperative timeframe. Univariate and multivariate analyses were performed (statistical significance set at  $p < 0.05$ ), and outcomes were compared to those reported in 47,426 NSQIP cases after matching by CPT and ICD-10 codes.

**Results:** A total of 888 consecutive lumbar surgery patients whose closure was performed by a plastic surgeon were reviewed. Patients in the plastics closure group had lower rates of hypertension (52.7% vs 61.8%,  $p < 0.001$ ) but higher rates of diabetes (19.8% vs 6.7%,  $p < 0.001$ ) than those undergoing lumbar spine surgeries nationally. However, both wound-related revisional surgeries (1.2% vs 2.6%,  $p = 0.01$ ) and wound-related readmissions (1.5% vs 4.2%,  $p < 0.001$ ) were significantly lower for the plastics closure group than the NSQIP group. Rates of transfusion (2.7% vs 4.7%,  $p = 0.005$ ) and urinary tract infection (0.2% vs 1.3%,  $p = 0.004$ ) were also lower for the plastics closure group. Within the plastics closure group, ASA was the only operative characteristic that was significantly higher in patients with wound-related complications than those without (2.8 vs 2.5,  $p < 0.001$ ). There were no demographic or operative characteristics that were predictive of wound-related complications following plastic surgery closure.

**Conclusion:** Plastic surgeon closure of lumbar spine surgeries may decrease the risk of wound-related revisional surgeries and readmissions, even within a population predisposed to higher wound-related complication rates [2]. Therefore, the findings of this study provide support for increased plastic surgery consultation in lumbar spine cases.

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## **An Assessment of Patient-Reported Outcomes and Quality of Life Following Superior and Superomedial Weiss Pattern Reduction Mammoplasty**

Abstract Presenter: Marcos Lu Wang MD

Abstract Co-Author(s): Sophia Arbuiso, Ashley Zhang, Chase Alston, Isaiah Rhodes, David Otterburn MD

**Purpose:** Macromastia can negatively impact a patient's quality of life in several ways, and is associated with not only physical pain, but with emotional suffering as well (1). This study aims to quantify improvements in overall well-being following superior and superomedial Weiss pattern reduction mammoplasty.

**Methods:** Patients undergoing a reduction mammoplasty at a single institution were enrolled in this prospective study. Patients completed the BREAST-Q Reduction/Mastopexy Module, a standardized questionnaire used to evaluate patient-reported quality of life and satisfaction (2), at their preoperative clinic appointment and again at their postoperative clinic appointments. Paired t-tests were calculated to compare preoperative and postoperative scores.

**Results:** 10 BREAST-Q surveys were completed preoperatively and 10 were completed postoperatively following reduction mammoplasty, with a median follow-up time of 2.53 months (0.66-31.66 months). Average resected tissue was 714 grams per breast. Patients reported significant increases in physical well-being ( $p < 0.01$ ) and with satisfaction with their breasts ( $p < 0.01$ ). Psychosocial well-being and sexual well-being following reduction mammoplasty increased postoperatively but did not reach statistical significance ( $p > 0.05$ ). Patients reported high satisfaction with nipples with a mean score of 16.1 out of 20 possible points, high satisfaction with outcome with a mean score of 22.3 out of 24 possible points, and high satisfaction with the information they received preoperatively with a mean score of 41 out of 48 possible points.

**Conclusion:** These results suggest that reduction mammoplasty is associated with

increases in physical well-being, as well as high rates of overall satisfaction and satisfaction with postoperative appearance. Although objective data demonstrated decreased sensation of the NAC following reduction mammoplasty, this did not appear to impact the patients' sexual well-being. This data suggests that superior and superomedial Weiss pattern reduction mammoplasty are associated with greater benefits in the physical aspects of a patient's life, including physical pain and physical appearance, than in the emotional aspects of a patient's life, including psychosocial and sexual well-being, although these areas still demonstrated positive trends.

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## A Systematic Review of the Literature on the Use of Micro-needling for Facial Rejuvenation

Abstract Presenter: Jose Foppiani Mudr

Abstract Co-Author(s): Angelica Hernandez MD, Kassandra Beltran, Otakar Raska, Erin Kim MD, Maria Escobar MD, Bernard Lee MD, MBA, MPH, Dr. Samuel Lin MD

**Background:** Microneedling has seen a rise in popularity as a non-surgical alternative for facial rejuvenation. Consequently, the aim of this systematic review was to evaluate the patient-reported outcomes (PROs) and safety profiles associated with this technique.

**Methods:** A systematic review was conducted adhering to PRISMA guidelines to investigate PROs of microneedling. Descriptive statistics and a proportion meta-analysis was utilized for patient satisfaction using Stata statistical software.

**Results:** A total of 21 papers encompassing 723 patients undergoing micro-needling procedures were included in the meta-analysis. Of the included patient cohort, 71%

were female, 6% were male, and 23% were unknown. The average age of patients was 48.4 years. Pooled meta-analysis found that 83% of patients reported satisfaction with their treatment (95% CI [0.76; 0.88]). In 85% of cases, facial anesthetic was applied pre-intervention, with a median of 4 treatments (IQR 3-5) per patient. Furthermore, the most common reported adverse effects were transient erythema (6.77%), followed by scaling (1.65%), burning sensation (1.5%), and pruritus (0.41%).

**Conclusion:** The meta-analysis revealed that microneedling is associated with high patient satisfaction. Adverse effects were minimal and primarily encompassed transient erythema, scaling, burning sensation, and pruritus. The prevalence of high satisfaction alongside a low incidence of minor adverse effects underscores microneedling as a viable non-surgical alternative for facial rejuvenation. These findings can serve as a valuable reference for clinicians in informing patients and guiding practice, reinforcing the potential of microneedling in the spectrum of facial aesthetic procedures.

## **Optimizing Business Practice During the Different Seasons: A Google Trend Analysis of Aesthetic Surgery Consumer Patterns**

Abstract Presenter: Christian Palacios

Abstract Co-Author(s): Heli Patel, Maheen Akhter MD, Rahim Nazerali MD

Aesthetic surgeons must often adapt to rapidly-changing consumer trends, which shape the services they offer. However, several external factors can influence the frequency by which patients undergo aesthetic procedures, including seasonal changes, as well as trends in national consumer spending. In our study, we refer to Google Trend values (GTVs), which define search queries of a specific topic as a proportion of all search queries, and consumer spending to trend historic demands in aesthetic surgery.

Data from the American Society of Plastic Surgeons (ASPS) revealed frequencies of the five most commonly-performed aesthetic surgical procedures in 2005-2020, which included breast augmentation, liposuction, rhinoplasty, rhytidectomy, and blepharoplasty. Data on total annual consumer spending was collected from the Bureau of Economic Analysis (BEA) for this time period. Consumer interest was determined by querying each of the five procedures on Google Trends, which were then evaluated based on seasonal popularity. Pearson correlation coefficient and one-way ANOVA were used to analyze relationships across consumer spending, procedure frequency, seasonal patterns, and GTVs.

From 2005-2020, a total of 4.69 million breast augmentations, 3.83 million liposuction procedures, 4.19 million rhinoplasties, 2.06 million rhytidectomy procedures (excluding 2005), and 3.67 million blepharoplasties were performed by ASPS plastic surgeons. With regard to Google Trend search queries, breast augmentation and liposuction were most popular in the spring (GTV = 54.43,  $p = 0.0008$ ; GTV = 58.93,  $p < 0.0001$ , respectively) and least popular in the fall (GTV = 44.77,  $p = 0.0008$ ; GTV = 46.09,  $p < 0.0001$ , respectively). Rhinoplasty queries peaked in the summer (GTV = 37.25,  $p = 0.024$ ) and rhytidectomy queries in the winter (GTV = 18.36,  $p = 0.0014$ ). The frequency of rhytidectomy surgeries was found to have a significant positive correlation to consumer spending trends ( $r = 0.71$ ;  $p = 0.003$ ), while the frequency of breast augmentation surgery showed a significantly negative correlation to consumer spending trends ( $r = -0.49$ ;  $p = 0.05$ ). There was a positive correlation found between the frequency of blepharoplasties ( $r = 0.65$ ;  $p = 0.007$ ), rhytidectomies ( $r = 0.63$ ;  $p = 0.01$ ), and breast augmentations ( $r = 0.54$ ;  $p = 0.03$ ) and their corresponding GTVs.

The frequency of aesthetic surgeries and the volume of their online queries are significantly correlated to changes in consumer spending and seasonal patterns. Evaluating trends in aesthetic surgery can afford surgeons a greater familiarity with the ever-changing demands of a dynamic patient population. Understanding the conditions that elicit a higher demand of certain procedures can prompt surgeons to tailor their marketing and business practices and improve healthcare resource utilization. Future studies should further investigate similar trends by variation in geographical regions and may analyze the impact of sociocultural factors on the frequency of aesthetic procedures.

### **Three Decades of Outpatient Plastic Surgery Safety: A Review of 42,720 Consecutive Cases**

Abstract Presenter: Rachel Rohrich

Abstract Co-Author(s): Tal Brown BS, Stav Brown MD, Rod Rohrich MD, FACS

**Background:** Outpatient plastic surgery offers cost-effective solutions and enhanced privacy but demands careful patient assessment for suitability and vigilant anticipation of adverse events. This study provides recommendations to maximize patients' safety in the outpatient setting considering both patient- and procedure-specific factors, by analyzing over 40,000 consecutive cases spanning across three decades of clinical

experience.

**Methods:** We retrospectively reviewed all consecutive cases completed by board-certified plastic surgeons at an accredited outpatient surgical center between 1995-2023. Patient demographics, operative details, and postoperative complications were recorded to determine both patient- and procedure-specific risk factors for complications and inpatient admissions. Operative details included total operative-time, lipoaspirate amount, and whether the procedure was a combined case. Complications included hematoma, seroma, wound-dehiscence, infection, and venous thromboembolic events (VTE). Additionally, we collected complications that required return to the operating room (ROR) and admission to an inpatient facility. Continuous variables were compared using a student t-test and logistic regressions were utilized to assess the predictive value of variables. Receiver operating characteristic (ROC) curves were created for each variable and the Youden's method was used to determine the optimal cutoff points. A subgroup-analysis for procedures of the face, breast and body was also performed.

**Results:** 42,720 consecutive cases were performed with an overall complication rate of 0.74 percent (n = 318). Compared with the control population, patients who experienced a VTE or an inpatient transfer, had a higher BMI ( $p < 0.001$ ;  $p < 0.0001$ , respectively), longer operative duration ( $p = 0.0024$ ;  $p = 0.0012$ , respectively) and were more likely to have undergone combined procedures ( $p < 0.001$ ;  $p = 0.0001$ , respectively). Undergoing a combined procedure was the strongest predictive factor for VTE and inpatient admissions (OR = 12.65,  $p = 0.0009$ ; OR = 3.73,  $p = 0.0002$ , respectively), followed by longer operative time (OR = 1.45,  $p = 0.006$ ; OR = 1.32,  $p = 0.003$ , respectively).

**Conclusion:** To our knowledge, this is the largest long-term private practice plastic surgery study in accredited outpatient settings spanning almost 30 years, further confirming that outpatient plastic surgery can be done in a consistent and safe manner with proper preoperative evaluation and patient optimization. Postoperative monitoring should be considered for high-risk patients, particularly those with a BMI exceeding 26 kg/m<sup>2</sup>, operative times surpassing 3 hours, lipoaspirate volumes greater than 3 liters, and patients undergoing combined procedures - particularly in cases involving abdominoplasty.

## **Aesthetic outcomes in treating capsular contracture: A comparison of ovine reinforced hybrid mesh (Ovitex PRS) versus porcine acellular matrix (Strattice )**

Abstract Presenter: Cyril Harfouche MD

Abstract Co-Author(s): Michael Brucker MD, Salvatore Pacella MD

**Introduction:** Capsular contracture remains the most common and insidious complication in modern cosmetic breast augmentation. With incidence rates varying from 2-15% following primary breast augmentation, it is one of the leading indications for revisional augmentation procedures in the U.S. Capsulectomy, pocket revision and implant exchange is commonly considered the gold standard of surgical management for capsular contracture. However, clinical evidence to support this as a reproducible therapy is insufficient. Most recently, the use of pocket revision with acellular dermal matrices (ADM) has been widely adopted as effective treatment for recurrent capsular contracture. To date there has been no study documenting the efficacy of ovine-based or hybrid biologic/synthetic meshes in treatment of capsular contracture. In addition, this type of mesh has never been evaluated in comparison to standard porcine matrices that are commonly utilized for treatment of capsular contracture. In this study, we present a consecutive clinical comparison of the use of Ovitex™ PRS (a 2 ply reinforced absorbable matrix) to porcine mesh (i.e. Strattice™) in treatment of capsular contracture.

**Methods:** A retrospective analysis was conducted at two participating private practice centers from May 2016 to Nov 2023 on Patients undergoing revision breast augmentation for Baker grade III or IV capsular contracture utilizing Strattice™ (LifeCell Corporation, Branchburg, NJ) or Ovitex™ PRS Resorbable (TELA Bio, Malvern, PA) Mesh. Patient charts were reviewed for patient outcomes and post-operative recurrence of capsular contracture. Cost of each type of mesh was determined and compared per square cm based on standard pricing from each vendor. Statistics were performed utilizing IBM SPSS v28.0 (Armonk, NY). Statistical Methods employed include descriptive statistics, Wilcoxon signed rank sum test was used to compare the primary outcome measure between both groups. In addition, multivariate regression analysis was conducted to control for confounding variables between both groups.

**Results:** Mean patient age was  $55.9 \pm 11.9$  years. A total of 89 breasts were included in the analysis with a mean follow up of  $357 \pm 206$  days after surgery. 59(66.3%) breasts were treated with Ovitex™ and 30(33.7%) were treated with Strattice™. All patients experienced a reduction in Baker grades. Patients treated with Ovitex™ had a statistically significant decrease in grade change post-operatively when compared with

the Strattice™ group ( $p < 0.05$ ). Of note, 4 cases presented with recurrent contracture following previous placement of Strattice™ and were salvaged with Ovitex™, they all returned to Baker Grade 1. In the Ovitex™ group, 57 (96.6%) breasts exhibited a postoperative contracture grade of 1, while only 2(3.4%) experienced a grade 2 capsular contracture compared to 22(73.3%) and 7(23.3%) in the Strattice™ group, respectively. There was one recurrence of grade 3 capsular contracture in the Strattice™ cohort. Average cost was \$27.37/cm<sup>2</sup> for Strattice™ compared to \$22.28/cm<sup>2</sup> for Ovitex™.

**Conclusion:** Ovitex™ PRS Resorbable may be successfully utilized to treat capsular contracture. Patient outcomes are similar and may be superior to Strattice™ in recurrent capsular contracture, particularly when a previous acellular matrix had been utilized. Cost data shows significant cost savings with the use of Ovitex™ compared to Strattice™.

## **A Systematic Review of liposuction-induced lymphedema in patients with lipedema.**

Abstract Presenter: Osama Darras MD

Abstract Co-Author(s): Samer Adawi, Diwakar Phuyal MD, Rommy Obeid, Mazen Al-Malak MD, Fuad Abbas, Riley Marlar MD, Filippo Andrea Giova Perozzo MD, Raffi Gurunian MD

**Background:** Suction-assisted lipectomy, also known as liposuction, has proven effective in alleviating the symptoms experienced by patients with lipedema. However, its impact on lymphatic function remains largely unknown. This systematic review was designed to look for the literature evidence of liposuction-induced lymphedema for patients with lipedema.

### **Methods:**

We aimed to review the literature for articles investigating the lymphatic function in liposuction patients using a specific search algorithm on these databases; Cleveland Clinic's Journals, Books@Ovid, MEDLINE, AGRICOLA, APA PsycInfo, and Embase. The techniques were classified, outcomes and complications analyzed, papers not mentioning lymphedema as an outcome were excluded.

**Results:** Studies were identified and analyzed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Multiple languages were included. Case studies with less than 3 patients, commentary, expert opinion, editor's



letter, and duplicate studies were excluded. 146 papers underwent abstract screening, 31 underwent full text screening yielding the final 5 papers included in our review. A total number of 255 patients included in this review from our final 5 papers. Only 13 patients developed lymphedema after liposuction. Of the identified cases, 5 of them had stage 2 lipedema, 5 had stage 3 lipedema, and none had stage 1 lipedema. All but one patient had tumescent lymph-sparing liposuction. The patients' ages ranged from 22 to 77 years old. Patients developed lymphedema after different liposuction sessions. This ranged from 1 to 3 sessions; however, this was underreported in the studies. The diagnosing method of lymphedema is underreported as well. Only mentioned in two patients were diagnosed using lymphoscintigraphy.

**Conclusions:** Although there is significant body of evidence that liposuction improves lipedema, there may be a risk associated with impairing lymphatic function although the risk seems low. The findings of this review were not conclusive due to the low incidence of liposuction-induced lymphedema and may be due to underreporting. Therefore, there is a need for more endeavors to undertake retrospective cohort, case control and case series studies aimed at exploring the development of lymphedema after liposuction within different hospitals databases to help patients be fully informed about the procedure.

### **Apixaban for VTE Prophylaxis Following Abdominoplasty: Establishing a Safety and Efficacy Profile**

Abstract Presenter: Jonathan Bricker MD

Abstract Co-Author(s): Sarah Ferenz, Simon Moradian MD, Kareem Termanini MD, Brandon Jackson MD, John Y.S. Kim MD

**Purpose:** Abdominoplasty is responsible for the majority of venous thromboembolic events (VTE) that occur in aesthetic surgery cases. The Caprini Risk Assessment Model is a validated tool developed to assess VTE risk and guide postoperative anticoagulation, often with a low molecular weight heparin like enoxaparin. However, many surgeons are hesitant to administer it following abdominoplasty due to concerns of postoperative hematoma. Apixaban, a newer oral anticoagulant, is emerging as a potential alternative to enoxaparin, but more research is needed to assess its association with hematoma development. Therefore, the goal of this study is to assess the safety and efficacy of apixaban as a method of anticoagulation for abdominoplasty

patients.

**Methods:** A retrospective chart review was conducted on 282 consecutive abdominoplasty cases performed by the senior author between 2018 and 2023. Patient demographic information and surgical details were obtained from the chart, including concurrent procedures, length of time in the operating room, and any use of postoperative anticoagulation. The primary outcome variables, venous thromboembolism and hematoma, were recorded. Data was analyzed using IBM's SPSS Software (Armonk, NY) and statistical significance was set to  $p < 0.05$ .

**Results/Complications:** 282 patients were identified, 275 female (97.5%) and 7 male (2.5%), with an average age of 42.5 years (range 25 – 77). Average preoperative weight and BMI were 75.2 kg (44.2 – 128.2) and 27.5 (17.5 – 44.1), respectively. Average surgical duration was 227 minutes (104 - 426). Two-hundred sixty-one (92.6%) patients had concurrent direct lipectomy and liposuction, 266 (94.3%) rectus muscle plication, and 78 (27.7%) a concurrent breast procedure. Average follow up time was 6 months (0 – 37).

One-hundred eleven (39.4%) patients received postoperative anticoagulation. Eighty-seven (30.9%) were prescribed prophylactic apixaban. Twenty-four patients (8.5%) were prescribed an alternative blood thinner (enoxaparin or rivaroxaban). Patients who were prescribed apixaban had greater mean age (43.9 vs 41.7,  $p = 0.019$ ), surgical duration (245.1 min. vs 216.4,  $p < 0.001$ ), preoperative BMI (30.4 vs 25.7,  $p < 0.001$ ), and weight (82.9 kg vs 70.2,  $p < 0.001$ ) compared to those who were not.

Three patients (1.1%) developed VTE postoperatively. Of these, one was prescribed two weeks of postoperative enoxaparin and developed a PE one month from surgery. The second developed a PE within 24 hours of surgery on no postoperative anticoagulation. The third patient completed two weeks of apixaban after undergoing abdominoplasty with liposuction, direct lipectomy, rectus plication and mastopexy. She returned a month later for minor debridement surgery. Given the short duration of the surgery, she was not prescribed additional postoperative anticoagulation. One week later, she was hospitalized for a saddle PE and left popliteal DVT.

Four patients (1.4%) developed a postoperative hematoma requiring drainage in the operating room. None (0%) of these patients were on prophylactic anticoagulation when they developed the hematoma.

**Conclusion:** Apixaban is a safe and effective alternative to enoxaparin for VTE prophylaxis after abdominoplasty. Further studies with larger sample sizes and direct

comparisons of various anticoagulants are needed to delineate the comparative safety and efficacy profiles.

## **Is liposuction a safe and effective treatment for lipedema? A systematic review and meta-analysis**

Abstract Presenter: Syed Farhan

Abstract Co-Author(s): Muhammad Sohaib Khan, Lambros K Viennas

**Introduction:** Lipedema, a chronic loose connective tissue disease (LCT) primarily affecting women, poses significant challenges in both diagnosis and treatment. Characterized by disproportionate lipedema tissue distribution in the extremities, buttocks, and lower abdominal wall, it is resistant to diet, exercise, and weight loss<sup>1-2</sup>. Lipedema, associated with comorbidities including lymphedema, venous disease, and joint disease, can lead to pain, mobility issues, edema, inflammation, poor quality of life, and psychological distress<sup>1</sup>. Although non-surgical options, including medical treatment, comprehensive decongestive therapy, exercise, and diet, can improve symptoms, liposuction is currently the only proven therapeutic treatment for lipedema<sup>3, 4</sup>. This systematic review and meta-analysis article aims to provide a comprehensive overview of liposuction as a treatment modality for lipedema, exploring its efficacy, safety, and long-term outcomes.

**Methods:** A literature search of PubMed (MEDLINE), Cochrane CENTRAL, and Google Scholar was conducted for relevant studies till 31st January 2024. Only studies reporting on patients undergoing liposuction for lipedema procedures were included.

**Results:** Nine studies reported that 668 patients underwent lipedema treatment, while the total procedures in each study ranged from 40 to 519. The mean time per procedure was 118 minutes. The Mean Total Lipoaspirate volume per liposuction ranged from 2482 mL to 6355 mL, while the Mean Volume of Removed Fat per Liposuction ranged from 1909 mL to 3831 mL. The infection rate varied from 0.34% to 1.4% between the two reported studies. Spontaneous pain as Visual Analogue Scores (VAS) was found to have decreased by standard mean difference (SMD) of 4.27 (95% CI [2.70, 5.83];  $p < 0.001$ ). Quality of Life (QOL) was increased after liposuction in all studies by SMD 2.41 (95% CI [1.71, 3.11];  $p < 0.00001$ ). Sensitivity to pressure was also found to be decreased post-operatively after liposuction by SMD 1.41 (95% CI [0.52, 2.30];  $p = 0.002$ ).

**Conclusion:** In conclusion, our systematic review and meta-analysis support the efficacy of liposuction as an effective and safe treatment modality for lipedema, offering significant reductions in pain and sensitivity to pressure. Patients reported quality of life (QOL) increased post-operatively after liposuction. The infection rate was minimal, and a majority of complications were minor in severity.

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## **A Novel Injectable Composite Collagen Hydrogel for Dermal and Soft Tissue**

Abstract Presenter: Xue Dong MD, PhD

Abstract Co-Author(s): Samuel Medina, Jini Jeon, Tim Li, Riley Mayne, Jason Spector MD

**Purpose:** Soft-tissue augmentation (STA) is a frequently performed procedure for both reconstructive and aesthetic purposes. Autologous fat and hyaluronic acid are the most used materials for STA, but the former is beset by inconsistent graft take and the need for a surgical procedure, whereas the latter, although available off the shelf, requires reapplication every 1-2 years as it induces little to no new tissue deposition. A previous study of microsphere dermal templates (MDT), novel collagen hydrogel scaffolds containing high-density collagen microspheres embedded in low-density collagen bulk, demonstrated significantly more rapid and robust vascularization compared to the commonly used commercial wound matrix Integra™. Herein we tested a flowable form

of the MDT to see if it would similarly support local tissue ingrowth and induce the deposition of new and permanent tissue resulting in long lasting augmentation.

**Methods:** Sterile 1% atelocollagen microspheres (80-300um in diameter) were mixed with 0.3% telocollagen bulk at different microsphere-to-bulk ratios, including 70:30, 50:50, 30:70, to fabricate a homogeneous viscous solution for injection. The mixed collagen suspension was then injected in a subcutaneous immunocompetent mouse model with 500ul placed bilaterally on the dorsa. The mixed collagen suspension was cured into hydrogel in situ after injection. Quantification of volume retention and histologic analysis of the injected substrates were performed.

**Results:** All the collagen suspension groups were gel-like substances after mixture and were easily injected via an 18G needle subcutaneously with no leakage. The groups with higher collagen microsphere ratios showed greater volume retention after both 30 days (70:30: 112.4%, 50:50: 84.2%, 30:70: 53.6% of T0 volume) and 90 days (70:30: 121.9%, 50:50: 84.0%, 30:70: 63.9% of T0 volume). Maintenance of projection and shape of the injected hydrogel was correlated with higher collagen microsphere-to-bulk ratios. Robust neovessel formation was noticed grossly on the surface of the explants as early as 30 days (seen in Figure). Histologic analysis demonstrated an even distribution of collagen microspheres throughout the entirety of the injected hydrogel with appreciable cell infiltration and vascularization within the bulk collagen. The amount of M1 and M2 macrophages significantly decreased overtime, demonstrating minimal inflammation and there was no evidence of an adverse foreign body reaction. In addition, increased host collagen deposition and collagen maturation was noted over time in all groups, with the 70:30 groups showing the most robust tissue regeneration.

**Conclusions:** In contrast to the rapid degradation seen with monophasic collagen solutions that were initially used to provide soft tissue fill, this simple but unique composite collagen hydrogel promotes neovascularization and tissue regeneration resulting in complete maintenance of the volume and projection of the injected material. Longer term studies are ongoing to verify the longevity of the new tissue formed.

## **Establishing Test-Retest Reliability and Smallest Detectable Change of FACE-Q Aesthetic Module Scales**

Abstract Presenter: Lucas Gallo MD

Abstract Co-Author(s): Patrick Kim, Anne Klassen PhD, Achilleas Thoma MD, Matthew Gallo BHSoc

**BACKGROUND:** The test re-test (TRT) reliability of FACE-Q Aesthetic scales has yet to be assessed. The aim of this study was to establish the TRT reliability of 17 FACE-Q Aesthetic scales, as well as to determine the smallest detectable change (SDC) that can be identified by these scales.

**METHODS:** Data were collected from an online international sample (i.e., Prolific). Participants  $\geq 20$  years old, who had been to a dermatologist or plastic surgeon for a facial aesthetic treatment within the past 12 months were asked to provide demographic and clinical information and complete an online REDcap survey consisting of 17 FACE-Q Aesthetic scales. Participants were asked if they would be willing to complete the survey again in 7 days. Only participants who reported no important change in the scale construct and completed the re-test within 14 days were included.

**RESULTS:** A total of  $n=472$  participants were invited to complete the TRT survey. The mean age of the sample was 36.6 ( $\pm 11.5$ ) years and 82.4% were female. With outlier data removed, all FACE-Q scales demonstrated an  $ICC > 0.70$  indicating 'good' TRT reliability. The standard error of measurement for included scales ranged from 3.37 – 11.87, corresponding to a range of SDC(group) from 0.95 to 3.23 and SDC(ind) from 9.34 to 32.91.

**CONCLUSION:** All included FACE-Q scales demonstrated sufficient TRT reliability and stability overall after outlier data were removed.

## **Weight Changes Following Abdominoplasty: Factors Affecting Continued Weight Loss at 5 Years Follow-up**

Abstract Presenter: Jonathan Bricker MD

Abstract Co-Author(s): Sarah Ferenz, Simon Moradian MD, Kareem Termanini MD, Brandon Jackson MD, John Y.S. Kim MD

**Purpose:** Abdominoplasty may be considered a procedure performed after a patient has already lost weight, but many surgeons have clinically observed that patients continue to lose weight in the postoperative period. This study sought to quantify continued weight loss following abdominoplasty.

**Methods:** A retrospective chart review was conducted on all abdominoplasty cases performed by the senior author between 2018 and 2022. Patients were excluded from analysis if they did not have at least one postoperative weight recorded. Patient demographics were obtained, including preoperative weight and BMI. Subsequent weights were recorded at 3, 6, 12, 24, 36, and 60 months. One weight was documented 6-12 months prior to surgery to calculate preoperative weight loss. Independent samples t-tests and chi-square tests were used for comparisons of continuous and categorical variables, respectively. Data was analyzed using IBM's SPSS Software and significance was set to  $p < 0.05$ .

**Results:** 186 patients met inclusion criteria, 180 female (96.8%), 6 male (3.2%), with average age of 42.6 years (range 25 – 66). Average surgical duration was 226 minutes (104 - 426). 168 (90.3%) patients had direct lipectomy/liposuction performed at the time of abdominoplasty, and 173 (93%) had rectus muscle plication. 18 (9.7%) patients had prior bariatric surgery. Average follow up time was 7 months (0.23 – 37).

Average preoperative weight and BMI were 167.4 lbs (97.4 - 282.6) and 27.8 (17.5 - 41.8), respectively. The average weight and percentage of body weight change at last recorded follow up was -4.3 lbs (-64 to +29.8 lbs) and -2.2% (-40 to +17%). At the recorded intervals these changes were -5.7 lbs (-3.1%) at 3 months, -5.2 lbs (-2.7%) at 6 months, -4.5 lbs (-2.5%) at 12 months, -4.9 lbs (-2.6%) at 2 years, -6.0 lbs (-3.1%) at 3 years, and -9.8 lbs (-5.3%) at 5 years.

Overall, 60.8% of patients lost weight postoperatively, compared to 39.2% who stayed the same or gained weight. Those who lost weight had a significantly greater preoperative weight (173.5 vs 157.7 lbs,  $p = 0.003$ ) and BMI (29 vs 25.9,  $p < 0.001$ ) compared to those who stayed the same or gained weight. No significant differences were noted in rates of prior bariatric surgery, pregnancy, hypertension, diabetes and former smoking status between these groups. A higher percentage of patients who underwent direct lipectomy and liposuction lost weight after surgery compared to those who didn't (64.3% vs 27.8%,  $p = 0.003$ ).

Average weight change in the 12 months prior to surgery was -1.0 lbs (range -53 to +30.9 lbs). There was a small negative correlation detected between percentage of body weight lost prior to surgery and after ( $r = -0.26$ ,  $p = 0.002$ ).

**Conclusion:** Most patients undergoing abdominoplasty experienced continued weight loss up to 5 years postoperatively. Those who continued to lose weight had higher preoperative weights/BMIs and were less likely to have significant weight reduction prior to surgery. Further studies are needed to assess changes in aesthetics and body contour with continued weight reduction and correlate results to patient satisfaction.

## **The Effect of Open Browlift on Nasal Aesthetics and Morphometrics**

Abstract Presenter: Vikram Mookerjee MD

Abstract Co-Author(s): Seema Shrestha, Louisa Darko, Derek Steinbacher MD, DMD, FACS

**Purpose:** Surgical elevation of the brow can affect the appearance of the facial upper third, midface, and nose. In particular, raising the brow can generate the appearance of a more rotated nasal tip. However, there is no quantitative data examining how browlift affects nasal aesthetics. The purpose of this study was to quantify the impact of open browlift on nasal morphometrics.

**Methods:** A retrospective study of adult patients undergoing open browlift was conducted. Three-dimensional photogrammetric evaluation of the facial upper third and nose was performed pre- and post-operatively (Vectra; Canfield Scientific, Parsippany, N.J.). Standard anthropometric points were placed and measured. Outcome variables were nasofrontal angle, tip projection, tip rotation (as a function of nasolabial angle), supratip break angle, nasal length, and the Goode ratio (defined as the ratio of nasal projection to nasal length). Data analyzed over time included preoperatively, at immediate (1-2 weeks) follow up, and at intermediate (>6 months) follow up. Statistical analysis was performed using dependent t-test to compare between time points, with values of  $p < 0.05$  considered statistically significant.

Surgical maneuvers and approach were the same for all patients. An open browlift approach was undertaken, starting with a trichophytic incision in the anterior hairline and dissection carried down in the subperiosteal plane. The temporal fusion line was undermined to continue the dissection laterally, immediately superficial to the deep temporal fascia, and then down into the midface. The deep surface of the frontalis was radially scored with electrocautery to reduce muscle activity. Permanent sutures were placed in the periosteum deep to the peak of each eyebrow, then suspended on



monocortical bone screws placed superiorly in the frontal bone. The trichophytic incision was closed with permanent suture.

**Results:** Total ten patients were included. The mean decrease in nasofrontal angle pre- and post-operatively was -2.98 degrees ( $p < 0.01$ ). The mean increase in nasal tip rotation was 3.09 degrees ( $p < 0.01$ ). The mean increase in supratip break was 2.86 degrees ( $p < 0.01$ ). These changes were maintained at intermediate follow up. Changes in tip projection, nasal length, and the Goode ratio were not statistically significant.

**Conclusions:** Open browlift appears to directly affect nasal aesthetics. In this study, patients undergoing open browlift experienced decreases in nasofrontal angle and increases in nasal tip rotation and supratip break. This study provides evidence that open browlift predictably affects nasal morphometrics, which may assist surgeons with preoperative counseling and intraoperative decision making.

### **Mapping Mandibular Aging in the White Population: AI-Enhanced Shape Analysis of the Lower Facial Third Bony Changes Based on 3D CT Scans of 280 Patients**

Abstract Presenter: Sara Hussein MD

Abstract Co-Author(s): Alexandre Meira Pazelli MD, Abdallah Abu Shehab MD, Jess Rames MD, Meng, Adam Wentworth, Basel Sharaf MD

**Background:** The facial skeleton undergoes dynamic resorption and remodeling with aging which impacts facial shape. Despite the recognition of these skeletal alterations, sparse research has been conducted to explore facial skeletal aging in-depth. This study aims to assess the aging pattern of the mandible, which forms the lower third of the face and the transition point to the neck, and comprehensively analyze normal population across different genders and age groups.

**Methods:** A retrospective study was approved by our institutional review board, where head and neck Computed Tomography (CT) scans and demographic data of white ethnicity were imported and analyzed. We divided our cohort into three age groups (20:39, 40:59, and 60:79 years old) and further stratified them by gender. We excluded trauma scans and edentulous individuals or any suspicion of deformities and orthodontics interventions. 3D CT scans were reconstructed by Machine-Learning (ML)-assisted scripts in Mimics software v.25 for each subject. Statistical shape modeling (SSM) was used to create an average 3D mandible for each age group. Of a total of

280 mandibles, we conducted pair-wise analysis where 20:39 SSM was compared to 40:59 and 60:79, and 40:59 was compared to 60:79 for each gender. Contour variation was analyzed using 3D overlays and heatmaps analysis. Furthermore, semi-automated anthropometric landmarks were identified, and linear and angular measurements were calculated.

**Results:** The most pronounced bone resorption was observed across the midline and the inferior border of the mandible. The ramus height showed marked decrease with aging in both genders, aligning with the linear measurements. This resorption is more extensive in females with 3 ( $\pm$  5.23) mm reduction ( $p < 0.001$ ) among the 60:79 age group. In contrast, Inter-rami and inter-condylar widths increased with age with a mean 4.42 mm widening, which shows rami divergence with aging ( $p < 0.01$ ). The widening was more posterior towards the condyles for females and more anterior towards the coronoid process in males. Bigonial width did not show significant changes ( $p = 0.54$ ). The gonial angle increased with aging in females from 119.3 to 123.2 degrees ( $p < 0.01$ ). However, the gonial angle for males does not follow a clear pattern, except for the extra bone resorption in the characteristic gonion projection ( $> 3$  mm), giving a smoother transition to the rami with aging. Anteriorly, even with retained anterior teeth, there is a subtle inward collapse of the middle height of the mandibular body, demonstrating high-level resorption across the alveolar side. This finding was particularly notable in females, where it leads to chin protrusion; with an increase of up to 11.1 degrees ( $p < 0.01$ ) in the alveolar angle.

**Conclusions:** By leveraging AI-assisted shape analysis, we bridge the gap in aging research between historical knowledge and advanced technology. The mandibular bone resorption intensifies during the 5th and 6th decades, leading to structural changes such as rami divergence, slight alveolar inversion, and chin protrusion, particularly in females. These findings underscore the need for personalized aesthetic interventions as part of facial rejuvenation and reconstruction management based on age and gender.

### **A systematic review of the efficacy and safety of autologous vs irradiated homologous cartilage grafts for dorsal augmentation rhinoplasty**

Abstract Presenter: Dinithi Liyanage MD

Abstract Co-Author(s): Sushanth Vayalappa MD, Jonathan Suresh, Ankur Khajuria MD

**Background:** Various graft materials, including septal, auricular, and costal cartilage, as well as alloplastic implants, have been utilized for dorsal augmentation rhinoplasty.

Autologous costal cartilage (ACC) is frequently used due to its availability and strength, despite potential complications such as hypertrophic chest scars and pneumothorax. Irradiated homologous costal cartilage (IHCC) has emerged as an alternative to mitigate these risks. Prior systematic reviews evaluating autologous and/or irradiated homologous grafts have been of low methodological quality. We conducted a high-quality systematic review to evaluate outcomes for ACC versus IHCC for dorsal augmentation.

**Methods:** The study was registered a priori on PROSPERO (CRD42023445786). MEDLINE, EMBASE, Google Scholar, and the Cochrane Central Register of Controlled Trials databases were searched up to October 2023. Data extraction and quality assessment were performed by two independent authors. The main outcomes of interest were warping, resorption, revision rates, infection rates, and displacement. GRADE and Cochrane's ROBINS-I were used to assess the methodological quality and risk of bias respectively.

MEDLINEs:

**Results:** Out of 1527 articles identified, 43 studies with 2774 participants were included in the overall analysis (29 retrospective, 14 prospective). IHCC grafting occurred in 1353 patients while ACC grafting occurred in 1913 patients. For both ACC and IHCC, warping was seen in 101/921 (11%) patients and 25/1252 (2%) patients respectively. 2% (16/760) patients in the ACC groups experienced resorption of graft compared to 6% (977/1235) in the IHCC group. 107/1492 (7%) patients had to undergo a revision surgery for various reasons in the ACC group compared to 49/1233 (4%) patients in the IHCC group. 3% (35/1325) patients had infection in the ACC group vs 2% (17/1135) in the HCC group. Displacement was observed in 28/1098 (3%) patients with ACC and 8/1042 (1%) patients with IHCC. 94% of patients reported very satisfactory or satisfactory results in both groups. Upon completing the risk of bias assessment, the majority of the papers showed a serious risk of bias.

**Conclusion:** Robust evidence for superiority of one graft type over the other for dorsal augmentation rhinoplasty is lacking. Prospective, level I data, incorporating standardized clinical and patient-reported outcomes is urgently needed, to optimize informed consent.

## **Efficacy and Safety of STRATAFIX for Panniculectomy and Abdominoplasty**

Abstract Presenter: Anshumi Desai MD

Abstract Co-Author(s): Katelyn McClintock, Orel Tabibi, Rohan Mangal, Armaan Sobhan, Devinder Singh MD, Wrood Kassira MD, Peter Borowsky

**INTRODUCTION:** Panniculectomy and abdominoplasty are frequently performed by plastic surgeons to address both aesthetic and functional concerns. The variability in surgical approaches significantly influences the duration of surgery, complications, and overall outcomes (1). STRATAFIX™ (Ethicon, Somerville, NJ, USA) is an absorbable knotless suture that provides a few key advantages over conventional suture, such as reducing operating room time, eliminating potential knot-related complications, and reducing suturing difficulty (2). It is widely used by plastic surgeons; however, there is a lack of data on its use for panniculectomy and abdominoplasty. We aimed to study its efficacy and safety for panniculectomy and abdominoplasty.

**METHODS:** A retrospective cohort study included patients undergoing panniculectomy or abdominoplasty between January 2020 to September 2023 at a single institution with a follow-up of 90 days after surgery. Patient demographics, treatment characteristics, and outcomes were collected from the electronic medical records. Patients were stratified into two cohorts: those who underwent subdermal closure with STRATAFIX (n=22, 23.6%) and those who did not (n=71, 76.3%). The primary outcome measure was to compare the difference in complication rates between the cohorts. The secondary outcome included the measurement of the operative time.

**RESULTS:** Of 93 patients meeting the inclusion criteria, mean age and BMI were 44 years [SD 9.7], and 32.9 kg/m<sup>2</sup> [SD 6.7] respectively. Baseline demographics like age, BMI, smoking status, and comorbidities were similar across both cohorts. The history of massive weight loss (p=0.008), functional etiology for surgery (p=0.001), and use of closed-incision negative pressure therapy (ciNPT) (p<0.001) were significantly higher in the non-STRATAFIX cohort. Complications were higher in the non-STRATAFIX group (22.5% vs. 13.6%, p=0.037). Major infection rates requiring IV antibiotics were 7% (n=5) in the non-STRATAFIX group and 4.5% (n=1) in the STRATAFIX group (p=0.68). Oral antibiotic-treated minor infections were equal at 7% (n=5) and 4.5% (n=1) respectively (p=0.68). Seroma occurred in 1.4% (n=1) of non-STRATAFIX patients, with none in the STRATAFIX group. Major wound complications were 11.3% (n=8) in the non-STRATAFIX and 4.5% (n=1) in the STRATAFIX cohort (p=0.37). Hematoma was reported in 2.8% (n=2) of non-STRATAFIX patients. No re-operations, hypertrophic scars, skin necrosis, scar contracture, or suture granuloma were noted in either group.

Fat necrosis was more common in the STRATAFIX group (9.1% (n=2) vs. 4.2%(n=3), p=0.38). Logistic regression analysis controlling for age, BMI, etiology, smoking, history of weight loss, and ciNPT usage reaffirmed these findings. For standalone panniculectomy and abdominoplasties (n=51), the average operative time was 140.46 minutes [SD 68.8] for the non- STRATAFIX cohort (n=39), against 118 minutes [SD 56.3] for the STRATAFIX cohort (n=12) (p=0.31).

**CONCLUSION:** Overall complications, individual complications, and operative time were lesser in patients with STRATAFIX for subdermal closure, however not statistically significant. Further studies with larger sample sizes may be needed to confirm these findings and achieve statistical significance.

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## **Nasal Tip Deprojection in Rhinoplasty**

Abstract Presenter: Shaishav Datta MD

Abstract Co-Author(s): Bugra Tugertimur MD, Steven Hanna MD, Paige Goote MD, Matthew Morris MD, David Mattos MD, Richard Reish MD, FACS

**Purpose:** Rhinoplasty is one of the most commonly performed facial surgeries in the USA [1]. There exist many major and minor nasal tip support structures that impact tip projection [2, 3]. Overprojection may result from anatomic factors or may occur iatrogenically during primary rhinoplasty. Achieving reliable, reproducible, and stable results is the aim of nasal tip deprojection rhinoplasty. The senior author's technique, detailed here, effectively corrects overprojection while preserving tip strength and minimizing the need for subsequent revisions.

**Methods and Materials:** A retrospective chart review of 2,003 rhinoplasty cases in the senior author's practice was conducted between July 2014 to June 2022. The inclusion criteria were cosmetic or functional rhinoplasty cases with nasal tip deprojection, with a minimum of 12 months of follow-up. Outcomes of interest included the rate of operative

revisions, overall rate of operative take-back, and the rate of postoperative infection.

**Results:** 447 patients met the inclusion criteria. The mean age of our study group was 32.1 years old, with 409 females. 291 cases were primary rhinoplasties. Mean follow-up period was 22.4 months. Eight patients (1.8%) required empiric antibiotics postoperatively, with 17 patients (3.8%) requiring operative revision.

**Conclusions:** Our case series demonstrates that combining resection of the medial crura with lateral crural steal and a columellar strut graft allows us to achieve considerable nasal tip deprojection with control over tip rotation and a strong foundation for long-term stability. The comprehensive patient follow-up spanning at least 12 months further supports the reliability of our technique.

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## **Peeling the Curtain: Techniques for Preparing and Applying Chemical Peels to the Face and Neck**

Abstract Presenter: Mehdi Lemdani

Abstract Co-Author(s): Jane Ewing, Zachary Gala MD, Robyn Broach, Ivona Percec MD, PhD, Stephanie Honig MD

**BACKGROUND:** While advances in aesthetic devices represent new therapies for aesthetic improvement of the skin, chemical peels remain a reliable and effective therapy that can be adjusted to the individual patient's skin type with differing peeling agents and their formulations. The aim of this study is to share techniques for the preparation, application, and post-application management of chemical peels for aesthetic improvement of the facial skin.

**METHODS/TECHNIQUE:** Consent was obtained from the patients to share their results

for this study. Five patients received chemical peels in applications that included use of Glytone Enerpeel products: 1) 30% Pyruvic Acid, 10% Lactic Acid (LA), 0.5% Ferulic Acid; 2) 20% trichloroacetic acid (TCA), 10% LA and 0.5% Kojic Acid, 3) 25% TCA; 4) 40% TCA and 5) 50% Pyruvic Acid formulations. All received 3.75% trichloroacetic (TCA), 15% LA peels to the eyelids and lips. Immediate pre-procedure and post-procedure photos were collected for patients and follow-up was done on day seven.

Application of a peel should ideally be preceded by four to eight weeks of tretinoin as a pretreatment that enhances the peeling agent's penetration. Prior to applying the peeling agent, a lipid reagent should be applied at the medial and lateral canthus to protect the eyes, as well as alar bases and oral commissures to protect these regions.

Application of the peeling agent can be done with a nylon brush, which exfoliates skin and deeper penetration. When brushing caudally from the neck, a "feathering" pattern should be done at the edge to conceal the line demarcation between peeled and unpeeled skin. Stronger formulations can cause significant level II to III frosting, a process where the skin appears white-coated or completely white due to significant protein denaturation of the keratin. The degree of frosting should be monitored when applying, with consideration also given to patient skin type, tolerance, and area of the face.

Following application of the peeling agent a neutralizing wipe, such as an amino acid-based solution, should be gently pressed where the peeling agent was applied but should not be rubbed. An epidermal "mask" of exfoliated skin should form approximately three days after the procedure for moderate to deep peels. The patient should be counseled to continue applying the recovery balm generously and allow the skin to heal from the inside out.

**RESULTS:** The results of the senior author's methods resulted in no complications for any of the patients. All patients expressed satisfaction with their results. While slight variation existed from patient to patient, results were consistent, and patients showed good recovery from the procedure.

**CONCLUSION:** Chemical peels remain an effective therapy for aesthetic improvement of the skin of the face and neck. The techniques and types of peeling agents discussed maximize penetration and even distribution of the agent while taking into account patient tolerance, skin type, and needs. Plastic surgeons should be facile with this excellent tool for skin rejuvenation in the aesthetic surgery armamentarium.

## **Eyelid skin in Morbihan disease is pathologically chronic lymphedema and is an indication for super-microsurgical lymphaticovenous anastomosis**

Abstract Presenter: Shinsuke Akita MD, PhD

Abstract Co-Author(s): Kentaro Kajiya, Enkhtuul Gantumur, Kazuki Takagaki, Nao Itai, Nobuyuki Mitsukawa MD, PhD

**Background:** Super-microsurgical lymphaticovenous anastomosis (LVA) has been developed in the field of extreme lymphedema. We reported that the histological changes in the microlymphatic vessels of chronic lymphedema of the extremities depend on the degree of progression of the lymphedema, and that in irreversible advanced lymphedema, the junctions of lymphatic endothelium of the lymphatic capillaries are remodeled from discrete bouton-like structures to continuous zipper-like structures<sup>1</sup>. LVA may also be useful to treat eyelid lymphedema. The aim of the study was to test the therapeutic effect of LVA on eyelid edema in Morbihan disease and to determine whether pathological changes that could be considered chronic lymphedema of the skin occur.

**Methods:** A retrospective case-control study was performed. Postoperative recurrence rates were compared between the patients who underwent debulking surgery plus LVA (study group) and the patients who underwent debulking surgery (control group) for Morbihan disease. The three-dimensional microstructures of the excised skin were pathologically compared with the eyelid skin without edema to determine whether they caused tissue changes that should be diagnosed as chronic lymphedema.

**Result:** No significant short-term complications occurred after surgery in either group. The recurrence rate within 1 year after surgery was significantly lower in the study group than in the control group (1/7 vs 5/6, respectfully,  $p = 0.03$ ). Pathologically, patients with Morbihan disease showed signs of changes in the microstructure of capillary lymphatic in the dermis, which is characteristic of chronic lymphedema in advanced stage.

**Discussion:** LVA reduced the risk of postoperative recurrence during debulking surgery in Morbihan disease with DBF on ICG angiography. The excised skin also developed pathological change that should be treated as in advanced-stage lymphedema. These clinical and pathological results suggested that debulking surgery plus LVA might be a suitable treatment option for Morbihan disease.

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## Optimal Maneuvers for Alteration of Tip Rotation

Abstract Presenter: Anthony Deleonibus MD

Abstract Co-Author(s): R'ay Fodor, Russell Frautschi MD, Viren Patel MD, Abigail Meyers MD, Rafael Ramos Vecchio MD, Bahman Guyuron MD, Ali Totonchi MD

**Background:** Nasal tip rotation relies on structural support from the upper and lower lateral cartilages, the caudal septum, the medial crura, and the anterior septal angle. Comprehensive understanding of the distinct and combined effects of maneuvers influencing these structures and thereby tip rotation is required to facilitate judicious preoperative planning. This study aims to characterize the effects of intraoperative maneuvers affecting tip rotation.

**Materials/Methods:** This is a retrospective study of patients who underwent primary rhinoplasty at a single private practice between 2001 and 2022. Preoperative and postoperative standardized right profile images were compared. Tip rotation was quantified using the nasolabial angle. Patients were stratified into one of three categories: overrotated, ideally rotated (male:  $95.96 \pm 2.57^\circ$ , female:  $97.7 \pm 2.32^\circ$ ), and underrotated. Matched pairs analyses were used to determine significant differences between preoperative and postoperative values. Logistic regressions and Wilcoxon signed-rank tests was employed to detect significant effects of maneuvers on postoperative values.

**Results:** Three hundred eighty-six patients (310 female, 76 male; mean age:  $31.15 \pm 13.99$  years) were included. The mean time between surgery and follow-up was  $897.09 \pm 888.79$  days. Preoperatively, 250 patients were overrotated, 79 patients were underrotated, and 57 were optimally rotated. For overrotated patients, the mean preoperative nasolabial angle was  $110.98 \pm 6.89^\circ$  and the postoperative mean was  $106.90 \pm 8.88^\circ$ . For underrotated patients, the preoperative mean was  $85.62 \pm 8.87^\circ$  compared to a postoperative mean of  $91.54 \pm 8.12^\circ$ . Finally, optimally rotated patients had a preoperative mean of  $97.25 \pm 1.61^\circ$  and a postoperative mean of  $99.37 \pm 6.33^\circ$ . For both underrotated ( $p=0.0010$ ) and overrotated ( $p<0.0001$ ) patients, significant changes in nasolabial angle were achieved in the desired direction. Preoperatively optimally

rotated patients did not experience significant changes in the nasolabial angle ( $p=0.0588$ ). For patients within the range of ideal nasolabial angles preoperatively, the columellar strut was found to significantly increase tip rotation ( $p=0.0345$ ), as were tip cartilage onlay grafts ( $p=0.0192$ ). Patients who were preoperatively underrotated significantly benefitted from the caudal septum wedge ( $p=0.0491$ ) and caudal septum rectangle ( $p=0.0025$ )-both of which significantly increased tip rotation. The caudal septum rectangle was also found to play a significant role in derotating the tip in patients who were preoperatively overrotated ( $p=0.0266$ ). Preoperatively overrotated patients further benefitted from tip cartilage shield grafts, which significantly decreased tip rotation for this patient group ( $p=0.0111$ ). Linear regression identified the caudal septum rectangle as the most significant factor driving increased rotation ( $t$  ratio: 3.13,  $p=0.0106$ ); the lobule graft was found to be the second most effective ( $t$  ratio: 2.30,  $p=0.0441$ ). Linear regression further identified that tip rotation suture was most effective when combined with the caudal septum wedge ( $p=0.03164$ ), as opposed to combination with the columellar strut ( $p=0.18536$ ) or the caudal septum rectangle ( $p=0.28504$ ).

**Conclusions:** Derotation was most significantly driven by tip cartilage shield grafts and caudal septum rectangles; increased rotation was most significantly influenced by columellar strut grafts, lobule grafts, tip onlay grafts, caudal septum wedges, and caudal septum rectangles, with the latter having the most profound effect overall. These findings also imply that the tip rotation suture yields optimal results when combined with the caudal septum wedge.

### **Incidence of Post Operative Venous Thromboembolism Following Cosmetic Abdominoplasty in Patients with History of COVID-19**

Abstract Presenter: Xingchen (Cindy) Li MD

Abstract Co-Author(s): Charles Lee MD, Ashley Sun, Mary Newland, John Potochny MD

**Purpose:** Venous thromboembolism (VTE) is a complication of abdominoplasty with low incidence but devastating consequences (1). A history of COVID-19 may cause additional thromboembolic effects on patients, although the duration of this is unclear given the limited follow-up information available for long and post-COVID conditions (2,3). A prior small retrospective study suggested that a history of COVID infection may increase VTE rates after lipoabdominoplasty (3). Our study aims to further assess in a larger population patient risk of VTE for those with a history of COVID-19 after

abdominoplasty.

**Methods:** The TriNetX LLC. National Health Research database was queried to identify patients who underwent cosmetic abdominoplasty in the years 2017-2020 (pre-Covid pandemic) and 2020-2023 (post-Covid pandemic). In addition, post-pandemic patients were further studied by querying the data to look for those with a history of COVID versus those without. These cohorts were analyzed to calculate the incidence rate of VTE in the 30 days post operative.

**Results:** A cohort of 3,381 patients who underwent cosmetic abdominoplasty on prophylactic anticoagulation was identified. There were total of 1,486 patients in the pre-pandemic and 1,895 patients in the post-pandemic group. In the post-pandemic group, there were 361 patients with a prior history of COVID and 1534 patients without. The rate of VTE was not significantly different in the pre (2.0%) versus post (2.1%) pandemic cohorts ( $p=0.91$ ). However, in the post-pandemic cohort, there was a significant difference in VTE rates between patients with (4.2%) and without (1.8%) prior history of COVID ( $p=0.01$ ).

**Conclusion:** Our study showed there was no significant increase in VTE incidence after abdominoplasty during the pandemic. However, patients with a history of COVID may be more susceptible to postoperative VTEs as its true long term morbid effects are yet to be fully understood. Therefore, history of COVID should be carefully considered when determining a patient's VTE risk and warrants further study for optimal peri-operative and postoperative anticoagulation strategies.

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## **Advancements in Neck Contouring: Integrating Radiofrequency-Assisted Liposuction with BodyTite and Buccal Fat Pad Excision**

Abstract Presenter: Emilio Trignano MD

Abstract Co-Author(s): Corrado RUBINO, Matilde Tettamanzi

**Background:** The integration of neck liposuction with BodyTite Manipulus Radiofrequency (RF) technology and buccal fat pad excision for enhanced neck rejuvenation promise heightened precision and efficacy in sculpting the neck and jawline. Neck liposuction, coupled with RF technology, provides controlled thermal energy for adipose tissue treatment and collagen remodeling, while buccal fat pad excision offers refined contouring of the lower face and neck. This integrated approach aims to optimize patient outcomes and advance the field of aesthetic plastic surgery.

**Methods:** A prospective study was conducted from 2016 to 2023 on 90 consecutive patients who presented to the author's private clinic and required neck remodeling surgery for aesthetic purposes. Patients were monitored and clinic appointments were scheduled at intervals of 0, 1, 2, and 6 months post-treatment for evaluation. A tape measure recorded submental length at 1 and 6 months, and a satisfaction survey was administered one week before surgery and after six months. Physicians assessed improvement using a five-point scale for patient satisfaction and a four-point scale for overall improvement.

**Results:** All patients underwent successful RFAL treatment, consistently achieving satisfaction with the outcomes. The average reduction in submental length measured 9.8 mm during the 6-month follow-up period. Additionally, the removal of buccal fat pads played a pivotal role in facial slimming and enhancing the aesthetics of the upper cheek region.

**Conclusions:** The integration of neck liposuction with BodyTite RF technology and buccal fat pad excision offers a promising approach for enhanced neck rejuvenation and facial contouring. This combined method demonstrates heightened precision and efficacy in sculpting the neck and jawline, aiming to optimize patient outcomes and advance the field of aesthetic plastic surgery.

## **Beauty beyond borders: Tracing global shifts in aesthetic procedure medical tourism**

Abstract Presenter: Elizabeth O'Neill MD MPH

Abstract Co-Author(s): John Toms III, Keid Idrizi, Daniel Najafali, Aaron Wiegmann MD, Sammy Sinno MD

**Background:** Medical tourism has historically been characterized by patients seeking out inaccessible care in more medically advanced countries. In aesthetics, the reverse may be true, with citizens from developed countries traveling abroad. This may be driven by a combination of factors such as cost-effectiveness, privacy, and access to niche treatments. However, there is limited literature defining the extent of this trend. We hypothesize that the current United States aesthetics market is driving medical tourists to other countries, and aim to quantify global trends, as well as analyze the geographical flow of aesthetic medical tourists.

**Methods:** Data from the International Society of Aesthetic Plastic Surgery (ISAPS) Global Surveys from 2016 to 2022 was collected from 7,545 surgeons worldwide. Estimates for medical tourism procedures were derived using ISAPS country-specific annual total surgical and non-surgical aesthetic procedures and medical tourism percentile breakdowns. Trend analysis and compound annual growth rate (CAGR) calculations, representing a compounding percentage yearly increase, were conducted. To address missing annual values in countries' reports for CAGR calculations, we applied mean imputation to each country's dataset when feasible, but excluded countries from the analysis if they lacked data for three or more years.

**Results:** The United States was consistently reported as one of the top countries of origin for medical tourists from 2016 to 2022 - and was the top country of origin for those traveling to Brazil, Colombia, India, Italy, Mexico, and Thailand. Other top countries of origin included the United Kingdom, Canada, Switzerland, Australia, Portugal, and Spain. There were regional preferences in destination choice with European medical tourists predominantly favoring nearby countries, those from Australia choosing destinations in Asia, and those from North America often selecting locations within the continent.

The estimated global CAGR for aesthetic procedures defined as medical tourism (those traveling from one country to another for surgery) was 9.9%. The country with the highest growth rate was Argentina at 21.9%, followed by Romania at 17.0%. Mexico saw the largest increase in share of global medical tourism procedures, rising from

6.3% in 2016 to 9.4% in 2022. Other fast-growing destinations included Turkey (13.6%), and Colombia (13.4%). In contrast, India and Italy underwent declines, with CAGRs of -11.4% and -5.5% respectively. The United States saw a slight decline in share from 14.2% to 12.1% but still led in total volume of procedures.

**Conclusions:** Our study highlights trends and changes in the aesthetic procedure tourism market from 2016 to 2022. Notably, many United States citizens are seeking procedures abroad. Mexico and Turkey are emerging as leading destinations, experiencing growth in total annual procedures. This contrasts with the decline seen in traveling to the United States, potentially reflecting a saturated, cost-prohibitive market. These findings support the need for targeted research to elucidate the factors driving these changes, such as pricing, patient preferences, procedural specifics, and surgical outcomes. Understanding these underlying motivations for medical tourism may allow countries to develop responsive healthcare policies and promote the ethical evolution of aesthetic medical tourism with an emphasis on patient safety.

## **The Dangerous World of DIY Plastic Surgery**

Abstract Presenter: Emily Long MD

Abstract Co-Author(s): Daniela Lee, Jose Foppiani Mudr., Kirsten Schuster MD, JD, Samuel Lin MD

**Purpose:** Online marketplaces have made it increasingly possible for non-medical professionals to order professional-grade medical products and devices for home use, including neurotoxins, dermal fillers, chemical peels, and lasers.<sup>(1)</sup> Online communities promote products, share techniques, and support other users in their do-it-yourself (DIY) aesthetic journeys. This study aimed to learn more about the demographics of this group, their motivations, and complications incurred from DIY procedures.

**Methods:** A survey was distributed to the public using Amazon Mechanical Turk, Reddit, and TikTok. Inclusion criteria included adults eighteen years of age and older. Participants were inquired regarding their knowledge of, perceived safety of, and experience with DIY cosmetic procedures. Descriptive and univariate statistics were performed on survey responses. Additional pertinent viewpoints from DIY Facebook groups and subreddits were manually extracted. Survey results were validated by cross-referencing with posts and internally-run surveys in DIY Facebook groups and subreddits.

**Results:** Of 385 complete and validated survey responses, 18 respondents reported performing DIY procedures. The average age was 42.9-years-old, median household income was \$75,000-99,000 USD, and the majority (78.8%) had completed a college degree. The primary motivation for pursuing DIY procedures was cost-savings (44.4%), followed by desire to personally control outcomes (33.3%). The most popular procedures were neurotoxin injections and microneedling. Less common DIY procedures included thread lifts, dermal fillers, mole removal, professional-grade chemical peels, laser treatments, and plasma pen skin tightening. Complications reported included vascular injuries, scarring, hyperpigmentation, allergic reactions, fat necrosis, and infection. Most supplies were purchased from foreign beauty supply websites (66.7%). Over one-third (38.9%) of respondents were uncomfortable disclosing their DIY history with a physician, citing "fear of judgment" as their primary reason. Respondents reported a desire for more affordable pricing of professional cosmetic procedures, increased availability of educational information focused on safe techniques, and decreased judgment from plastic surgeons.

**Conclusion:** There is a privately expanding online community of patients performing DIY professional-grade cosmetic procedures. This group is largely composed of college-educated, middle-aged females, who desire low-cost aesthetic improvements, and obtain products from foreign beauty websites. This group is highly secretive as they do not want to compromise their imported product streams, and many influencers stand to profit from marketing foreign medical products. For these reasons, a considerable limitation of our study was the low number of responses from individuals within the DIY community. However, while users of online forums rarely report complications, numerous serious negative complications were reported anonymously in our survey. Respondents who had suffered complications reported feeling as though they lacked support both within their online communities, and from medical professionals, revealing a need for increased attention on this issue from the plastic surgery community. Plastic surgeons should be aware of potential histories of at-home procedures, educate patients about risks of unsupervised procedures, and provide non-judgemental support to patients presenting with complications. Furthermore, plastic surgeons should advocate for increased regulation of online marketplaces to prevent the import of non-FDA-approved products and complications from DIY procedures.

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## **Rhinoplasty Ethnic Considerations: Artificial Intelligence (AI) Morphing and Cadaveric Structural Cartilage Grafts**

Abstract Presenter: Patrick O'Connor MD

Abstract Co-Author(s): Joshua Choe, Elisa Atamian MD, Christopher Aiello, James Bradley MD, FACS

**Background:** Many patients who undergo a rhinoplasty procedure prefer to maintain their ethnic characteristics rather than aim toward Euro-western ideals. Effective communication of these preferences are important during the preoperative consultation. Recent Artificial Intelligence (AI) 3D morphing now offers the ability to plan rhinoplasty nasal shaping based on a patient's preferences. It is not known whether these morphing tools create improved rhinoplasty outcomes.

**Methods:** Rhinoplasty patients who emphasized ethnic considerations (based on a validated survey) underwent either preoperative 1) Deep Surface AI or Vectra morphing or 2) No morphing (n=392) to communicate their preferences. Structured rhinoplasty used cadaveric cartilage (MTF) for procedures because of lack of septal cartilage. Outcome assessment was based on perioperative complications, long term stability (1-year), need for revisions, and patient-reported functional and aesthetic outcomes using the SCHNOS validated questionnaire, as well as, Patient-Reported Outcomes Measurement Information System (PROMIS) for psychosocial indicator assessment.

**Results:** The 2 ethnic rhinoplasty groups studied (Morphing vs No Morphing) had similar demographics, operative techniques, complications (2% vs 3%), and revisions (3% vs 5%). Operative techniques included variations of: Upper vault narrowing, dorsal onlay graft (to raise radix), spreader grafts, columellar strut grafts, tip graft, alar base resection, lateral wall osteotomy with use of cadaveric (MTF) grafts. Patients who underwent preoperative 3D 'morphing' to record patient nasal shape preferences based on their ethnic considerations and cultural ideals compared to 'no morphing' had greater improvement in functional and aesthetic (SCHNOS) scores ( $3.2 \pm 0.4$  vs  $2.0 \pm 0.3$ ) and a greater decrease in Psychosocial Indicators (PROMIS scores): Anxiety ( $58.5 \pm 6.6$  vs.  $55.2 \pm 8.6$ ), Depression ( $50.6 \pm 7.6$  vs.  $48.7 \pm 9.4$ ), Meaning and Purpose ( $49.6 \pm 7.6$  vs.  $51.7 \pm 9.4$ ).

**Conclusions:** Nasal reshaping with ethnic considerations based on patient preferences



can have more successful outcomes with the utilization of 3D morphing programs like Deep Surface AI and operative techniques tailored to these preferences.

## **Breast Suspension and Ligament Reconstruction Mammoplasty in 95 Consecutive Cases**

Abstract Presenter: Wilberto Cortes MD

Abstract Co-Author(s): Tara Mather MD, William Dzwierzynski MD, John LoGiudice MD

**Background:** Breast ptosis results from an involution of breast parenchyma with the underlying Coopers' ligaments becoming stretched over time resulting in a complete loss of support to the breast mound. This loss in volume results in a decrease in upper pole fullness, an increase in the lower pole fullness and width, and in addition a loss of breast projection. Many techniques have been described to address the components of a youthful breast. Mastopexy presents many challenges including avoiding tissues from "bottoming out" with a boxy look, maintaining upper pole fullness, as well as ideally providing an "implant-like" look with a round, projected mound.

The authors present their experience using a specialized technique to address the components of a ptotic breast. The procedure uses a superior medial pedicle for nipple transposition. This is combined with an inferior dermoglandular pedicle for auto-augmentation (Graft/Briggs flap), to improve the upper pole fullness and increase projection. In order to avoid the superior medial pedicle from bottom out, superior suture suspension of the superior medial flap to the pectoralis muscle fascia is utilized. Finally, the lower pole excess skin is deepithelized and superiorly based dermal grafts from the tissue that is routinely discarded is used to provide support to the breast mound medial and lateral pillars and avoid the superior medial flap from migrating.

**Methods:** Analysis of electronic records of patients who underwent breast suspension with ligament reconstruction between April 24th, 2012 and September 13th, 2023 were analyzed. A total of 95 consecutive cases were discovered. Photographic records were taken before and during follow-up clinic visits at 1 month, 3 months, 6-8 months and occasionally greater.

**Results:** Breast suspension with ligament reconstruction mammoplasty was successfully achieved in 95 consecutive patients. Average age was 40 years old

(standard deviation 7 years, maximum: 54 years, minimum: 25 years). Average body mass index (BMI) was 30 (standard deviation: 4, maximum: 45, minimum: 21). Complications were as follows: Partial areola necrosis (N = 2, 2.1%), partial inferior dermoglandular distal tip necrosis (N = 4, 4.2%), and minor complications including small wound breakdown in the vertical limb closure (N = 6, 6.3%). No cases of bottom out deformity were recorded, but patients with poor quality of skin may eventually have a natural descent of the whole breast mound occur without ptosis.

**Conclusion:** Breast suspension with ligament reconstruction mammoplasty offers a safe and reliable technique that improves patient surgical results. This technique is not indicated for all types of breasts. Nevertheless, it provides another option to the plastic surgeon armamentarium to address the challenges of mastopexies.

### **Long-term Efficacy and Patient Satisfaction with Micro-Autologous Fat Transplantation (MAFT) for Gummy Smile Correction**

Abstract Presenter: Tsai-Ming Lin MD. Ph.D.

**Introduction:** Gummy smiles, marked by an excessive gingival display greater than 2-3 mm, detrimentally affect facial aesthetics and self-esteem. Traditional correction methods, such as botulinum toxin injections, offer temporary solutions requiring frequent repetition, while more invasive surgical options like orthodontics and gingival manipulations come with increased complexity and variable effectiveness. This study evaluates Micro-Autologous Fat Transplantation (MAFT) as a minimally invasive, durable alternative for long-term gummy smile correction.

**Materials and Methods:** From October 2015 to December 2023, 52 patients were treated with MAFT. Fat was harvested, processed, and micro-injected into the nasolabial fold, ergotrid, and upper lip under total intravenous anesthesia. Assessments included preoperative and postoperative gingival display, patient satisfaction, and complications, with follow-ups at one, three, six months, or longer.

**Results:** With an average follow-up of 65 months, significant reductions in gingival display were observed. The procedure's mean duration was 50 minutes, delivering an average of 17.2 mL of fat. Reductions in gingival display averaged 4.6 mm for the right canine incisor, 4.7 mm for the left canine incisor, 4.8 mm for the right canine, and 4.4 mm for the left canine. Patient satisfaction was high, with 92% reporting satisfaction or greater, and minimal discomfort reported. No major complications were noted, and any

minor side effects were transient.

**Conclusion:** MAFT emerges as a safe, highly effective, and patient-preferred method for correcting gummy smiles, providing a long-term solution that enhances facial aesthetic harmony and patient quality of life. This study solidifies MAFT's standing as a leading alternative to more invasive traditional methods, advocating for its broader adoption in cosmetic surgery. Future research might explore MAFT's efficacy in broader applications, potentially transforming approaches to facial aesthetics. Future studies should focus on standardizing treatment protocols, expanding patient numbers, and extending follow-up to better evaluate MAFT's long-term efficacy and broader applications in cosmetic surgery.

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**Take your facelifts to the next level: Safety and Efficacy of PLASMA Resurfacing with face and necklifts**

Abstract Presenter: Melinda Lacerna Kimbrell MD

**Goals/Purpose:** Deep facial skin resurfacing with radio-frequency (RF) plasma technology started in the early 2010's. When compared to other deep facial resurfacing techniques such as phenol chemical peels or CO<sub>2</sub> and erbium ablative laser skin resurfacing, plasma resurfacing results in better correction of superficial and deep rhytids, photo-damage and more tissue contraction resulting in improved skin and tissue tightening. Performing deep plasma skin resurfacing at the same time as the rhytidectomy procedure offers the patient improved facial rejuvenation results in one surgical session and recovery period.

**Methods/Technique:** A retrospective review of a single surgeon's experience from 2017-current is presented. A total of 90 patients were treated in one session, combining a face and necklift procedure with fat grafting and full face deep plasma skin resurfacing. Patients ages range from 50-86, with 88 females and 2 males. The procedures were performed under IV sedation (88 patients) and 2 under general anesthesia (2 patients).

Once adequate general or IV sedation was administered, tumescent solution was infiltrated into the face and neck (average volume of 180 cc total). Rhytidectomy techniques performed included SMAS plication, SMAS imbrication or Deep plane techniques (surgeon choice depending on the patient's facial anatomy). A concurrent necklift and platysmaplasty was also performed. Next, full face resurfacing was performed with helium RF plasma in a majority of the patients (80), while nitrogen RF plasma was performed in 8 patients. Settings for the helium RF plasma were at 40% energy at 4 liter flow, single pass on the whole face, a second pass was performed on the chin and peri-oral areas. The energy was decreased to 20% at 4 liter flow on the areas of the rhytidectomy lateral elevated skin flaps. For the 8 patients treated with the nitrogen plasma, energy settings were at 4 kilojoules (kj), single pass, and was lowered to 3 kj over the areas of the lateral elevated skin flaps.

Finally, fat grafting was performed on the face via Coleman's technique. The patients were followed the next day, weekly, then monthly. Longest follow-up is at 7 years post-operative.

**Results/Complications:** There were three complications. One patient experienced a late onset cellulitis on her forehead at 7 weeks post-operative, and this resolved with a one week course of oral antibiotics. Two patients had small areas of hypertrophic scarring on their chin areas that resolved completely with light CO<sub>2</sub> resurfacing combined with laser-assisted drug delivery of kenalog 40. There were no incidents of skin necrosis on the areas of the elevated rhytidectomy or necklift skin flaps. Aesthetic results showed very good correction of deep and superficial rhytids, photo damage and

much improved overall quality of the skin.

**Conclusion:** This small series over the course of seven years shows the safety and efficacy of performing deep RF plasma resurfacing immediately after rhytidectomy procedures. The elevated skin flap can be treated effectively by lowering the energy settings of the plasma devices. Patients can appreciate a single session surgical procedure that results in comprehensive facial and neck rejuvenation, with less downtime when compared to a staged procedure.

## **Optimizing Readability of Plastic Surgery Education Materials through AI: A ChatGPT Intervention Study**

Abstract Presenter: Luis Antezana MD

Abstract Co-Author(s): Waleed Alameh MD, Abdallah Abu Shehab MD, Waleed Alameh, Alexandre Meira Pazelli MD, Sara Hussein MD, Jorys Martinez-Jorge MD

**Introduction:** Health literacy is an independent predictor of population health status and treatment outcomes and is directly related to the readability of available patient education materials (PEMs). The National Institutes of Health (NIH) and the American Medical Association (AMA) have recommended that PEMs be written at a level lower than the 8th-grade education level.

**Objectives:** To assess the readability of online PEMs about the most common plastic surgery procedures published by several academic institutions across the US. We then evaluated the utility of ChatGPT (OpenAI Inc., San Francisco, CA) to improve the readability while maintaining the comprehensibility of those materials.

**Methods:** Online PEMs regarding five common plastic surgery procedures (according to the American Society of Plastic Surgeons), including liposuction, breast augmentation, abdominoplasty, breast lift, and eyelid surgery were collected from the websites of 20 top institutions in plastic surgery (according to the Plastic Surgery Research Council). The materials were assessed using six readability scales. ChatGPT was then used to create improved texts with lower readability scores within the recommended NIH/AMA range. Grammarly (Grammarly Inc., San Francisco, CA) was used to assess the comprehensibility of the text before and after the use of ChatGPT.

Statistical analysis was performed using SPSS 28.0 (IBM Inc., Armonk, NY).

**Results:** None of the PEMs were written at or below the AMA/NIH's recommended reading level. The average educational level required to comprehend the texts across all institutions, as assessed by the readability scales, was at the 12th-grade level, with no significant difference between institutions. Some materials require a college-level education or higher. The level of comprehensibility of the text was 84.8 out of 100. After using ChatGPT, the average readability grade improved to the 7th-8th grade level, with a mean difference of 4.2 compared to the original text ( $p < 0.001$ ) (Figure 1). The level of comprehensibility also significantly improved to 87.6 ( $p < 0.001$ ).

**Conclusions:** Online PEMs help improve healthcare utilization, preventative care, patient-physician communication, and patient satisfaction. However, current materials related to plastic surgery procedures are not written at or below the AMA/NIH's recommended education level, which could impact the utility of those PEMs for the general public. ChatGPT is an innovative AI tool that is increasingly utilized in healthcare. In this study, we showed that the utility of AI can help improve the readability of PEMs while also enhancing the comprehensibility of the materials.

## **Cadaveric Dissection of the Superficial Fascia System in abdomen and Anatomy-based abdominal Lipoplasty**

Abstract Presenter: Zhijin Li

Abstract Co-Author(s): Junxian Wen, Yang Wang

**Background:** Liposuction-assisted abdominal contouring is one of the most popular liposuction operations. (1) This seems to imply that "abdominal liposuction may be just a simple operation and a good postoperative result can be easily achieved by purely holding the cannula in hand and reciprocating." But this is just a trap. In fact, complications happen after abdominal liposuction, such as uneven skin, especially in the lower abdomen. (2,3) Besides, there are many contour deformities in the abdomen. (4,5) This requires doctors to perform liposuction according to different abdominal conditions. To refine the abdominal contouring procedures, our team dissected the abdominal SFS in fresh specimens, aiming to give a thorough topographic anatomy of SFS, present a theory about the abdominal fat accumulation mechanism, figure out the anatomical explanations of one or even two horizontal skin creases and the roll deformities between them, thus put forward a set of corresponding methods of contouring improvement.

**Methods:** A total of 20 fresh female specimens (mean age, 54 years; age range, 35-76 years) were dissected. Dissections were made on one side of abdomen from skin to deep fascia. The SFS was lifted with removing as much of the fat as possible so as to clearly observe the retinaculum cutis. Besides, intact SSC tissue blocks were obtained on the other side of abdomen on the six horizontal planes and four vertical planes. The changes of SAT and DAT from medial to lateral, and from cephalic to caudal, were recorded.

**Results:** The thigh was divided into three sections, namely, the median (four subunits: upper abdomen, mid-abdomen periumbilical zone, lower abdomen, suprapubic zone), the negative (two subunits: costal zone, subcostal zone), and the lateral section (two subunits: lateral chest, lateral abdomen). We found that the form of the SFS has regional variations. Therefore, based on these varied features, the SFS among the eight subunits of the abdomen fall into five categories based on amount, toughness and density in DAT (least, less, median, more, most; notated by degree I-V) and RCP (most loose, loose, average, tight, tightest; notated by degree I-V). Five different liposuction methods were formulated to manage these subunits: inward tightening (all-layer mass liposuction), primary flatten (mass liposuction), secondary flatten (normal aspiration), border feather-out (aspiration for smooth contour), restricted flatten (conservation



aspiration) . Besides, the author proposed the anatomical explains about three scenarios of abdominal contour deformity: adhesion zones, roll deformities, depression in the negative section.

**Conclusions:** The SFS of the abdomen showed a regional variation pattern, based on which we proposed a series of new anatomy-based liposuction approaches. Topographic anatomy of the SFS in the abdomen region helps us understand its contour deformities and provide an anatomic basis for surgical correction. A well-sculpted abdomen with its different sections presented in harmony can be safely obtained using these approaches.

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#### **Hematoma Prevention in Outpatient Plastic Surgery: Three Decades of 42,720 Consecutive Cases**

Abstract Presenter: Tal Brown BS

Abstract Co-Author(s): Rachel Rohrich, Stav Brown MD, Rod Rohrich MD, FACS

**Background:** Postoperative hematoma stands out as one of the most common complications within the field of plastic and reconstructive surgery. With the shift towards favoring cosmetic surgical procedures in outpatient facilities over traditional

operating rooms, hematoma prevention becomes critically important for enhancing patient safety and achieving optimal surgical outcomes. This study aims to identify the risk factors associated with hematoma development in outpatient settings and provides recommendations for enhanced patient safety by analyzing over 40,000 consecutive cases spanning across three decades.

**Methods:** All consecutive cases, performed by board-certified plastic surgeons at an accredited outpatient surgical facility from 1995 to 2023, were retrospectively reviewed.

Patient demographics and operative details were recorded to determine both patient- and procedure-specific risk factors for developing hematomas following cosmetic procedures performed in the outpatient setting. Operative details included total operative-time, lipoaspirate amount, and whether the procedure was a combined case. Continuous variables were compared using a student t-test and logistic regressions were utilized to assess the predictive value of variables. Receiver operating characteristic (ROC) curves were created for each variable and the Youden's method was used to determine the optimal cutoff points.

**Results:** A total of 42,720 consecutive cases were performed across 29 years. A total of 318 complications were recorded, with hematoma accounting for 61.32 percent of all complications (n=195). The overall complication rate for hematomas was 0.46 percent. Most hematomas occurred in breast-related cases (34.6 percent, n=110). Compared with the control population, patients experiencing hematomas had lower BMI ( $p < 0.0001$ ), shorter operative durations ( $p < 0.0001$ ) and were less likely to have undergone a combined procedure ( $p < 0.0001$ ). The leading predictive variable for a decreased risk of hematoma formation was undergoing a combined procedure, with combined cases associated with a 3.73 times lower risk for developing hematomas (OR 0.268;  $p < 0.0001$ ). Longer operative time was associated with a 1.33 times lower risk of developing hematomas (OR 0.75;  $p = 0.0001$ ).

**Conclusions:** This study presents the largest analysis of the risk factors associated with hematomas in outpatient plastic surgery settings, analyzing three decades of experience. The use of bleeding reduction modalities such as Tranexamic Acid (TXA) should be considered for patients with a BMI lower than 25.55 kg/m<sup>2</sup> and operative time shorter than 2.07 hours, identified as significant risk factors for developing hematomas in cosmetic procedures in the outpatient setting.

## **A pilot study- Does Liposuction of the posterior arm fat pad and axilloplasty restore the axilla after Massive Weight Loss?**

Abstract Presenter: Gudjon Gunnarsson MD

The fat of the arms consists of superficial alveolar fat and deep lamellar fat separated by the superficial fascia (1).

The growing fat pads of the posterior arm (PAF) and shoulder pull down the posterior axillary fold and contents of the axilla causing irreversible damage and distortion to the topographic anatomy, visible after massive weight loss. The expanded skin and elongated ligaments contribute to the characteristic posterior axillary fold and lack of natural axillary dome with subsequent physical and psychological burden to the MWL patients. These changes need to be considered in planning of the reconstruction. There has not been sufficient focus on the importance of the axilla in MWL brachioplasty or how it differs from the postmenopausal batwing deformity of the upper arms. We designed a prospective study to test a procedure specifically designed to mend the underlying pathology of obesity and MWL. Liposuction Assisted Axillo Brachioplasty, LAAB.

**Material and Methods:** A prospective pilot study was designed aiming to test the effect of liposuction of the PAF and specific axillo-brachioplasty (LAAB) on the axilla and evaluate the effect on the patient's preoperative complaints and wellbeing and allow for adjustments for future comparative studies on a larger scale.

We measured the diameter of the arm and axilla at points A, B and C, and applied a standardized questionnaire regarding body perception and psychosocial well-being, (BODY-Q, standardized Danish version translated to Norwegian). Pre and postoperatively and at follow up visits. The patients were examined after 6 months (4-12 months). Patients clinical data and complications were registered on study forms and informed consent attained applying to the standards of the Helsinki

**Results:** Fifteen women, 30 arms. Age average; 48 (29 -66) interestingly most (12/15) were between 42-62, the same age as women otherwise request brachioplasty or slightly earlier. Follow-up was 6 months on average (4-12 months).

All 15 had a history of MWL operation average BMI 42 (39-52). The mean height 167cm (152-181). Weight 71.9kg, ( 44- 94) BMI 24, range (19- 32.9).. Ten patients (67%) had gastric bypass surgery, four (27%) had a gastric sleeve operation, one had both. Three patients had diabetes and hypertension and, interestingly, they were the same patients. The rest did not have any comorbidities. Eight (53.3%) patients were postmenopausal at the date of surgery, and none had hormone replacement therapy. Three patients had a history of prior pregnancy and normal delivery. There were 3 smokers, one patient

had connective tissue disorder (not Ehler Danlos). There were no correlations with any of the comorbidities related to the results. And there were no complications other than one minor skin erosion treated conservatively by the patients GP.

There was a significant improvement in all measurements A-C, most significantly at point A in the axilla where the reduction was associated with relief of preoperative ailments and high patient satisfaction.

**Conclusion:** Among the most significant findings in this small series on MWL patients is the improvement of the axilla and its correlation with patient satisfaction. The study supports the clinical relevance of the posterior arm fat pad (PAF). A systematic debulking of the PAF does improve the axillary contour and facilitate restoration of the displaced axilla after MWL. The procedure is safe and uncomplicated with a very high patient satisfaction shown in this series. LAAB can be recommended to correct the loose axilla, reduce and tighten the residual fat and skin of the upper arm after MWL.

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#### **ARCO: Aesthetic Rib Cage Osteosynthesis a novel technique for the anterior rib cage remodeling**

Abstract Presenter: Hugo Aguilar Villa MD, Msc

Abstract Co-Author(s): Hector Mauricio Serrano Reyes, Silvia Villabona, Brian Ramirez

**Introduction:** Body contouring has become a trend in aesthetic plastic surgery, with interventions aimed at meeting patients' aesthetic expectations (1). In the pursuit of the perfect body, deformities of the anterior thoracic cage, such as anterior lower rib cartilage prominence, have been identified as causes of dissatisfaction in these patients. This scenario let the development of ARCO, a unique surgical intervention for anterior rib remodeling; ARCO fulfills all innovation criteria, showcasing effectiveness and safety in the short and long term for the patient. This is substantiated by the best available scientific evidence, an aspect that has been somewhat overlooked in the

development of new techniques in aesthetic plastic surgery (2).

**Methods:** A prospective study of the ARCO technique was conducted on patients in Colombia, performed by a single certified plastic surgeon. Pre-surgical and postoperative measurements of rib cage diameter at the eighth rib level were recorded. Spirometry assessments were conducted both pre and late postoperatively to evaluate long-term respiratory volume changes. Peak pulmonary values and compliance were documented to illustrate intraoperative safety. Additionally, a Body-Q satisfaction survey and complication reports were gathered.

**Results:** Among 34 patients, the average age was 34 years, and the mean body mass index was 25.1 kg/m<sup>2</sup>. Significant chest perimeter reduction at the eighth rib level (Welch's Factor=9.3,  $p<0.001^*$ ) was observed, averaging an 8 cm decrease. Peak and pulmonary compliance values remained stable throughout the procedure stages with no statistically significant differences. Spirometry variables indicated no restrictions in respiratory volumes: FVC (T-Student=0.371,  $p=0.712$ ), FEV1 (T-Student=-0.82,  $p=0.414$ ), FEV1/FVC (T-Student=0.32,  $p=0.743$ ), PEF (T-Student=0.05,  $p=0.960$ ), and FEF:25-75 (T-Student=0.366,  $p=0.715$ ). Body-Q satisfaction was notably higher at the third postoperative month with ARCO compared to the preoperative consultation (T-Student=-2.29,  $p=0.025^*$ ).

**Discussion:** ARCO effectively reduces chest perimeter at the eighth rib, enhancing the aesthetic appeal of the anterior rib margin and achieving high patient satisfaction. The technique addresses various risks associated with anterior rib remodeling, aiming to prevent complications like pneumothorax and hemopneumothorax (3). ARCO utilizes a greenstick fracture approach, avoiding the neurovascular bundle in the posterior rib border, and employs a piezo tome with ultrasonic waves of 25-29 Hz, posing no risk to neurovascular tissues that require frequencies above 50 Hz to be affected (4). Moreover, ARCO's fixation with osteogenic material ensures proper rib curvature, preventing malunion-related complications and eliminating the need for postoperative corsets. The intervention has not proven to be a safety risk for patients, as intra and postoperative respiratory reference values have not been statistically significantly altered.

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## **A Comprehensive Assessment of Soft Tissue Sagging after Zygoma Reduction Surgery through Artificial Intelligence Analysis**

Abstract Presenter: Bumjin Park MD

Abstract Co-Author(s): YunYong Park, Kenneth Kim MD

**Background:** Overdevelopment of the zygomatic bones often results in the protrusion and flaring of the midfacial region.<sup>1</sup> This makes the face appear more square-shaped rather than the more favorable oval shape. Therefore, zygoma reduction surgery has become a commonly performed procedure for patients looking to obtain a more ideal facial shape.<sup>1,2</sup> One of the main complications of zygoma reduction surgery is facial soft tissue ptosis.<sup>3,4</sup> Previously, the evaluation of cheek soft tissue ptosis was only based subjectively by the patients and the surgeons.<sup>5</sup> Our research aims to provide an objective evaluation of soft tissue sagging in the cheek region after zygoma reduction surgery through the utilization of artificial intelligence.

**Methods:** In this study, we conducted research on 301 patients who underwent zygoma reduction surgery at our institution from January 2018 to September 2022. Following the exclusion criteria, which aimed to exclude inappropriate candidates, the study was conducted on a total of 72 patients. We utilized artificial intelligence (AI) for the evaluation of cheek sagging in our series of patients who underwent zygoma reduction surgery. We employed four methods: tracking facial landmarks, detecting changes in cheek curvature, and examining changes in the nasolabial fold and marionette's line. The obtained numerical results were then assessed for statistically significant differences using statistical validation methods.

**Results:** Utilizing artificial intelligence with the four indicators demonstrated that there were no statistically significant differences between pre and post-surgery evaluations.

**Conclusion:** In our series of patients, artificial intelligence analysis demonstrated that

soft tissue ptosis did not occur. AI has the advantage of offering an objective evaluation for both the patient and the doctor. Future research can build upon this application to examine various influencing factors and develop new tools utilizing machine learning to evaluate and also predict the extent of cheek sagging in patients before undergoing surgery.

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## **Assessment of Linea Semilunaris Positioning in Anatomical Definition Lipoabdominoplasty with Rectus Abdominis Diastasis Treatment**

Abstract Presenter: Helio Alves MD

Abstract Co-Author: Daniel de Almeida Rocha Valente

Lipoabdominoplasty has solidified its place in the repertoire of plastic surgeons since its inception by Saldanha in 2001(1). Recent years have witnessed a notable advancement in liposuction techniques with the advent of high-definition liposuction pioneered by Hoyos(2), which highlights the muscular structures of the abdominal wall through precise marking with superficial liposuction.

This study aimed to assess the variation in the positioning of the linea semilunaris - or

semilunar lines - (SLL) on the aponeurosis before and after rectus abdominis diastasis treatment and its correlation with the SLL observed on the skin in patients undergoing anatomical definition lipoabdominoplasty.

Thirteen patients from the author's private practice who underwent anatomical definition lipoabdominoplasty were included in this study conducted from January 2023 to January 2024. Preoperatively, the SLL were marked on the skin. Measurements of rectus abdominis diastasis size, plication, and distance from the SLL to the midline were taken under direct visualization after detachment of the abdominal flap. After plication, the new position of the SLL was evaluated, and their projection in the abdominal flap was recorded after closure.

Patients exhibited a mean rectus abdominis diastasis of 2.83cm, ranging from 1.9 to 3.6cm. Plication averaged 4.2cm, ranging from 3.4 to 6cm. Statistically significant differences were found in the positioning of SLL projection on the skin before and after rectus abdominis plication, both to the right and left ( $p < 0.01$ ), which was also confirmed through direct visualization ( $p < 0.01$ ). Additionally, a strong correlation (0.778) was observed between the size of the plication and the displacement of SLL projection on the skin according to the Pearson correlation test.

As anatomical definition lipoabdominoplasty gains popularity, achieving the correct final position of linea semilunaris after diastasis treatment is crucial to avoid aesthetic complications. Simão (2020) noted marking the SLL medially to their palpation-identified position, assuming positional modifications without specific measurements(3). To increase precision, some authors propose preoperative marking with ultrasonography; however, they also disregard possible changes in the positioning of the structures after the plication of the abdominal wall.(4) Our results showed significant displacement of the SLL when comparing pre- and post-operative distances from the midline after rectus abdominis plication. Medial misplacement of the SLL could lead to inadequate contouring of the rectus abdominis muscle, negatively affecting the aesthetic outcome. The author suggests marking the SLL preoperatively 1 to 3 cm more laterally, depending on diastasis width.

In conclusion, medial displacement of SLL projection in the skin occurs after rectus abdominis aponeurosis plication, emphasizing the need to address this displacement to achieve favorable aesthetic results.

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## **Improving Results in Abdominoplasty Combined with Hip Expansion by Fat Grafting for Waistline Contour: Defining the Linea Alba and Semilunaris**

Abstract Presenter: Tara Mather MD

Abstract Co-Author(s): William Dzwierzynski MD, John LoGiudice MD, Wilberto Cortes MD

**Background:** Abdominoplasty combined with hip expansion by fat grafting is essentially a lipoabdominoplasty that focuses on the waist and the hips to recreate an "hourglass profile". Recent advances in abdominoplasty techniques combined with a better understanding of the blood supply allow the definition of important anatomical structures of the abdomen with an athletic look. One of the techniques to achieve a smaller waist is the implementation of a wide abdominal plication which is in essence is an "internal corset". It is challenging to define the linea alba with this technique, as the tunnel for plication is wider than normal to expose the lateral border of the rectus abdominis muscle and the external oblique aponeurosis. Because the skin tone in patients requiring abdominoplasty is often compromised due to multiple factors the location of the linea alba can shift in the postoperative period. The authors present their experience using progressive steps to recreate the linea alba and the linea semilunaris.

**Methods:** Medical records of patients who underwent abdominoplasty combined with hip expansion by fat grafting and reconstruction of the linea alba and semilunaris from July 1st, 2019 and September 13th, 2023 were analyzed. Photographic records were taken before and during follow-up appointments at 1 month, 3 months, 6-8 months and greater than a year when possible. The technique utilizes VASER liposuction of the linea alba and linea semilunaris combined with MicroAire technology for fat extraction. Under direct vision, debulking of the fat and expansion of the linea alba is performed. In order to fix the lineal alba and control its depth and location to the midline, 2-3

progressive tension suture are used. Finally, we take the advantage of the medial migration of the abdominal flap that results from the wide abdominal plication to recreate the linea semilunaris.

**Results:** A total of 482 consecutive cases were identified. Average age was 39 years old (standard deviation 8 years, maximum: 61 years, minimum: 22 years). Average body mass index (BMI) was 29 (standard deviation: 0.4, maximum 42, minimum: 21). Complications were as follows: symptomatic anemia requiring transfusion (2, 0.4%), partial wound dehiscence (9, 1.9%), delayed wound healing (5, 1.0%), seroma (3, 0.6%), surgical site infection (7, 1.5%), symptomatic scar requiring revision or steroid injection (16, 3.3%), urinary retention (4, 0.8%), and other medical complications (5, 1.0%).

**Conclusion:** Abdominoplasty combined with hip expansion by fat grafting and reconstruction of the linea alba and semilunaris refines patients' surgical results providing a more athletic look. This technique does not compromise the abdominal flap and has low complication rates.

### **Clinical Trial to Evaluate the Efficacy of Botulinum Toxin Type A Injection and CO2 laser with pin hole methods for Reducing Scar in Patients with Facial Laceration**

Abstract Presenter(s): Seong Hwan Kim MD, Seong Hwan Kim

Botulinum toxin type A (BoNTA) is known to prevent fibroblast proliferation and expression of TGF- $\beta$ 1[1]. It also induces temporary muscle paralysis and decreases tension vectors. Fibroblasts induce scar contracture and hypertrophy by producing collagen fibers in wound healing processes.<sup>2</sup> The pinhole method involves creating multiple small holes that extend from the epidermis layer to the deeper dermis using an ultra-pulse carbon dioxide (CO<sub>2</sub>) laser[2]. The effectiveness of this method in treating various skin conditions, such as hypertrophic scars, sebaceous hyperplasia, anetoderma, and elastosis perforans serpiginosa, has been proven. In contrast with the conventional CO<sub>2</sub> ablative laser, the pinhole method can induce regeneration and realignment of collagen bundles at the desired depth. The aim of this study is to identify the effect of BoNTA and CO<sub>2</sub> laser with pin hole method on the scar formation. 82 patients with forehead laceration were enrolled in this study and randomized into two groups with or without injection of BoNTA. When the patients presented to the clinic to remove the stitches, BoNTA was injected to the BoNTA group with 42 patients and saline was injected to the control group with 40 patients. The BoNTA was injected on dermal layer with 5U/cm. After that, half patients in both groups were treated with CO<sub>2</sub> laser using the pin hole method 2~3 times. We used the pinhole method with an ultra-

pulse CO2 laser (UM-L30®, Union Medical Co. Ltd., Seoul, Korea) to treat the lesions. All laser treatments were performed by the same plastic surgeon.

In the first session, multiple small holes, approximately 1 mm in diameter, were made along the entire lesion at 1-2 mm intervals to the depth of the papillary dermis, where the suture scar existed. The residual areas of the lesion were treated in the second and third sessions in the same manner. Follow-up was done in 1 month, 3 months, and 6 months. The scars were analyzed with the Patient and observer scar assessment scale (POSAS), Stony Brook Scar Evaluation Scales (SBSES) and Visual analogue scale (VAS) and analyzed with independent t-test, along with clinical photographs, cutometer and biopsies. In all scar scales, the scores changed into favorable direction in both groups and the changes were larger in BoNTA group compared with the control group. On SBSES and VAS, better improvements on BoNTA group showed statistical significance. Skin biopsy showed less collagen deposition on dermal layer in BoNTA group. Improvement of aesthetic, functional and emotional aspect of the scar formation in the groups treated with BoNTA and CO2 laser was illustrated. The application of botulinum toxin type A and CO2 laser may be expanded to prevent hypertrophic scar after trauma, burns or operations.

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#### **M-Shaped Auricular Cartilage in Asian Rhinoplasty**

Abstract Presenter: Yang An MD, PhD

**Introduction:** The demand for rhinoplasty in Asia is growing annually and short nasal deformity has been one of the main reasons for the surgery due to its high incidence. There is an urgent need for a rhinoplasty suitable for Asians because of their different facial features from Westerners. In previous research, we have developed M-shaped auricular cartilage grafts as a new method for the correction of short nose deformity with good effect for Asians. However, although the basic approach to M-shaped cartilage surgery is well understood, there is a great deal of variety and uncertainty when plastic

surgeons perform the procedure, and there is still a lack of fixed standard guidance on the specific details. Based on the results of the finite element analysis, we gave clinical recommendations for the details of the M-shaped auricular rhinoplasty. Moreover, we evaluated the aesthetic and functional results of M-shaped auricular rhinoplasty compared to classical methods.

**Method:** Finite element analysis was used to explore and compare cartilage stability with different suturing methods, sizes of M-shaped cartilage, and suturing positions. A 0.01 N load was applied to a 1 cm<sup>2</sup> area of the nasal tip to simulate nasal tip palpation and the maximum deformations of the different groups were compared, which were used to make stability judgments. Besides, 45 patients were enrolled and divided into three groups of 15 patients: the first group of patients underwent M-shaped auricular rhinoplasty, the second group underwent auricular-septal rhinoplasty, and the third group underwent classical auricular rhinoplasty. All of these patients underwent comprehensive rhinoplasty and all of them had silicone or expanded polytetrafluoroethylene implants in the dorsum of their noses. Six months after surgery, their postoperative satisfaction was assessed by three classic scales: ROE Scale, FACE-Q Rhinoplasty Module, and NOSE Scale.

**Results:** In the finite element analysis, the maximum deformation of the model was minimal when the M-shaped cartilage was sutured medially in the middle of the septal cartilage and laterally in the outer corner of the lateral cartilage. In the postoperative evaluation, the patient score improvements on the three scales (ROE/FACE-Q/NOSE Scale) were higher in the M-shaped auricular rhinoplasty population (group 1: 1.65/1.79/0.11) compared with classical auricular rhinoplasty (group 3: 1.4/1.51/0.05); and the patient score improvements in the auricular-septal rhinoplasty population (group 2: 2.04/1.98/0.28) were the highest.

**Conclusions:** In order to achieve optimal surgical results, M-shaped cartilage should be sutured medially in the middle of the septal cartilage and laterally in the outer corner of the lateral cartilage. In the retrospective clinical study part, the clinical efficacy of M-shaped auricular cartilage tip rhinoplasty was demonstrated: compared with classical auricular cartilage rhinoplasty, the effect of M-shaped auricular rhinoplasty is better; however, when compared with auricular-septal rhinoplasty, its effect is slightly worse.

## Ultrasound Guided Minimal Incision Rib Repositioning

Abstract Presenter: Johnny Franco MD

**Goals/Purpose:** The purpose of this study is to evaluate the safety of minimally invasive rib repositioning. Rib procedures in aesthetics have always been of interest to plastic surgeons to be able to truly shape the skeletal body of an individual. In the past the morbidity and technical challenges of rib removal have limited its use in most practices. Our series describes how to safely use the ultrasound and piezotome to reposition the ribs safely while improving the overall contour of an individual.

**Methods/Techniques:** Our innovative technique involves the use of an ultrasound and piezotome to safely and effectively create a greenstick fracture of the free floating ribs (11th and 12th). In certain circumstances the 10th rib was also treated using this technique. Two parallel lines are marked 7 cm on each side of the midline on the posterior torso. The ribs are then verified with the use of the ultrasound to make sure the incision placement is in the correct position. A 1 cm incision is made on each side between the 11th and 12 ribs. The periosteum is then lifted with a freer. Once the periosteum has been lifted the piezotome is used to cut a single cortex of the rib. The rib can then be manually moved into position. The patient is then placed in a corset to splint and shape the waist for six weeks.

**Results/Complications:** A retrospective study was completed of patients treated at our practice using the ultrasound guided minimal incisions for rib repositioning. Thirty-one consecutive patients were included in the study over a one year period. Patients had a follow-up that ranged from 7 days to 210 days and averaged 90 days. No complications were associated with the ultrasound guided rib repositioning procedure. In the study we had no revision and no pneumothorax from any of the patients. Typically the patients were treated in combination with other procedures.

**Conclusions:** Minimal incision ultrasound guided rib repositioning is an effective and safe method to modern body contouring. As many patients have transitioned their aesthetic goals to more of an athletic appearance and less of a focus on buttock volume this has been instrumental in our practice. It has been revolutionary that we can change the structural shape of an individual through a 1 cm incision and accomplish this safely. Patients that were too skinny for a Brazilian Butt Lift or still felt square after a body contouring procedure now have options. In future studies we will evaluate the amount of structural change that is possible with this method with pre and post-op measurements.

## **Simultaneous Face Lift and Facial Bone Contouring: Update and Controversy**

Abstract Presenter: Cheng-Wei Hsiao MD

**Background:** Solitary facelift in wide face produce unsatisfied result. Solitary facial bone reduction usually resulted in sagging of the face even in young age.

Congenital lateral downward prominent supraorbital bone, usually resulted in congenital lateral hooding. Mongolian fold also will has limitation in med. Forehead lift.

Therefore facelift in those patients will have unideal cosmetic outcome.

The surgery for facelift or facial bone reduction usually each has a long operative time, swelling and blood loss consideration. Therefore, these two procedures are often performed separately. In recent years, an increasing demand for simultaneous facial bone reduction and facelift has been observed, however few studies(1,2,3,4) have examined safe and effective of simultaneous facial bone reduction and facelift.

**Objective:** The aim of this study was to present a safe, easy and flexible method for combining facelift and facial bone reduction through single facelift incision with minimal blood loss.

**Methods:** From 2015 to 2022, the senior author performed facial bone reduction with facelift by using a subcutaneous approach through single facelift incision in patients with wide facial bone and an aging face. Operative time, intraoperative blood loss, postoperative course, and complications were recorded.

**Results:** In total, 132 patients met the inclusion criteria and were included in the study. The combined surgery was successfully performed in all cases, and no serious complications were reported. The follow-up period ranged from 6.5 to 60 months. The average operating time was 187 minutes, and the mean intraoperative blood loss was minimal (30 mL). All patients were satisfied with the outcome, different scores were assessed with Global Aesthetic Improvement Scale.

**Conclusions:** The demand and pressure coming from the patients, it forces our plastic surgeon to reconsider the necessity in the near future.

Facelift and facial bone reduction using a subcutaneous approach through single facelift incision provides complete visualization of the facial bone , superior hemostasis control result in an easy and safe surgery that does not require additional intraoral incisions.

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## Breast

### Hope for Anatomic Implants? Designing Positionally Stable Smooth Breast Implants

Abstract Presenter: Tim Li

Abstract Co-Author(s): Riley Mayne, Jini Jeon, Sophia Salingaros, Matthew Liao, Samuel Medina, Hector Salazar Martinez, Xue Dong MD, PhD, Jason Spector MD

**PURPOSE:** The voluntary recall of textured breast implants due to their association with Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL) has eliminated the key benefit of textured surface--positional stability. We have engineered a novel smooth-surface breast implant, known as the Positionally Stable Smooth Implant (PSSI), which contains 2mm diameter smooth cylindrical wells on the implant shell, allowing for tissue ingrowth and thereby stabilizing the implant. Previous studies demonstrated that stability was associated with an increased total surface area of the implant. The current study aimed to 1) investigate long-term positional stability of this novel smooth implant design, and 2) characterize capsule formation around the implant. We hypothesized that miniature PSSI implants designed with same total surface area but varying well dimensions/densities can provide improved stability versus smooth implants.

**METHODS:** Hemispherical miniature 2cc breast implants were manufactured using polydimethylsiloxane and casted using 3D-printed inverted negative molds. All PSSI

implants were designed with the same total surface area of 1170mm<sup>2</sup>; dimensions of wells on the shell surface are reported in millimeters in the following variations in width (W), depth (D), and number of wells (in parenthesis): W2D1(52), W2D2(26), and W2D4(13). Control groups consisting of smooth and salt-imprinted textured implants were fabricated. Six sterilized implants per group were implanted subcutaneously into the bilateral dorsa of Sprague-Dawley rats. Implant rotation was measured with Micro-CT every 2 weeks for a total of 12 weeks to assess positional stability. Animals were sacrificed at 12 weeks, and implant-capsule units were explanted en bloc for histological analysis.

**RESULTS:** Between 1 and 3 months, smooth implants had a cumulative positional rotation of 107 degrees, which was significantly greater than textured implants at 43 degrees, W2D1(52) at 37 degrees, W2D2(26) at 48 degrees, and W2D4(13) at 41 degrees ( $p < 0.001$ ). There was no significant difference in rotation between textured and all PSSI groups after three months. Upon explantation, micro-CT and gross examination showed tissue growing into and conforming to the well dimensions of PSSI groups. Trichrome staining demonstrated that capsules of smooth implants and those surrounding non-well regions of PSSI had parallel and uniform collagen fiber alignment, whereas collagen fibers of textured implants and those within PSSI implant wells appeared less organized, contouring to the surface morphology. Immunofluorescent staining of CD86 demonstrated significantly higher amount of M1 macrophages in the textured implant capsule than smooth and PSSI groups ( $p < 0.0001$ ). No significant difference was observed in CD206 expression of M2 macrophages among all groups. The M1/M2 ratio for textured implant capsule was 4.84, smooth 1.08, W2D1(52) 1.75, W2D2(26) 1.63, and W2D4(13) 2.38.

**CONCLUSIONS:** This novel breast smooth implant design with cylindrical well features provided implant positional stability equivalent to that of a textured implant. PSSI implant design with same total surface area but different well dimension and density demonstrated comparable long-term stability. The reduced level of pro-inflammatory M1 macrophages observed in PSSI capsules compared to the textured group supports the biocompatibility of the novel implant. These results suggest a promising alternative to textured surface for inducing positional stability in breast implants.



## **Evaluating Durability of the Intercostal Artery Perforator Flap for Breast Conserving Treatment by Quantifying Volume Changes After Radiation Therapy.**

Abstract Presenter: Miriam Becker

Abstract Co-Author(s): McKay Reese, Christopher Reid MD, Robert Clark MD, Sarah Blair, Haydee Ojeda-Fournier, Catheryn Yashar, Garrison Leach MD

**Background:** The intercostal artery perforator flap (ICAP) is a technique facilitating breast conservation treatment (BCT) for patients with defects otherwise necessitating mastectomy. It is unclear whether reconstructed breast volume is maintained over time and what effects occur after radiation. This study aimed to assess volume changes in irradiated breasts following ICAP BCT compared to small tumor lumpectomies.

**Methods:** The study included 134 patients who received radiation as part of either ICAP BCT (n=22, one bilateral, 23 breasts), or lumpectomy for T1 tumors (n=112, one bilateral 113 breasts). The patients undergoing lumpectomy for T1 tumors were selected as a control group for whom volume loss beyond their relatively small tumor defect volume could be reasonably attributed to radiation (XRT) effects, thereby providing a baseline estimate of radiation-related volume loss for comparison with the ICAP cohort. Breast volumes at preoperative baseline and within 12 months of radiation were calculated from routine mammograms using  $\pi/3 \times \text{height} \times \text{radius}^2$ ; significance of change was assessed using paired t-tests. (1)

**Results:** Both groups experienced significant volume loss within one year of radiation. Within the ICAP cohort, average baseline breast volume was 775.4 (316) cc. Average tumor volume defect was 231.5 (150) cc, comprising 28.5 (12) % of breast volume. Within one year of surgery and radiation, mean breast volume of the ICAP cohort was 622.1 (276) cc, a loss of 153.3 (184) cc, a 19.3 (23) % mean volume decrease from pre-operative baseline ( $p < 0.001$ ).

Within the lumpectomy cohort, average baseline breast volume was 1079.4 (674) cc. Average tumor volume defect was 88.6 (57) cc, comprising 9.2 (10) % of breast volume. To isolate radiation effects from surgical volume loss, a postoperative baseline volume was calculated, with subsequent volume loss after radiation calculated relative to this baseline. From a mean postoperative baseline volume of 990.9 (645) cc, within one year of surgery and radiation, the T1 lumpectomy cohort experienced a loss of 193.8 (5) cc, a 19.6 (22) % mean volume decrease from pre-operative baseline ( $p < 0.001$ ).

**Conclusion:** Based on the results from the lumpectomy cohort, radiation appears to

account for approximately 19% of breast volume loss (in addition to specimens), experienced within one year of BCT/XRT. The volume loss of 19.3% by year one observed among the ICAP cohort appears to be congruent with expected volume loss attributable to radiation effects within this timeframe. Furthermore, the loss of 19.3% of breast volume within one year following excision of 28.5% of breast volume indicates that about 9.2% of breast volume was restored via reconstruction and maintained post-radiation. Overall, this reconstructive option to expand BCT candidacy appears to have comparable results to standard BCT after radiotherapy. Long-term reporting of volume maintenance in ICAP reconstructed breasts will be important, given that radiation effects continue to occur over time. Anticipating these effects may help guide patient and surgeon expectations and inform the planning of future interventions addressing symmetry.

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## **Presentation and Management of Silicone Lymphadenopathy: A Single Institutional Retrospective Cohort Study**

Abstract Presenter: Orel Tabibi

Abstract Co-Author(s): Anshumi Desai MD, Peter Borowsky, Kashyap Tadisina MD, Susan Kesmodel, Kristin Rojas, Devinder Singh MD, Juan Mella-Catinchi MD, MPH, Taylor Smartz

**Introduction:** Implant-based breast reconstructions are one of the most common surgical procedures performed by plastic surgeons. Our study is based in Miami, Florida, often considered a global hub for Plastic Surgery as a high number of breast surgeries are performed here, which surpasses that of many other locales. Silicone Lymphadenopathy (SL) is a complication of breast implants that involves migration of silicone to nearby soft tissue/lymph nodes. 1 Data on its clinical features and management is scarce. To our knowledge, this is the largest single-institution study to describe the clinical presentation and management of SL.

**Methods:** Single-institution retrospective cohort study was conducted from our database where search terms "Silicone lymphadenopathy", "silicone adenitis" and

"silicone adenopathy" were used to identify all patients with SL (January 2016-September 2023). Patient demographic characteristics, clinical features, imaging findings, pathological investigation, and treatment were documented in the medical records.

**Results:** Of 50 patients identified with SL, the mean age and BMI were 58.92 years [SD 12] and 26 kg/m<sup>2</sup> [SD 5.29] respectively. 47 (94%) patients were white. 36 (72%) identified as Hispanic, 13 (25%) as non-Hispanic, and 1 (2%) refused to disclose their ethnicity. SL occurrence was distributed as 18 patients (36%) on the left side, 17 patients (34%) on the right, and 15 patients (30%) bilaterally. Aesthetic reasons accounted for 46 (92%) of the implant placements. Symptomatic presentation was noted in 16 (32%) patients; tender lymphadenopathy (n=10, 20%) the most prevalent, followed by non-tender lymphadenopathy (n=4, 8%), and systemic symptoms (n=2, 4%). 44 (88%) of patients had an implant rupture detected on imaging. Of 6 (12%) without rupture, all had intact implant capsules and 2 had a prior implant exchange. Axilla was the most common site for SL detection (n=43, 86%), with concurrent axillary and internal mammary lymph node involvement in 5 patients (10%), and isolated internal mammary lymph node detection in 5 patients (10%). Most common radiologic method of detection was ultrasound (n=40, 80%) followed by a mammogram (n=35, 70%) and MRI (n=8, 16%). 22 (44%) patients had SL detected on more than one imaging modality. Suspicious imaging led to needle biopsies in 8 patients (16%); 7 core needle and 1 fine needle, all benign results, with 7 exhibiting typical histological features indicative of SL. After SL detection, 45 (90%) patients were managed conservatively with regular follow-up. 2 (4%) had implants removed and 3 (6%) of them had it exchanged.

**Conclusion:** A conservative approach is recommended for SL. Clinicians should be vigilant in the ultrasound detection of SL, as more patients are asymptomatic. Biopsy and surgical intervention should be reserved for those with abnormal imaging, symptomatic persistence, or evidence of implant rupture. In patients with a history of breast cancer, evaluation for lymphadenopathy is essential to exclude malignancy. Personalized management is paramount to prevent unnecessary interventions and healthcare expenditures.

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## **The Role of Lymphatic Microsurgical Preventive Healing Approach (LyMPHA) in Reducing Breast Cancer-Related arm Lymphedema (BCRaL)**

Abstract Presenter: Andrew Hannoudi

Abstract Co-Author(s): Summer Yono MD, Hassan Chamseddine, Sanjay Rama MD, Jessica Bensenhaver, Lindsay Petersen, Saul Nathanson, Theresa Schwartz, Daniel Yoho MD, Jenna Luker MD, Donna Tepper MD, Maristella Evangelista MD, Dunya Atisha MD

**Introduction:** The Lymphatic Microsurgical Preventive Healing Approach (LyMPHA) is a lymphaticovenous anastomosis done at the time of axillary lymph node dissection (ALND) to facilitate lymphatic drainage and prevent secondary lymphedema, which can be a devastating complication of breast cancer treatment. Current guidelines lack surgical prevention recommendations for lymphedema, likely due to insufficient high-level evidence of surgical intervention effectiveness in preventing lymphedema (1). The goal of the study is to evaluate the efficacy of immediate LyMPHA at the time of ALND in reducing breast cancer-related arm lymphedema (BCRaL).

**Methods:** A retrospective chart review was performed on breast cancer patients who underwent ALND with or without immediate LyMPHA at a quaternary care hospital from 2016-2022. Patients with preoperative lymphedema or Stage IV disease at presentation were excluded. Lymphedema was defined as persistent heaviness and/or swelling, and the need for complete decongestive therapy (CDT) greater than 12 months after surgery. Patients' percentage of functional impairment was also assessed utilizing the Lymphedema Life Impact Score (LLIS). Patient demographics, medical history, and treatment history were compared between groups. Outcomes of interest included postoperative complications (hematoma, seroma, cellulitis, wound dehiscence, unexpected return to OR, and readmission), the incidence of lymphedema, and percentage of functional impairment. Univariate analysis was used to evaluate differences between demographics and clinical outcomes. Cox regression was conducted to evaluate the incidence of lymphedema while accounting for age, BMI, smoking, marijuana use, radiotherapy, chemotherapy, eventual conversion to stage IV, and the incidence of LyMPHA.

**Results:** 187 patients underwent ALND, and 121 of those patients also had LyMPHA. Mean follow-up was 35 months (SD±21). Mean age was 56.44 years old (SD±13.61). Mean BMI was 30.42 kg/m<sup>2</sup> (SD±6.88). 76.5% of patients underwent neoadjuvant chemotherapy, 88.8% underwent adjuvant chemotherapy, 5.3% had a history of

radiotherapy, and 85.0% underwent adjuvant radiotherapy. Univariate analysis did not demonstrate differences in BMI, race, comorbidities, history of previous radiation, pathological stage, and postoperative complications. Patients who underwent LyMPHA had significantly decreased drain duration (13.0 days vs 15.0 days,  $p=0.042$ ), percentage of functional impairment (4.7% vs 11.6%,  $p=0.045$ ), and risk of lymphedema which persisted over time ( $p=0.003$ ). The entire cohort lymphedema rate after 2, 3, and 4 years postoperatively was 24.80%, 30.90%, and 35.20%, respectively. Cox regression analysis demonstrated that at any point in time, patients who underwent ALND and LyMPHA were half as likely to experience lymphedema as ALND alone patients ( $HR=0.50$ ,  $p=0.023$ ).

**Conclusion:** While the indication of ALND continues to decline, there remains a subset of patients for whom ALND remains necessary. Therefore, offering LyMPHA at the time of ALND presents an opportunity to prevent or mitigate lymphedema progression over time, and ultimately reduces morbidity in the breast cancer population.

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## An Exploration of the Impact of Smoking History on Breast Volume Loss Following Breast Conserving Treatment and Radiation Therapy

Abstract Presenter: Miriam Becker

Abstract Co-Author(s): McKay Reese, Garrison Leach MD, Sarah Blair, Catheryn Yashar, Haydee Ojeda-Fournier, Cyril Harfouche MD, Kelli Lopes, Christopher Reid MD

**Background:** Breast shrinkage often follows breast conserving treatment (BCT) and radiation therapy (XRT). The impact of prior smoking on the extent of this shrinkage is unknown, and this study aimed to explore and quantify any associations.

**Methods:** Breast volume changes were calculated for 112 patients (one bilateral, 113 breasts) following T1 tumor lumpectomies. From preoperative baseline to seven years post-radiation, volumes were calculated from mammograms using  $\pi/3 \times \text{height} \times \text{radius}^2$ . Mann-Whitney U-Tests compared volume changes at each time point between patients

actively smoking (n=1) or with a smoking history (n=29), and patients who never smoked (n=83).

Multivariate analysis assessed volume change as a function of patient age, pack-years smoked, diabetes, radiation dosage, fractions, technique, boost dose, whole/ partial breast XRT, treatment length, chemotherapy type (hormonal/cytotoxic), baseline breast volume, and months since treatment.

**Results:** Patients with any smoking history experienced significantly greater volume loss during the first two years after treatment, and by year one, lost 26.5% of breast volume compared to 13.4% among non-smoking patients ( $p=0.02$ ). By year two, the smoking group volume loss was 23.9%, compared to 16.3% for non-smoking patients ( $p=0.04$ ). Larger baseline breast volume and increased pack-years smoked were significant predictors of increased volume loss during years one, two and three ( $p<0.05$ ). For year three a diabetes diagnosis was also significant ( $p=0.03$ ).

**Conclusions:** Findings suggest prior smoking may contribute to significantly increased breast shrinkage within the first two years following BCT/XRT. Increased pack-years and larger baseline breast volume may predict greater volume loss within this timeframe.

## **Myeloid-mediated Mechanotransduction Modulates Cellular Patterning During the Foreign Body Response (FBR)**

Abstract Presenter: Andrew Hostler

Abstract Co-Author(s): Maria Gracia Mora Pinos, Jonathan Yasmeh, Katharina Fischer MD, Maia Granoski, Hudson Kussie, Aaron Mason MD, Kellen Chen PhD, Geoffrey Gurtner MD

**Purpose:** Implantable biomedical devices have revolutionized clinical practice and benefit millions of patients, accounting for more than 70 million device implantations annually. Approximately 30% these devices will undergo premature failure during their lifetime. Premature device failure is primarily due to an immune-mediated physiologic reaction otherwise known as the foreign body response (FBR). Biophysiochemical incompatibilities between the host tissues and device biomaterial induce inflammatory-fibrotic tissue repair pathways that result in fibrosis encapsulation of the device. Emerging evidence has demonstrated that cellular mechanical signaling pathways play a critical role during fibrosis and tissue repair. While FBR is an innate biologic reaction, it remains poorly understood. In this study, we utilize human peri-implant capsule tissue

to further investigate the cellular crosstalk, mediated through mechanical signaling, between inflammatory and fibrotic cell populations during FBR.

**Methods:** Peri-breast implant associated capsule tissue was collected from patients (n=14) undergoing standard of care surgery to treat capsular contracture. Capsular contracture was scored using the Baker scale and categorized into mild (B1/B2: n=8) and severe FBR (B3/B4: n=6). Histological analysis using H&E, Masson's trichrome, and picrosirius red was performed. CT-FIRE and Curve Align was performed to characterize the collagen architecture of the capsule tissue. Immunofluorescent staining using CD68 (macrophage marker), aSMA (myofibroblast marker), CD45 (hematopoietic cell marker) and FAK (mechanotransduction marker).

**Results:** Severe FBR demonstrated significantly increased capsule thickness compared to mild FBR ( $p=0.0003$ ). Collagen deposition ( $p=0.0049$ ), fiber length ( $p=0.0099$ ), and density ( $p=0.0062$ ) were also significantly increased in severe FBR when compared to mild FBR. Collagen mean fiber distance ( $p=0.0401$ ) was significantly decreased in severe FBR compared to mild FBR. Severe FBR resulted in an increase in CD68 (macrophage) and aSMA (myofibroblast) layering within the FBR capsule, shown by significantly increased co-localized expression of CD68 and aSMA ( $p<0.01$ ) and co-localized CD68 and FAK ( $p=0.0465$ ). More severe FBR also increased the aSMA and inflammatory tissue-localized cell inhabitants ( $p<0.009$ ).

**Conclusions:** Our results demonstrate an increase in immune-mediate crosstalk between macrophages and myofibroblasts, correlating with more severe capsule formation and capsule tissue fibrosis. Interestingly, severe FBR resulted in distinct macrophage-myofibroblast cellular layering in addition to elevated mechanoresponsive myeloid cell presence. Since myeloid cells home to sites of tissue injury, targeting these mechanotransductive myeloid cells could lead to novel, preventative FBR therapeutics.

## **The Impact of the Breast Microbiome on Capsular Contracture after Implant-Based Breast Reconstruction**

Abstract Presenter: Serena Bhaskerrao

Abstract Co-Author(s): Jacquelyn Knox, Aileen Gozali, Nisha Parmeshwar, Laura Barnes, Merisa Piper

**Purpose:** Capsular contracture remains one of the most challenging complications after implant-based breast reconstruction, affecting up to 20% of women with implants. While the etiology of capsular contracture is still not well understood, a common theory is the

development of subclinical infection and a resulting biofilm. This has led to active investigation into potentially contributing microbial species. Toward this, we aimed to explore the breast microbiome in patients with capsular contracture.

**Methods:** We analyzed data from our two-armed randomized-controlled trial comparing 24 hours of peri-operative antibiotics to 7 days of post-operative antibiotics in patients undergoing immediate post-mastectomy tissue expander breast reconstruction. For this analysis, we only included patients in the 24-hour antibiotic group. We collected "pre-operative samples" (breast skin swabs and breast tissue from the mastectomy), as well as post-operative samples (periprosthetic fluid via tissue expander aspiration) at up to 4 post-operative clinic visits. The microbiomes of these samples were analyzed using 16s rRNA sequencing. Post-operative outcomes including the development of capsular contracture and post-operative infection were recorded. Microbiome data was analyzed for trends.

**Results:** Out of 20 patients (32 breasts) in the 24-hour group, we identified 2 patients (10%) who developed capsular contracture in a total of 3 out of their 4 reconstructed breasts. All capsular contractures were Baker grade 2 and treated conservatively. Each of the two patients developed a post-operative infection in one breast. Patient 1's infection preceded the diagnosis of capsular contracture. Patient 2 had documented capsular contracture before an indolent infection was diagnosed. Both patients required operative washout and implant exchange for infection treatment. Looking at the breast microbiome data, Patient 1's pre-operative samples had the highest % relative abundance of species in the *Pseudomonas* genus. This remained the most abundant genus until the fourth post-operative sample, which was collected near the time of infection and predominantly contained *Staphylococcus*. Notably, *Staphylococcus* was also among the top 10 most prevalent genera in all pre-operative samples from Patient 1. The culture data from this patient's operative washout grew *Staphylococcus Aureus*. Patient 2's preoperative samples had the highest % relative abundance of species in the *Staphylococcus* genus, though this changed over the course of post-operative sample collection. Patient 2's infection occurred approximately 2 months after the final post-operative sample was collected, and bacterial cultures from the operating room grew *Staphylococcus Epidermidis* and *Staphylococcus Saccharolyticus*.

**Conclusions:** While our sample size is small, we found that pre-operative breast samples of patients who later developed capsular contracture had a high % relative abundance of genera commonly associated with post-operative infection and capsular contracture formation. Enrollment is ongoing, and further data is needed to determine associations between specific bacterial species in the breast environment and capsular contracture formation. However, harnessing this data has the potential to further our



understanding of the etiology of capsular contracture and to facilitate individualized risk stratification and peri-operative management.

## **Disrupting Mechanotransduction Prevents the Acute and Chronic Foreign Body Response**

Abstract Presenter: Jonathan Yasmeh

Abstract Co-Author(s): Hudson Kussie, Andrew Hostler, Maia Granoski, Maria Gracia Mora Pinos, Katharina Fischer MD, Kellen Chen PhD, Geoffrey Gurtner MD

**PURPOSE:** Over 70M biomedical devices are implanted globally each year and up to 30% of devices fail due to the foreign body response (FBR). There is much unknown regarding the acute FBR following implantation and how it differs from the longer, more chronic FBR. Currently, there are also no FDA-approved therapies that effectively prevent FBR and biomedical implant failure.

**METHODS:** We created pathological human-like FBR in mice using our previously published mechanically stimulated implants (MSIs) (Padmanabhan et al, 2023, Nat Biomed Eng). The MSIs contained encapsulated coin motors connected to external 3V batteries to initiate mechanical stimulation through vibration, which create significant FBR fibrosis. Mice either received saline only (vehicle) or a prophylactic 5mg/kg NSC Rac inhibitor dose. After 7 days (POD 11) of mechanical stimulation (MS), the acute FBR, samples from 5 no mechanical stimulation (NMS), 5 MS with saline (MS+S) and 5 MS with Rac Inhibitor (MS+RI) were collected. After a month (POD 30), the chronic FBR, 5 NMS, 10 MS+S, and 10 MS+RI samples were collected. The explanted FBR tissue was analyzed using staining including Picrosirius Red, Hematoxylin and Eosin, Trichrome, and immunohistochemistry (IHC) for  $\alpha$ SMA, F4/80, and DAPI. Results were analyzed with ImageJ, Matlab, CurveAlign, and CTfire.

**RESULTS:** At acute POD 11, MS+S significantly increased FBR capsule compared to NMS ( $p=0.0465$ ), and MS with Rac Inhibitor treatment significantly reduced FBR capsule by 47% from 284.8 $\mu$ m to 133.8 $\mu$ m compared to MS+S ( $p=0.0331$ ) near NMS levels. Comparably, at chronic POD 30, MS+S significantly increased FBR capsule compared to NMS ( $p=0.005$ ), and MS with Rac Inhibitor treatment significantly reduced FBR capsule by 51% from 370.2 $\mu$ m to 183.2 $\mu$ m compared to MS+S ( $p=0.008$ ) near NMS levels.

At chronic POD 30, the ECM architecture of the capsules differed significantly, with the MS+S group having wider and less dense collagen fibers than the MS+RI ( $p=0.02$ ). Using trichrome imaging, distinct architecture layers were evident in the MS+S capsule at POD 30 and were not observed at POD 11. The unique inner layer had less wide, dense, and aligned collagen fibers ( $p=0.0020$ ,  $p=0.0078$ ,  $p=0.0051$ ) compared to inhibited FBR which possessed no layering. Finally, we observed a significant reduction from MS+S to MS+RI in macrophages (F4/80,  $p=0.02$ ) and myofibroblasts ( $\alpha$ SMA,  $p=0.03$ ).

**CONCLUSION:** We determine that disrupting mechanical signaling significantly reduces acute and chronic FBR capsule size and fibrotic ECM architecture. We observed a novel layering in the chronic FBR associated with distinct layers of macrophages and fibroblasts within the capsule. A prophylactic therapeutic that could prevent FBR could have notable effects on patients and biomedical implants.

## **Exploring Uncharted Territory: A Comprehensive Study on the Implications of Cosmetic Breast Augmentation, Mastopexy, and Breast Reduction on Subsequent Breast Reconstruction**

Abstract Presenter: Langfeier Liu

Abstract Co-Author(s): Lauren Kim, Alexis Lakatta MD, Thomas Steele MD, Sumeet Teotia MD, Nicholas Haddock MD

**Purpose:** Cosmetic breast surgeries, such as augmentation, mastopexy, and reduction, represent a substantial component of aesthetic medical practices. Despite their popularity, the influence of these surgeries on subsequent breast reconstruction for cancer patients—a vital consideration given breast cancer's prevalence and the role of reconstruction in recovery remains underexplored. This study investigates the effects of previous cosmetic breast surgeries on the outcomes of various breast reconstruction techniques following cancer treatment.

**Methods:** A retrospective chart review was performed at a single academic institution from January 2011 to May 2023, examining patients who underwent cosmetic breast surgery prior to breast reconstruction. This analysis compared patients with histories of implant augmentation, breast reduction, mastopexy, and augmentation-mastopexy (aug-pxy) against those patients receiving reconstruction without any cosmetic surgery history. Data on demographics, comorbidities, smoking history, cancer treatments,

complications, and revisions were collected, alongside patient satisfaction and well-being assessed through BREAST-Q surveys. Statistical analysis was performed using SPSS, with significance set at  $p < 0.05$ .

**Results:** 124 patients (50 autologous, 74 implant) with a history of cosmetic breast surgery, which included 102 implant augmentations, 17 breast reductions, five mastopexies, and 9 aug-pexies were analyzed against 1307 patients (683 autologous, 624 implant) with no history of prior cosmetic breast surgery. Patients with prior cosmetic surgeries had significantly lower BMIs ( $p < 0.001$  for cosmetic surgery history;  $p < 0.001$  for augmentation surgery) and a higher incidence of tissue expander hematoma (cosmetic surgery  $p < 0.001$ , augmentation  $p = 0.036$ , reduction  $p = 0.003$ ). A preference for implant-based reconstruction was more common among patients with augmentation history ( $p < 0.001$ ), whereas those with reduction surgeries were more likely to opt for autologous reconstruction ( $p = 0.047$ ). Of note, a significantly higher proportion of patients with a prior history of cosmetic breast surgery ( $p < 0.001$ ) and augmentation breast surgery ( $p < 0.001$ ) chose either PAP or LAP autologous surgeries respectively. On average, patients with a history of prior cosmetic breast surgery ( $p = 0.003$ ) or augmentation breast surgery ( $p = 0.002$ ) who pursued autologous-based reconstruction had significantly more breast revisions. Additionally, patients with a history of prior cosmetic breast surgery ( $p = 0.040$ ,  $0.004$ ) or augmentation breast surgery ( $p = 0.042$ ,  $0.010$ ) who pursued implant-based reconstruction had on average significantly more breast revisions and total number of OR visits for breast reconstruction respectively. Postoperatively, we noted a significantly higher BREAST-Q chest physical wellbeing ( $p < 0.05$ ) and sexual wellbeing score ( $p < 0.05$ ) when comparing all patients with a history of cosmetic breast surgery to those patients with no history of cosmetic breast surgery.

**Conclusion:** This study examines the relationship between previous cosmetic breast surgeries and breast reconstruction outcomes. Our findings demonstrate the importance of integrating a patient's complete surgical history into post-mastectomy reconstruction planning with an understanding of how specific types of previous cosmetic breast procedures critically influence the selection of reconstruction techniques. While prior surgeries can enhance reconstruction outcomes, they also elevate the risk of complications, increase the likelihood of surgical revisions, and lead to more frequent operating room visits. This study suggests that different types of cosmetic breast surgery influence the decision-making of implant versus autologous reconstruction.

## **Absorbable Antibiotic Bead Prophylaxis in Implant-Based Breast Reconstruction: A Single-Institution Experience**

Abstract Presenter: Hilary Liu

Abstract Co-Author(s): Xiaosu Liu, James Fisher MD, PhD, Carolyn De La Cruz MD, Michael Gimbel MD, Vu Nguyen MD, Brodie Parent MD, MS, Casey Zhang

**Introduction:** Implant-based reconstruction is the most common form of breast reconstruction following mastectomy. However, surgical site infection remains a serious complication, leading to substantial morbidity and cost for the patient and healthcare system. A promising prophylactic adjunct involves the use of biodegradable antibiotic-coated beads, which have been well-studied in the orthopedic literature. This preliminary study aims to describe a single institution's experience with absorbable antibiotic beads for preventing infection in implant-based breast reconstruction.

**Methods:** A retrospective cohort study was performed of all patients who underwent implant-based reconstruction between January 2021- October 2023. Patients who met one or more high-risk criteria for infection (Group 1) including BMI > 30, active or prior smoking, type 2 diabetes mellitus, and history of radiation therapy, received absorbable antibiotic beads which were mixed with vancomycin and gentamicin. Group 2 received standard of care, but did not receive antibiotic beads. Outcomes included development of periprosthetic infection, need for re-admission for intravenous antibiotic therapy, re-operation, and loss of reconstruction. Multivariable regression was performed to control for known risk factors associated with infection.

**Results:** Two-hundred forty-six patients were included in the study. Fifteen (6.1%) patients received antibiotic beads during the first-stage expander-based reconstruction (Group 1). Two-hundred twenty-three (90.7%) patients received standard antibiotic prophylaxis (Group 2). No difference was detected in infection rate between patients who received antibiotic beads at the time of primary reconstruction compared to the standard of care (33.3% vs. 22.0%,  $p=.309$ ). After controlling for BMI, diabetes, history of radiation, and smoking status, antibiotic beads were not significantly associated with infection (OR 1.24, CI 0.37- 4.13,  $p=.721$ ). BMI and former smoking status were significantly associated with increased odds of infection (OR 1.1 CI 1.02 – 1.13,  $p=.001$ , and OR 4.5 CI 1.3 – 15.6,  $p=.02$ ). Antibiotic beads were used in 8 cases for salvage attempt following periprosthetic infection. Of the 8 salvage procedures with antibiotic beads, 7 infections were resolved (87.5%). One patient had a recurrence of infection.

**Conclusion:** This study presents preliminary results of our institution's experience using

antibiotic beads for infection prophylaxis in high-risk patients undergoing breast reconstruction and salvage of infected breast implants. Additional prospective studies are currently ongoing, and are needed help to elucidate safety and efficacy.

## **Reporting Sensation: Charting BREAST-Q Sensation Module Outcomes Over Time in Neurotized Autologous and Two-Stage Alloplastic Reconstruction**

Abstract Presenter: Ashley Zhang

Abstract Co-Author(s): Sophia Arbuiso, Isaiah Rhodes, Chase Alston, David Otterburn MD, Daniella De Freitas

**Introduction:** As the surgical community has increasingly realized the importance of patient-reported outcomes as a measure of success of a surgery, new tools have been developed to allow providers to assess patient satisfaction and psychosocial outcomes in a standardized manner. The BREAST-Q Sensation Module was published in November 2021 to address the need for a way to evaluate patient-reported breast sensation and symptoms and their impact on quality-of-life (1). In this study, we aim to map the temporal pattern of BREAST-Q Sensation module scores after reconstruction and to compare scores between autologous and device-based reconstruction.

**Methods:** Patients undergoing mastectomy and breast reconstruction were administered the Sensation Module of the BREAST-Q preoperatively and yearly after surgery. BREAST-Q scores of patients receiving autologous and alloplastic breast reconstruction were compared with Wilcoxon rank-sum tests at each time point. All statistical analyses were performed in R. All autologous reconstruction was done with a neurotized deep inferior epigastric perforator flap. All alloplastic reconstruction was two-stage. A predetermined alpha level of 0.05 was used as criteria for statistical significance.

**Results:** This study included 90 patients with alloplastic reconstruction and 103 patients with autologous reconstruction who answered the BREAST-Q at at least one timepoint. Breast Sensation scores are higher in the alloplastic group in the first 1-2 years after reconstruction before scores in the autologous group increase from 3 years onward. The autologous group had much higher scores for the Breast Symptoms scale than the alloplastic group, with a statistically significant difference at 2 years postoperative (91 vs. 75.5,  $p < 0.05$ ). For the Quality-of-Life Impact of Sensation scale, the alloplastic group had higher scores in the first 3 years after surgery, but scores began to decline

thereafter, while the autologous group had improved scores over time.

**Conclusion:** Patients with autologous breast reconstruction experience fewer unpleasant breast symptoms than patients with alloplastic breast reconstruction. Interestingly, while patients with alloplastic reconstruction report greater breast sensation and QoL impact in the short-term, scores in patients with autologous reconstruction become equal or better in the long-term. This may be explained by the time course of allograft reinnervation of autologous flaps. Patient selection bias may also play a role, as patients eligible for autologous reconstruction tend to have a higher BMI and larger breast surface area to reinnervate. Further study is ongoing to control these results for breast size.

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## **Correlating the Pittsburgh Trunk Lymphedema Staging System with Breast Cancer Treatment and Reconstruction**

Abstract Presenter: Shayan Sarrami

Abstract Co-Author(s): Casey Zhang, Korrina Gidwani, Carolyn De La Cruz MD

**Introduction:** Few established classification systems exist to determine abnormalities in truncal lymphatic anatomy. The Pittsburgh trunk lymphedema staging system (PTLSS) allows for complete assessment of the chest based on dermal backflow patterns seen on indocyanine green (ICG) lymphography. We aim to describe the lymphatic anatomy of the trunk in breast cancer patients and correlate breast cancer treatment and reconstruction to lymphedema severity using the PTLSS.

**Methods:** This study is a retrospective review of patients undergoing breast reconstruction with clinical suspicion of lymphedema who received ICG lymphography of their chest from August 2023 to January 2024. Four subcutaneous injections were placed at the distal most extent of the axillary drainage territory, between the umbilicus and costal margin of each hemi-trunk. The trunk was analyzed in five regions (superior breast, inferior breast, inframammary fold (IMF), medial chest, lateral chest). Each region was assigned a level of dermal backflow using ICG imaging. Analysis of variance

(ANOVA) was used to compare the degree of dermal backflow within each region of the trunk and identify regions with the most severe lymphatic disruption. Each hemi-trunk was staged from 0 to 5, based on the cumulative dermal backflow score, as described in the PTLSS. Patients were group according to breast cancer treatment and presence of reconstruction. Poisson regression was used to analyze the association between these interventions and lymphedema severity. All statistical analysis were performed with SPSSv24.0 ( $p < 0.05$  considered statistically significant).

**Results:** 32 unique hemi-trunks (19 patients) were mapped. Six hemi-trunks had no surgical or radiation damage and showed no signs of dermal backflow, acting as internal controls. The remaining 26 chests that underwent intervention (radiation, chemotherapy, axillary dissection, mastectomy, and/or reconstruction) had significantly worse dermal backflow in every region of the trunk compared to the controls (all  $p$ -values  $< 0.05$ ). Among patients who received an intervention, dermal backflow was significantly worse in the superior trunk and was more linear inferiorly ( $p < 0.001$ ). The superior and inferior breast regions had the worst dermal backflow, with 69% of patients having no lymphatic flow. At the IMF 58% of patients had no flow while 38% had diffuse dermal backflow patterns. In the medial and lateral trunk, there were normal, linear, lymphatic patterns seen in 38% and 27% of patients, respectively. Radiation showed a significant positive correlation to increasing lymphedema severity ( $RR = 0.64$ ,  $p = 0.022$ ). Chemotherapy, axillary dissection, mastectomy, and reconstruction did not significantly correlate to lymphedema severity ( $RR = 0.35, 0.13, 0.32$ , and  $0.36$ , respectively).

**Discussion:** Breast cancer treatment and reconstruction alters lymphatic flow of the trunk and causes a wide variation in lymphatic anatomy. Severe dermal backflow and disruption of lymphatic channels can be seen most often in the superior trunk to the level of the IMF. We found a significant correlation between radiation and increased severity of lymphedema using the PTLSS. This study can help better understand the downstream effects on lymphatic function in this patient population.

### **Analyzing the Impact of Reduction Mammoplasty on Adolescents with Symptomatic Macromastia: Insights from the BREAST-Q Survey**

Abstract Presenter: Matthew Parham

Abstract Co-Author(s): Michelle Roy, Vamsi Mohan, Heather Burns MD, Sarah Layon, Matthew Davis MD, Amy Xue MD, Robert Dempsey MD, Renata Maricevich MD

**Background:** Macromastia frequently manifests during adolescence with significant physical and psychosocial symptoms. Reduction mammoplasty is the primary treatment for symptomatic macromastia, however, insurance criteria are frequently discordant with ASPS recommendations, resulting in denial of coverage (1). Furthermore, young

patients are often required to pursue ineffective treatments before being considered for approval (2). There is a growing body of literature describing the benefits of reduction mammoplasty for adolescent patients (3). This study evaluates the benefits of reduction mammoplasty on physical and psychosocial well-being in adolescent patients using the BREAST-Q survey.

**Methods:** Patients treated for symptomatic macromastia with reduction mammoplasty at our breast clinic were asked to complete the pre- and post-operative BREAST-Q reduction survey.

Retrospective review and descriptive analysis of patient characteristics, operative data, and outcomes were conducted for all patients that completed both surveys. Survey item subsets were summed and scaled between 0 and 100 (Q-Scores), where higher scores signified more favorable responses regarding breast appearance, psychosocial wellbeing, and physical wellbeing. Significance was determined for matched pre- and post-operative survey items and scores using Wilcoxon sign-rank tests.

**Results:** 142 patients that underwent reduction mammoplasty completed preoperative surveys. 64 patients completed both pre-and post-reduction surveys. Average age was 16.7 years (SD 1.2) and average BMI was 31.0 (SD 4.9). Prior to surgery, all patients reported physical symptoms such as shoulder pain (92.2%), neck pain (92.2%), and back pain (98.4%). Patients most frequently underwent wise-pattern reduction mammoplasties using the superomedial pedicle. An average of 831.2 g (SD 419.8) of tissue removed from each breast. Complications per breast reduced included hematoma (1.6%), wound dehiscence (3%), wound infection (1.6%), nipple paresthesia (5.5%), and scar hypertrophy (5.5%). Significant improvements were observed in all matched BREAST-Q survey questions. Postoperative Q-scores demonstrated a 220.3% improvement in breast appearance ( $15.8 \pm 0.14.0$  to  $50.6 \pm 5.5$ ,  $p < 0.0001$ ), a 106.6% improvement in psychosocial wellbeing ( $39.5 \pm 16.3$  vs  $81.6 \pm 17.6$ ,  $p < 0.0001$ ) and a 149.9% increase in physical wellbeing ( $33.3 \pm 14.5$  vs  $83.2 \pm 14.7$ ,  $p < 0.0001$ ).

**Conclusion:** By using a validated metric such as Breast Q, we were able to quantify the impact of reduction mammoplasty. Comparative analysis of pre- and postoperative patient Q-scores suggests that reduction mammoplasty in adolescence significantly improves physical and psychological aspects of quality of life. The low rate of complications in this cohort affirms the safety of reduction mammoplasty in adolescents. We hope to increase coverage and reduce hesitancy to perform this operation in adolescents by adding to the literature demonstrating that the observed benefits of reduction mammoplasty substantially outweigh the associated risks.

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## **The Racial and Ethnic Epidemiology of Breast Anaplastic Large Cell Lymphoma in the United States**

Abstract Presenter: Lauren Lowe

Abstract Co-Author(s): Dylan Kim, Christine Rohde MD, MPH, Connor Kinslow, David Horowitz, Alfred Neugut

**Introduction:** The incidence rate of primary breast anaplastic large cell lymphoma (ALCL) is rapidly rising in the United States (US). Host hereditary factors may contribute to the development of ALCL in the setting of chronic inflammation in the capsule of breast implants. Specific genes such as BRCA1 or BRCA2 have been associated with an increased risk of ALCL. Anecdotally, fewer cases of breast ALCL have been reported in Black and Asian patients compared to their White counterparts, but no study to date has comprehensively investigated the incidence of breast ALCL by race and ethnicity despite evidence of genetic and environmental variability. We therefore sought to characterize the racial and ethnic epidemiology of breast ALCL in the US.

**Methods:** Cases of breast ALCL (ICD-O-3 code 9714) and T-cell lymphoma, not otherwise specified (T-NOS; ICD-O-3 9702) newly diagnosed from 2000-2020 were identified in the Surveillance, Epidemiology, and End Results (SEER) database. Age-adjusted incidence rates per 10,000,000 women per year were calculated. Incidence rates were stratified by race and ethnicity into the following categories: Hispanic, non-Hispanic White (NHW), non-Hispanic Black (NHB), non-Hispanic American Indian/Alaska Native (NHAIAN), and non-Hispanic Asian/Pacific Islander (NHAPI).

**Results:** From 2000-2020, the incidence rates of breast ALCL and ALCL/T-NOS were

9.7 (7.7-11.9) and 15.4 (12.9-18.1), respectively, per 10,000,000 persons per year. The incidence rate increased over the study period; 21.0 (14.9-28.8) compared to 3.0 (1.1-6.6) in 2000-2004. When stratified by race and ethnicity, the incidence rates for breast ALCL were 11.6 (9.0-14.9) for NHW patients, 3.5 (0.7-10.1) for NHB patients, 0 (0.0-63.5) for NHAIAN patients, 0.9 (0.02-5.7) for NHAPI patients, and 7.5 (4.0-13.0) for Hispanic patients. For ALCL/T-NOS, the corresponding incidence rates were 17.5 (14.2-21.4), 10.2 (4.6-19.3), 24.8 (0.6-118.2), 4.7 (1.5-11.4), and 11.2 (6.7-17.6). In the most recent period (2017-2020), the corresponding incidence rates of ALCL were 26.2 (17.3-38.4), 5.8 (0.1-30.0), 0 (0.0-307.5), 0 (0.0-18.3), and 15.1 (5.5-33.3). Incidence rates of ALCL/T-NOS were 41.9 (30.4-56.8), 5.8 (0.1-30.0), 0 (0.0-307.5), 3.3 (0.08-23.4), and 25.9 (12.3-47.8), respectively.

**Conclusion:** Incidence of breast ALCL differs by race and ethnicity in the United States - generally, non-Hispanic White patients are associated with the highest incidence, followed by Hispanic patients. It remains unclear whether these differences are due to genetic diversity, healthcare access, environment, or data reporting biases. Future studies may explore how these findings correlate to global breast ALCL incidence rates across other countries.

## **Verifying Predictive Models for Determining Final Implant Volume in Two-Stage Implant-Based Breast Reconstruction**

Abstract Presenter: Tara Thomason

Abstract Co-Author(s): Amanda Sergesketter MD, Brett Phillips MD, MBA

**Background:** Most breast reconstructions following mastectomy utilize a two-stage tissue expander (TE) to implant approach (1). Prior studies on both prepectoral and subpectoral breast reconstructions have identified formulas for predicting final implant volume using TE size and final fill (2,3). The aim of this study is to test the accuracy of these models.

**Methods:** A retrospective chart review of patients that underwent two-stage TE to permanent implant breast reconstruction within the Duke University Health System between 2021 and 2023 was performed. Demographic, oncologic, and reconstructive data were collected. The equations  $26.6 + 0.38*(TE \text{ final fill}) + 0.61*(TE \text{ size})$  for prepectoral and  $71.7 + 0.8*(TE \text{ final fill}) + 0.1*(TE \text{ size})$  for subpectoral reconstructions were used to calculate predicted final implant volumes, which were then compared to

actual implant volumes (2,3).

**Results:** 73 prepectoral patients (120 breasts) and 41 subpectoral patients (70 breasts) met criteria for inclusion. All patients had at least 2 months of postoperative follow-up. The average predicted implant volume was 20cc less than the average actual volume in both the prepectoral (479.0 vs. 499.5cc) and subpectoral (480.3 vs. 500.5cc) groups. The root-mean-square errors (RMSEs) for each data set were 75.6 and 59.3cc, respectively.

**Conclusions:** In general, both models underpredicted final implant volume. Depending on the implant profile, a 60-75cc difference equates to the models being accurate within 3-4 sizes for prepectoral and 2-3 sizes for subpectoral reconstructions, suggesting their potential use as a starting point to guide surgeon decision-making. Being able to predict final implant volume more accurately will optimize surgical planning, decrease the number of implants ordered for each case, and reduce costs.

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## **Comparative Analysis of Comorbidity Indexes in Implant-Based Breast Reconstruction**

Abstract Presenter: Allen Green

Abstract Co-Author(s): Shannon Francis, Maheen Akhter MD, Rahim Nazerali MD

**Background:** Recent studies have begun to extrapolate the use of comorbidity indices, such as the Charlson Comorbidity Index (CCI) and Modified Frailty Index (mFI-11), to

stratify post-surgical complication risk across multiple fields of surgery, including plastic surgery. However, complication risk among implant-based breast reconstruction (IBBR) patients has not been studied. Understanding how comorbidity scores affect post-surgical outcomes in IBBR can help better identify appropriate surgical candidates.

**Methods:** We performed a retrospective analysis of adult female patients who underwent IBBR between January 2016 and December 2021 using the Merative™ Marketscan® Research Databases. Patients were excluded if they did not have continuous insurance enrollment 90 days prior to or after their breast implant placement. We extracted data on patient demographics, concurrent surgical procedures, pre-operative comorbidities, and 90-day postoperative adverse outcomes. Comorbidity index scores were calculated using ICD-10 diagnosis codes. Chi-squared tests were performed for demographic analysis. Multivariable logistic regression controlling for demographic and surgical variables was conducted to determine associations between comorbidity indexes and adverse outcomes, including complications and post-operative surgical management.

**Results:** Among 10,119 IBBR patients during the study period, 2,127 (21.0%) experienced a complication within 90 days of breast implant placement. Patients from the South ( $p<0.001$ ) had higher complication rates, but no differences were seen by age ( $p=0.22$ ) or insurance type ( $p=0.41$ ). Additionally, patients who underwent direct-to-implant IBBR procedures ( $p<0.001$ ) or concurrent autologous reconstruction ( $p<0.001$ ) experienced higher rates of complications.

On regression analysis, each subsequent point increase in CCI score was associated with 12% increased odds of local complications ( $p<0.001$ ), 21% increased odds of distant complications ( $p<0.001$ ), and 13% increased odds of any complication ( $p<0.001$ ). Patients with higher CCI score had higher rates of fat necrosis ( $p=0.023$ ), wound dehiscence ( $p=0.012$ ), seroma/hematoma formation ( $p=0.025$ ) and lymphedema ( $p<0.001$ ). Additionally, these patients had higher rates of thromboembolic events, specifically deep vein thrombosis ( $p<0.001$ ), pulmonary embolism ( $p=0.008$ ), and stroke ( $p=0.012$ ). Further regression analysis into individual CCI-indexed comorbidities revealed that chronic pulmonary disease (OR=1.31 [1.11,1.54];  $p=0.001$ ), liver disease (OR=1.35 [1.02,1.77];  $p=0.032$ ), and cancer (OR=1.45 [1.29,1.63];  $p<0.001$ ) were the key drivers in the association between CCI score and complication risk.

Individual point increases in mFI-11 score were also associated with increased odds of local, distant, and all complications, albeit less significantly. Most notably, increases in mFI-11 score were associated with 23% increased odds of post-operative surgical management for each subsequent point increase ( $p<0.001$ ). Patients with higher mFI-11

scores had higher rates of incision and drainage procedures ( $p=0.041$ ) and tissue debridement ( $p=0.012$ ). Subsequent regression analysis reported that impaired sensorium ( $OR=1.44$  [ $1.06, 1.92$ ];  $p=0.017$ ) was the main contributor to the association seen between mFI-11 and post-operative surgical management.

**Conclusion:** This study, which uses a national commercial insurance database, highlights important associations between comorbidity indexes and adverse post-operative outcomes in IBBR. These findings can help us predict and plan for complications among certain patients. Future work is needed to better understand how these indexes can be implemented in a clinical setting to appropriately screen surgical candidates ahead of time.

## **Complications in Transmammary vs Axillary Sentinel Lymph Node Biopsy Approach**

Abstract Presenter: Jennifer Wang

Abstract Co-Author(s): Shannon Su, Owen Brown MD, Gabriela Garcia Nores MD, Albert Losken MD, Peter Thompson MD

**Background:** Sentinel lymph node biopsy (SLNB) is a pivotal procedure in breast cancer staging, and can be performed through both transmammary and axillary-incision. When compared to the axillary approach, the transmammary-incision approach allows the SLNB to be conducted via the breast incision, however requires more soft tissue dissection (1-3). We hypothesize that the transmammary approach to SLNB may lead to increased rates of seroma and implant malposition, among other postoperative complications.

**Methods:** Patients that underwent immediate implant-based breast reconstruction from January 2017 to August 2023 were retrospectively reviewed. Included patients had mastectomy and SLNB surgeries with one of four breast surgeons, and immediate breast reconstruction with one of three plastic surgeons. Complications of interest included implant visibility, seroma, mastectomy skin necrosis, hematoma, implant failure, infection, and implant malposition.

**Results:** 238 patients were included in our study, of which 171 underwent SLNB via axillary-incision and 67 underwent SLNB via transmammary-incision. Average follow up was 8 months. Sentinel lymph node retrieval was 100% in both groups. Binomial logistic

regression model showed no significant difference in overall complication rates between the two approaches (p-value= 0.438).

**Conclusion:** Transmammary-incision SLNB approach does not have significantly greater rates of complication compared to axillary-incision SLNB approach. A patient specific approach is appropriate when considering SLNB method.

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## **Comparative Analysis of Surgical Outcomes in Right and Left DIEP Flap Breast Reconstruction: A Matched Cohort Study**

Abstract Presenter: Rachel Schafer

Abstract Co-Author(s): Madeleine Blazel, Rommy Obeid, Riley Marlar MD, Diane Jo, Steven Bernard MD, Graham Schwarz MD, Risal Djohan MD, MBA, Raffi Gurunian MD, Sarah Bishop MD

**Background:** In deep inferior epigastric perforator (DIEP) flap breast reconstruction, the internal mammary vessels are commonly employed as primary recipient vessels. However, there exists debate regarding the reliability and anatomical characteristics of the left internal mammary vein (IMV). Prior studies have highlighted discrepancies in IMV size between the left and right sides, with some suggesting that the left IMV is smaller and potentially at a higher risk for venous complications. The clinical significance of these anatomical variations in the context of surgical outcomes remains ambiguous. To date, no matched cohort study has comprehensively evaluated the differences in outcomes between left and right flap reconstructions, considering patient demographics and prior medical history. Therefore, our study aims to address this gap by conducting a matched cohort analysis to elucidate the implications of flap laterality on surgical outcomes.

**Methods:** A matched analysis was conducted on 358 patients who underwent bilateral DIEP flap breast reconstruction at a single tertiary-care, academic institution between January 2016 and July 2022. Patient demographics, medical history, surgical characteristics, and postoperative complications were assessed. Patients served as their own paired comparison for left versus right flap outcomes. Statistical analyses, including Wilcoxon rank sum test, Pearson's Chi-squared test, and Fisher's exact test, were employed to compare outcomes between left and right flaps.

**Results:** Among the 358 patients included in the study, the median age was 51 years (interquartile range [IQR]: 45-58), with a median BMI of 29.1 (IQR: 25.8-32.3). The majority of patients had never used tobacco (70%), and 84% were diagnosed with breast cancer. The distribution of breast cancer stages varied, with 52% at stage 1, 23% at stage 2, 13% at stage 3, and 1.3% at stage 4 and 44% of patients had a history of radiation therapy. Surgical characteristics revealed a median length of surgery of 9.46 hours (IQR: 7.95-11.85). Venous coupler size differed significantly between left and right flaps, with a median size of 2.50 mm (IQR: 2.50-2.50) for left flaps and 3.00 mm (IQR: 2.50-3.00) for right flaps ( $p < 0.001$ ). Evaluation of postoperative complications demonstrated an overall complication rate of 20%. Specific complications included partial flap loss, total flap loss, partial mastectomy necrosis, partial nipple-areolar complex (NAC) necrosis, seroma, hematoma, skin dehiscence, and infection. However, there were no statistically significant differences in the rates of postoperative complications between left and right flaps ( $p > 0.05$ ).

**Conclusions:** Our study addresses a critical gap in the literature by conducting a matched cohort analysis to comprehensively evaluate the differences in outcomes between left and right flap reconstructions in DIEP flap breast reconstruction. By controlling for patient demographics, medical history, and surgical characteristics, we have minimized the influence of confounding variables, providing a robust assessment of the impact of flap laterality on surgical outcomes. Our findings suggest that despite variations in venous coupler size, there are no statistically significant differences in the rates of postoperative complications between left and right flaps. These results underscore the reliability and effectiveness of both left and right flaps as reconstructive options following mastectomy.

**Incidence of Post-Operative Bleeding Complication with the Use of VTE Chemoprophylaxis Following Autologous Breast Reconstruction**

Abstract Presenter: Charles Lee MD

Abstract Co-Author(s): Alexis Lo MD, Ashley Sun, Olivia Waldron, Timothy Shane Johnson MD,



**Purpose:** The use of chemoprophylaxis for venous thromboembolism (VTE) in autologous breast reconstruction remains controversial due to insufficient data regarding incidence of postoperative VTE, optimal timing for chemoprophylaxis, and post-prophylaxis risk of bleeding 1, 2. However, VTE is a well-documented postoperative complication especially in the setting of malignancy, BMI, and surgical length 3, 4. To combat these potential complications, thromboprophylaxis is often administered in surgical patients to prevent VTE development and avoid potential readmission. The purpose of this study was to evaluate the risk of postoperative bleeding in breast cancer patients undergoing autologous breast reconstruction receiving VTE prophylaxis.

**Methods:** The TriNetX LLC. National Health Research database was queried to identify breast cancer patients who underwent autologous breast reconstruction surgery between 2002 and 2023. Patient's prophylactic anticoagulation status was assessed and the rate of post-procedural hemorrhage and hematoma of the skin and subcutaneous tissue within 30 days was obtained. Statistical analysis was performed on TriNetX. Descriptive statistics were used to describe patient demographic information. Risk ratios were used to compare incidence of post-procedural hemorrhage and hematoma of the skin and subcutaneous tissue (ICD-10: L76.2 and L76.3) within 30 days.

**Results:** A total cohort of 10,725 patients was identified in this study. The average age of patients at indexed event was  $51.6 \pm 10$  years old and a majority of patients were self-reported to be white (8109; 76%), followed by unknown race (1,024; 9.5%) and African American (888; 8.3%). Approximately 45% of the patients received prophylactic anticoagulation and 55% did not. A total of 486 bleeding complications were recorded. Incidence of bleeding observed in those who did and did not receive prophylactic anticoagulation were 4.61% and 4.49%, respectively. There was no significant difference in risk of bleeding between the two cohorts ( $p=0.773$ ).

**Conclusion:** The use of thromboprophylaxis for VTE to limit the risk of postoperative bleeding in women undergoing autologous breast reconstruction is a controversial aspect of perioperative care. This study utilizes a large-scale analysis to suggest that there is no statistically significant difference in risk of postoperative bleeding between those who received and did not receive prophylactic anticoagulation. Prophylactic anticoagulation in patients undergoing autologous breast reconstruction may therefore be safely administered within the 30 post-operative period to prevent VTE without increasing the postoperative bleeding risk.

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## **Differentially Expressed Genes in the Breast Tissue of Women Undergoing Cosmetic Implant Placement**

Abstract Presenter: Puja Jagasia

Abstract Co-Author(s): Ramsey Timmerman, Sophia Allison, David Dolivo, John Y.S. Kim MD, Megan Fracol MD

**Background:** The inflammatory milieu of the implant capsule has been well-characterized. However, no studies have examined whether this inflammatory process extends beyond capsule into the breast. We hypothesized the breast implant foreign body response alters the expression of immune cells in the breast parenchyma.

**Methods:** Healthy women presenting with breast-related cosmetic complaints were recruited from the plastic surgery clinic between 2018-2022. Reverse transcription polymerase chain reaction (RT-PCR) was performed on breast tissue samples to quantify immune-related gene expression levels between IN and IE. Bulk RNA sequencing was performed to identify differentially expressed genes and altered signaling pathways in the breasts of IN versus IE. Gene expression levels of the implant-exposed breast tissue were expressed as fold change relative to the implant-naïve cohort, after normalizing to GAPDH expression, using the  $\Delta\Delta C_t$  method. Mann Whitney tests were used to compare  $\Delta C_t$  values. Statistical analysis was performed with GraphPad Prism version 9.3.0 (Graphpad, San Diego, CA) and significance set at  $P < 0.05$ .

**Results:** Breast tissue samples were collected from 65 patients (35 IN versus 30 IE). Compared to IN patients, RT-PCR showed IE breast tissue had elevated expression of genes characteristic of plasma cells and Th17-cells. Fold change in IE relative to IN for SDC1, the gene encoding CD138 (a plasma cell-associated cell surface proteoglycan) was 1.90x ( $p=0.01$ ), while expression of PAX5 (a transcription factor down regulated in the conversion of B-cells to plasma cells) was 0.53x ( $p=0.031$ ). Fold change for expression of Th17-related genes was 2.16x for IL17A ( $p=0.004$ ), 1.66x for RORC ( $p=0.024$ ), 2.36x for BATF ( $p<0.001$ ), and 1.72 for IL22 ( $p=0.064$ ).

We performed a pilot bulk RNA-seq analysis on a subset of 20 patients (10 IE versus 10 IN). Plasma cell related genes that were significantly upregulated in IE samples included XBP1 (2.22x,  $p<0.002$ , a transcription factor uniquely required for plasma cell differentiation), and FAS (1.89x,  $p<0.001$ ). Th17-cell-related genes that were significantly upregulated in IE samples included C1QL1 (2.68x,  $p<0.01$ ), BATF (2.44x,  $p<0.01$ ), and IL17RB (2.26x,  $p<0.05$ ). Other upregulated pathways identified in IE compared to IN breast tissue included B-cell activation, Th2 related genes, T-cell activation, chemotactic factors, and responses to estrogen.

**Conclusion:** This is the first study to demonstrate that peri-implant inflammation extends beyond the implant capsule to breast parenchyma. We propose a potential biologic pathway, mediated by the implant foreign body response, that culminates in elevated antibody production against common breast proteins. Immediately after breast implant placement, the silicone surface gets coated with self-protein, which signals an influx of inflammatory cells. Antigen-presenting cells in the capsule that abut the implant surface phagocytose the coated self-protein and present these antigens to other lymphoid cells in the capsule. Activated Th17-cells, in conjunction with self-antigen presentation, migrate into the breast tissue and activate B-cells into antibody-secreting plasma cells.

## **Comparative Analysis of Reduction Mammoplasty Versus Oncoplastic Breast Reduction: Assessing Clinical, Aesthetic, and Patient-Reported Outcomes**

Abstract Presenter: Jennifer Rodriguez

Abstract Co-Author(s): SeungJu Oh MD, Kevin Hu, Paris Butler MD, MPH,

**Background:** Oncoplastic breast reduction, which involves removing breast cancer while reshaping and reducing the size of the breast, has been proven effective for women undergoing breast conservation surgery. This technique has been shown to

improve symptomatic macromastia and enhance aesthetic outcomes when compared to standard breast conservation therapy alone. The purpose of this study was to examine the comparative outcomes between oncoplastic breast reduction and reduction mammoplasty in respect to clinical safety profile, patient-reported outcome, and aesthetic results.

**Methods:** A single-surgeon (senior author), single-institution retrospective chart review was performed on patients who underwent either oncoplastic breast reduction or bilateral breast reduction (BBR) from April 2022 to December 2023. Patients who underwent unilateral breast reduction, implant-based or autologous-based breast reduction were excluded from the study. Patient demographics and post-operative clinical data was collected from the electronic medical record. BREAST-Q survey was utilized to assess Quality of Life (QoL) outcomes. Post-operative breast aesthetics were assessed on a Likert scale of 1-5 with ten matched patients in six domains: shape, size, symmetry, nipple areolar complex (NAC), postoperative scarring, and overall postoperative aesthetic.

**Results:** Of the 66 patients included in the study, 44 (66.7%) underwent BBR for benign macromastia and 22 (33.3%) underwent oncoplastic breast reduction. Macromastia patients were younger (mean age, 37.3 vs 53.6;  $P = <0.001$ ), had lower ASA class ( $P = 0.012$ ), and greater resection weight (mean, 820.6 vs 581.7 g;  $P < 0.001$ ) compared to patients receiving oncoplastic reduction. Wise pattern resection was used in 100% of BBR patients versus 90.9% of oncoplastic reduction patients ( $P = 0.002$ ). Complication rates were not significantly different between the two cohorts. Both cohorts experienced significant improvements in sexual well-being and satisfaction with breasts ( $P < 0.05$ ), but only the BBR cohort experienced significant increases in the scales for psychosocial and physical well-being ( $P < 0.001$ ). In all domains, BBR patients experienced a greater increase in postoperative BREAST-Q scores ( $P < 0.01$ ), which can be explained by the fact that oncoplastic patients had higher preoperative BREAST-Q scores than BBR patients on all scales ( $P < 0.01$ ). Among the six aesthetic domains, patients in the oncoplastic aesthetic cohort experienced lower scar ratings ( $P = 0.039$ ) and trended toward lower overall ratings ( $P = 0.025$ ) compared to the BBR aesthetic cohort. Although scores for shape, size, symmetry, and NAC appearance aesthetic were also lower for the oncoplastic aesthetic cohort, the differences were not statistically significant.

**Conclusions:** These results suggest oncoplastic breast reconstruction demonstrates a safety profile comparable to standard BBR. Although the BBR group reported a more pronounced quality of life improvement post operatively, the oncoplastic reconstruction patients also displayed a significant improvement. These findings suggest that

oncoplastic breast reconstruction be more readily discussed with breast cancer patients as a favorable surgical option when a lumpectomy is indicated.

## **To Beads or Not to Beads: Analyzing the Safety and Efficacy of Antibiotic Beads in Implant Based Breast Reconstruction**

Abstract Presenter: Anna Vaeth

Abstract Co-Author(s): Jaime Bernstein MD, Ashley Zhang, Karina Condez, Kristen Castellano, Grant Black MD, David Otterburn MD

**Purpose:** Infection rates are as high as 35% in patients with implant-based breast reconstruction following mastectomy. Systemic oral prophylactic antibiotics are often prescribed in the post-operative period but have not shown significant evidence-based benefit. Absorbable antibiotic beads provide local therapy and have limited studies on their use in breast reconstruction. The aim of this study was to evaluate the efficacy of prophylactic absorbable beads in the immediate post-operative period following tissue expander (TE) breast reconstruction.

**Methods:** This is a prospective study of patients undergoing mastectomy and pre-pectoral, drainless, TE reconstruction. The peri-prosthetic fluid was collected through the TE drainage port in the operating room immediately after closure, 1 week post-operatively, and a third timepoint at 2 or 3 weeks postoperatively. The fluid was studied for microorganisms through traditional culture. Groups were divided into those who received antibiotic beads and those who did not. Antibiotic beads were placed in the breast pocket following TE placement and made using vancomycin and gentamicin. Outcome measures include positive postoperative cultures and clinical signs of infection such as fever, erythema, or edema at the breast. Each patient had at least 30 days of follow-up postoperatively.

**Results:** The study included a total of 31 patients and 54 breasts. There were 22 patients (36 breasts) in the no beads group and 9 patients (18 breasts) in the beads group. In the no beads group, the average age was 50 years old and average BMI was 23.8. In the beads group, the average age was 49 and average BMI was 24.4. In the no beads group, 4 breasts tested positive with fluid culture (11%) while only 1 breast tested positive in the no beads group (5.5%). In the no beads group, the cultures were positive for *Cutibacterium acnes* in 1 breast, *Staph epidermidis* in 2 breasts, and *Enterobacter cloacae* in 1 breast. The 1 breast in the beads group was positive for *Cutibacterium*

acnes. In patients without beads, only 3 breasts had clinical signs of infection that concurred with positive cultures (8.3%) while no patients with beads had clinical signs of infection. Of note, no patients had adverse reactions to antibiotic beads.

**Conclusions:** Although this is a pilot study, we have shown that overall, prophylactic antibiotic beads can reduce the rate of post-operative infections in the immediate post-operative period. We also show that antibiotic beads can be administered safely in this patient population. More follow-up time and larger sample sizes are needed to further analyze antibiotic beads in patients undergoing TE breast reconstruction.

### **Use of Exparel versus Marcaine in Abdominally-based Autologous Breast Reconstruction**

Abstract Presenter: Nisha Gupta

Abstract Co-Author(s): Karen Li, Nicole Episalla MD, Samuel Huffman MD, Christian Lava, Alison Hill, David Song MD, MBA, FACS, Kenneth Fan MD

**Background:** Managing postoperative pain control is crucial in reducing postoperative opioid use, decreasing hospital length of stay (LOS), and improving outcomes in abdominally based, autologous breast reconstruction (Ab-ABR). Exparel (Pacira Pharmaceuticals, Inc., Parsippany, NJ) and Marcaine (Pfizer, New York, NY) are forms bupivacaine with differing durations of action that are used to treat postoperative pain in Ab-ABR. As Exparel is formulated to have a longer duration of action than Marcaine, the purpose of this study is to determine if differences in postoperative pain control truly exist following administration of Exparel versus Marcaine for patients undergoing Ab-ABR.

**Methods:** A retrospective analysis of patients undergoing Ab-ABR between 2017 and 2022 was performed. Patients were administered Exparel or Marcaine at the time of Ab-ABR within the pectoralis fascia and immediately deep to the anterior rectus sheath just medial to the semilunaris. Demographics, comorbidities, and opioid utilization were collected. Postoperative pain was assessed using the Numeric Rating Scale from 0 to 10 (10 being worst pain) and categorized by site of pain (chest or abdomen). Primary outcomes included postoperative pain scores and opioid utilization.

**Results:** A total of 239 patients underwent Ab-ABR. Two hundred (83.7%) received Exparel and 39 (16.3%) received Marcaine at the time of operation. At the time of reconstruction, 125 (52.4%) were delayed and 133 (55.7%) were bilateral Ab-ABR. Ab-

ABR types included 156 (65.3%) DIEP, 59 (24.7%) ms-TRAM, and 10% both. Six (2.5%) patients had a history of opioid use. Exparel was associated with a longer median duration of postoperative opioid use (3.0 vs. 2.5 days,  $p=0.045$ ). There were no significant differences among daily or total opioid usage for the entirety of the hospital stay. Exparel and Marcaine had the same overall pain scores pre-opioid administration across all time points. There were no significant differences between groups after opioid administration across all time points. For pain scores in the abdomen, Exparel had a significantly higher pain score at 48 hours (5 vs 2,  $p = 0.0398$ ). There were no significant differences in pain scores in the chest at any time point. Marcaine administration was associated with a significantly shorter LOS (2 vs. 3 days,  $p < 0.001$ ). This remained significant on multivariate analysis (CI: -2.384, 0.187,  $p = 0.022$ ).

**Conclusion:** Our preliminary data shows that Exparel has comparable efficacy to Marcaine in reducing postoperative pain and opioid use despite Exparel's long-acting formulation. Exparel is significantly more costly than Marcaine, and therefore, our findings may encourage the use of Marcaine instead of Exparel for local anesthesia in Ab-ABR, potentially reducing financial burden for patients and hospitals.

## **Superolateral Pedicle Breast Reduction for Patients with Medially Positioned Nipple-Areolar Complex**

Abstract Presenter: Nicole Episalla MD

Abstract Co-Author(s): Karen Li, Alice Bell, Isabel Snee, Kenneth Fan MD, Samer Jabbour MD, Christian Lava

**Background:** The choice of pedicle technique in breast reduction (BR) surgery is crucial for optimizing postoperative outcomes. The superomedial pedicle (SMP) is commonly used but is limited in cases where the nipple-areolar complex (NAC) is positioned too medially, restricting its mobility. In such instances, plastic surgeons often resort to the inferior pedicle (IP) technique, despite its technical challenges and suboptimal outcomes regarding breast shape and nipple sensation. The superolateral pedicle (SLP) remains an alternative to the IP method. However, it has been previously suggested that it may not be suitable for larger breasts due to concerns over vascular supply and positioning. This study demonstrates the efficacy and safety of the SLP in BR for various resection weights.

**Methods:** A single-institution retrospective review of all patients undergoing BR using

the SMP or SLP Wise-pattern technique from September 2022 to January 2024 was conducted. Demographic data, comorbidities, operative details, and postoperative complications were collected. Postoperative complications were categorized into minor and major (i.e., reoperation).

**Results:** A total of 146 breasts (n=90 patients) underwent BR: 30 (20.5%) breasts used the SLP technique and 116 (79.5%) used the SMP technique. Mean age was  $45.3 \pm 14.5$  years. Mean body mass index (BMI) for SLP and SMP groups were  $34.6 \pm 4.7$  and  $33.4 \pm 5.9$  kg/m<sup>2</sup>, respectively. Mean nipple-to-inframammary fold (N-IMF) distances were  $12.5 \pm 3.3$  and  $16.3 \pm 4.0$  cm, respectively ( $p=0.010$ ). Mean sternal notch-to-nipple (SN-N) distances were  $34.0 \pm 2.9$  and  $35.0 \pm 4.9$  cm, respectively ( $p=0.562$ ). Median weight of breast tissue resected was 782 (interquartile range [IQR]: 580.5-1,042) g. Mean follow-up duration was  $1.7 \pm 1.3$  months. In the SLP group, 4 (13.3%) breasts experienced at least one complication, including seroma requiring aspiration (n=3, 10.0%) and abscess formation requiring antibiotics (n=2, 6.7%). In the SMP group, 8 (10.1%) breasts experienced at least one complication, including seroma (n=2, 1.7%), hematoma (n=7, 1.7%), abscess formation (n=4, 3.4%), dehiscence (n=2, 1.7%), partial nipple necrosis (n=1, 0.8%), and fat necrosis (n=1, 0.8%). Collectively, there were 5 (3.4%) cases of reoperation, all in the SMP group. The incidence any complications was comparable between SLP and SMP groups ( $p=0.253$ ). In a propensity score matching analysis, the incidence of any complications was comparable between SLP (n=30 breasts) and SMP (n=23 breasts) groups (average treatment effect on the treated (ATT)=0.067;  $p=0.713$ ).

**Conclusion:** The SLP Wise-pattern technique for BR is efficacious and safe, showing comparable complication rates to the SMP technique, with no need for reoperations across a wide range of breast sizes. These findings support its viability as an alternative to traditional pedicle techniques in BR surgery.



## **Does the Donor Matter? An Analysis of Donor Nerve Selection in Neurotized DIEP Flap Breast Reconstruction Sensory Return**

Abstract Presenter: Marcos Lu Wang MD

Abstract Co-Author(s): Ashley Zhang, Grant Black MD, Hao Huang MD, David Otterburn MD

**Purpose:** Neurotized deep inferior epigastric perforator (DIEP) flaps are increasingly utilized to improve and restore breast sensation in breast reconstruction patients. Most commonly, neurotization is performed by coapting a sensory branch of the tenth (T10), eleventh (T11), or twelfth (T12) intercostal nerve within the DIEP flap to the anterior cutaneous branch of the third intercostal nerve (T3) in the chest, as described by Spiegel et al. No previous study has investigated the effect of donor nerve selection on sensation of the autologous flap. In this study, we aim to compare the regional pattern of sensation return over time in DIEP flaps innervated with T11 and T12 to guide donor nerve selection.

**Methods:** Forty-two patients (65 breasts) underwent neurotized DIEP flap breast reconstruction. Of these, 35 flaps used T11 as the donor nerve, and 30 flaps used T12 as the donor nerve. All nerve coaptation was performed with a nerve allograft to T3. Pre- and postoperative sensation was evaluated using the AcroVal pressure-specified sensory device (AxoGen, Alachua, FL) in four quadrants (superior, medial, inferior, lateral) and the nipple-areolar complex of the native or reconstructed breast at specified time points. Higher values correlate to a higher threshold of pressure needed to elicit sensation, indicating worse sensation return.

**Results:** Baseline characteristics, treatment details, and postoperative complications were similar between the two groups, except the T12 group experienced higher rates of skin necrosis (26.7% vs. 5.7%,  $p = 0.047$ ). Preoperative sensitivity measurements were comparable between the two groups across all breast areas (Figure 1). In the first six months after reconstruction, the T12 cohort experienced greater sensitivity in the medial quadrant of the breast compared to the T11 cohort ( $p = 0.019$ ). At 6 to 12 months after reconstruction, the T12 cohort had greater sensitivity in the superior, inferior, and lateral quadrants, and the nipple-areolar complex ( $p < 0.05$ ). After 12 months, a significant difference persisted in the inferior and lateral quadrants ( $p < 0.05$ ).

**Conclusions:** We found a statistically significant improvement in cutaneous sensation of DIEP flaps innervated with a T12 donor nerve compared to T11, despite higher rates

of mastectomy skin flap necrosis. To our knowledge, this is the first reported difference in sensation based on donor nerve selection; these results may guide future surgical decision-making to optimize sensory recovery.

## **Patient Perceptions of Breast Cancer, Mastectomy, and Reconstruction via Social Media**

Abstract Presenter: Ethan Paliwoda

Abstract Co-Author(s): Mathew Trandafirescu, Avi Gajjar, Sanjana Dhulipalla, Nicholas Paliwoda, Jeff Kim MD, Benjamin Schalet MD, MS

**Introduction:** Breast cancer's global burden prompts a comprehensive understanding of patient experiences surrounding surgical interventions to improve the physician-patient relationship. Social media serves as a new potential avenue to further plastic surgery research and posts made by patients themselves may offer insight into care outcomes (1). This study's objective is to further understand patient perceptions regarding breast cancer, mastectomies, and reconstructions via social media to better understand patients' coping mechanisms and support-seeking behaviors as well as guide physician-patient dialogue.

**Methods:** A cross-sectional analysis was conducted of Instagram and TikTok social media posts between May 2015 and November 2023 related to breast cancer surgeries using procedure-related hashtags such as "#Mastectomy," "#DoubleMastectomy," "#DIEPFlap," "#TRAMFlap," and "#LATFlap. Other autologous and alloplastic reconstructions were limited in searchable post volume. Three reviewers analyzed, confirmed, and categorized patient social media post content to prevalent themes related to Breast-Q foci, examining variations between platforms, treatment phases, and procedure types.

**Results:** Data from 1,028 individuals undergoing breast cancer surgeries were analyzed. Posts encompassed various procedures: double mastectomy (39.11%), single mastectomy (22.28%), deep inferior epigastric perforator flap (31.81%), latissimus dorsi flap (3.60%), and transverse rectus abdominis muscle flap (3.70%). The top ten themes identified were 'Raising Awareness' (893, 86.9%), 'Spreading Positivity' (546, 53.1%), 'Resiliency' (319, 31.0%), 'Online Support' (253, 24.6%), 'Update of Appearance' (214, 20.8%), 'Uses Music' (210, 20.43%), 'Recovery/Rehab' (205, 19.94%), 'Scientific Explanation' (203, 19.65%), 'Relief with Results' (155, 15.08%),

and "Treatment Process" (150, 14.59%). Other notable themes included 'Use of Humor' (144, 14.0%), 'Decision-Making' (120, 11.7%), 'Fear of Surgery' (118, 11.5%), and 'Mental Health' (114, 11.1%).

Instagram posts were more likely to discuss spreading positivity ( $p<0.001$ ), resiliency ( $p=0.001$ ), and mental health ( $p=0.011$ ), while TikTok posts were more likely ( $p=0.001$ ) to discuss a scientific explanation, decision-making, and symptoms ( $p<0.001$ ).

Preoperative posts were more likely ( $p<0.001$ ) to discuss a scientific explanation, decision-making, and fear of surgery, while postoperative posts were more likely ( $p<0.001$ ) to discuss updates of appearance, recovery/rehab, and spreading positivity ( $p=0.012$ ). Differences existed between those who posted after single mastectomies, double mastectomies, and autologous reconstruction: raising awareness ( $p<0.001$ ), update of appearance ( $p=0.013$ ), recovery/rehab ( $p<0.001$ ), scientific explanation ( $p=0.015$ ), treatment process ( $p=0.003$ ), range of motion ( $p<0.001$ ), self-esteem ( $p=0.017$ ), and wound management ( $p=0.008$ ).

**Conclusion:** Social media posts provide a publicly available dataset that catalogs patient experiences through the breast reconstruction journey. Concerns of patients via social media reflect themes of Breast-Q measures. Understanding nuanced patient discussions across platforms, treatment phases, and surgical types can provide novel insights for providers. Utilizing the knowledge gained from this data may allow for a more individualized approach toward consenting patients for surgery. Postoperatively, physicians may better incorporate expectations surrounding appearance and the healing process. Tailoring interactions based on these insights facilitates improved support, informed discussions, and enhanced patient experiences throughout their treatment journey. The impact of social media on postoperative body image and mental health warrants continued investigations.

## References:

<sup>1</sup> Timberlake AT, Wu RT, Cabrejo R, Gabrick K, Persing JA. Harnessing Social Media to Advance Research in Plastic Surgery. *Plast Reconstr Surg*. 2018;142(4):1094-1100. doi:10.1097/PRS.0000000000004811

## **Fat Necrosis after DIEP Reconstruction: An Analysis Of Over 400 Flaps**

Abstract Presenter: Serena Bhaskerrao

Abstract Co-Author(s): Jacquelyn Knox MD, Aileen Gozali MD, Merisa Piper MD

**Introduction:** Fat necrosis is a significant problem after deep inferior epigastric perforator (DIEP) flaps. While many factors have been associated with fat necrosis, we aimed to analyze a large database of DIEP flaps with long-term follow-up to better define these risk factors and investigate how the development of fat necrosis may impact other complications.

**Methods:** We performed a retrospective review of patients who underwent post-mastectomy DIEP flap reconstruction between 2004-2022. Demographics, treatment details, and post-operative outcomes were collected. Patients who developed fat necrosis were compared to those who did not, and a sub-analysis was performed on fat necrosis requiring operative intervention.

**Results:** We identified 256 patients (407 flaps). Mean follow-up was  $24 \pm 20$  months. Fat necrosis developed in 111 (27%) flaps, of which 66 (60%) required operative intervention. A higher prevalence of neoadjuvant radiation (47% vs 30%,  $P < 0.01$ ) was observed in patients who developed fat necrosis. Fewer flaps in the fat necrosis group used  $>2$  perforators (81% vs 90%,  $P = 0.02$ ). Flaps that developed fat necrosis had higher rates of infection requiring oral (14% vs 6%,  $P < 0.01$ ) or IV antibiotics (8% vs 3%,  $P = 0.04$ ), delayed wound healing (14% vs 5%,  $P < 0.01$ ), operative wound breakdown (13% vs 5%,  $P = 0.01$ ), and partial flap loss (4% vs 1%,  $P < 0.01$ ). 61% (27/44) of infections occurred in the first 30 days post-operatively. While the rate of operative wound breakdown was higher in the operative fat necrosis group (18% vs 4%), this was not significant on regression analysis ( $P = 0.05$ ). More patients with operative fat necrosis required revision fat grafting (47% vs 24%,  $P = 0.02$ ).

**Conclusions:** Patients should be counseled that a large percentage of those who develop fat necrosis may ultimately require surgical excision and fat grafting to address the resulting contour deformities. Additionally, as fat necrosis may increase the risk of other complications such as infection and wound breakdown, future investigation will focus on whether early intervention may reduce these risks.

## **Oral Contraceptive Pills and Reduction Mammoplasty: A Retrospective Cohort Analysis**

Abstract Presenter: Chloe Cottone

Abstract Co-Author(s): Alyssa Reese MD, Katherine Foote, Jordan Frey MD

**Intro:** Oral contraceptive pills (OCPs) are commonly utilized by women aged 15-45 for contraception and menstrual cycle regulation. Despite being associated with an increased risk of thromboembolism, their potential impact on surgical outcomes, particularly in the context of reduction mammoplasty, remains an area of inquiry. This retrospective cohort study aimed to explore the association between OCP use and outcomes following reduction mammoplasty, utilizing data from the TriNetX database.

**Methods:** A retrospective cohort study was conducted using the United States Network in TriNetX. CPT 19318 was used to identify patients who underwent breast reduction surgery. Within this group, two cohorts were created: OCP and Control. OCP was defined by those who were taking oral contraceptive pills at the time of surgery (Norgestimate, Norgestrel, Dienogest, Desogestrel, Drospirenone, Ethynodiol, Ethinyl Estradiol) and Control could not be taking OCPs at the time of surgery. Propensity score matching was carried out for age, race, previous delivery (vaginal and cesarean), and body mass index. Outcomes within six months of surgery were documented, including mastodynia, ptosis, fat necrosis, deformity or disproportion of the breast, postoperative hematoma/hemorrhage, and postoperative embolism/thrombosis. Relative risk within a 95% confidence interval and chi-squares were calculated.

**Results:** After matching, each cohort was comprised of 8,526 patients with a mean age of 31.7 years (SD: 11.5 years). Controls exhibited a 1.36-fold higher likelihood of postoperative hematoma/hemorrhage, with 195 (2.3%) Controls experiencing the complication compared to 143 (1.7%) individuals taking OCPs (CI:1.10-1.68;  $p<0.01$ ). However, the OCP group did not demonstrate an increased risk for developing an embolism or thrombosis, with 32 (.38%) experiencing the complication compared to 35 (.41%) Controls (RR=.91; CI:.57-1.48;  $p=.71$ ). No statistical difference was found between groups in terms of mastodynia ( $p=.10$ ), ptosis ( $p=.15$ ), fat necrosis ( $p=.54$ ), or deformity or disproportion of reconstructed breast ( $p=.32$ ).

**Conclusion:** The results of this study indicate that discontinuation of OCPs prior to reduction mammoplasty would not offer any discernible advantages in terms of postoperative outcomes. The decision to continue or discontinue OCPs before reduction

mammoplasty should be based on patient-specific factors, rather than on reducing the risks associated with the procedure.

## **No Refill Needed: Long Term Effects of a Methadone-Based ERAS Protocol for Improved Pain Management in DIEP Flap Breast Reconstruction Following Hospital Discharge**

Abstract Presenter: Chase Alston

Abstract Co-Author(s): Nancy Qin, Marcos Lu Wang MD, Sophia Arbuiso, Isaiah Rhodes, Ashley Zhang, Hao Huang MD, Jaime Bernstein MD, Leslie Cohen MD, David Otterburn MD

**Purpose:** Inadequate postoperative pain relief places patients at risk for increased morbidity, including surgical complications and chronic postoperative pain. In our previous study, we reported that our methadone-based Enhanced Recovery After Surgery (ERAS) protocol for deep inferior epigastric perforator (DIEP) flap breast reconstruction resulted in lower postoperative opioid requirements, lower pain scores, and decreased incidences of tachycardia. This study aims to establish ERAS pathway patient opioid requirements after hospital discharge.

**Methods:** This is a prospective study of 387 patients who underwent DIEP flap breast reconstruction by two attending surgeons at a tertiary care institution from March 2017 to December 2023. Of the 378 patients, 186 were managed prior to ERAS implementation, and 193 were seen following implementation. The ERAS pathway includes a single dose of intra-operative weight-based methadone and specific management guidelines, such as patient education, medication optimization, and fluid management. All patients were discharged on either postoperative day 2 or 3. At the time of discharge, all patients were prescribed oxycodone 5 mg for pain as necessary. Patient home opioid pain medication usage was surveyed for 14 days post-discharge. All opioid usage units were converted to morphine milligram equivalents (MME). Paired t-test analysis was used to compare differences in opioid usage between days at home for a subset of patients, as well as compare opioid refill requests for patients prior to vs following ERAS pathway implementation.

**Results:** When comparing opioid refills request patterns between the 186 non-ERAS patients, and the 193 ERAS pathway patients, there was no significant difference in average number of patients requesting an opioid prescription refill. Of note, patients in

the non-ERAS group that requested refills asked for a higher number of refills than those in the ERAS pathway group that requested refills ( $p < 0.05$ ). Additionally, a subset of 71 ERAS patients reported discharge pain medication usage. Of these patients, 43 patients (60.6%) discontinued opioid medications on home day 3 (postoperative day 5 to 6), 59 patients (83.1%) discontinued opioid medications on home day 7 (postoperative day 9 to 10), and 69 patients (97.2%) discontinued opioid medications on home day 13 (postoperative day 15 to 16). Of the 14 home days surveyed, there was a statistically significant decrease in mean opioid medication usage between home day 1 and 4, with average medication use falling to less than one pill per day (10.75 MME to 6.6 MME,  $p < 0.05$ ). Further decrease in pill usage was observed between home day 11 and 14 (1.7 MME to 0.5 MME,  $p < 0.005$ ).

**Conclusion:** Our preliminary results demonstrate that most patients in our methadone-based ERAS pathway require decreased opioid pain medications at home, with over 60% of patients stopping opioid use by home discharge day 4. Among patients that request opioid medication refills, the number of refills requested by an individual ERAS pathway patient is less than that requested by the non-ERAS pathway patient. This study establishes a baseline opioid requirement for ERAS pathway patients and advocates for minimizing opioids prescribed upon hospital discharge.

### **Single-surgeon, Single-Stage, Safe Surgery: Characteristics of 207 Latissimus Dorsi Flap Breast Reconstructions**

Abstract Presenter: Youssef Aref

Abstract Co-Author(s): Yasmina Samaha MD, Brianne Mitchell MD, Edward Ray MD, FACS, Randy Sherman MD, Philip Brazio MD

**Background/Purpose:** The latissimus dorsi flap (LDF) is a historical workhorse and contemporary salvage mainstay for breast reconstruction. There is still debate regarding the timing and staging of LDF-implant breast reconstruction. We examine the outcomes of a single-surgeon, single-institution experience of LDF breast reconstruction outcomes, with focus on staging of flap and implants.

**Methods and Materials:** We performed a retrospective chart review of patients who underwent LDF breast reconstruction from 2008-2021 by a single surgeon (RS). Charts were reviewed for demographics, comorbidities, indications, number and type of planned stages, and outcomes. Acute and chronic complications and revisions were

compared according to indication and staging of reconstruction, as well as use of radiation. Staging groups were 1-stage LDF alone, 1-stage LDF/implant, 2-stage LDF to implant, and 2-stage LDF/tissue expander to implant. The 1-stage LDF/implant cohort was compared versus all other groups. Capsular contracture incidence was compared between the 1-stage LDF/implant cohort and the staged implant groups.

**Results:** Our study included 154 patients and 207 LDF flaps. Mean follow-up was 46.89 months (1-164). Comparing indications for reconstruction, there was a non-statistically significant trend toward acute minor complications with primary reconstruction versus salvage indication (28% vs. 12.5%,  $p=0.065$ ). Radiation after LDF reconstruction was significantly associated with a higher rate of late and total complications compared to before, both before and after, and no radiation (53.3% vs 26.6% vs 0% vs 28.1%,  $p$ -value=0.026, 60% vs 32.8% vs 0% vs 38.5%,  $p$ -value=0.037). There was a large but not statistically significant difference in capsular contracture for the 1-stage LDF/implant group versus staged implant groups (29.6% vs. 0%,  $p=0.115$ ). The 1-stage LDF/implant cohort had a significantly greater rate of late complications (32.1% vs 10%,  $p$ -value=0.04), total complications (40.6% vs 15%,  $p$ -value=0.025), late revisions (35.8% vs 10%,  $p$ -value=0.020), and total revisions (40.1% vs 15%,  $p$ -value=0.028). After excluding capsular contracture, however, there were no significant differences in complications or revisions on the basis of indication, staging, or radiation status ( $p > 0.05$ ).

**Conclusion:** Our study demonstrates the safety of performing single-staged LDF with implant for breast reconstruction. There was a trend toward increased incidence of capsular contracture which merits analysis in future studies with larger cohorts of staged reconstructions. Capsular contracture remains a common complication, and future research should examine means to reduce the risk of capsular contracture following LDF breast reconstruction.

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ASPS Staff would like to thank and remember Dr. Randy Sherman, who contributed to this abstract before his passing in July 2023. More information is available from Plastic Surgery News at <https://www.plasticsurgery.org/for-medical-professionals/publications/psn-extra/news/remembering-randy-sherman-md-1951-2023>.



## **Early Discharge After DIEP Flap Surgery: A Feasible Approach Without Increased Complications**

Abstract Presenter: Puja Jagasia

Abstract Co-Author(s): Elianna Dash, Matthew Sigel, Courtney Andrews, Jordan Johnson, Andrew James, Ricardo Torres-Guzman MD, Megan Vucovich MD, Susan Orra MD, Carrie Kubiak MD, Elizabeth Dale Slater MD, Stephane Braun MD, Lauren Connor MD, Galen Perdakis MD

**Background:** Deep Inferior Epigastric Perforator (DIEP) flap surgery offers better satisfaction and quality of life (QoL) than other reconstruction options but may involve longer hospital stays and significant post-surgery care (1). Enhanced recovery after surgery (ERAS) protocols have improved quality of care and reduced postoperative length of stay (LOS) in hospitals. Our study aims to investigate the impact of ERAS pathways on DIEP outcomes, evaluating how modern interventions might reduce inpatient hospitalization length without compromising patient safety and postoperative QoL.

**Methods:** A computerized search was conducted on September 29th, 2023, using five databases. The search strategy was: "Free Tissue Flaps" OR "Myocutaneous Flap" OR "Surgical Flaps" AND "Patient Discharge". From the results of the computerized search, researchers manually selected studies that described DIEP flap protocols and outcomes with a mean LOS less than 5 days to be included in the review. Study characteristics included original articles, clinical trials and descriptive studies. Studies in languages other than English, conferences articles, editorials, reviews, abstracts, and book chapters were excluded. Studies that occurred in animal models, in-vitro or ex-vivo were excluded. We recorded rates of total flap loss, partial flap loss, hematoma, seroma, infection and reoperation. The studies were separated into five groups based on mean LOS following DIEP flap. Group 1: <1; Group 2: 1.1-2 days; Group 3: 2.1-3; Group 4: 3.1-4 and Group 5: 4.1-5 We used the Kruskal-Wallis test to determine significant differences in complication rates between the 5 groups because of the non-normal distribution of complication rates.

**Results:** After screening 703 studies, 27 papers were selected based on our inclusion criteria, encompassing 2,175 patients for analysis. Among these, 68 patients underwent outpatient DIEP flap procedures, and 218 received drain-free DIEP flap surgeries. Infection emerged as the most reported complication, with rates ranging from 1.56% to 5.17%. The highest infection rate occurred in patients with a length of stay (LOS) ranging from 1.1 to 2 days, whereas the lowest rate was noted in those with an LOS of

4.1 to 5 days. There were no reports of total flap loss in studies with LOS less than 2 days, while the rate of total flap loss in studies with LOS between 4 and 5 days was 2.74%. Statistical analysis revealed no significant differences between groups in terms of total flap loss ( $p=0.315$ ), partial flap loss ( $p=0.051$ ), hematoma ( $p=0.459$ ), seroma ( $p=0.319$ ), infection ( $p=0.59$ ), or the necessity for reoperation ( $p=0.346$ ).

**Conclusion:** Complication rates are not statistically different across various short LOS groups following DIEP surgery. This suggests that abbreviated LOS following DIEP flap breast reconstruction is feasible without significantly increasing postoperative complications, supporting the incorporation of early discharge protocols in appropriate patients.

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## Radiation Effects on Lymphatic Anatomy of the Chest: The No Flow Zone

Abstract Presenter: Shayan Sarrami

Abstract Co-Author(s): Korrina Gidwani, Casey Zhang, Meeti Mehta BS, Carolyn De La Cruz MD

**Introduction:** Breast cancer related truncal lymphedema can be a difficult post-surgical complication that is not yet well understood. We aim to analyze the effects of radiation on lymphatic structures of the chest and map changes in lymph flow using indocyanine green (ICG) lymphography. Radiation is a known risk factor of lymphedema development but the extent of its damage on truncal lymphatics has never been assessed. Severe lymphatic destruction can be represented as zones of no lymphatic flow seen on ICG imaging. We will explore the incidence of no flow zones in irradiated chests and identify changes in lymphatic drainage pathways.

**Methods:** This study is a retrospective review of breast cancer patients with a clinical suspicion of truncal lymphedema who received ICG lymphography of their chest from August 2023 to January 2024. Data was collected on all breast cancer treatment

modalities including radiation, chemotherapy, axillary dissection, and mastectomy. Zones of no lymphatic flow were recorded using ICG lymphography. Lymphatic drainage to the ipsilateral axillary nodes, ipsilateral inguinal nodes, and to contralateral lymph node basins were also assessed. Univariate analysis and multivariable logistic regressions were performed to analyze the association between treatment modalities and the presence of no flow zones. Chi-square test of independence was used to test the difference in drainage pathways between patients with and without radiotherapy. All statistical analysis were performed with SPSSv24.0 ( $p < 0.05$  considered statistically significant).

**Results:** Our cohort included 32 hemi-trunks (19 patients). 19 sides (59%) had undergone prior radiation and 13 had not. Additionally, 69% underwent mastectomy, 53% had chemotherapy, and 31% had axillary dissection. Zones of no lymphatic flow were seen in 66% of hemi-trunks. Prior radiation was significantly associated with hemi-trunks containing absent lymphatic flow ( $p = 0.027$ ). On multivariate analysis, controlling for confounding chemotherapy, axillary dissection, and mastectomy, radiation was associated with 18.57 times increase in odds of absent lymphatic flow. Overall, lymphatic drainage to the ipsilateral axilla was seen in 41% of hemi-trunks, drainage to the groin was seen in 81%, and contralateral drainage was seen in 28%. Using Chi-square analysis, radiation was significantly associated with less lymphatic drainage to the ipsilateral axilla ( $p < 0.001$ ) and increased contralateral drainage ( $p = 0.003$ ). There was no significant change in drainage to the inguinal nodes in trunks that received radiotherapy ( $p = 0.604$ ).

**Discussion:** We show that prior radiation is significantly associated with zones of no lymphatic flow and increased drainage to contralateral lymph node basins. This represents severe damage to lymphatic vessels resulting in lymph stasis and formation of aberrant drainage pathways. This is the first study to illustrate no flow zones of the irradiated chest using ICG imaging and shows the level of lymphatic damaged caused by radiation therapy.

## **Towards an Understanding of How Textured Breast Implant Shells Negatively Impact HUVEC Growth**

Abstract Presenter: Jini Jeon

Abstract Co-Author(s): Tim Li, Riley Mayne, Sophia Salingaros, Dylan Kim, Xue Dong MD, PhD, Jason Spector MD

**Purpose:** Safety concerns have been raised regarding silicone breast implants due to their link with Breast Implant Associated Anaplastic Large Cell Lymphoma (BIA-ALCL) and the recently identified BIA Squamous Cell Carcinoma (BIA-SCC). Previous research conducted in our laboratory has documented an unexpected reduction in the growth of BIA-ALCL and primary T cell lines when exposed to textured silicone implant shells. Given this intriguing finding, we expanded our investigation to examine the impact of widely used commercial silicone textured breast implant shells on various cell lines within the peri-implant environment, such as endothelial cells. Interestingly, we observed a similar significant decline in cell count following direct culture with textured implant shells over eight days. These preliminary findings prompted us to explore the possibility of a harmful metabolic or biochemical factor being directly released from the implant shells, by utilizing conditioned media (CM) from media in wells lined with textured implant shells in varying concentrations.

**Methods and Materials:** To simulate a peri-prosthetic microenvironment, Allergan and Mentor textured implant shells were cut, sterilized via steam autoclave, and used to line the wells of 96-well plates. Low serum (2%) media was added to implant shell-lined wells and no-plant wells, and 150  $\mu$ L of resulting media from each well was collected every 48 hours for use as conditioned media (CM). Human Umbilical Vein Endothelial Cells (HUVECs) were seeded in a separate 96-well plate with ~1,000 cells/150 $\mu$ L (10-15% confluence) and fed with collected CM at varying dilution ratios every 48 hours up to 8 days. Ratios of CM:Fresh Media (FM) 1:0, 2:1, 1:2, 1:5, 1:15 were used for replenishment. Wells with HUVECs receiving fresh media were used as the control. Cell count and morphology were assessed on Days 1, 4, and 8.

**Results:** The most significant decrease in cell count was observed for the non-diluted (1:0) textured shell-exposed CM group on Day 8 compared to FM diluted and FM groups. In comparison, when CM was increasingly diluted with FM, cell count increased over time, especially in higher CM:FM ratios 1:2, 1:5, 1:15, which were similar to the FM group cell counts ( $p < 0.05$ ). The presence of hypertrophied HUVECs were observed in the 1:0 textured shell-exposed CM group. Both Allergan and Mentor textured implant shells had similar impacts on cell behavior.

**Conclusions:** The negative impact of textured implant shells on endothelial cell count was observed with direct cell exposure to shells as well indirect exposure through CM. Results of this study strongly suggest the involvement of a factor released by the implant shell into its surroundings, potentially disrupting normal cellular growth and metabolism, in addition to the possible effect of shell surface absorption of nutrients. Further investigation into the interactions between different cell types and implant shells is crucial for a more comprehensive understanding of the potential risks associated with these prostheses.

### **Correlation between Vascular Comorbidities and Socioeconomic Status As Risk Predictors for Breast Cancer Related Lymphedema (BCRL)**

Abstract Presenter: Bracha Pollack

Abstract Co-Author(s): Adana Campbell MD, Arielle Roberts DO, MS, Jonathan Rubin, Jinyeon Shin, Gopika Ashokan, Hyeung Ju Park, Babak Mehrara MD

**Purpose:** Breast cancer related lymphedema (BCRL) is the most common cause of secondary lymphedema in developed countries. Previous studies have shown that cardiovascular co-morbidities such as hypertension increase the risk of developing BCRL (1). However, more recent studies have also shown that socioeconomic factors significantly influence the development of disease (2). Given the correlation between cardiovascular diseases and socioeconomic factors, the purpose of this study was to analyze the independent effects of these variables on the risk of BCRL development.

**Methods:** We identified patients treated at Memorial Sloan Kettering Cancer Center for breast cancer with either axillary lymph node dissection (ALND) or SLNB (sentinel lymph node biopsy) procedures from January 2000 to November 2023. Results were limited to those who had a minimum of 18 months follow up. Variables of interest included diabetes, hyperlipidemia and hypertension status at time of ALND or SLNB, time to BCRL diagnosis, and socioeconomic risk factors, including race, ethnicity, insurance status, and social deprivation index (SDI) using patients' zip codes. Univariable analysis was performed using either Chi-squared test or Mann Whitney U test. Multivariable analysis was performed using a multiple logistic regression model.

**Results:** The database search yielded a total of 28,863 patients who underwent SLNB or ALND procedures with a minimum of 18 months follow up. Within this group, 2,306

(median age 53) were diagnosed with BCRL. On univariable analysis, BCRL rate was higher among Black patients (14% vs. 8.5%,  $p<0.0001$ ), Hispanic or Latino patients (8.6% vs. 6.6%,  $p<0.0001$ ), those with Medicaid (4.9% vs. 3.8%,  $p<0.0006$ ) or Medicare insurance (41.5% vs. 39.1%,  $p<0.0006$ ) and in those with diabetes (9.3% vs 6.6%,  $p<0.0001$ ) and hypertension (31.4% vs. 27.7%,  $p<0.0001$ ), while Asian race was protective (5.6% vs. 8.6%,  $p<0.0001$ ).

On multivariable analysis, several notable socioeconomic risk factors were independently associated with BCRL development. These included Black race (OR 1.22, 95% CI 1.0-1.4,  $p=0.0110$ ), Medicare insurance coverage (OR 1.20, 95% CI 1.1-1.3,  $p=0.0004$ ), and SDI score (OR 1.002, 95% CI 1-1.004,  $p=0.0065$ ) with Asian race identified as a protective factor (OR 0.62, 95% CI 0.5-0.8,  $p<0.0001$ ).

**Conclusion:** Our large retrospective study highlights the role of socioeconomic factors in BCRL development and suggests that the increased risk of disease in patients with vascular co-morbidities may be related to socioeconomic factors or complex treatment effects rather than independent effects of these co-morbidities. These findings are important as they raise crucial questions relating to patient care and suggest that access to care is a significant risk factor for BCRL.

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## Post-mastectomy Flat Closure: A Mixed-Methods Analysis of Patient Outcomes and Perspectives

Abstract Presenter: Daniel Soroudi

Abstract Co-Author(s): Nisha Parmeshwar MD, Aileen Gozali MD, Merisa Piper MD

**Background:** Post-mastectomy flat closure is an increasingly common reconstruction option, but comprehensive research on patient-reported outcomes remains limited.(1)

Understanding the psychosocial impact of mastectomy is crucial for guiding patient decisions on breast reconstruction, and the BREAST-Q survey has been instrumental in assessing postoperative outcomes.(2) By combining quantitative analysis and qualitative document analysis, we seek to explore the post-mastectomy flat closure experience. This study analyzes clinical outcomes, evaluates patient satisfaction and quality of life metrics via the BREAST-Q, and explores the applicability of the BREAST-Q survey for this patient population.

**Methods:** A retrospective review was conducted for patients who underwent post-mastectomy flat closure at our institution from 2014 to 2022, examining patient demographics, surgical details, and complications. Data was reported as means  $\pm$  standard deviations. Following consent, patients completed the BREAST-Q survey, rating satisfaction and factors influencing their choice for flat closure. Each domain within the BREAST-Q survey was independently evaluated. The median scores, along with their interquartile ranges (IQR), were calculated for further analysis. Further, qualitative analysis of patient emails, employed an inductive, triangulated approach to extract themes and provide a multi-faceted understanding of the post-surgical experience.

**Results:** 252 patients underwent post-mastectomy flat closure at a mean age of  $61.36 \pm 12.28$  years. The mean time between mastectomy and the last plastic surgery follow-up was  $832.7 \pm 797.4$  days. The overall postoperative complications rate was 17.5% (n=44), with specific complications including seroma (4.8%), hematoma (7.1%), nipple or skin necrosis (0.4%), surgical site infection requiring oral and/or IV antibiotics (2.0%), and other complications (3.2%)

50 (19.8%) patients completed the BREAST-Q survey, on average  $4.6 \pm 2.36$  years after their mastectomy procedure. Patients reported high satisfaction with their surgeons, moderate satisfaction with their breasts, and high physical well-being. Survey results illuminated reasons for choosing flat closure, such as lower complication rates and avoidance of foreign objects. Furthermore, qualitative feedback from 15 email correspondents revealed some limitations of the survey's relevance and language, highlighting emotional impacts and a desire to improve future surveys. The qualitative analysis identified four main categories: Study Participation, Reasons for Declining Participation, Negative Language and Emotional Impact of Survey, and Desire to Help Improve.

**Conclusions:** Our study provides a comprehensive insight into the experiences and outcomes of patients who opted for post-mastectomy flat closure. The study reaffirms that flat closure is a viable option with generally low complication rates, aligning well

with patient-centric reasons for this choice. However, the study also exposes gaps in patient satisfaction and the limitations of existing survey tools like the BREAST-Q in capturing the nuanced experiences of this specific population. Future research should focus on refining patient-reported outcome measures and fostering clinician-patient dialogues that offer flat closure as a routinely discussed reconstruction option in post-mastectomy care.

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## **Predictors of Nipple-Areola Complex Ischemia Following Nipple-Sparing Mastectomy with Breast Reconstruction**

Abstract Presenter: Diego Gomez

Abstract Co-Author(s): Isra Abdulwadood, Heidi Kosiorek, Patricia Cronin, Julie Billar, Edward Reece MD, Alanna Rebecca MD, William Casey III, MD, Barbara Pockaj, Daniel Rhee MD

**Purpose:** Nipple-areola complex (NAC) ischemia is a rare but known complication following nipple-sparing mastectomy (NSM) with breast reconstruction. The authors sought to characterize predictors of NAC complications.

**Methods:** A prospectively maintained database was queried to identify patients who underwent NSM with immediate reconstruction. The effect of patient demographic and surgical characteristics on postoperative NAC ischemic complications was investigated. Multivariate logistic and linear regression were performed.

**Results:** A total of 444 patients underwent nipple-sparing mastectomies with reconstruction (791 breasts) between 2006 and 2023. Sixty-eight patients (15%) experienced a nipple complication, with 46% having bilateral nipple complications (99 breasts). The mean time from surgery to complication recognition was 12 days. The majority of complications were managed with observation requiring no intervention



(n=33; 49%), while 8 (12%) required topical treatments and 28 (41%) required operative intervention. Of those requiring operative intervention, 11 (2.5% of total patients) experienced a complete nipple loss. Demographic factors such as age (OR 1.05; p=0.0017) and active smoking (OR 6.35; p=0.0076) were significantly associated with the development of any nipple complication. Severe cardiac and pulmonary disease were also associated with the development of NAC ischemia, although these were rare comorbidities (0.9% and 0.5%, respectively). Surgical factors, including bilateral surgery were also associated with a significantly increased risk of NAC ischemia (OR 4.33; p=0.029). In multivariate analysis, reconstruction method was significantly associated with the development of nipple necrosis when comparing autologous reconstruction versus direct-to-implant reconstruction (OR 2.75; p=0.0491). Implant location (prepectoral versus subpectoral), incision location, previous breast radiation therapy, and previous breast surgery were not associated with increased risk of NAC ischemia.

**Conclusion:** Age, active smoking, and bilateral surgery were associated with a significantly increased risk of nipple-areola ischemia. Although the use of implant expander reconstruction is commonly used in patients undergoing post-operative radiation therapy, it was not associated with improved nipple outcomes when compared to direct-to-implant or autologous reconstruction.

### **Tissue Expander Salvage After Postoperative Infection Depending on Prepectoral, Subpectoral, and Dual-Plane Placement in Breast Reconstruction: A Single Institution Review of 1,206 Patients**

Abstract Presenter: Meghan Perez

Abstract Co-Author(s): Stuart Powell, Dylan Kim, Christine Rohde MD, MPH, Jeffrey Ascherman MD, FACS, David Dugue MD

**Introduction:** The choice of reconstructive approach in implant-based breast reconstruction after mastectomy has fluctuated in the last decade, with prepectoral reconstruction resurging in popularity with the advent of acellular dermal matrices. Infection is a feared complication in all device-based breast reconstruction, but may be particularly devastating in pre-pectoral reconstruction where device involvement necessitates operative intervention and explantation. Trialing conservative management with antibiotic therapy may enable implant salvage in certain cases. While previous studies have characterized overall complication profiles in different planes of reconstruction following mastectomy, no existing studies describe the likelihood of

implant salvage with respect to the plane of reconstruction in a large patient cohort.

**Methods:** Patients who underwent device-based breast reconstruction after mastectomy from January 2013 to December 2023 were identified by CPT code and retrospectively reviewed. Patients with post-operative infections were identified and patient characteristics were collected and analyzed for clinical outcomes. Patients were separated into four groups (total submuscular, dual plane, pre-pectoral with ADM and pre-pectoral without ADM) and outcomes were compared, with device salvage and explantation as the main outcomes of interest. Device salvage was characterized as clinical resolution of infection following conservative management and explantation was characterized as removal of implants. Multivariate logistic regression was used to calculate most contributory predictors of salvage vs. explantation ( $p < 0.05$ ).

**Results:** 2,012 reconstructed breasts in 1,206 patients were analyzed. Postoperative infection occurred in 99 (4.9%) cases. The infection rate was highest in dual plane procedures (31/280, 11.1%), followed by prepectoral (20/243, 8.2%) and submuscular (48/1489, 3.2%) placement ( $p < 0.001$ ). Oral antibiotics were provided most frequently in prepectoral cases (90.0%) ( $p = 0.67$ ). Intravenous antibiotics and/or hospital admission occurred most frequently in prepectoral (75.0%), followed by submuscular (58.3%) and dual plane reconstruction (25.8%) ( $p = 0.0012$ ). Rate of explantation was highest in dual plane (80.6%) procedures, followed by submuscular (70.8%) and prepectoral (65.0%) placement ( $p = 0.43$ ). Rate of salvage was comparable in submuscular (31.8%) and prepectoral (31.6%) reconstruction, but less frequently observed in dual plane reconstruction (21.4%) ( $p = 0.60$ ). History of diabetes and neoadjuvant chemotherapy trended toward lower rates of salvage ( $p < 0.2$ ); however, neither were significant predictor variables in multivariate logistic regression.

**Conclusion:** Submuscular implant placement in device based breast reconstruction is associated with lower rates of implant infection and greater likelihood of salvage in our practice. Dual plane procedures were associated with the highest rate of infection and lowest rates of salvage, although findings were not statistically significant. Our data suggests that while patients theoretically have increased soft tissue coverage with dual plane reconstruction, it may not confer much benefit to prepectoral reconstruction from an infectious standpoint. Overall, our data suggests that conservative management of infection in device-based reconstruction is a reasonable treatment option, with resolution of infection in many cases.

# **Intraoperative Visualization of the Lateral Upper Arm Pathway in Immediate Lymphatic Reconstruction: A 5-Year Follow Up**

Abstract Presenter: James Fanning

Abstract Co-Author(s): Yuma Fuse, Dhruv Singhal MD

**Background:** The lateral upper arm pathway represents a collateral route of lymphatic drainage postulated to terminate in the deltopectoral groove distinct from the arm's main lymphatic collectors. The lateral upper arm pathway may prevent or alleviate breast cancer-related lymphedema (BCRL) by draining to higher level lymph nodes spared during axillary lymph node dissection (ALND). However, we previously reported that the lateral upper arm pathway is visualized intraoperatively draining to the axilla with the arm's main collecting channels in 10% (3/29) of immediate lymphatic reconstruction (ILR) patients.<sup>1</sup> Our objective was to complete a 5-year follow up to better describe intraoperative visualization of the lateral upper arm pathway draining into the axilla in ILR patients.

**Methods:** A retrospective review of breast cancer patients undergoing ILR from September 2016 through May 2023 was performed. Intraoperative lymphatic mapping was performed with fluorescein isothiocyanate (FITC) injected at the medial upper arm or hand/wrist, while isosulfan blue was injected over the cephalic vein in the lateral upper arm prior to ALND. Patient demographic and intraoperative lymphatic channel data were analyzed.

**Results:** 333 consecutive breast cancer patients who underwent ILR after ALND were identified. Patients had a median age of 54 years and 99% were female. Divided FITC lymphatics were identified in 97% (323/333) of patients and blue divided lymphatics were identified in 8.1% (27/333) of patients after ALND. A median of 2 divided FITC lymphatics were identified, and a median of 1 divided blue lymphatic was identified. Blue divided lymphatics were significantly closer to the axillary vein (median 1.4 cm) compared to FITC divided lymphatics (median 2.3 cm) ( $U = 14,815$ ;  $p = 0.001$ ). Blue divided lymphatic diameters (median 0.40 mm) were comparable to FITC divided lymphatic diameters (median 0.60 mm) ( $U = 8,690$ ;  $p = 0.314$ ).

**Conclusion:** In this 5-year follow up of intraoperative lymphatic channel mapping in ILR cases, we visualized blue divided lymphatics in the axilla in a comparable proportion of patients. For the first time, we describe that lymphatics of the lateral upper arm pathway travel closer to the axillary vein than the arm's main lymphatic collectors when visualized intraoperatively. As the lateral upper arm pathway is visualized

intraoperatively in only a small proportion of patients, this may represent an anatomic variation of the pathway's drainage. Further studies are needed to confirm if these patients also demonstrate drainage to the deltopectoral groove, which may confer a lower risk of BCRL after ALND.

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## **Autologous and Implant Based Reconstructive Trends Following Unilateral Modified Radical and Radical Mastectomy: A SEER Database Analysis**

Abstract Presenter: Jian Li

Abstract Co-Author(s): Stephen Stearns MD, Angelica Hernandez MD, Samuel Lin MD

**Background:** Breast cancer is the second leading cause of cancer among women in the United States, necessitating a diverse array of therapeutic interventions<sup>1</sup>. Radical and modified radical mastectomy remain effective oncologic treatment modalities, however, cause significant deformity requiring autologous and implant-based repair to reconstruct the chest. Longitudinal trends in chest wall reconstruction after modified radical mastectomy remain under described.

**Purpose:** This retrospective study utilizes the Surveillance, Epidemiology, and End Results (SEER) database to investigate trends in breast reconstruction over two decades (2000-2020) following unilateral modified radical and radical mastectomy. The primary objectives are to assess whether there is a decline in autologous reconstruction (AR) in favor of implant-based reconstruction (IBR), to analyze demographic shifts in patients undergoing these procedures, and to examine differences in oncologic management.

**Methods:** We analyzed data from the SEER 17 registry, encompassing seventeen geographic regions in the United States. Female patients undergoing radical mastectomy between 2000 and 2020 were included. Detailed demographic and oncologic variables were collected, and reconstruction types were categorized as IBR,

AR, or a combination. Subgroup analyses compared IBR and AR patients, and demographic changes between the 2000-2010 and 2010-2020 cohorts were examined.

**Results:** Of the 25,649 patients included, 51.8% underwent IBR, and 48.2% underwent AR. AR patients tended to be younger, more frequently Black, with higher incomes, and less rural residence compared to IBR patients. Longitudinal analysis revealed a shift from AR to IBR dominance, with AR decreasing from 41.8% of all reconstructions in 2000 to 24.5% in 2020. Significant demographic changes in AR patients between 2000-2009 and 2010-2020 included increased average age, higher proportions of Black and Asian patients, lower income, and increased non-marital status. Oncologic management also differed, with AR patients less likely to undergo chemotherapy and radiation, and experience longer times to reconstruction than IBR patients.

**Conclusions:** This study highlights a shifting landscape in post-modified-radical mastectomy breast reconstruction, with a notable decline in AR in favor of increasing IBR popularity. Demographic changes reveal evolving trends in patient characteristics, emphasizing the importance of understanding these shifts for equitable access and informed decision-making in breast cancer reconstructive care.

### **Similar Complication Rate for DIEP and Abdominal Body Contouring Following Massive Weight Loss**

Abstract Presenter: William West III

Abstract Co-Author(s): Amelia Davidson, Timothy Nehila, Nicole Le MD, MPH, Kristen Whalen MD, Deniz Dayicioglu MD

**Purpose:** The incidence of obesity in the United States continues to rise with subsequent increases in the incidence of bariatric surgery for massive weight loss (MWL). Prior bariatric surgery with massive weight loss demonstrates an increased complication rate in abdominal procedures. In terms of plastic surgery, this broadly includes deep inferior epigastric perforator (DIEP) free flap breast reconstruction and abdominal body contouring (traditional abdominoplasty, fleur-de-lis/vertical, and circumferential body lift). Obesity is a known risk factor for breast cancer, so many patients will have MWL surgery and breast cancer. These patients most frequently undergo body contouring surgery (BCS) for excess skin following MWL. Bariatric surgery followed by mastectomy with breast reconstruction gives these patients the unique opportunity to utilize their redundant tissue similar to abdominal BCS. Due to the

known increase in complication rates for abdominal procedures following MWL, many patients may be hesitant to consider DIEP for their breast reconstruction. In this study, patients who underwent DIEP breast reconstruction surgery following MWL were compared to those who received abdominal BCS following MWL to assess relative complication rates and potentially provide patients considering DIEP with reassurance that their complication rate is similar to commonly performed abdominal BCS.

**Methods:** A retrospective cohort study was performed including patients treated at either a National Cancer Institute designated cancer center or a tertiary referral hospital who underwent either DIEP or abdominal BCS following MWL between October 2011 and February 2022. Patients met inclusion criteria if they lost more than 50% of excess body weight, were at a stable weight for the six months prior to surgery, and had a complete chart for analysis. Statistical analysis included independent samples t test and Fisher's exact test for univariate analyses along with multivariate analysis for predictive variables of postoperative complication.

**Results:** A total of 24 DIEP flaps (in 14 patients) and 188 abdominal body contouring procedures (in 188 patients) met inclusion criteria. The average age was  $55 \pm 10$  years in the DIEP group compared to  $49 \pm 12$  years in the abdominal BCS group. Average BMI in the DIEP group was  $32.2 \pm 4.8$  kg/m<sup>2</sup> compared to  $34.0 \pm 8.8$  kg/m<sup>2</sup> for the abdominal BCS patients. The postoperative complication rate did not differ between the two groups (50% with DIEP vs. 34% with BCS,  $p=0.17$ ). Multivariate analysis further demonstrated that procedure type was not a predictor of postoperative complication ( $p=0.34$ ).

**Conclusion:** Patients with DIEP procedures were found to have similar complication rates to those who received standard abdominal BCS. It should be noted that the complications after DIEP were frequently Clavien-Dindo IIIb (66%) and required surgical intervention. This information can be used by plastic surgeons when counseling MWL patients considering DIEP that their chance of postoperative complication is similar to commonly performed abdominal body contouring procedures.

## **What's the Threshold? Investigating Body Mass Index & Hemoglobin A1C Cutoff Values for Complication Risk in Breast Reconstruction: A NSQIP Database Study**

Abstract Presenter: Sarah Thornton

Abstract Co-Author(s): Robert George MD, Madeline Chin MD, Steven Moura MD, Samuel Poore MD, PhD, Caroline Bay

**Background:** In reconstructive breast surgery, there is insufficient literature on threshold values for hemoglobin A1C (A1C) and body mass index (BMI) to identify patients at high risk for complications. This study aimed to evaluate the effectiveness of A1C, BMI, and other patient factors in predicting complications and to identify cutoff values for plastic surgeons to use in preoperative evaluation.

**Methods:** Retrospective analysis of breast reconstruction complications was conducted utilizing data from the National Surgical Quality Improvement Program Database (2020-2022). Logistic regressions examined the association of A1C, BMI, age, and diabetes, smoking, and hypertension status with complications. Receiver operating characteristic curves were constructed to identify cutoff values with the highest sensitivity and specificity for predicting complications. The discriminatory ability of A1C and BMI to predict complications was assessed using area under the curve (AUC).

**Results:** The study included 2,713 cases. At least one complication was documented in 12.8% of cases (n = 348). BMI was the only significant predictor of complications based on logistic regression. Patients with BMIs 35 kg/m<sup>2</sup> or greater had the highest odds of complications (OR 2.060, p<0.001). AUCs for A1C and BMI curves for all complications were significantly different (0.516 vs. 0.586, p < 0.0004), indicating BMI as having superior ability to predict complications. A BMI cutoff of 27.9 kg/m<sup>2</sup> provides the greatest specificity and sensitivity for complications.

**Conclusions:** Based on odds ratios, A1C, age, and diabetes, smoking, and hypertension statuses were not significant predictors of complications after breast reconstruction, however BMI was. Based on AUCs, BMI is a stronger predictor than A1C. Our findings suggest a cutoff value for A1C is unnecessary because it has limited utility in predicting a patient's risk of developing the examined complications.

## Identifying Areas for Targeted Improvement in Post-Mastectomy Implant-Based Breast Reconstruction Patient Education: A Qualitative Study

Abstract Presenter: Aileen Gozali MD

Abstract Co-Author(s): Serena Bhaskerrao, Zuivanna Rivas, Daniel Soroudi, Jacquelyn Knox MD, Merisa Piper MD

**Purpose:** Implant-based breast reconstruction requires patients' understanding of its complex perioperative management to make informed decisions and optimize care. Despite it being the most common method of breast reconstruction after mastectomy, patients still lack a thorough understanding of what this procedure entails. We aim to utilize patient-provider perioperative communications to identify knowledge gaps in post-mastectomy implant-based breast reconstruction.

**Methods:** Patients who underwent immediate post-mastectomy tissue expander (TE) or implant placement at a single academic institution from September 2021 to September 2022 were included. Patient-generated calls and messages in the perioperative period – defined as from the time of referral to plastic surgery to the first postoperative visit after their most recent implant-based breast reconstructive surgery – were extracted from medical records and qualitatively analyzed.

**Results:** Of the 82 patients identified, 72 (87.8%) underwent staged reconstruction with TE placement and 10 (12.2%) had direct implant placement. 59 (72.0%) patients received implants as their final reconstruction, while 19 (23.2%) required TE or implant explantation due to infection or flap necrosis. The median distance to the hospital was 93.7 miles (SD=169.5). The median perioperative period was 248 days (SD=176). 393 communications were generated by 75 patients (91.5%), and the subjects of inquiry and encounter resolutions were recorded. Most communications were generated after TE placement and before implants were placed or removed (74%). Qualitative analysis showed the most common subjects of inquiry to be about postoperative management (44.5%), surgical site concerns (26.5%), and general questions about the procedure (17.0%). Within postoperative management inquiries, patients most often inquired about activity restrictions (23.4%), drain management (16.6%), and wound management (15.4%). Most inquiries were resolved through patient re-education (60.8%), which included answering questions (60.7%), providing reassurance (29.7%), and giving instructions (10.0%).

**Conclusions:** Our study revealed that most patient-generated inquiries pertained to postoperative management following TE placement, with specific recurring questions



related to TEs. Most inquiries were resolved through re-education, emphasizing a gap in patient education. While secure patient-provider messaging systems are increasingly utilized, there may be patients who lack the resources to access this platform, underscoring the importance of healthcare providers considering clinic visits as an invaluable opportunity for comprehensive postoperative management education.

## **Characterization of the Differences in Cellular Response to Silicone Particles in Smooth and Textured Breast Implant Capsules**

Abstract Presenter: Sarah Petrecca

Abstract Co-Author(s): Hillary Nepon MD, Nikita Kalashnikov, Peter Davison MD, Tassos Dionisopoulos MD, Joshua Vorstenbosch MD, PhD, FRCSC

**PURPOSE:** Breast implants trigger a foreign body response resulting in a fibrous encapsulation around the implant(1). Breast implant capsule is often benign; however, chronic capsule inflammation can promote excessive symptomatic capsule scarring or tumor formation around the device. Silicone particles in breast implant capsules have been linked to the pathoetiology of capsular contracture and are hypothesized to represent an inflammatory stimulus for breast implant capsular-associated diseases(2,3). Textured implants have a lower incidence of capsular contracture but are linked to ALCL. To date, the localized cellular response surrounding silicone particles has not been investigated. We aim to determine the differences in silicone infiltration in smooth and textured breast implant capsules and characterize the specific cellular responses to silicone particles in the capsule.

**METHODS:** Capsule tissue from textured silicone (N=15) and smooth silicone (N=15) breast implants was collected from consenting patients undergoing revisions. Silicone infiltration and capsular thickness were assessed histologically. Capsular cell populations were measured by immunohistochemistry (macrophages, CD3+ total T-cells, CD4+ helper T-cells, fibroblasts, and myofibroblasts).

**RESULTS:** Silicone infiltration was greater in textured implant capsules (radius=4.87  $\mu$ m) than smooth implant capsules (radius= 4.28  $\mu$ m) (p=0.47). Smooth implant capsules had an increased thickness (smooth implant capsule thickness=1058  $\mu$ m, textured implant capsule thickness=848  $\mu$ m) (p=0.27). In addition, they displayed increased total macrophages (p=0.01), M2 macrophages (p=0.03), myofibroblasts (p=0.04) and fibrotic cells (p=0.08). Textured implant capsules had increased CD4+ T-

cells ( $p=0.88$ ). The presence of all immune cells was enriched in silicone-dense areas, irrespective of implant surface ( $p<0.001$ ).

**CONCLUSIONS:** Our results suggest that the immune response to silicone particles in capsular tissue varies according to both implant surface and silicone infiltration. Smooth implant capsules exhibit a macrophage-dominant response, potentially mediating the deposition of fibroblasts and myofibroblasts, leading to thicker capsules. Textured implants exhibit enhanced CD4+ T-cell infiltration, which may pertain to ALCL etiology. The increased immune response to silicone particles could underscore the link between silicone presence and capsular contracture. Expanding our understanding of these differences could determine the mechanisms underlying breast implant capsule-related pathology.

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## **Venous Thromboembolism Risk in Breast Reconstruction: Application of the Caprini Risk Assessment Model**

Abstract Presenter: Casey Zhang

Abstract Co-Author(s): Dhipthika Srinivasan DO, Xiao Zhu MD, Vu Nguyen MD

**Background:** The Caprini Risk Assessment Model is the most clinically validated model to assess risk of venous thromboembolism (VTE) in surgical patients. This study aims to better understand the risk of VTE in women undergoing breast reconstruction using this model.

**Methods:** This was a retrospective cohort study utilizing The National Surgical Quality Improvement Quality Program (NSQIP) database to identify patients who underwent breast reconstruction between 2010-2021. After assigning a Caprini score to each patient, univariate regression analysis was performed to test for association with VTE.

**Results:** A total of 73,176 patients were included. 325 patients developed VTE, with an overall incidence of 0.4%. For each unit increase in Caprini score, there was a 1.47 times increase in odds of developing VTE (OR 1.47, CI 1.303-1.648,  $p < 0.001$ ). Risk of VTE was 5.17 times higher in autologous reconstruction than implant-based (OR 5.17, CI 4.096-6.514,  $p < .001$ ). In autologous reconstruction, a Caprini score of 6 or over was significantly associated with higher odds of VTE (OR 1.51, CI 1.136-2.017,  $p = .005$ ); no significant association was noted in implant-based reconstruction (OR 1.356, CI 0.892-2.059,  $p = .154$ ). Among patients who underwent autologous reconstruction, abdominal free flaps were associated with significantly higher odds of VTE compared to latissimus dorsi flap and pedicled TRAM reconstruction (OR 1.74, CI 1.253-2.421,  $p > .001$ ).

**Conclusion:** This study validates the Caprini Risk Assessment model in breast reconstruction and confirms previous findings that autologous reconstruction is associated with higher risk of VTE. We recommend 7-10 days of post-operative VTE chemoprophylaxis for this high-risk population undergoing autologous reconstruction with a Caprini score of 6 or over. Similar prophylaxis measures can be considered in implant-based reconstruction.

## **Uncovering the Socioeconomic Determinants of Breast Reconstruction Decisions Across Diverse Demographics**

Abstract Presenter: Bradley Melnick

Abstract Co-Author(s): Abigail Uryga, Sammer Marzouk, Abbey Landini, Tokoya Williams MD, Raiven Harris, Robert Galiano MD

**PURPOSE:** Breast cancer is a major global public health issue. Despite advancements in treatments improving survival rates, the journey to recovery encompasses more than just achieving remission. Breast reconstruction (BR) post-mastectomy is often crucial for physical and psychological well-being, however, decision-making for reconstruction is complicated by socioeconomic factors. Given that existing data largely reflects the experiences of white, educated women, this study aims to explore these factors in a broader demographic, contributing to a more equitable understanding of healthcare

choices and outcomes.

**METHODS:** Four hundred thirteen women from diverse backgrounds with a history of surgical intervention for breast cancer were surveyed in May 2023. Conducted by Kantar Lightspeed LLC, the computer-based survey combined a 45-item questionnaire, developed with the BRAVE Coalition, and the 13-item Satisfaction with Breasts sub-scale of the BREAST-Q. It focused on socioeconomic factors such as income, education, social support, and information access, relating these to the decision to undergo BR. Statistical analyses included Chi-square tests to assess associations, and Cramer's V and odds ratios to assess the strength of these associations.

**RESULTS:** Highly statistically significant moderate associations were found between education level and BR decision ( $p < 0.01$ ,  $V = 0.232$ ), and between income level and BR decision ( $p < 0.001$ ,  $V = 0.317$ ). Women with a graduate degree were more than 3 times as likely to opt for reconstruction than those with a high school education ( $OR = 3.18$ ,  $p < 0.01$ ,  $95\% CI = 1.52-6.98$ ), and women earning over \$99,999 per year were more than 5 times as likely to opt for reconstruction compared to those earning less than \$50,000 per year ( $OR = 5.77$ ,  $p < 0.001$ ,  $95\% CI = 3.12-11.09$ ). Contrary to expectations, ethnicity was not significantly associated with BR decision ( $p > 0.1$ ). Furthermore, factors like lack of social support or information did not show statistically significant differences in decision-making across ethnic group ( $p > 0.1$  and  $p > 0.5$ , respectively).

**CONCLUSION:** Socioeconomic status (SES), particularly education and income, emerged as highly significant predictors in the decision to pursue BR. The lack of statistically significant differences between ethnicity and BR rates paves the way for deeper investigations into social determinants of health, an avenue we are currently exploring. Our findings emphasize the need to better understand how and why these associations between SES and BR rates exist, as well as the importance of providing specialized counseling when working with patients from disadvantaged socioeconomic backgrounds. Addressing these disparities will empower women to make more informed healthcare decisions and ensure access to their legal right to breast reconstruction.

## **Understanding Trends in Incidence and Management of Pregnancy-Associated Breast Cancer in a National Sample Using Claims Data**

Abstract Presenter: Kaamya Varagur MD, Mphil

Abstract Co-Author(s): Matt Keller, Joseph Ribaud, Nicholas Fadell, Cameron Martin, KEVIN HE, Justin Sacks MD, MBA, Joani Christensen MD, Rachel Anolik MD

**Background:** Breast cancer diagnosed during pregnancy or 1-2 years post-partum is termed pregnancy-associated breast cancer (PABC). Incidence of breast cancer in women 45 and younger increased globally over the past several decades. Concurrently, the US has seen an eightfold increase in the proportion of pregnancies among women over 35 years old. Changes in PABC incidence over this period have not been characterized, and standard management of patients with PABC has not been described. Here we examine trends in incidence and management of PABC and non-PABC in women 45 and younger in the Merative™ MarketScan™ Commercial and Multi-State Medicaid Databases.

**Methods:** We examined claims data from the Merative MarketScan Commercial and Multi-State Medicaid Databases for female patients ages 18-45 with breast cancer diagnoses between 2007-2021. We analyzed trends in PABC incidence and treatments received in patients with PABC vs. non-PABC. PABC was defined as breast cancer diagnosis within one year of pregnancy, delivery, or lactation-related claims. Cochran-Armitage tests were used for incidence trend analysis. Only patients with post-index treatment claims were included in analysis of treatments. Student's t-tests and chi-squared tests were used for univariate comparisons of continuous and categorical variables, respectively. Kaplan-Meier survival analysis and univariate Cox regressions were used to assess the effect of pregnancy-association on latency to each treatment.

**Results:** 39,009 patients aged 18-45 were included, of whom 987 patients had PABC. Over the study period there was a significant increase in the proportion of breast cancer cases that were classified as PABC in this age group ( $Z = -5.7534$ ;  $p < 0.001$ ). There was also a decrease in the proportion of both overall cases and PABC in women aged 40 or older over the study period ( $p \leq 0.004$ ). 36,252 patients were included in analysis of treatments, of whom 920 (2.60%) had PABC. Patients with PABC experienced higher rates of chemotherapy, adjuvant chemotherapy, mastectomy, trastuzumab use, and ovarian suppression therapy than patients with non-PABC ( $p < 0.001$ ). However, they had lower rates of radiation or breast conserving surgery than patients with non-PABC ( $p < 0.001$ ). Patients with PABC who had mastectomies experienced comparable rates of both delayed and immediate tissue expander placement and both implant-based and

autologous reconstruction as patients with non-PABC ( $p \geq 0.242$ ). In both groups, implant-based reconstruction was more common than autologous reconstruction (PABC: 55.6% implant, 18.3% autologous; non-PABC: 58.0% implant, 19.5% autologous). Compared to patients with non-PABC, patients with PABC experienced increased latency between the index diagnostic event and tumor resection surgery (mastectomy or breast conserving surgery), radiation therapy, and adjuvant chemotherapy ( $p < 0.001$ ). Patients with PABC experienced comparable latency from mastectomy to delayed autologous or implant-based reconstruction ( $p \geq 0.142$ ).

**Conclusions:** There has been an increase in PABC rates among women 45 and younger over the past 15 years in a national sample, with increasing rates in women under 40. Patients with PABC experience differences in types and timing of medical and surgical treatments, including delays in initial tumor resection surgery, but have comparable preferences for and timing of breast reconstruction.

## **Marijuana Consumption and Its Implications on Breast Reduction Surgery: A Comparative Effective Analysis of Clinical Outcomes and Quality of Life**

Abstract Presenter: Jane Ewing

Abstract Co-Author(s): Chris Amro MD, Ashley Chang BA, Zachary Gala MD, Mehdi Lemdani, Robyn Broach, Joseph Serletti MD, Said Azoury MD

**Introduction:** While there is evidence suggesting that marijuana use can have implications in the perioperative setting for various surgeries, specific research on its effects on breast reduction outcomes is limited. Given the increasing prevalence of marijuana use, understanding its impact on surgical procedures, especially those as sensitive as breast reduction, becomes imperative. This study elucidates the impact of marijuana consumption in breast reduction procedures.

**Methods:** A retrospective review of patients who underwent breast reduction surgery performed by plastic and reconstructive surgeons within the University of Pennsylvania Health system between January 2016 and June 2022 was performed. Adult female (> 18 years) undergoing breast reduction with the wise pattern technique were included in the study. Patients with oncoplastic resection or concurrent procedures (i.e. mastopexy) were excluded. To control for confounding variables, a propensity score-matching analysis was performed comparing breast reduction patients who had no history of marijuana use with those that had a history of marijuana use. A 1:1 nearest-neighbor

matching method was employed to account for the following covariates: age, body mass index, ptosis, and breast tissue mass. Patient demographics, clinical attributes, and postoperative details were analyzed. Quality of life (QoL) changes were gauged using pre- and postoperative BREAST-Q.

**Results:** Of 415 patients who underwent breast reduction, 140 patients documented marijuana use. After propensity matching, a total of 108 patients (54 marijuana users vs 54 non-users) were analyzed. The average age was 39 years  $\pm$  12 and BMI 30.1kg/m<sup>2</sup>  $\pm$  5.3. There were no differences between the two groups in comorbidities, breast symmetry, excision patterns, pedicle use, or drain count ( $p>0.05$ ). Furthermore, surgical outcomes including surgical site occurrences (SSO), scarring, pain levels, hypersensitivity, or sensation loss were comparable between the groups ( $p>0.05$ ). There were also no differences in number of readmissions, reoperations, or emergency department visits ( $p>0.05$ ). Both groups showed enhanced postoperative QoL, regardless of marijuana usage.

**Conclusion:** To the best of our knowledge, this study is the first to evaluate marijuana use in patients undergoing breast reduction surgery. The findings of this study suggest that marijuana consumption does not markedly affect the outcomes of breast reduction surgeries. Both groups, those who reported marijuana use and those who did not, demonstrated no differences in surgical outcomes and a notable improvement in postoperative QoL was evident. This study provides surgeons with the knowledge to offer more informed patient counseling regarding the implications of marijuana use in relation to breast reduction procedures.

## **Controlling Nutritional Status (CONUT) Score Predicts Complications in Breast Reconstruction**

Abstract Presenter: Anca Dogaroiu

Abstract Co-Author(s): Maycie Garibay, Douglas Sammer MD, Andrew Zhang MD, Andrei Odobescu MD PhD

**Introduction:** Ensuring proper nutritional intake for elective surgery patients has long been identified as a cornerstone of wound healing. However, albumin alone is a poor predictor of complications in breast reconstruction, patients commonly presenting with albumin values within the normal range [1]. Therefore, there remains a need for a more complete measure of nutritional status in this patient population. The Controlling Nutritional Status (CONUT) Score evaluates nutritional risk based on three commonly

tested and widely available parameters: serum albumin, lymphocytes, and cholesterol [2]. In microsurgery, the CONUT score was shown to be a predictor of flap complications [3]. Given the complex nutritional status of microsurgical breast reconstruction patients, we seek to identify if the CONUT score is a predictor of postoperative outcomes in patients undergoing autologous reconstruction.

**Methods:** We conducted an 8-year retrospective review of patients who underwent autologous breast reconstruction at our institution. Patients who had lab results enabling the calculation of the CONUT score (albumin, cholesterol, and lymphocyte count) within 90 days of surgery were identified. Charts were reviewed for operative details and post-operative complications. The primary endpoint was returning to the operating room within 30 days due to flap complications. Secondary endpoints were hematoma, seroma, ischemia, congestion, or infection requiring operating room return. Patients with a minimum of 30 days of follow-up were included. In total, 29 patients with 44 individual flaps were identified.

**Results:** In our population, the CONUT score demonstrated an AUC of 0.736 (95% CI: 0.529-0.944) for predicting 30-day flap complication rate requiring a return to the OR. Total flap loss occurred in one instance (n = 1, 2.3%). Our analysis identified the optimal cut point as a CONUT score of 2. We then separated our population into two groups: those with a CONUT score of 0-1 and those with a CONUT score of 2 or more. Those with a higher CONUT score had a significantly higher 30-day return to OR complication rate (7.4% vs 35.3%, p = 0.04).

**Conclusion:** The CONUT score is a promising method for evaluating nutritional status in patients undergoing autologous breast reconstruction. In our population, a CONUT score of 2 or more was significantly predictive of complications requiring return to the OR. Future directions for this research include investigating additional breast procedures, such as implant-based reconstruction, and assessing a larger population.

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## **Nipple-Sparing Mastectomy After Prior Mastopexy or Reduction Mammoplasty: A Systematic Review of Surgical Outcomes**

Abstract Presenter: Sophia Pressman

Abstract Co-Author(s): Syed Ali Haider M.B.B.S., Sahar Borna MD, Cesar Abraham Gomez Cabello MD, Antonio Forte MD, PhD, MS, Adekunle Elegbede MD

**INTRODUCTION:** Safety and aesthetic outcomes of nipple-sparing mastectomy (NSM) are suboptimal in patients that have macromastia or ptosis. Emerging literature suggests advantage to preconditioning such patients with mastopexy or reduction mammoplasty (M/RM) prior to NSM. However, published studies are small, leaving surgeons without a comprehensive overview of the outcomes and implications of such an approach. This systematic review aims to synthesize the existing literature regarding the surgical outcomes of NSM in patients with a history of M/RM.

**METHODS:** A systematic review adhering to the PRISMA guidelines was conducted. Identification of records included a literature of five databases, including CINAHL, EMBASE, PubMed, Scopus, and Web of Science. Only original reports of patients who underwent M/RM with subsequent NSM were considered. Studies that did not adequately report surgical outcomes were excluded. Data relating to surgical and oncologic outcomes were collected. Pooled analyses were performed on collected data after standardization.

**RESULTS:** A total of 372 records were identified from database searching, of which 11 met inclusion criteria. One additional eligible study was included via citation chaining, resulting in a total of 12 studies. These studies encompassed data from 288 patients, with a mean age of 45 years, and 534 breasts. There was an average nine-month (range 0.8-140.4) interval between M/RM and NSM and 13-month (range 0.3-132) follow-up. The pooled analysis of 12 studies revealed a total of 24 cases (4.5%) of nipple/NAC necrosis. Across the 11 studies reporting mastectomy skin flap necrosis, there were 15 cases (2.9%). NAC epidermolysis incidence was reported in just four studies, with a total of eight cases (5.0%). Among the studies examining hematoma outcomes, a total of 12 cases (3.7%) were identified, with seven necessitating evacuation in the operating room. In the seven studies reporting seroma incidence,

there were 16 cases (6.3%). Additionally, only half of studies reported oncologic outcomes, and across these 6 studies, there was only one reported case (0.3%) of positive margins requiring NAC resection.

**CONCLUSION:** Preliminary findings suggest that NSM can be performed safely in patients with prior M/RM, with acceptable rates of complications and oncologic outcomes. However, heterogeneity among studies necessitates cautious interpretation of the results. Further well-designed studies with larger sample sizes and longer follow-up periods are warranted to elucidate the optimal surgical approach and long-term outcomes.

### **National Trends and Outcomes For Immediate Replacement After Ruptured Implant Removal**

Abstract Presenter: Daniela Lee

Abstract Co-Author(s): Kirsten Schuster MD, JD, Lulianna Taritsa, Jose Foppiani Mudr., Angelica Hernandez MD, Samuel Lin MD

**Purpose:** Breast augmentation is one of the most common breast procedures, with over 3.5 million Americans having breast implants. The incidence of ruptured implants ranges from 1–35%, with risk increasing with time and comorbidities. We aim to study trends and post-operative outcomes after ruptured breast implant surgery.

**Methods:** The American College of Surgeons National Surgical Quality Improvement Program database was queried to identify patients that underwent removal of a breast implant due to rupture (CPT 19330) between 2016 and 2021. Patients were categorized based on whether they received an immediate implant replacement (during the same anesthetic event) or not. Univariate analyses were performed to assess any group differences in patient characteristics and post-operative outcomes. Subgroup analyses were performed for patients with ICD10 codes specific for "encounter for cosmetic surgery" and breast cancer history.

**Results:** A total of 2,509 patients who underwent removal of ruptured breast implants were identified, out of which 483 patients (19.3%) had immediate replacement. The proportion of surgeries occurring on an outpatient basis was notably greater in the patients who had same-day breast implant replacement compared to patients who had delayed or no replacement ( $p < 0.001$ ). Out of the patients who were admitted, length of

total hospital stay was significantly longer in patients not receiving an immediate replacement (2.8 days v. 1.5 days;  $p < 0.001$ ). Moreover, BMI was significantly higher in the non-replacement group (26.7 vs. 26.1;  $p = 0.049$ ). There was no difference in other patient risk factors or comorbidities. The total complication rate within 30 days postoperatively was 3.4%, with no statistical significance between the two groups. Within the cosmetic subgroup (94 patients), 34 (37.2%) had immediate replacement, of which 3 had complications while no postoperative events occurred in the non-replacement group ( $p = 0.045$ ). Within the breast cancer subgroup (397 patients), 63 (15.9%) had immediate replacement. Amongst these patients, complication rates were not statistically different ( $p = 0.695$ ), although operating time, total hospital stay, and age were significantly lower with immediate replacement ( $p < 0.001$ ,  $p < 0.001$ ,  $p = 0.031$ ).

**Conclusion:** Receiving an immediate breast implant after removal of a ruptured one appears to be safe in the short-term and may be better than no replacement. While immediate replacement was associated with decreased length of stay, these patients may also inherently present less intricate rupture scenarios compared to their abstaining counterparts. Further research with more longitudinal data and clearer documentation of breast augmentation indications is needed to evaluate long-term outcomes.

## **Postoperative Outcomes in Delayed vs Immediate DIEP Flap Reconstruction**

Abstract Presenter: Makayla Kochheiser

Abstract Co-Author(s): Sophia Arbuiso, Matthew Liao, Samuel Medina, Sarah Diaddigo, Albert Truong MD, Leslie Cohen MD, David Otterburn MD

**Purpose:** The ideal timing of deep inferior epigastric perforator flap (DIEP) breast reconstruction remains unclear. Options for autologous breast reconstruction following mastectomy include immediate breast reconstruction that is performed on the same day as the mastectomy or delayed reconstruction where a tissue expander is placed at the time of mastectomy and autologous reconstruction is performed at a later date. The purpose of this study is to assess the complication rate following DIEP breast reconstruction in patients undergoing immediate versus delayed surgery.

**Methods:** A retrospective cohort study was conducted at our institution from 2020 to 2023 and included patients who underwent autologous DIEP flap breast reconstruction. Patient demographics, indication for surgery, and postoperative major and minor complications were recorded, including soft tissue infection, dehiscence, seroma, hematoma, and 90-day readmission and reoperation. Patients were analyzed based on

the timing of breast reconstruction: immediately following mastectomy versus delayed reconstruction. Univariate analysis was performed to determine differences in postoperative complications between the two cohorts.

**Results:** A total of 340 DIEP flap reconstructions in 186 patients were included. Of these, 220 flaps in 119 patients were performed immediately following mastectomy; 121 flaps in 67 patients were delayed. There was no significant difference in age, body mass index, American Society of Anesthesiologists (ASA) classification, or length of hospital stay between groups. There was no significant difference in major complications, including 90-day hospital readmission and reoperation between patients undergoing immediate and delayed autologous breast reconstruction. There was a difference in minor complications, with a significantly higher rate of postoperative soft tissue infection for those requiring antibiotics and had erythema (42.8% vs 23.8%,  $p=0.0096$ ) in patients undergoing immediate DIEP flap reconstruction. There was no significant difference in the number of patients with soft tissue infections that required washout for management. There was no significant difference in other minor postoperative complications, including wound dehiscence, fat necrosis, seroma, or hematoma.

**Conclusions:** This study reveals a higher rate of postoperative soft tissue infections in patients undergoing immediate DIEP flap reconstruction with no significant difference in other minor or major complications. These findings suggest that the timing of autologous reconstructive surgery may impact the postoperative course and have an effect on wound healing. This information can aid in operative planning, especially in high-risk patients.

### **Factors Driving Low Rates of Post-mastectomy Breast Reconstruction in LMICs: A Systematic Review**

Abstract Presenter: Ganiat Giwa

Abstract Co-Author(s): Moreen Njoroge, Ananya Dewan, Kristen Broderick MD, Kowsar Ahmed

**Introduction:** Breast cancer remains a significant public health concern, especially in low- and middle-income countries (LMICs), with a 12-53% five-year survival rate. Post-mastectomy breast reconstruction is a crucial component of comprehensive cancer care, yet rates of utilization remain low in LMICs. Studies have documented the psychosocial benefits of this procedure, citing the improved quality of life, self-esteem,

and body image experienced by women who undergo reconstruction. This review aims to consolidate the factors driving the limited rates of post-mastectomy breast reconstruction in LMICs to identify areas for intervention.

**Methods:** We conducted a systematic review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). We searched 5 databases for peer-reviewed articles published between January 2013 and October 2023 discussing challenges and perceived barriers to post-mastectomy breast reconstruction. We included original articles published in English within the last decade, and set in LMICs as per World Bank classifications. We assessed for quality using STROBE and JBI guidelines. Two independent reviewers extracted data into three categories: socio-cultural, structural, and financial themes. Data was summarized in graphic and numeric formats.

**Results:** 15 papers were included in this review; 11 countries and spanning over 3 continents. Study settings were patient-based (n=10), provider/hospital-based (n=3), or both (n=2). 73% of studies mentioned barriers under 2 or more categories; 20% mentioned only structural barriers, and 7% mentioned only socio-cultural factors. Percentages in parentheses represent the frequency of each theme in the studies included.

A significant socio-cultural barrier to reconstruction was the perception that it was purely aesthetic rather than a therapeutic surgery (47%). Barriers noted in 33% of studies included fear of anesthesia, recovery time, and stress. Higher education was mentioned as a positive predictor of reconstruction in 27% of papers. Younger age and employment were associated with higher rates of reconstruction overall.

The most prevalent structural barrier noted was a lack of patient awareness, especially prior to mastectomy (47%). Limited numbers of practicing plastic surgeons (40%); urban-clustered tertiary treatment facilities (33%), and low surgeon referral rates (27%) reduced reconstruction utilization. Other structural barriers highlighted were the surgeon's perception of the patient's "desire" for reconstruction and lengthy commutes to care centers in 27% of studies.

Self-payment was the most cited (60%) financial limitation to reconstruction and most significant barrier overall. Exclusion clauses in insurance coverage for defining breast reconstruction as purely cosmetic or vague government policy language was described in 7% of studies.

**Conclusion:** Barriers to post-mastectomy breast reconstruction in LMICs are

multifaceted involving financial, socio-cultural, and structural aspects of care. The perception of reconstruction as strictly cosmetic is pervasive beyond social settings, thus impacting patient willingness, provider practice and insurance/government policy. Reconstruction remains highly unaffordable to patients.

## **Does Area Deprivation Index Provide a Sharper Image of Post-Mastectomy Breast Reconstruction Disparities?**

Abstract Presenter: Meeti Mehta BS

Abstract Co-Author(s): Nerone Douglas, Elizabeth Moroni MD, Carolyn De La Cruz MD

**Purpose:** Although access to post-breast cancer reconstructive surgeries continues to improve, inequities in its delivery and utilization still remain. Post-mastectomy reconstruction remains a crucial component of the physical and psychosocial domain of breast cancer care. Previous studies have demonstrated a breast reconstruction care gap, in part fueled by racial and socioeconomic disparities. The purpose of this study is to use Area Deprivation Index (ADI) to assess the full impact of other sociodemographic factors on access and utilization of breast reconstruction.

**Methods:** This was a retrospective cohort of patients who underwent breast cancer surgery from 2014-2019. Patients were stratified by race, age, ADI, median household income, and geography. Population and socioeconomic data were obtained from the United States Census Bureau. ADI was calculated and stratified by the top 25% (most disadvantaged neighborhoods). Charts were abstracted, summary statistics were computed, and a binomial regression was used to calculate relative risks (RR). Significance was assessed at  $\alpha=0.05$ .

**Results:** 5619 patients underwent breast cancer surgery. The average age at diagnosis was  $60.2 \pm 12.5$  years. 37 patients (0.7%) were not female, 568 (10.1%) were a minority race, 523 (9.3%) lived in rural locations, and 460 (8.2%) had a median annual household income < \$43,000. 2238 patients (39.8%) lived in neighborhoods with the top 25% ADI. Compared to Caucasians, African American patients had a 34% reduced likelihood of breast reconstruction, while Asian patients had a 60% reduced likelihood of reconstruction (RR 0.66, CI 0.49-0.91,  $p=0.009$ ; RR 0.40, CI 0.16-0.98,  $p=0.04$ , respectively). Compared to urban patients, rural patients were more likely to have breast reconstruction (RR 1.51, CI 1.23-1.85,  $p<0.001$ ). Compared to lower-income patients, patients with income > \$71,000 were more likely to have reconstruction (RR

1.19, CI 1.08-1.31,  $p < 0.001$ ). Compared to younger patients, patients > 60 years old had a 55% reduced likelihood of breast reconstruction (RR 0.45, CI 0.39-0.51,  $p < 0.001$ ). Compared to patients from lower ADI neighborhoods, patients from the top 25% ADI neighborhoods had a reduced likelihood of breast reconstruction (RR 0.76, CI 0.68-0.85,  $p < 0.001$ ).

**Conclusions:** The use of ADI in numerous recent studies has provided a more inclusive and concrete method to assess the true impact of sociodemographic factors on health care across neighborhoods. We have demonstrated that there are more drivers of this complex gap than household income and race alone; the disparity exists due to a sum of system-wide issues putting individual neighborhoods at the highest risk.

### **The Impact of Sterilizing Solutions on the Tensile Strength of Silicone Breast Implants: A Comparative Study for Intraoperative Use**

Abstract Presenter: Leah Thomas BS

Abstract Co-Author(s): Kylie McMath, NP, PhD Student, Subhas Gupta MD, PhD, FRCSC, FACS

**Purpose:** The integrity and longevity of silicone breast implants are critical in plastic surgery, affecting patient outcomes and the success of breast augmentation and reconstruction. Given reported rupture rates ranging from 5.4% to 34.2% within ten years of implantation, examining irrigating solutions' interaction with silicone implant shells is vitally important (1). The study's purpose is to determine the impact of various solutions on breast implants' shell integrity based on typical immersion times during operative procedures.

**Methods and Materials:** Silicone implants were divided into 80 equal pieces, each measuring 2.5 cm x 2.5 cm. Each of the 80 implants were divided into 4 equal groups and soaked in a specific solution. These groups were saline solution, an antibiotic solution, a dilute chlorhexidine gluconate solution (Irrisept®), SAF-Clens® AF Dermal Wound Cleanser, and betadine solution. Saline solution served as a baseline control. A three-antibiotic (clindamycin-cefazolin-gentamicin) solution served as a gold standard control. The soaks lasted for 60 seconds, after which the implants were calibrated to a commercial tensiometer (Mxmoonfree 500N Digital Force Gauge). Tension was measured in Newtons over a displacement of 1.0 cm.

**Results:** Our results are summarized in Table 1, and our statistical analyses are summarized in Table 2.

The average tensile strengths were as follows: saline at 8.25 N, triple antibiotic at 8.94 N, chlorhexidine gluconate at 8.84 N, SAF-Clens® AF at 7.41 N, and betadine at 8.01 N. Using a two-tailed T-test, a statistically significant difference was observed between the groups of triple antibiotic solution vs betadine ( $P=0.0394$ ) and the triple antibiotic solution vs. SAF-Clens® AF ( $P=0.0032$ ).

**Conclusion:** This study elucidates the subtle yet significant effects of irrigation solutions on silicone breast implant tensile strength. Although most solutions showed no significant difference from saline, the notable variance between antibiotic, SAF-Clens® AF, and betadine solutions underscores the importance of choosing irrigation agents that avoid compromising silicone implant material. While we know that antibiotic solutions designed specifically for surgical implant procedures offer a safe method of targeting bacterial infections, solutions like chlorhexidine gluconate offer a promising alternative in sterilization for intraoperative use. These findings guide clinicians in optimizing intraoperative practices to protect implant durability and patient well-being. Further research is advised to examine long-term impacts of solution exposure on implant integrity and establish best-use guidelines for these agents, thereby improving plastic surgery care quality. Surgeons should exercise caution and consider alternative options when selecting irrigation solutions for breast implant surgeries to ensure the best possible outcomes for patients.

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## **Racial Differences in Immediate Breast Reconstruction Complication Rates**

Abstract Presenter: Mattia Mahmoud

Abstract Co-Author(s): Said Azoury MD, Linda Saikali

**Introduction:** Breast reconstruction after mastectomy is an important step in the management and treatment of breast cancer. Though reconstruction has been deemed beneficial for postmastectomy patients, the literature on racial disparities in breast



reconstruction outcomes is mixed. One study found that IBR surgical complication rates did not differ by race/ethnicity (1) whereas another reported that Black patients were significantly more likely to experience all-cause complications compared to White patients (2). To date, no study has examined potential mediators of the racial/ethnic differences in immediate breast reconstruction complication rates (IBR). The authors sought to examine mediators of the racial differences (Black vs White) in IBR complication rates using the American College of Surgeons–National Surgery Quality Improvement Program (ACS-NSQIP) data sets.

**Methods:** A cross-sectional study design was used to assess racial differences in IBR complication rates and explore to what extent these differences are explained by the following covariates: age, menopausal status, BMI, diabetes status, smoking status, and socioeconomic status (SES). Self-identified Black or White women, ages 45 years and above from the NSQIP during the years 2012 to 2022. Women were excluded if they have no values available for the covariates IBR is defined as two different outcomes: implant-based (E/I) reconstruction (mastectomy only vs E/I reconstruction) and autologous reconstruction (mastectomy only vs autologous reconstruction). A logistic regress was used to estimate differences in IBR outcomes for Black versus White women. A mediation analyses was used to determine the extent to which the covariates mediate the association between race and our outcome.

**Results:** Overall, 60,003 post-mastectomy patients were included; of these, 20,001 (33%) underwent IBR. Of these patients undergoing reconstruction, the vast majority received implant-based reconstruction (76%) compared with autologous (24%). Overall, 24,789 Black women and 35,214 White women were included in our analysis. Black women were 12% more likely to have IBR complications (95% CI: 1.12 [1.02, 1.30]), adjusted for age, menopausal status, BMI, diabetes status, smoking and SES. Mediation analyses suggested that 43% of the treatment delay among Black women could be removed if an intervention equalized their age, menopausal status, BMI, diabetes status, smoking status, and socioeconomic status (SES) to that of White patients. The largest mediating factor was BMI, accounting for 48% of the racial disparity in IBR complication rates.

**Conclusion:** Black women are 12% more likely to experience IBR complications. Equalization of the mediators used in this study could reduce the disparities by 48% for Black women. Future research should identify other causes of racial disparities in complication rates and intervene accordingly.

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## **Comparison of Immediate Versus Delayed DIEP Breast Reconstruction in Patients Requiring Postmastectomy Radiation Therapy**

Abstract Presenter: Rommy Obeid

Abstract Co-Author(s): Joseph Quick, Riley Marlar MD, Rachel Schafer, Fuad Abbas, Diwakar Phuyal MD, Osama Darras MD, Filippo Andrea Giova Perozzo MD. Raffi Gurunian MD, Sarah Bishop MD

**Background:** Women with high-risk breast cancer frequently undergo therapeutic mastectomy followed by postmastectomy radiation therapy (PMRT) prior to definitive delayed autologous breast reconstruction (DBR). The alternative is a one-staged immediate autologous breast reconstruction (IBR) approach followed by irradiation of the reconstructed breast tissue. While DBR is more common, data in the literature is still unclear as to the superiority of DBR versus IBR in the context of PMRT. Our study aims to compare complication rates and the need for revision surgeries between the DBR group and the IBR group as well as the difficulty of microsurgical breast reconstruction in a radiated versus nonradiated field.

**Methods:** We conducted an IRB-approved retrospective study of all patients who received a mastectomy followed by deep inferior epigastric perforator (DIEP) reconstruction at our institution in the setting of PMRT. Exclusion criteria included history of prior radiation and history of permanent implant-based reconstruction. Wilcoxon-Mann-Whitney test was used to analyze the minor complication rates (not requiring return to the operating room), major complication rates (requiring return to the operative room), and revisional surgery rates ranging from the date of mastectomy to the final follow-up date at our institution. Intraoperative notes were closely investigated for flap loss or other intraoperative complications including arterial thrombosis, venous thrombosis, and technical difficulty (artery or vein requiring reanastomosis).

**Results:** 164 patients were identified from 2016 to 2022 at our institution who underwent deep inferior epigastric perforator (DIEP) breast reconstruction and PMRT of one breast. Of the 164 patients, 147 underwent DBR while 17 underwent IBR. Age at reconstructive surgery, smoking status, and diabetes mellitus status between the two groups did not differ.

The DBR group had 2 complete flap losses and 3 partial flap losses while the IBR group had no flap losses or partial flap losses ( $p=0.712$ ,  $p=0.798$ ). There were 3 incidences of intraoperative flap failure in the DBR group and zero incidences of flap failure in the IBR group (2.1% versus 0%,  $p=0.798$ ). Rates of intraoperative arterial thrombosis, venous thrombosis, or required reanastomosis did not significantly differ between the two groups.

There were no significant differences in major complication rates ( $z=1.273$ ,  $p=0.203$ ), minor complication rates ( $z=-0.025$ ,  $p=.980$ ), or revisional surgery rates ( $z=1.128$ ,  $p=1.128$ ). Of note, there were no significant differences in fat necrosis excisions after DIEP breast reconstruction in DBR versus IBR (6.9% versus 1.3%,  $p=0.413$ ). The DBR group did average 0.43 pre-DIEP major complications which required a return to the OR while the IBR group averaged 0 due to the timeline of their surgery ( $z=2.53$ ,  $p=0.011$ ).

**Conclusion:** While the total complication and revision rates did not differ between patients receiving IBR with PMRT and DBR with PMRT, pre-DIEP complication rates are inherently absent in the IBR group and may be a significant factor in patients receiving DBR.

## **Breast Intentions: Impact of Acellular Dermal Matrix in Tissue Expander-Based Breast Reconstruction**

Abstract Presenter(s): Taylor Allenby MD

Abstract Co-Author(s): Kayvon Jabbari, Marlie Fisher MD, PhD, Taylor Allenby MD, Michael Gehring MD, Daniel Najafali, An-Jey Su, Kia Washington MD, Katie Egan MD, David Mathes MD

**Background:** Acellular dermal matrices (ADMs) are commonly used in tissue expander-based breast reconstruction (BR) despite incomplete FDA clearance [1]. Comparative studies on BR with and without ADM are limited to retrospective, single institution reviews with small sample sizes [2]. Current literature largely demonstrates no difference in complication rates between cases with and without ADM. Yet, the limited number of direct comparative analyses serves as a major barrier to FDA approval, and the implant-based breast reconstruction literature largely consists of low

strength of evidence studies [3]. Further, there is a significant correlation between ADM-related publications and industry funding [4]. In this study, we leverage a national database to better assess the complication profile among female patients undergoing expander-based BR with and without ADM.

**Methods:** The data used in this study was collected from the TriNetX Network, which provided access to electronic medical records from approximately 114 million patients from 80 healthcare organizations. Female patients who underwent bilateral or unilateral tissue expander-based BR were included utilizing International Classification Code 10 and Current Procedural Terminology codes. Patients were divided into two groups based on ADM utilization. Representative subgroups were created based on postoperative radiation treatment. Propensity-score matching was performed to isolate the effect of ADM in all groups. Groups were assessed up to 6-months after initial tissue expander placement for the following outcomes: seroma, surgical site infection (SSI), hematoma, capsular contracture, dehiscence, and explantation. Comparative statistics were performed using the TriNetX analysis tool with a significance threshold set at an alpha value of 0.05, denoted as  $p < 0.05$ .

**Results:** Of the 15,661 tissue expander-based BR patients, 10,154 (64.8%) underwent BR alone while 5,507 (35.2%) underwent BR with ADM. Reconstruction with ADM was associated with a significantly increased risk of seroma, SSI, hematoma, capsular contracture, dehiscence, and explantation up to 6-month postoperatively ( $p < 0.05$ ). However, postoperative radiation was found to be greater among the ADM group compared to the no ADM group (15.51% vs 8.26%,  $p < 0.0001$ ). There were no differences in the risk of all breast-related complications for ADM vs no ADM among patients receiving postoperative radiation ( $p > 0.05$ ). Among patients with no postoperative radiation, reconstruction with ADM was associated with an increased risk of seroma (Risk Ratio(RR): 1.385, 95% CI: 1.109-1.729,  $P = 0.0039$ ), hematoma (RR: 1.357, 95% CI: 1.126-1.636,  $P = 0.0013$ ), dehiscence (RR: 1.374, 95% CI: 1.152-1.639,  $P = 0.0004$ ), and explantation (RR: 1.404, 95% CI: 1.131-1.743,  $P = 0.0020$ ).

**Conclusion:** This is the largest report, to our knowledge, demonstrating the risk profile of expander-based BR with ADM. There may be a role for ADM among patients undergoing postoperative radiation therapy. The results of this study further warrant critical investigation by way of multicenter randomized controlled trials in order to establish superiority, equivalence, or non-inferiority of ADM in BR in alignment with FDA regulations [5].

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## **In Autologous Breast Reconstruction, Machine Learning Models are Poor Predictors of Post-Surgical Morbidity: A Retrospective Cohort Study on a National Database.**

Abstract Presenter: Constantine Velmahos

Abstract Co-Author(s): Aris Paschalidis, Giorgio Giatsidis MD, PhD

**Purpose:** In autologous breast reconstruction (ABR), high post-surgical morbidity is reported in 20-40% of select patients. Unfortunately, multivariate logistic regression models and clinically relevant variables with high odds ratios, such as age, body mass index (BMI), American Society of Anesthesiology (ASA) score, and modified frailty index (MFI), predict morbidity with insufficient accuracy. As machine learning (ML) has shown impressive predictive capabilities in several clinical scenarios, we hypothesize that ML may predict post-surgical morbidity in ABR with higher accuracy than classical statistical logistic regression models.

**Methods:** The "American College of Surgeons - National Surgical Quality Improvement Program" (ACS-NSQIP) database was retrospectively queried to identify ABR cases from January 2005 to December 2020. The primary outcome was to predict the

presence of any 30-day post-operative morbidity. This outcome was a composite of all 18 variables in the ACS-NSQIP that track post-operative morbidity. The secondary outcome was to individually predict the 7 complications with the highest incidence in the cohort: return to operating room, bleeding, readmission, superficial infection, wound dehiscence, deep infection, organ/space infection (listed in descending incidence). Three ML models (Random Forests, XGBoost, and L1-L2-RFE) were compared to one multivariate logistic regression (mLR) model and four univariate logistic regression models (age, ASA score, BMI, mFI-5). Performance was analyzed using the area under the curve (AUC).

**Results:** Of the 25,163 ABR cases identified, 8,330 (33.1%) experienced 30-day postoperative morbidity. Random Forests, XGBoost, and L1-L2-RFE predicted postoperative morbidity similarly to the mLR model (AUC: 0.645, 0.643, and 0.653 vs. 0.653, respectively). The difference in AUC between ML and mLR models was consistently  $<0.03$ . Both mLR and ML predicted post-surgical morbidity with  $>0.10$  higher AUC values than any of the four single-factor models, which all showed  $AUC < 0.6$  (Age:  $AUC=0.501$ ; ASA score:  $AUC=0.555$ ; BMI:  $AUC=0.561$ ; MFI-5:  $AUC=0.5450$ ). Among individual complications, bleeding (L1-L2-RFE:  $AUC=0.754$ ) and deep infection (XGBoost:  $AUC=0.722$ ) were predicted with the highest AUC. For each individual complication, the difference in AUC between all models (ML, mLR, and single-factor) was  $<0.05$ .

**Conclusions:** ML and mLR performed comparably, yet sub-optimally in the prediction of post-surgical morbidity in ABR. Single-factor models with commonly clinically utilized variables were even worse predictors of morbidity. As all models achieved low AUC, these models may be limited by current surgical database robustness rather than innate predictive capability. Thoughtful design and granularity of future ABR databases may enhance predictive model performance, but further research is warranted.

## **Sizing the Risk And Examining Implant Size Limits in Implant-Based Breast Reconstruction**

Abstract Presenter: Mehdi Lemdani

Abstract Co-Author(s): Zachary Gala MD, Jane Ewing, Ayaka N. Deguchi MD, Robyn Broach, Joseph Serletti MD

**BACKGROUND:** Implant-based breast reconstruction (IBR) can have varying outcomes depending on implant size and type of procedure, whether performed direct-to-implant (DTI) or in a two-stage (TS) procedure with tissue expanders placed first. While implant size has been examined as a possible factor in patient complication, few studies have attempted to directly determine its relationship with patient outcomes. Our aim was to determine outcomes related to implant size and defining optimal implant size cutoffs for both DTI and TS cohorts.

**METHODS:** Patients undergoing IBR from 2018-2022 at our institution were included. A breast-level study was conducted of the cohort. Due to differences in clinical consideration between DTI and TS procedures, we conducted two separate but parallel analyses of each cohort. We assessed complications post-reconstruction using implant size as a predictor. Risk-adjusted logistic regression models, considering demographic and comorbidity factors, evaluated the implant size-outcome relationship for both DTI and TS cohorts. The Youden Indices of Receiver Operating Characteristic (ROC) curves identified optimal implant size cutoffs. Area under curve (AUC) was reported to assess model prediction quality.

**RESULTS:** A total of 1,098 patients who underwent IBR were identified. Of these patients, a total of 1,734 breasts received IBR, of which 1,380 (79.6%) breasts underwent a TS procedure and 354 (20.4%) underwent DTI. The average DTI implant size was 424 cc  $\pm$  125 while TS was 489 cc  $\pm$  143. Within the DTI cohort, Surgical Site Infections (SSI) were observed in 7.6% of cases, with an AUC of 0.8112 and an implant size threshold of 560 cc. Other complications and their respective AUC values leading to implant size cutoffs in the DTI cohort included: implant loss at 9.3% (AUC: 0.7527, Size: 580 cc), hematoma at 3.7% (AUC: 0.7544, Size: 650 cc), and seroma at 8.8% (AUC: 0.6745, Size: 595 cc). Within the TS cohort, SSI was observed in 6.8% of cases, with an AUC of 0.5452 and implant size threshold of 790 cc. Other outcomes in the TS cohort examined included: implant loss at 2.5% (AUC: 0.5224, Size: 700 cc), hematoma at 4.1% (AUC: 0.5041, Size: 700 cc), and seroma at 16.7% (AUC: 0.4934, Size: 790 cc).

**CONCLUSION:** Our study highlights the significance of implant in determining post-operative complications after DTI IBR. While TS patients receiving extremely large implants may experience complications, our results suggest that implant size does not predict complications. By contrast, reliable AUC models near or exceeding 0.7 were generated in the DTI cohort and suggest that implant size has predictive power for complications in this cohort. This data offers surgeons implant size thresholds for better patient counseling, surgical planning, and outcome optimization.

## **Use of Deep Inferior Epigastric Perforator Flap As Salvage Breast Reconstruction After Primary Latissimus Dorsi Flap: Case Series and Operative Technique**

Abstract Presenter: Khoa Nguyen

Abstract Co-Author(s): Ally Ha MD, Katie Egan MD, James Butterworth MD, Christodoulos Kaoutzanis MD, David Mathes MD

**Background:** Deep inferior epigastric artery perforator (DIEP) free flap and pedicled latissimus dorsi musculocutaneous flap (LDMF) are two options for autologous breast reconstruction. In some cases, reconstruction with LDMF is inadequate and DIEP flaps remain an option for salvage reconstruction in those who previously underwent LDMF. Here, we discuss a case series that reviews the operative technique of utilizing a DIEP flap as salvage reconstruction in patients with prior LDMF breast reconstruction.

**Methodology:** A multi-institutional series of seven patients who underwent a DIEP flap after a previous LDMF breast reconstruction from July 2020 to December 2023 was retrospectively reviewed. Pre-operative, intra-operative, and post-operative outcomes were collected. Three patients were surgically managed at the University of Colorado Hospital and four patients were surgically managed at the University of Kansas Medical Center.

**Results:** The mean age of the patients was 59 years old with a range of 50-79 years old. The length of follow-up ranged from six months to three years. Complications included delayed wound healing in one patient while another patient experienced wound dehiscence, seroma, and cellulitis. Five patients (71.4%) underwent adjuvant radiation prior to DIEP salvage reconstruction, including the two patients that experienced complications. Retainment of the LDMF at the time of DIEP reconstruction was dependent on the need for volume and its feasibility for coverage. One of the seven patients (14.2%) had her initial LDMF completely excised, whereas another patient (14.2%) had partial excision of her LDMF. In the remaining five patients (71.4%), the LDMF was elevated and deepithelialized to retain for volume augmentation. De-innervation of the latissimus muscle was performed on two patients (28.6%) who had discomfort related to animation deformity. Subsequent reconstructive revisions were completed in six patients (85.7%). Five patients (71.4%) had fat grafting. Two (28.6%) patients that underwent fat grafting also had additional dog-ear revision. One patient (14.2%) underwent abdominal scar revision.



**Conclusion:** Salvaging a prior LDMF flap with a DIEP flap requires preoperative planning and adjustments in operative approach to use the autologous tissue. Operative considerations should include the patient's preoperative concerns, including animation deformity, inadequate volume, and volume mismatch and how the LDMF can be incorporated with the DIEP at the time of operation. Subsequent revisions may be necessary depending on patient satisfaction. Our multi-institutional approach for management of prior LDMF in the setting of planned DIEP reconstruction includes: 1. Evaluation of volume and native skin paddle to determine if LDMF should be excised or deepithelialized and retained, 2. Preoperative evaluation for pain or animation deformity related to LD with de-innervation of the thoracodorsal nerve at time of operation.

### **Disaggregation of Asian Subgroups in Postmastectomy Immediate Breast Reconstruction: A SEER Database Analysis**

Abstract Presenter: Dylan Kim

Abstract Co-Author: Christine Rohde MD, MPH

**Purpose:** Asian American, Native Hawaiian, and Pacific Islander (AANHPI) patient populations continue to be underrepresented in plastic surgery research and are often defined as one monolithic group despite the cultural, socioeconomic, and clinical heterogeneity of this patient population. Whereas the general AANHPI population has been shown to be underrepresented in reception of postmastectomy breast reconstruction, existing literature has not characterized the disaggregation of such rates for AANHPI ethnic subgroups.

**Methods:** Patients who underwent mastectomy were identified in the 2007-2020 registries within the Surveillance, Epidemiology and End Results (SEER) Database. The SEER database contains granular information about specific AANHPI ethnicity. Patients were stratified by race and ethnicity, and additional demographic, oncologic, and survival variables were collected. Multivariate binary logistic regression was conducted to assess for reception of postmastectomy immediate breast reconstruction ( $p < 0.05$ ).

**Results:** 227,279 patients who underwent mastectomy were identified. 50,559 of 146,038 (34.6%) non-Hispanic White patients and 5,690 of 17,584 (32.4%) AANHPI patients underwent subsequent breast reconstruction ( $p < 0.001$ ). The difference in rates of reconstruction between the two groups decreased from 6.7% in 2007 to 1.0% in 2020. Patients who identified as Korean (41.7%), Pacific Islander (40.7%), Asian Indian

or Pakistani (34.9%), and Japanese (34.6%) were associated with the highest rates of postmastectomy breast reconstruction. Among subgroups with more than 100 recorded patients, Hawaiian (24.1%), Filipino (23.3%), Cambodian (22.9%), and Samoan (11.7%) groups were associated with the lowest rates. After controlling for age, oncologic stage, preoperative radiation and chemotherapy treatment, relative income, and rural-urban density, 18 out of 21 AANHPI ethnic subgroups with sufficient sample size predicted a lower likelihood of breast reconstruction ( $p < 0.05$ ) when compared to non-Hispanic White patients. Odds ratios for reception of reconstruction ranged from 0.09 (95% CI: 0.02-0.43) for Micronesian patients to 0.69 (95% CI: 0.61-0.78) for Japanese patients. Chamorro, Melanesian, and New Guinean ethnicities were non-significant predictor variables. Other negative predictors of reception of breast reconstruction included older age, more advanced oncologic stage, preoperative radiation, neoadjuvant chemotherapy, lower income, and residence in a noncentral metropolitan area ( $p < 0.001$ ). A sensitivity analysis restricted to the years 2019 and 2020 showed that, while the rates of reconstruction for several ethnic subgroups (e.g. Japanese, Korean) increased to non-significant differences when compared to non-Hispanic White patients, the majority of subgroups (e.g. Chinese, Asian Indian or Pakistani, Hawaiian) still conferred a relatively lower likelihood of reconstruction.

**Conclusions:** Disparities in reception of immediate breast reconstruction exist within the AANHPI patient population despite an overall trend of improving relative representation for the procedure. This analysis supports the need for disaggregation in plastic surgery research for improved knowledge and targeted interventions.

### **Evaluation of the Modified 5-Item Frailty Index as a Predictor of BREAST-Q Scores in Immediate Tissue Expander Reconstruction – An Analysis of 3,442 Patients**

Abstract Presenter: Uchechukwu Amakiri BS

Abstract Co-Author(s): Francis Graziano MD, Min Ji Kim, Jacob Levy MD, Lillian Boe, Carrie Stern MD, Babak Mehrara MD, Jonas Nelson MD

**Purpose:** Patient frailty status has previously been validated as a predictor of poor postoperative outcomes. More specifically, the Modified 5-Item Frailty Index (mFI-5) has been demonstrated to be an effective preoperative predictor of postoperative complications in patients undergoing tissue expander (TE) breast reconstruction [1]. There is, however, a paucity of literature evaluating the impact of frailty on patient-

reported outcome measures. Thus, the purpose of this study was to examine the importance of mFI-5 in predicting BREAST-Q scores following TE breast reconstruction.

**Methods:** Female patients above the age of 18 who underwent immediate TE breast reconstruction between January 2017 and April 2023 were eligible for inclusion. Four domains of the BREAST-Q were examined, including Sexual Well-being (SEX), Psychosocial Well-being (PWB), Satisfaction with Breasts (SWB), and Physical Well-being of the Chest (PWBC). Patients were considered to be low frailty if they scored less than two points in the mFI-5 and high frailty with 2 or more points. Patients' frailty scores increased by one point for each of the following comorbidities: congestive heart failure, diabetes mellitus, chronic obstructive pulmonary disease or pneumonia diagnosis within 30 days, functional status, and hypertension requiring medication. Statistical significance was set as a p-value less than 0.05, and a minimal clinically important difference (MCID) of 4 was used for BREAST-Q score evaluation.

**Results:** 3,442 patients were included in this study. The majority of patients (93.3%) were categorized as low frailty while 231 (6.7%) patients met criteria for high frailty. When compared to low frailty patients, high frailty patients were more often older ( $p<0.001$ ), minority patients ( $p<0.001$ ), single ( $p<0.001$ ), underwent adjuvant radiotherapy ( $p=0.002$ ), and had increased BMI ( $p<0.001$ ). On nonparametric testing, in the preoperative time period, high frailty patients scored significantly lower in all domains of the BREAST-Q. MCID was met in the domain of SWB, PWBC, and SEX. At the 1-year postoperative time, low frailty patients scored statistically and clinically significant higher scores for SWB, PWBC, and SEX. When all variables of interest were controlled for in multivariable linear mixed effects models, however, patient frailty status was no longer a significant predictor or modifier of any BREAST-Q domain.

**Conclusion:** When all variables of interest were accounted for, frailty was not significantly associated with any of the evaluated BREAST-Q domains in patients undergoing immediate TE breast reconstruction. This demonstrates that patient-reported outcomes in low frailty and high frailty patients are comparable, suggesting that TE breast reconstruction is safe and efficacious in the frail population. While it is important to be able to identify frail patients due to the proven utility of predicting postoperative outcomes, it may not be the most useful predictor of patient-reported outcomes in TE breast reconstruction. Future research should examine the interaction of time and frailty to determine if a relationship exists between BREAST-Q scores and mFI-5 depending on time point.

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## **Methadone-Based ERAS Protocol for Improved Inpatient Pain Management after DIEP Flap Breast Reconstruction**

Abstract Presenter: Nancy Qin

Abstract Co-Author(s): Marcos Lu Wang MD, Chase Alston, Anna Vaeth. Jaime Bernstein MD, Leslie Cohen MD, David Otterburn MD

**Introduction:** The Enhanced Recovery After Surgery (ERAS) protocol, first introduced in colorectal surgery, is a comprehensive and multidisciplinary protocol. It encompasses various elements including nutritional guidance, optimizing fluid balance, and minimizing post-operative nausea. One of its main components is its use of a single weight-based dose of intraoperative methadone. Previous studies have demonstrated that a single dose of methadone can provide superior analgesia compared to multiple doses of short-acting opioids. Widely adopted across surgical specialties, ERAS has consistently shown benefits including shorter hospital stays and enhanced patient satisfaction. However, its implementation remains relatively limited in plastic surgery. This study seeks to assess the effectiveness of the ERAS protocol on decreasing post-operative pain and narcotic consumption in patients undergoing deep inferior epigastric perforator (DIEP) flap breast reconstruction.

**Methods:** We performed a retrospective review of all patients who underwent DIEP flap reconstruction from October 2020 to May 2021 to establish a historical control group (n = 36). Following this, the ERAS protocol was implemented in May 2021, and patients were prospectively enrolled in the ERAS cohort from May 2021 to March 2024 (n = 190). Primary outcomes, including length of stay, pain scores, heart rates, blood pressures, and occurrence of tachycardia, were compared between the ERAS and control cohorts using univariate analysis. Post-operative narcotic use was also recorded and converted to morphine milligram equivalents (MME) to enable standardized comparisons. Additionally, as a secondary aim, unpaired Student's t-tests and Spearman correlation analysis were conducted to identify risk factors associated with increased post-operative narcotic use and pain.

**Results:** Patients in the ERAS and control cohorts were comparable in age, body mass index (BMI), weight, race, and comorbidities statuses including hypertension, diabetes, hyperlipidemia, and cardiovascular disease. Our study found that patients in the ERAS cohort had significantly lower post-operative pain scores (3.96 vs. 4.99,  $p=0.01$ ), incidence of tachycardia (6.3% vs. 25%,  $p=4E-4$ ), as well as heart rates (85.6 vs. 91.7%,  $p=7E-4$ ). Patients in the ERAS cohort also had significantly lower post-operative narcotic use at 12 hours post-operatively (13.6 vs. 24.9 MME,  $p=0.02$ ), 24 hours post-operatively (41.7 vs. 70.7 MME,  $p=0.01$ ), and in total throughout the entire post-operative stay (83.3 vs. 132.3 MME,  $p=0.009$ ). The two groups, however, were comparable in post-operative mean arterial pressures, systolic pressures, and length of stay. Our data also showed that younger age and higher BMI, weight, and flap weight were significantly associated with increased post-operative narcotic use and pain ( $p<0.05$ ). However, reconstruction laterality (unilateral vs. bilateral) and the timing of reconstruction (delayed vs. immediate) did not show significant associations.

**Conclusions:** Our study found that implementing the ERAS protocol significantly reduced post-operative opioid use, pain levels, heart rates, and tachycardia incidents. Additionally, we found that certain populations, such as younger patients and those with higher BMIs and flap weights, are at higher risk of increased post-operative pain. Overall, these findings underscore the potential for methadone to effectively manage pain, reduce reliance on opioids and improve overall patient comfort and satisfaction following autologous breast reconstructive surgery.

### **Feeling Matters: Objective Breast Sensation Evaluation by Anatomical Region and Its Impact on BREAST-Q Scores Post-Reconstruction**

Abstract Presenter: Ashley Zhang

Abstract Co-Author(s): Sophia Arbuiso, Chase Alston, Isaiah Rhodes, Grant Black MD, David Otterburn MD

**Introduction:** Impaired breast sensation can be a devastating side effect of mastectomy and breast reconstruction. Breast sensitivity is important not only for protective sensation, but also has significant impacts on quality of life. Studies have linked innervated reconstructions to improved patient-rated quality of life, but no previous study has examined objective sensory measurements with patient-reported outcomes (1). In this study, we aim to investigate the relationship between cutaneous breast sensation of different anatomical regions and BREAST-Q scores.

**Methods:** Patients with alloplastic and autologous breast reconstruction were administered the BREAST-Q and underwent sensory testing of the breasts with a pressure-specified sensory device at specific timepoints after surgery. BREAST-Q scores and sensation measurements were paired at each timepoint; any instances without both outcomes were dropped from the analysis. Univariate linear regression analysis was utilized to assess the relationship between various areas of the breast and corresponding scores on different BREAST-Q scales. Areas found to be significant in the univariate analysis were subsequently included in a multivariate linear regression analysis. A sub-analysis was performed with the subset of patients who'd completed the new Sensation Module of the BREAST-Q.

**Results:** 185 patients with both BREAST-Q and sensation testing were included in this study, comprising 93 with autologous reconstruction and 92 with implant-based reconstruction. On multivariate analysis, sensitivity of the nipple-areolar complex was identified as being significantly associated with higher scores on the Psychosocial Wellbeing scale ( $\beta = -0.15$ , 95% CI [-0.29, -0.01],  $p=0.032$ ) and the Sexual Wellbeing scale ( $\beta = -0.19$ , 95% CI [-0.35, -0.02],  $p = 0.03$ ). However, there was no correlation between breast sensation and Wellbeing of the Chest scores. In the univariate analysis, sensation in all areas of the breast was associated with higher Satisfaction with Breasts scores; however, these associations were not significant in the multivariate analysis. This suggests that overall breast sensation-as opposed to localized regions-plays a significant role in breast satisfaction. In a sub-analysis of breast sensitivity and the Sensation Module of the BREAST-Q, sensitivity of the lateral quadrant of the breast was significantly associated on multivariate analysis with higher scores on the Breast Symptoms scale ( $\beta = -0.21$ , 95% CI [-0.38, -0.05],  $p=0.02$ ).

**Conclusion:** In this first study of the effect of sensation of different anatomic regions of the breast on patient-reported quality of life, we found sensitivity of the nipple-areolar complex to be independently associated with Psychosocial and Sexual Wellbeing, underscoring the NAC's role as an erogenous zone. General breast sensitivity, rather than a particular region of the breast, correlates with Satisfaction with Breasts. Heightened sensitivity of the lateral breast was associated with fewer unpleasant breast symptoms. As reinnervation of the breast pocket after mastectomy begins from the lateral edge of the breast, these findings suggest that unpleasant symptoms (burning, tingling, etc.) precede the recovery of or occur in the absence of "normal" touch sensation.

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## **Weighing The Risks: Charting The BMI Boundaries In Free Flap Reconstruction After Nipple-Sparing Mastectomy**

Abstract Presenter: Mehdi Lemdani

Abstract Co-Author(s): Chris Amro MD, Zachary Gala MD, Jane Ewing, Robyn Broach, Joseph Serletti MD, Said Azoury MD

**BACKGROUND:** Autologous breast reconstruction (ABR) post nipple-sparing mastectomy (NSM) is recognized for its safety and aesthetic value. However, BMI-based recommendations for free flap reconstruction remain debated due to potential peri-operative risks. This study assesses outcomes concerning BMI, defining optimal BMI cutoffs post NSM.

**METHODS:** Patients undergoing free flap breast reconstruction from 2005-2018 at our institution were included. We assessed complications post NSM using BMI as a predictor. Risk-adjusted logistic regression models, considering demographic and comorbidity factors, evaluated the BMI-outcome relationship. Receiver Operating Characteristic (ROC) curves defined BMI cutoffs. Outcomes with Area Under the Curve (AUC) > 0.7 were considered. Youden's Index identified optimal BMI cutoffs.

**RESULTS:** A total of 3,066 patients who underwent free flap breast reconstruction was identified, of which 204 patients underwent NSM, totaling 295 breasts. The average BMI was 28.3kg/m<sup>2</sup> ±5.3. Surgical Site Infections (SSI) were observed in 3.7% of the cases, with an AUC of 0.7718 and a BMI threshold of 40.7. Other complications and their respective AUC values leading to BMI cutoffs included: seroma at 2.0% (AUC: 0.8607, BMI: 35.7), hematoma at 3.7% (AUC: 0.787, BMI: 37.8), fat necrosis at 5.8% (AUC: 0.7757, BMI: 37.6), fascial dehiscence at 0.3% (AUC: 0.9903, BMI: 30.4), and skin necrosis at 12.5% (AUC: 0.7777, BMI: 33.7). Flap loss due to vascular complications was observed in 1% of patients, with an AUC of 0.9834 and a BMI cutoff of 39.5.

**CONCLUSION:** Our study highlights the significance of BMI in determining post-operative complications after NSM and free flap breast reconstruction. While ABR offers

numerous benefits, it's crucial to be cautious when considering patients with BMI near or beyond our identified cutoffs. This data offers surgeons BMI thresholds for better patient counseling, surgical planning, and outcome optimization.

## **Drainless Tissue Expander Breast Reconstruction Described Methodologically**

Abstract Presenter: Alvin Nguyen

Abstract Co-Author(s): Cyril Harfouche MD, McKay Reese, Christopher Reid MD

**Background:** Two-stage prosthetic breast reconstruction is the most common operative approach following mastectomy in the United States. Traditionally, closed-suction drains are placed during the initial surgery to help manage seroma formation, but have been associated with patient discomfort and infection (1). Drainless tissue expansion has been reported possible previously, but lacking is a description of how to implement this approach and the associated demands (2-4). This study aims to describe what to expect in terms of frequency of follow-up, drainage sessions required, drainage volumes expected, and how the experience may differ based on reconstruction timing.

**Methods:** A retrospective review was performed for all patients who underwent prepectoral dual-port tissue expander placement from February 2023 to December 2023. Patient demographics, past medical history, perioperative chemo and radiation therapy, intraoperative details, and complications were reviewed. Periprosthetic drainage volumes recorded during all post-operative follow-up visits were collected. Descriptive statistics were used to summarize the outcome measures (mean, standard deviation), independent sample t-tests were used to compare means for immediate versus delayed reconstruction, and a descriptive linear mixed effects model was generated to longitudinally assess the change in drainage amount over successive sessions. Statistical significance was defined as  $p < 0.05$ .

**Results:** 28 patients making up 41 breasts were included in the analysis. 9 (32%) patients had nipple-sparing, 7 (25%) had skin-sparing, and 12 (42%) had simple mastectomies. 3 patients had surgical site infections and 3 had mastectomy flap necrosis. Average grand total drainage for an individual breast was 543 mLs (SD = 287 mLs). Average drainage per session for an individual breast was 85 mLs (SD = 38 mLs). Average number of follow-up days to reach point of no additional drainage was 36 days (SD = 13 days), with an average of 6.5 sessions within that time (SD = 1.7 sessions). The linear mixed effects model revealed significant decreases in amount



drained with each session (-20 mLs; 95% CI -24, -17;  $t = -11.9$ ) and highly variable individual patient trajectories, as indicated by variation in the baseline drainage amounts (154 mLs, SD = 57 mLs) and variation in the rate of change of drainage amounts across sessions (SD = 7.25 mLs). Finally, independent sample t-tests demonstrated statistically significant differences in total average drainage between immediate and interval-staged reconstruction (708 mLs and 425 mLs, respectively;  $p < 0.01$ ) and average drainage per session (107 mLs and 69 mLs, respectively;  $p < 0.001$ ). There were no significant differences between average days of follow-up and average number of drainage sessions required between immediate versus delayed reconstruction.

**Conclusion:** Drainless breast reconstruction is possible, does not require inordinate clinical demands, and has an equivalent safety profile to the standard approach utilizing drains. This study also provides a better understanding of the expected frequency of drainage sessions and volumes, as well as a description of differences when performed in an immediate versus delayed fashion.

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# **Immediate Versus Delayed Autologous Breast Reconstruction: Establishing the Role of Surgical Timing on Perioperative Blood Loss and Intraoperative Fluid Status**

Abstract Presenter: Danielle Harlan MD

Abstract Co-Author(s): Robert DeVito MD, John Stranix MD, Chris Campbell MD, FACS

**Introduction:** Literature details that nearly 1 in 5 women who undergo mastectomy in the United States receive autologous breast reconstruction<sup>1</sup>. These procedures are associated with higher levels of blood loss, although few data examine a temporal role on this phenomenon and the association with intraoperative fluid balance. The goal of this study is to evaluate intraoperative blood loss, fluid resuscitation, and urine output in immediate versus delayed autologous breast reconstruction.

**Patients and Methods:** A total of 264 patients who underwent autologous breast reconstruction at the University of Virginia between July 2017 – June 2022 were retrospectively extracted from our breast database. Included patients were stratified into unilateral vs. bilateral and immediate vs. delayed reconstruction. Pre- and postoperative hemoglobin and intraoperative fluid status were examined. Mean variables were compared using paired t-tests.

**Results:** Average preoperative hemoglobin was similar among all included groups (12.66 g/dl, sd = 0.073). Immediate bilateral reconstruction had greater postoperative hemoglobin reduction (-3.26 g/dl vs. -1.98 g/dl,  $p = 0.0015$ ) and transfusion rates (14.3% vs. 2.00%,  $p = 0.0206$ ) when compared to delayed bilateral reconstruction. Similar findings were seen in the unilateral group with greater hemoglobin reduction (-2.60 g/dl vs. -1.41 g/dl,  $p = 0.0001$ ) and transfusion rates (12.1% vs. 0%,  $p = 0.0246$ ) seen in the immediate cohort when compared to the delayed cohort. Greater intraoperative fluid resuscitation (+ 3199 cc vs. + 2586 cc,  $p = 0.002$ ) with greater resulting intraoperative net volume status (+ 2308 cc vs. +1866 cc,  $p = 0.019$ ) was observed in the bilateral immediate group when compared to the bilateral delayed group. This finding was not seen in the unilateral groups. Furthermore, no statistically significant differences were seen in intra-operative urine output when comparing immediate versus delayed bilateral and unilateral reconstructions.

**Conclusions:** Staging autologous breast reconstruction in both unilateral and bilateral cohorts was associated with reduced blood loss and need for postoperative blood transfusion. Greater intraoperative volume resuscitation was additionally observed in immediate bilateral autologous reconstruction, although no significant differences were

seen for the bilateral or unilateral cohorts for intraoperative urine output. Surgical timing impacts intraoperative blood loss and fluid resuscitation and is therefore a critical consideration for preoperative surgical planning and optimizing postoperative outcomes in both unilateral and bilateral autologous breast reconstruction.

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## **Risk Profiles in Breast Augmentation and Mastopexy – Multi-Institutional Data Analysis of 8,108 Cases Over 14 Years**

Abstract Presenter: Sam Boroumand

Abstract Co-Author(s): Samuel Knoedler, Gabriel Carrillo, Giuseppe Sofo, Michael Alfertshofer, Bohdan Pomahac MD, Martin Kauke-Navarro MD, Leonard Knoedler

**Purpose:** Mastopexy and breast augmentation are common surgical procedures performed to reshape the breasts, providing improved aesthetic outcomes for patients. These procedures can be done individually or in conjunction with each other depending on the patient's specific needs and aesthetic preferences. However, there is a scarcity of data about the risk factors, complication rates, and clinical outcomes when evaluating the procedures done in isolation versus in combination, which is the ultimate purpose of this study.

**Methods:** The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database was reviewed from 2008–2021 to identify female patients having undergone mastopexy and/or breast augmentation. Pre-, peri-, and post-operative variables of interest were extracted and analyzed including the incidence of medical and surgical complications at 30 days, reoperations, and readmissions. To establish risk factors, confounder-adjusted multivariable analyses were performed.

**Results:** In total, 8,108 patients were identified from the NSQIP database with 6,059 patients (mean age:  $35 \pm 10$ ; mean body mass index [BMI]:  $23 \pm 3.9$ ) having undergone isolated breast augmentation, 1,017 patients (age:  $44 \pm 12$ ; BMI:  $27 \pm 5.6$ ) undergone isolated mastopexy, and 1,032 patients (age:  $40 \pm 11$ ; BMI:  $25 \pm 4.0$ ) undergone

combined breast augmentation and mastopexy. 111 (1.8%) patients experienced postoperative complications following isolated breast augmentation, 32 (3.1%) patients following isolated mastopexy, and 33 (3.2%) patients following combined mastopexy and breast augmentation. Patients undergoing isolated mastopexy had a significantly higher rate of surgical complications, predominantly superficial incisional infections, relative to patients who underwent combined mastopexy and breast augmentation (2.2% vs. 0.4%,  $p<0.001$ ). However, patients who underwent combined mastopexy and breast augmentation had a significantly higher rate of readmission compared to isolated breast augmentation cases (1.1% vs. 0.3%,  $p=0.004$ ). Most notably, the multivariate analyses revealed that increased BMI (OR: 1.084;  $p=0.044$ ) and inpatient setting (OR: 6.343;  $p=0.005$ ) were identified as risk factors of any complication occurrence in patients who received combined breast augmentation and mastopexy, while lower PTT lab values and WBC count were identified as risk factors for complication occurrence in patients receiving isolated breast augmentation (OR: 1.220;  $p=0.019$ ) and isolate mastopexy (OR:1.117;  $p=0.034$ ), respectively.

**Conclusion:** Through this national, multi-institutional data spanning over a decade, we were able to provide a comprehensive interrogation of the related clinical variables that dictate complication rates and outcomes between isolated vs combined breast augmentation/mastopexy. In particular, we identified significantly higher rates of surgical complications with isolated mastopexy procedures but higher rates of readmission when combined with breast augmentation. Higher BMI and inpatient setting were also identified as independent risk factors for complications in the combined procedures patient cohort. Ultimately this study serves as a framework through which breast surgeons may integrate these nuanced findings into their perioperative workflow to optimize patient counseling regarding the safest and clinically most efficacious option for their patients considering mastopexy and/or breast augmentation.

## **Red Breast Syndrome - Where Has It Gone?: A Systematic Review of RBS Incidence Overtime**

Abstract Presenter: Kometh (Tony) Thawanyarat MD

Abstract Co-Author(s): Yelissa Navarro MD, Nathan Makarewicz, Chandler Hinson, Janet Coleman-Belin, Phillip Loan, Suraj Modi, Rahim Nazerali MD

**Introduction:** Red Breast Syndrome (RBS) has been noted in past literature as a possible complication of implant-based breast reconstruction (IBBR) with the use of

acellular dermal matrices (ADM). Since 2009, RBS has drawn medical attention with reported incidence ranging from 7%-9% among retrospective studies. However, in the past decade, there has been a noted decrease in the emergence of RBS despite its inclusion among analyzed complications in a number of studies. This systematic review aims to evaluate the trend in reported RBS incidence over time and determine an accurate incidence of RBS from reported literature.

**Methods:** A systematic literature review was performed in July 2023 that analyzed the incidence of RBS among retrospective cohort studies on complication rates of IBBR with ADM. Patient demographics, RBS incidence rates, and all-cause complications were captured. The review was performed according to preferred reporting items for systematic reviews and meta-analysis (PRISMA) guidelines and methodological index for nonrandomized studies (MINORS) criteria assessed study quality.

**Results:** From 2009 to 2023 a total of 48 studies (n=6251) met inclusion criteria of which 35 studies from 2017 to 2023 were not already included in a prior systematic review (n=5246). The mean incidence of RBS in the unreported studies was 2.88% with a weighted mean of 3.22%. Analysis of the trend in RBS over time shows an increasing reported incidence rate from 2009 with a peak incidence between 2016 and 2017 followed by a steady decline through 2022.

**Conclusion:** The incidence of RBS among prior studies and systematic reviews has fluctuated significantly since its initial emergence in 2009. Reported incidence rates have been on the decline since 2018 with a true weighted incidence of 3.22% from analysis of recent reported studies. Potential causes for the decline in incidence include practice changes in ADM preparation, changes in the ADM brand used for IBBR, and improved categorization of RBS compared to cellulitis/infection. Despite more robust criteria for diagnosis, no consensus for management has yet been established.

## **Enhanced Recovery After Surgery Protocol Decreases Length of Stay and Postoperative Narcotic Use in Tissue Expander-based Breast Reconstruction**

Abstract Presenter: Jeremiah Taylor

Abstract Co-Author(s): Precious Moman, Jose Chevalier, Charles Tseng MD, Jaco Festekjian MD, Michael Delong MD

**Intro:** ERAS protocols optimize perioperative care to reduce hospital stay and improve patient outcomes in various surgical domains.<sup>1</sup> Yet, its role in tissue expander-based breast reconstruction (TEBR) remains less well explored. This study evaluates an ERAS protocol's effectiveness in the context of post-mastectomy TEBR at a high-volume center.

**Methods:** All patients undergoing immediate TEBR from April 2019 to June 2023, following the adoption of the ERAS protocol, were classified as the ERAS cohort. Patients treated prior to the introduction of ERAS served as retrospective controls. We collected data on patient age, BMI, surgical laterality, expander placement, acellular dermal matrix (ADM) use, operative time, postoperative length of stay (LOS), inpatient and discharge narcotic quantities, inpatient pain assessments, postoperative radiation therapy presence, and complications within 90 days post-surgery. Statistical analyses to compare the cohorts utilized chi-square or Fisher's exact and t-tests or Wilcoxon rank-sum tests, as appropriate. During the study period, our institution experienced an alteration in TEBR placement preferences. Subpectoral placement, the norm until 2018, has been associated with increased postoperative pain, increased narcotic use, and lower seroma rates compared to prepectoral placement.<sup>2</sup> To account for this, multivariable linear regression models were constructed to evaluate the independent effects of the ERAS protocol on inpatient milligram morphine equivalents (MME), inpatient LOS, and postoperative complications, while controlling for expander placement.

**Results:** There were 201 patients in each cohort, with statistically similar demographics. Prepectoral procedures were performed at a higher rate in the ERAS cohort (83.1% vs. 4.5%,  $p < 0.001$ ). Patients on the ERAS protocol were more frequently discharged by day 1 (96.5% vs. 70.2%,  $p < 0.001$ ) and had a lower inpatient MME median (79.8 vs. 151.8,  $p < 0.001$ ). Patients on ERAS had higher seroma rates (17.4% vs. 3.5%,  $p < 0.001$ ), hematoma incidence (4.5% vs 0%,  $p = 0.004$ ), and lower pain levels on POD 0 (2.8 vs 3.6;  $p < 0.001$ ) and POD1 (2.9 vs 3.5;  $p = 0.003$ ). At discharge, the ERAS group was prescribed a median of 225.0 less MME (150.0 vs 375.0;  $p = 0.003$ ). Non-ERAS had more "other" complications (5% vs. 1%,  $p = 0.036$ ) such as emesis, ileus, uncontrolled pain and migraine. Adjusting for implant location, the ERAS protocol was associated with a 60.7 MME reduction ( $\beta = -60.7$ ,  $p < 0.001$ ) and a shorter inpatient duration ( $\beta = -0.4$ ,  $p < 0.001$ ). Prepectoral placement was also a predictor of decreased MME ( $\beta = -30.9$ ,  $p = 0.015$ ). Additionally, prepectoral placement was the sole predictor of seroma development ( $\beta = 0.2$ ,  $p = 0.003$ ), and decreased postoperative pain (POD0:  $\beta = -1.4$ ,  $p < 0.001$ ; POD1:  $\beta = -0.7$ ,  $p = 0.035$ ).

**Conclusion:** Our study reinforces the beneficial role of ERAS in TEBR, markedly

decreasing opioid consumption and hospital stay durations. Integrating ERAS into prosthetic breast reconstruction practices can optimize patient recovery while maintaining an acceptable complication profile.

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## **Weight Changes in Adolescents Undergoing Reduction Mammoplasty**

Abstract Presenter: Anna Boydstun

Abstract Co-Author(s): Austin Lignieres MD, Sarah Islam MD, Laura Humphries MD

**Objective:** Reduction mammoplasty is commonly cited to aid weight loss by facilitating the ability for physical activity. This study aims to analyze preoperative and postoperative weight and body mass index (BMI) changes in adolescents who underwent bilateral breast reduction (BBR) with a secondary focus on the impact of formal preoperative nutritional support.

**Methods:** A retrospective analysis was conducted of patients aged 12-19 years who underwent BBR at our institution between 2019 and 2023. Data included patient demographics, preoperative and postoperative weight and BMI, weight of tissue resected, and formal nutrition referral preoperatively. Dependent and independent t-tests were used for data analysis.

**Results:** There were 99 patients included in the study, 12 of whom received formal preoperative nutritional counseling. Overall, patients did not lose a significant amount of weight during the preoperative period or at 3 months and 1 year postoperatively. Patients demonstrated significantly greater weight loss preoperatively than at 3 months

postoperatively ( $M = -2.19\text{kg}$  vs  $0.57\text{kg}$ ,  $p < 0.001$ ) When stratified by nutrition group, patients who did not receive nutritional counseling had significantly greater weight loss preoperatively than at 3 months postoperatively ( $M = -2.10\text{kg}$  vs  $0.65\text{kg}$ ,  $p < 0.001$ ), while there was no significant difference in patients utilizing nutritional services. Furthermore, there was no significant difference between weight loss in the preoperative period and at 1 year postoperatively, regardless of nutritional counseling. Although adolescents with nutritional support had greater weight loss compared to those without nutritional services preoperatively and at 3 months and 1 year postoperatively, this was not significant.

**Conclusion:** Adolescents undergoing BBR had significantly greater weight loss preoperatively than at 3 months postoperatively, thus emphasizing the importance of initial consultation where weight is discussed. Patients with formal preoperative nutritional support lost more weight in the postoperative period than those without nutritional services. Although this was not a significant difference, it suggests that preoperative nutritional counseling in conjunction with the facilitation of physical activity following BBR could help adolescents lose weight postoperatively. Our study is limited by a small sample size of patients receiving nutritional counseling. Further studies with data from multiple institutions and more patients receiving nutritional services are warranted to determine true significance.

## **Evaluation of Opioid Prescriptions After Breast Reduction Surgery to Inform Creation of a Multimodal Postoperative Pain Protocol**

Abstract Presenter: Amelia Davidson

Abstract Co-Author(s): Abigail Peoples MD, Madison Hinson, Sabine Abukhadra, Elsa Katarina Acosta, Daniel Zaki MD, Lisa David MD

**Background:** Opioids, while effective in managing pain, can pose life-threatening risks to patients and communities. This is especially true when used in isolation for pain control. One of the main contributors to opioid over-prescription are surgeons, particularly in elective surgeries. For plastic surgeons, one of the most common outpatient procedures is breast reduction. Therefore, this study evaluates postoperative opioid prescriptions following breast reduction in order to evaluate for potential multimodal pain management incorporation including perioperative nerve blocks, gabapentinoids, muscle relaxants, and nonsteroidal anti-inflammatory drugs.



**Methods:** A retrospective chart review captured patients who underwent breast reduction between January 2016 and September 2023 at a single center. Demographics, opioid prescription data, other pain medication prescriptions, and post-operative pain-related medical visits and phone calls were recorded.

**Results:** A total of 762 patient records were analyzed. Post operative opioid prescriptions were written for 89% of patients, and only 5% of patients received a non-opioid pain prescription. Use of perioperative nerve blocks increased annually. Average prescribed morphine milligram equivalents (MME) decreased over time, with a significant decrease after NC STOP (Strengthen Opioid Misuse Prevention) Act enactment in January 2020 ( $259.8 \pm 149.8$  MME vs  $129.8 \pm 81.88$ ).

**Conclusions:** While prescribed post-operative MME is continuing to decrease, multimodal pain therapies are underutilized. Patients rarely request refills for opioid medications indicating further reduction in total treatment MME would be reasonable, especially if this reduction is concomitant with emphasizing multimodal perioperative pain management such as the increasing trend of perioperative nerve blocks. Translation of these findings to clinical impact may best be done through implementation of a breast reduction specific pain protocol. Reduction in total MME prescription is beneficial for both patient and community health during the ongoing opioid epidemic.

## **Efficacy of Exclusive Fat Grafting for Breast Reconstruction: An Updated Systematic Review and Meta-analysis**

Abstract Presenter: Nouf AlBattal

**Background:** Exclusive fat grafting is an alternative method to implant- or flap- based reconstruction techniques following mastectomies or breast conservation therapies. Its efficacy has been explored before but new data has come to light, resulting in previous results becoming outdated. Concerns have also been raised about the oncological safety of this procedure which must be evaluated alongside the efficacy to gain a comprehensive understanding of the merits of this alternative technique.

**Methods:** We queried the PubMed electronic database from its inception until August 2023 for studies evaluating the efficacy and oncological safety of exclusive fat grafting breast reconstruction following cancer-related mastectomy or breast conservation therapy. Results of the analysis were pooled and presented as means or valid

proportions. Results of the analysis were pooled using a random-effects model and presented with 95% confidence intervals (95% CIs) where appropriate.

**Results:** 41 studies were included in our analysis. Pooled results show that on average, 1.7 sessions of exclusive fat grafting were required to complete reconstruction in Breast Conservation Therapy (BCT) patients, with an average volume of 114.2 ml being injected. For mastectomy patients with irradiated breasts, 4.7 sessions were needed on average with 556.8 ml being required to complete reconstruction, compared to their non-irradiated Counterparts requiring only 2.6 sessions and 207.2 ml to complete reconstruction. Oncological recurrence events were found in 29/583 non-irradiated mastectomy patients ( $p=0.014$ ) and in 41/517 BCT patients ( $p=0.301$ )

**Conclusion:** Exclusive fat grafting is an oncologically safe and reasonably efficacious alternative to more common methods of breast reconstruction. More data is needed to fully characterize the oncological safety of this procedure in irradiated and non-irradiated mastectomy patients.

### **Assessing the Role of Sensation Preservation in Overall Patient-Reported Satisfaction Within Comparative Reduction Mammoplasty Techniques: a Systematic Review**

Abstract Presenter: Sophia Arbuiso

Abstract Co-Author(s): Sophia Salingaros, Malini Chinta MD, Lujain Al-Emadi, Ashley Zhang, Isaiah Rhodes, Chase Alston, KEVIN PAIN, David Otterburn MD

**Purpose:** Reduction mammoplasty is consistently shown to be associated with high patient satisfaction. Several variables play a role in overall satisfaction, including relief of physical pain and psychological suffering, postoperative aesthetic results, and sensation changes following the procedure (1). We aimed to analyze the role that sensation return plays in overall patient-reported satisfaction following reduction mammoplasty by analyzing studies that utilized two different groups that underwent reduction and measured and compared their postoperative sensation and satisfaction.

**Methods:** A systematic review was conducted to analyze studies that assessed outcomes following reduction mammoplasty that included both sensation changes and overall patient-reported satisfaction, and compared these between at least two groups, differing by either technique or size of reduction. Six databases were searched using

the OVID engine including Scopus, Embase, and MEDLINE following PRISMA methodology. All studies were screened by two independent reviewers.

**Results:** 1,294 articles populated in the search, eight of which met inclusion criteria. One study compared outcomes with patients who underwent large versus small reductions, and found no difference in postoperative sensation, but significantly higher postoperative satisfaction in the large reduction group. Another study compared patients who underwent reduction mammoplasty with patients with eutrophic breasts and patients with hypertrophic breasts that did not undergo reduction, and found that patients who underwent a reduction had significantly lower sensation than patients in the other two groups, but also had significantly higher postoperative satisfaction. The authors also found an association between satisfaction with aesthetic and functional outcomes and increased sexual function. One study compared superomedial and inferior pedicle techniques and found no difference in sensation, but significantly higher satisfaction and aesthetic outcomes in the superomedial pedicle technique. Similarly, when comparing the extended pedicle technique with free nipple grafts, no difference was found in sensation, but the extended pedicle group reported significantly higher satisfaction and aesthetic outcomes. One study compared the Orlando and Robbins methods and found significantly reduced sensation with the Robbins technique; however, there was no difference in satisfaction or aesthetic outcomes. Three studies compared vertical and Wise pattern incisions and found no difference in sensation or satisfaction postoperatively.

**Conclusion:** These results suggest that sensation preservation following reduction mammoplasty does not trend with overall satisfaction, and when there is a difference in satisfaction between groups, it preferentially correlates with aesthetic outcomes. In the study that compared large and small volume reductions, aesthetic outcomes were not compared; however, the patients who underwent larger reductions may have had increased satisfaction due to the greater degree of change in appearance and symptomatic relief following surgery. These results suggest that although sensation preservation is important, it may not play as significant of a role as aesthetic outcomes in patient satisfaction following reduction. Our results suggest that when choosing which technique to perform for reduction mammoplasty, the technique that will result in the greatest aesthetic appearance postoperatively should be prioritized.

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## **The Impact of Socioeconomic Status on Premature Tissue Expander Loss in Expander-Based Breast Reconstruction**

Abstract Presenter: Ann Carol Braswell

Abstract Co-Author(s): Hua Fang MD, Amanda Hua Fang, Amanda Hua Fang, Madeline Bald, Brad Denney MD, Maria Helena Lima MD

**Introduction:** Approximately 75% of breast reconstructions in the United States utilize tissue expander-based reconstruction. Risk factors including obesity, smoking, hypertension, increased age, and prior radiation have been shown to predispose patients to tissue expander (TE) loss before successful completion of expansion. Though breast reconstruction is one of the most common procedures in plastic surgery, socioeconomic disparities remain prevalent and are well described in the literature. That said, there is a paucity of data looking at socioeconomic status (SES) in the context of TE loss specifically. This study aims to analyze the association between different demographic factors, in particular SES, and premature TE explantation in patients undergoing expander-based reconstruction following mastectomy.

**Methods:** A retrospective analysis of patients undergoing expander-based reconstruction following mastectomy between January 1, 2018 and August 1, 2021 at a single institution was performed. The cohort was stratified into two groups based on expansion outcome: premature TE loss vs. successful reconstruction. Primary measures were comprised of demographic and outcome data including TE size, fill volume, time to second stage, removal or exchange prior to second stage, and reason for premature removal/exchange. SES was determined by using the median income for each patient's billing zip code from the Census Bureau income statistics.

**Results:** A total of 306 patients and 523 breasts were expanded over the course of this study. Overall the cohort had an average age of 51 years; 83% of patients were White, 12% Black, and 5% other. Following stratification, 42 breasts experienced premature loss of TE while 481 breasts were expanded successfully. 45% of premature TE removals were in the context of infection. There was no significant difference in age, race, tobacco use, BMI at TE, final fill volume, or time of expansion between the two groups ( $p>0.05$ ). That said, those with premature TE loss did have a significantly larger tissue expander placed ( $p=0.02$ ) and a larger initial fill volume ( $p=0.04$ ). Significantly more of the successful expansions employed acellular dermal matrix ( $p<0.001$ ). There

was no significant difference in type of mastectomy, chemotherapy before mastectomy or second stage, or radiation before mastectomy or second stage between the two groups. When looking at SES, there was no significant difference in median income between the two groups (\$70,297 vs. \$68,640,  $p=0.34$ ). There was also no significant difference in distance from the hospital (70.0mi vs. 77.0mi,  $p=0.35$ ).

**Conclusion:** There was no difference found in SES between those with premature TE loss and those who completed a successful expansion. Clinical outcomes and care were similar regardless of SES and distance from the hospital. Premature TE loss was associated with a larger expander placed initially and a larger initial fill volume.

## **Immunotherapy and Complications After Free Flap Breast Reconstruction**

Abstract Presenter: Saigopala Reddy

Abstract Co-Author(s): Robert DeVito MD, Nina Mehta, Christina Kapsalis MD, Andrew Kozlow, Chris Campbell MD, FACS, Yemi Ogunleye MD, SM

**Background:** Immunotherapy is a fast-growing therapeutic class of breast cancer treatment, as new agents are being discovered. Pertuzumab is a monoclonal antibody for treatment of HER2-positive breast cancer (about 15-30% of breast cancer cases) in conjunction with trastuzumab. Trastuzumab was not associated with postoperative complications but was shown to be associated with wound healing complications when administered with pertuzumab in patients undergoing breast reconstruction (1). Pertuzumab prevents heterodimerization of the HER2 receptor tyrosine kinase, downregulating cell proliferation and growth (2). It is thought to downregulate expression of epidermal growth factor receptor (EGFR, alias HER1, promotes wound healing and fibrosis), raising questions of increased complications after breast reconstruction. An understanding of Pertuzumab's effects on postoperative wound healing in free flap breast reconstruction would help guide timing of these procedures. We examined the relationship between the most-commonly used agents, trastuzumab and pertuzumab and complications after free flap breast reconstruction.

**Methods:** Retrospective, multi-institutional chart review was performed evaluating 434 women who underwent 660 free flap breast reconstructions from January 2017 to December 2022. Demographic, oncologic, and perioperative data including immunotherapy within 1 month of surgery was collected and analyzed. Primary study outcomes included flap complications, donor site complications, and infection.

Univariate and multivariate logistic regression analysis was performed to evaluate the association of outcomes with immunotherapy treatment.

**Results:** The mean age of patients was 50.8 years (SD 9.9) while mean BMI was 30.4kg/m<sup>2</sup> (SD 5.5). There were 8 total flap losses (1.2%) and 11 partial flap losses (2.5%). No significant association was found between immunotherapy treatment within 1 month of surgery and flap loss, delayed wound healing or infection ( $p>0.05$  for all). In multivariable analysis, higher BMI (odds ratio 1.04; 95% CI 1.01 to 1.08) and smoking history (odds ratio 2.48; 95% CI 1.44 to 8.40) were found to be independent risk factors for delayed wound healing but not flap loss.

**Conclusion:** Our study suggests that immunotherapy with pertuzumab and trastuzumab is not associated with postoperative complications after free flap reconstruction. Further research into outcomes after free flap breast reconstruction patients on newer immunotherapeutic agents on free flap reconstruction is imperative.

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#### **Long-Term Patient Reported Outcomes after Post-Mastectomy Aesthetic Flat Closure Compared to Implant-Based Breast Reconstruction**

Abstract Presenter: Aileen Gozali MD

Abstract Co-Author(s): Nisha Parmeshwar MD, Daniel Soroudi, Merisa Piper MD

**Purpose:** While there is an increasing national trend in patients seeking aesthetic flat closure (AFC) after mastectomy, little is known about patients' perceptions after AFC. This study aims to understand the impact of receiving post-mastectomy AFC versus implant-based reconstruction on patients' satisfaction and health rating.

**Method:** Patients who had AFC or implant-based reconstruction following unilateral/bilateral mastectomy between 2013 and 2022 were retrospectively reviewed.

Demographic and operative characteristics were collected. Patients who were at least 6 months from their final reconstruction were contacted to complete a survey, which included the BREAST-Q, and Likert scale questions on overall happiness and health rating.

**Results:** 50 (20%) AFC patients and 212 (36%) implant patients completed the surveys. AFC patients were older compared to the implant patients (58 vs 47,  $P<0.001$ ) and had higher BMI (25 vs 22,  $P<0.001$ ), while more implant patients had a history of anxiety (29% vs 14%,  $P=0.029$ ). More AFC patients received radiation therapy (42% vs 20%,  $P=0.002$ ) and had invasive cancer (86% vs 55%,  $P<0.001$ ). Time between mastectomy surgery and completion of survey were longer for AFC patients than for Implant patients (48 vs 35 months,  $P<0.001$ ). BREAST-Q scores and overall happiness were comparable, but more AFC patients rated their overall health lower (34% vs 19%). Multivariate ordered logistic regression identified higher BMI ( $\text{beta}=-0.11$ ,  $p<0.001$ ), larger pre-surgery bra-size ( $\text{beta}=-0.030$ ,  $p=0.009$ ), and history of anxiety ( $\text{beta}=-0.72$ ,  $p=0.019$ ) as independent predictors of lower overall health rating.

**Conclusion:** Our findings suggest that whether patients undergo AFC or implant reconstruction after mastectomy, quality of life as measured by BREAST-Q, overall happiness and health ratings are comparable, supporting the increasing awareness that patients who did not receive reconstruction after mastectomy are satisfied with their choice.

### **Unilateral Breast Reductions in the Setting of Prior Contralateral Breast Irradiation: A Propensity Score Matched Analysis\**

Abstract Presenter: Keisha Montalmant MD, MPH

Abstract Co-Author(s): Carol Wang BA, Peter Shamamian Jr, BS, Esther Kim, Daniel Kwon, Abena Gyasi, Olachi Oleru MD, Nargiz Seyidova MD, Ivory Fu

**Background:** Breast reduction after prior partial mastectomy and radiotherapy (RT) to the cancer-affected breast can be performed to improve symmetry and relieve symptoms of macromastia. However, RT can induce damage to not only the cancer-affected breast, but also to the contralateral breast, and as such, breast reduction in this clinical scenario is thought to have a higher risk of wound healing complications. To date, the extent to which prior breast RT affects the outcomes after surgery on the contralateral breast has not been adequately studied. Therefore, the purpose of this

study was to investigate the association between prior breast RT exposure and surgical complications in patients who underwent unilateral breast reduction.

**Methods:** An institutional retrospective review was conducted to identify all patients with a history of breast cancer who underwent unilateral breast reduction of the other breast between 2015 and 2023. Patients who had and had not received RT were subsequently propensity score matched in a 1:1 ratio. A match tolerance (caliper) of 0.05 was determined and utilized to ensure comparable matches. Patients were matched based on age, body mass index (BMI kg/m<sup>2</sup>), present comorbidities (diabetes mellitus, hypertension, and smoking status), and prior chemotherapy. Postoperative complications were recorded, and univariate analyses were performed to analyze the association between prior breast irradiation and postoperative complications. Statistical significance was set at  $p < 0.05$ .

**Results:** A total of 139 patients were identified for inclusion, and propensity score matching resulted in 72 patients for analysis (n=36 patients each). Prior to propensity score matching, differences in the rate of complications were seen in patients with a history of RT (n=69) and patients without a history of RT (n=70): reoperations (80.0% versus 20%), infection (63.6% versus 36.3%) and fat necrosis (55.5% versus 44.4%). However, univariate analyses of the propensity-matched cohorts resulted in no statistically significant associations between prior breast RT and postoperative complications: reoperations ( $p=0.31$ ), infection ( $p=0.64$ ), and fat necrosis ( $p=0.64$ ).

**Conclusions:** A propensity score-matched analysis indicates that there is no statistically significant association between previous radiotherapy to one breast and complications following breast reduction in the other breast. Therefore, this surgical technique should be strongly considered in patients who are seeking symmetry and relief from unilateral macromastia after prior RT for breast cancer treatment.

### **Sensory and Pain Outcomes in Inferior versus Superior-Medial Breast Reduction Surgery**

Abstract Presenter: Katya Remy MD

Abstract Co-Author(s): Curtis Cetrulo Jr., MD, FACS, Krishna Vyas MD, PhD, MHS, Lisa Gfrerer MD, PhD, William Gerald Austen Jr., MD, Katherine Carruthers MD



**Introduction:** Breast reduction surgery (BRS) effectively improves or resolves many of the symptoms of macromastia. The inferior and superior-medial pedicles are the most commonly used techniques. However, up to 75% of patients have reported being bothered by impaired sensation following surgery and the occurrence of chronic postoperative breast pain has been poorly described. The influence of pedicle technique on sensory outcomes has been controversial and their impact on postoperative pain is unknown. Therefore, this study aimed to compare the sensory and pain outcomes of the inferior pedicle versus the superior-medial pedicle technique in BRS.

**Methods:** A total of 40 patients undergoing BRS were included. 20 patients undergoing the inferior pedicle were age- and BMI-matched to 20 patients undergoing the superior-medial pedicle. Patients were evaluated preoperatively and postoperatively at 1, 3, 6 and 12 months. Quantitative sensory testing included Semmes-Weinstein monofilament testing on predefined quadrants of the nipple areola complex (NAC) and surrounding breast skin. Patient-reported outcome measures included nipple and chest sensation (5-point Likert scale) and the presence of pain in the breast area. The Patient Reported Outcome Measurement Information System (PROMIS) Neuropathic Pain Quality scale was used to assess for neuropathic pain. Pain intensity was assessed using the numeric rating scale (0-10).

**Results:** The mean NAC monofilament values were significantly better in the inferior pedicle versus the superior-medial pedicle at 1 and 3 months postoperatively ( $p < 0.05$ ) and comparable afterwards ( $p > 0.05$ ). The mean monofilament values at the surrounding breast skin were similar between both pedicle techniques throughout follow-up ( $p > 0.05$ ). Patient-reported nipple sensation was significantly better in the inferior pedicle group as compared to the superior-medial group at 1 and 3 months postoperatively ( $p < 0.05$ ) and comparable afterwards ( $p > 0.05$ ). At 12 months postoperatively, complete nipple sensation (5/5) was reported in 85% of patients in the inferior pedicle group as compared to 60% of patients in the superior-medial group ( $p > 0.05$ ). Patient-reported breast sensation was comparable between inferior and superior-medial pedicles throughout follow-up ( $p > 0.05$ ). At 12 months postoperatively, complete breast sensation (5/5) was reported in 90% of patients in the inferior pedicle group as compared to 80% of patients in the superior-medial group ( $p > 0.05$ ). Breast pain was reported in 30% of patients at 1 month postoperatively, 50% at 3 months, 30% at 6 months and 25% at 12 months. Pain had neuropathic qualities in 86% of cases, was intermittent in 95% and the average pain intensity was 6.3 ( $\pm 1.3$ ). Rates of pain were similar between inferior and superior-medial pedicle techniques throughout follow-up ( $p > 0.05$ ).

**Conclusions:** In BRS, the inferior pedicle may allow for earlier restoration of quantitative and patient-reported NAC sensation as compared to the superior-medial

pedicle. Regardless of pedicle technique, a quarter of patients had persistent breast pain at 12 months postoperatively, which was mostly neuropathic in nature. Therefore, patients undergoing BRS should be counseled about potential differences in sensory outcomes with different pedicle techniques, as well as a risk of persistent neuropathic pain.

## **Evaluating AI Virtual Assistant in Post-Operative Care for Breast Cancer Patients: A Comparative Study With Voice-Enabled Feature of OpenAI's ChatGPT-4 Application**

Abstract Presenter: Sahar Borna MD

Abstract Co-Author(s): Cesar Abraham Gomez Cabello MD, Sophia Pressman, Syed Ali Haider MBBS, Antonio Forte MD, PhD, MS

**Introduction:** In the U.S., over 3 million breast cancer patients and survivors (BCPS) are focusing more on quality of life due to improved survival rates. Addressing the gap in postoperative information, AI, especially as a specialized AI virtual assistant (AIVA) for breast cancer care, and advancements in Large Language Models (LLMs) like ChatGPT-4 are aiding healthcare professionals in patient management. This study aims to evaluate the effectiveness of the AIVA tool in addressing post-plastic surgery inquiries from breast cancer patients and survivors, comparing it to the voice-enabled application of OpenAI's ChatGPT-4 through verbal prompts.

**Methods:** We developed an AIVA using IBM Watson Assistant, a platform that enables the creation and training of chatbots. Our AIVA utilizes conversational AI technology to interact in real-time with BCPS, capable of understanding a broad spectrum of user inputs. We compiled 242 frequently asked questions by post-plastic surgery BCPS at Mayo Clinic Florida, encompassing 10 key postoperative care topics. Each question was initially answered by a plastic surgery expert for reference. We then presented these questions to AIVA and the voice-enabled ChatGPT-4 application. Our analysis focused on identifying knowledge gaps and the accuracy of AIVA and ChatGPT-4's responses compared to the expert's answers. Additionally, four medical professionals rated the appropriateness of the answers on a 5-point scale. We evaluated ChatGPT-4's responses for length, complexity, and wordiness using Hemingway and Flesch-Kincaid readability tools online. To analyze the data, we employed the Shapiro-Wilk test to ascertain data normality and the Kruskal-Wallis test for comparisons due to the non-normal distribution of our data.

**Results:** In a comparison of 10 topics, AIVA significantly outperformed ChatGPT-4 in accuracy, with median scores of 0.9 (0.6, 1.0) for AIVA and 0.6 (0.2, 0.8) for GPT ( $p < 0.001$ ). AIVA's answers also had a substantially lower knowledge gap than GPT's (median 0.1 (0.0, 0.1) vs 0.2 (0.0, 0.6),  $p = 0.028$ ). ChatGPT's accurate answers were generally more complex in language and structure than inaccurate ones ( $p < 0.001$ ). No knowledge gap was found in the accurate ChatGPT responses, while only 53.3% of inaccurate responses showed no knowledge gap ( $p < 0.001$ ). In these inaccurate responses, ChatGPT requested additional context or information 35% of the time, misunderstood words 5.8%, misheard questions 4.2%, and redirected to healthcare professionals 1.7%. 42% of responses were rated as incorrect, 46.6% of which showed no knowledge gap. Moreover, AIVA's responses received twice the Likert scores from our four reviewers compared to ChatGPT (median 3.0 (2.7, 3.0) vs 1.6 (1.2, 2.4),  $p < 0.001$ ). All responses rated as totally correct showed no knowledge gap ( $p < 0.001$ ). There was a significant correlation between the complexity of answers, their readability, and the received Likert scores, with higher scores indicating greater complexity and lower readability ( $p < 0.001$ ).

**Conclusion:** AIVA surpassed ChatGPT's audio app in patient query response, demonstrating greater accuracy, depth, and relevance. Our analysis suggests that ChatGPT's detailed answers tend to be more accurate. Statistically significant differences ( $p < 0.001$ ) across various metrics reinforce these findings.

### **Sensation- and Pain-Related Patient-Reported Outcome Measures (PROMs) Following Abdominal Free Flap Breast Reconstruction With and Without Neurotization**

Abstract Presenter: Amanda Fazzalari MD

Abstract Co-Author(s): Finn Tobias, Matthew Prospero, Anissa Saylany, Goutam Gadiraju, Tracy Landry, Kristin Schreiber, Erin Taylor MD, Matthew Carty MD, Jessica Erdmann-Sager MD

**Purpose:** Patients may suffer from persistent postoperative pain following mastectomy, referred to as Persistent Post-Mastectomy pain (PPMP). PPMP is associated with increased use of analgesics, physical disability, and decreased quality of life (QOL), with one proposed mechanism being nerve injury followed by neuroma formation. Neurotization with allograft to the 3rd, 4th, or 5th intercostal nerve has been employed

to restore sensation during breast reconstruction. This study aims to characterize neurotization practices performed during autologous breast reconstruction, as well as determine the potential of neurotization to reduce the PPMP and improve QOL, as measured by patient-reported outcome measures (PROMs).

**Methods:** A single-center retrospective cohort study was conducted including >18 years old females who underwent abdominal-based autologous breast reconstruction (deep inferior epigastric perforator [DIEP], superficial inferior epigastric artery [SIEA], muscle sparing or free transverse rectus abdominus myocutaneous [MS-TRAM, free TRAM] flaps) between August 2007 and October 2022 and were at least one-year post-operation. Patients were included in the study if they completed all of the following four scales from the BREAST-Q Reconstruction Module (Breast Sensation, Sensation: QOL Impact, Psychosocial Well-being and Breast Symptoms), Breast Cancer Pain Questionnaire, Pain Catastrophizing Scale, three PROMIS short forms (Anxiety 7a, Depression 8b and Sleep Disturbance 8b), and the Positive and Negative Affect Schedule Short Form. Sociodemographic and clinical variables, surgical course, postoperative complications, and PROM scores were analyzed.  $P < 0.05$  was deemed statistically significant.

**Results:** 298 patients underwent autologous breast reconstruction, 67 (108 breasts) with neurotization and 231 (361 breasts) without neurotization. The mean age and BMI of the neurotized and non-neurotized cohorts were 52 and 49 years and 28.3 and 29 kg/m<sup>2</sup>, respectively ( $p = 0.006$ ,  $p = 0.177$ ). The mean time point at which surveys were completed was 4.2 ( $\pm 1.3$ ) and 9.7 ( $\pm 2.9$ ) years postoperatively in the neurotized and non-neurotized cohorts, respectively ( $p < 0.001$ ). Differences in demographic distributions, comorbidities (obesity, hypertension, Diabetes Mellitus, prior DVT or PE), genetic mutations, chemotherapy, radiation, and postoperative complications of the neurotized and non-neurotized cohorts were not statistically significant ( $p > 0.05$ ). Similarly, history of SLNB or ALND, use of abdominal mesh and flap laterality between the cohorts were not statistically significant ( $p > 0.05$ ). There were significantly more regional blocks performed in the neurotized cohort ( $p < 0.001$ ), more free TRAMs in the non-neurotized cohort ( $p = 0.05$ ) and increased free flap weight in the non-neurotized cohort ( $p = 0.014$ ). Out of 108 neurotized flaps, allografts were used in all cases and the 3rd intercostal nerve (105 flaps, 97.2%) was most commonly used. Neurotization targeting the flap was performed via coaptation to the cutaneous nerve supplying the flap in 104 (96.3%) cases and to the breast skin or nipple in 4 (3.7%) cases.

**Conclusion:** Further analysis of pain, sensation and QOL, adjusting for cohort differences in a multivariable regression analysis, will be essential to uncover the nuanced differences in patient-reported outcomes between the neurotized and non-

neurotized cohorts. Our ongoing patient accrual will facilitate comprehensive data collection, enabling us to finalize and analyze the results in time for presentation at PSTM 2024.

## **Secondary Breast Reduction and Nipple-Areolar Complex Viability**

Abstract Presenter: Keisha Montalmant MD, MPH

Abstract Co-Author(s): Olachi Oleru MD, Nargiz Seyidova MD, Jake Sharaf MD, Peter Shamamian Jr, BS, Daniel Kwon, Esther Kim, Simeret Genet, Abena Gyasi, Peter Henderson MD MBA FACS

**Purpose:** Secondary breast reduction is performed for refractory macromastia after previous primary breast reduction. While obtaining information about which dermoglandular pedicle was used during the primary operation is thought to be helpful to determine the optimal approach to maintain nipple-areolar complex (NAC) viability, current literature debates the true clinical benefit of this information. Additionally, data regarding postoperative outcomes following secondary breast reduction where patients underwent single versus combined pedicles is limited. The present study investigates the risk of postoperative complications after secondary breast reduction procedures in patients with unknown primary pedicles.

**Methods:** A retrospective review was conducted of an institutional database of patients who had undergone breast reduction surgery between 2019 and 2023. Secondary breast reduction procedures were identified and stratified according to whether the pedicle utilized at the index operation was known or unknown. Patient demographics, clinical variables, operative techniques (including pedicle design during secondary breast reduction), and postoperative complications were collected and analyzed.

**Results:** A total of 15 patients (22 breasts) who had undergone secondary breast reduction was identified. The mean age at time of surgery was  $49.7 \pm 11.8$  years, and body mass index was  $29.6 \pm 4.4$  kg/m<sup>2</sup>. Common comorbidities included hypertension (26.6%, n=4) and diabetes (13.3%, n=2). No patients were identified as currently smoking. Twelve patients (80%) had previously undergone bilateral breast reduction, and three patients (20%) had previously undergone unilateral breast reduction. Among the 12 patients who had undergone a primary bilateral procedure, a secondary bilateral reduction occurred in 58% (n=7), and 42% (n=5) underwent a unilateral procedure. The primary pedicle was known in 46.7% (n=7) of patients, and unknown in 53.3% (n=8).

The rate at which the same pedicle was utilized for the secondary procedure among the known group was superior pedicle (100%, n=2/2), superomedial pedicle (75%, n=3/4), and inferior pedicle (0%, n=0/1). In the unknown group, the inferior pedicle (37.5%, n=3), superior pedicle (25%, n=2), and superomedial pedicle (12.5%, n=1) were utilized. The remaining two patients (25%) underwent secondary reductions that utilized more than one pedicle: one patient underwent a superomedial + central mound pedicle, and the other patient underwent a superomedial + central mound + inferior pedicle. All postoperative complications occurred in the unknown group (n=5), in which the inferior (n=3) and superomedial (n=2) pedicles were utilized for secondary reductions. Complications related to the NAC included loss of sensation (n=1), necrosis (n=2) and reoperation (n=1). However, there were no complications related to the NAC among patients who underwent a combined pedicle technique. Additional complications for the unknown group included seroma (60%, n=3), fat necrosis (40%, n=2), T-junction breakdown (40%, n=2), infection (20%, n=1), and abscess (20%, n=1).

**Conclusions:** Postoperative complications occurred more frequently after secondary breast reduction in patients with an unknown primary pedicle than in patients with a known pedicle. No complications related to the NAC occurred in patients who underwent a combined pedicle technique. These findings suggest that optimizing the number of pedicles utilized and cautious postoperative care is essential to mitigate risks associated with secondary breast reductions.

## **Examining Racial Disparities in Breast Cancer Treatment and Reconstruction**

Abstract Presenter: Tokoya Williams MD

Abstract Co-Author(s): May Li, Fatoumata Sylla, Sammer Marzouk, Raiven Harris, Robert Galiano MD

**INTRODUCTION:** This study examines differences in cancer stage and characteristics, treatments received, and reconstruction rates and outcomes among a racially diverse group of women. Existing data largely focuses on the experiences of Caucasian women, thus this study aims to fill in critical knowledge gaps in underrepresented Women of Color (WOC). Exploring these factors and how they relate to breast cancer in a broader demographic can highlight disparities and contribute to a more equitable understanding of healthcare outcomes.

**METHODS:** This study engaged a voluntary sample of 413 adult females with a history

of surgical intervention for breast cancer. A racially and ethnically diverse population was sampled from May 2023 to June 2023, including 250 White, 99 African American, 29 Hispanic, 24 Asian, and 11 American Indian/Alaska Native women. Conducted by Kantar Lightspeed LLC, the computer-based survey combined a 45-item questionnaire, developed with the BRAVE Coalition, the 13-item BREAST-Q Satisfaction with Breasts subscale, and several open response questions. It focused on cancer stage and characteristics, treatments received, and reconstruction rates and outcomes to examine differences among those of diverse racial backgrounds.

**RESULTS:** A total of 413 breast cancer survivors from a racially diverse background were surveyed. Respondents were asked about breast cancer stage, tumor characteristics, and treatments received. White women were significantly more likely to receive breast-conserving surgery compared to Black women ( $p < 0.001$ ). Black women were significantly more likely than White women to receive bilateral mastectomy ( $p < 0.001$ ). Black women were significantly more likely to undergo chemotherapy compared to white women ( $p = 0.003$ ). Notably, pairwise comparison of breast cancer stage at diagnosis, her2 status, and triple negative status showed no statistically significant difference between race groups ( $p = 0.37$ ,  $p = 0.14$ , and  $p = 0.15$ , respectively). Respondents were also asked about any breast reconstruction received and associated complications. Among patients who underwent mastectomy, White women received reconstruction at higher rates compared to Black women, however this difference was not significant. Among those who received reconstruction, Black patients were significantly more likely than White patients to experience complications in the form of flap compromise ( $p = 0.002$ ).

**CONCLUSION:** Despite no significant differences in breast cancer stage and tumor characteristics, race was found to be significantly associated with the type of breast cancer treatment received. White women were over three times more likely to undergo breast conserving surgery compared to their non-White counterparts. Further, Black women were significantly more likely to receive more aggressive cancer treatment in the form of bilateral mastectomy and chemotherapy compared to their White counterparts. Although there was no significant difference in rates of reconstruction between Black and White women post-mastectomy, Black women were significantly more likely than White women to experience flap compromise post-reconstruction. The present data suggests that Black women are receiving more aggressive treatments independent of cancer stage and characteristics, as well as experiencing greater post-reconstruction complications compared to White women. The results of this study highlight the need for more research into the underlying causes for these disparities in treatment and reconstruction outcomes in WOC.

## **Surgical Outcomes of Post-Mastectomy Breast Reconstruction in Patients with Systemic Lupus Erythematosus: A Retrospective Study**

Abstract Presenter: Syed Ali Haider M.B.B.S.

Abstract Co-Author(s): Sophia Pressman, Sahar Borna MD, Cesar Abraham Gomez Cabello MD, Antonio Forte MD, PhD, MS, Adekunle Elegbede MD

**Introduction:** Breast reconstruction post-mastectomy is a critical aspect of the recovery process for patients, offering psychological and aesthetic benefits. However, one previous study found that 32.9% of patients can develop complications (1). Patients with Systemic Lupus Erythematosus (SLE) represent a unique subset due to their altered immune response and potential for increased complications. The interplay between SLE and outcomes after breast surgery is underexplored in medical literature. This study aims to help fill the gap by evaluating the surgical outcomes of breast reconstruction in SLE patients.

**Methods:** A retrospective review was performed for adult patients who underwent mastectomy with associated breast reconstruction at one of the Mayo Clinic's three main campuses (Arizona, Florida, Rochester) between January 1, 2010, and December 31, 2023. Potential patients were identified through i2b2 using diagnostic (ICD-9, ICD-10) and procedure (CPT) codes. Patient charts were evaluated to assess eligibility. Patients without SLE or those who underwent mastectomy prior to 2010 or at an outside institution were excluded. Patient data and surgical outcomes were collected. Surgical outcomes of interest included mastectomy skin flap necrosis, nipple-areolar complex necrosis, wound dehiscence, hematoma, seroma, infection, tissue expander failure, and breast implant failure.

**Results:** The i2b2 search identified 103 patients, of which, 31 met inclusion criteria for analysis. The average age at time of mastectomy was  $48.8 \pm 12.6$  (range 26-75), and the average BMI was  $28.9 \pm 7.2$  (range 20.3-50.4). Twenty-four (77.4%) patients had a breast cancer diagnosis at the time of mastectomy. Seven (22.6%) included patients had a history of tobacco use. Thirteen (41.9%) patients were taking Hydroxychloroquine. Eight (25.8%) patients had undergone chemotherapy, and only three (9.7%) patients had a history of radiation. Twenty-seven (87.1%) patients underwent immediate reconstruction compared to four (12.9%) who underwent delayed. Twenty-two (71.0%) patients underwent implant-based reconstruction, with 19 patients receiving silicone implants and three receiving saline. Fifteen (48.4%) patients



experienced at least one complication, with four (12.9%) patients experiencing more than one. There was only one case (3.4%) of full-thickness mastectomy skin flap necrosis, with this patient undergoing surgical debridement and replacement of tissue expander. Two (9.5%) patients experienced tissue expander failure, and three (12.5%) patients had breast implant rupture. There were no cases of nipple-areolar complex necrosis in patients who underwent nipple-sparing mastectomy. Three (10.3%) patients developed wound dehiscence. There were seven (22.6%) cases of infection, three of which were treated with IV antibiotics. Two (6.7%) patients developed hematoma requiring evacuation. There were four (12.9%) cases of seroma.

**Conclusion:** This study provides insights into the surgical outcomes of SLE patients following post-mastectomy breast reconstruction, highlighting significant complication rates. With nearly half of the patients encountering at least one complication, further research to better elucidate the heightened risk profile in this demographic is warranted.

### **Evaluating Operative Times for Intraoperative Conversion of Axillary Node Biopsy to Axillary Lymph Node Dissection with Immediate Lymphatic Reconstruction**

Abstract Presenter: Shahnur Ahmed MD

Abstract Co-Author(s): Luci Hulsman, Dylan Roth, Carla Fisher, Kandice Ludwig, Folasade Imeokparia, R. Jason VonDerHaar MD, Mary Lester MD, Al Hassanein MD, MMSc, FACS

**Background:** Lymphedema can occur in patients undergoing axillary lymph node dissection (ALND) and radiation for breast cancer. Immediate lymphatic reconstruction (ILR) is performed to decrease the risk of lymphedema in patients after ALND. Some patients who ultimately require ALND are candidates for attempted sentinel node biopsy (SLNB) or targeted axillary excision. In those scenarios, ALND can be performed 1) immediately if frozen sections are positive or 2) as a second operation following permanent pathology. The purpose of this study is to evaluate immediate ALND/ILR following positive intraoperative frozen sections to guide surgical decision making and operative planning.

**Methods:** A single-center retrospective review was performed (2019-2022) for breast cancer patients undergoing axillary node surgery with breast reconstruction. Patients were divided into 2 groups: immediate conversion to ALND/ILR (Group 1) and no immediate conversion to ALND (Group 2). Demographical information and operative

time were recorded.

**Results:** There were 148 patients who underwent mastectomy, tissue expander (TE) reconstruction and axillary node surgery. Group 1 included 30 patients who had mastectomy, sentinel node/targeted node biopsy, TE reconstruction, and intraoperative conversion to immediate ALND/ILR. Group 2 had 118 patients who underwent mastectomy with TE reconstruction and SLNB with no ALND or ILR. Operative time for bilateral surgery was  $303.1 \pm 63.2$  minutes in Group 1 compared to  $222.6 \pm 52.2$  minutes in Group 2 ( $p=0.001$ ). Operative time in Group 1 patients undergoing unilateral surgery was  $252.3 \pm 71.6$  minutes compared to  $171.3 \pm 43.2$  minutes in Group 2 ( $p=0.001$ ).

**Conclusions:** Intraoperative frozen section of sentinel/targeted nodes extended operative time by approximately 80 minutes in patients undergoing mastectomy with breast reconstruction and conversion of SLNB to ALND/ILR. Intraoperative conversion to ALND adds unpredictability to the operation as well as additional potentially unaccounted operative time. However, staging ALND requires an additional operation.

### **Northwell Classification System: An Novel Framework for Assessing Patients in Aesthetic DIEP Flap Reconstruction**

Abstract Presenter: Patrick O'Connor MD

Abstract Co-Author(s): Sneha Subramaniam MD, Anna Daytz, Christopher Aiello, Josh Elbaz, Julia Silverman BS, Joshua Choe, Kevin Chen MD, Benjamin Schultz MD, Neil Tanna MD, MBA, Mark Smith MD, FACS

**Background:** Breast reconstruction with abdominally-based free flaps provides a durable reconstruction with established psychosocial benefits.<sup>1</sup> A common challenge of autologous reconstruction is a mismatch in available tissue volume at the donor site for reconstruction relative to the volume of the mastectomy specimen. In most cases at least one, and sometimes multiple, revision surgeries are undertaken to address these aesthetic concerns.<sup>2,3,4</sup> However, these additional surgeries translate to added costs and impose additional challenges for patients and physicians.<sup>5</sup> The present study introduces a unique classification system based on the relative volume of the free flap to mastectomy specimen, aiming to guide decision-making and discussions with patients regarding aesthetic reconstruction.

**Methods:** A retrospective review was conducted on all patients who underwent mastectomy with immediate breast reconstruction with deep inferior epigastric (DIEP)

flap reconstruction between 2018 and 2021 at a single institution. Data on breast flaps and mastectomy weights were also collected, and cohorts were classified into one of three reconstruction classes based on the weight of the flap relative to the mastectomy specimen weight. Patients with a "Class 1" had a flap weight that was greater than or equal to 115% of the mastectomy weight. "Class 2" was between 85% and 115%, and "Class 3" held the remainder with flap weight less than 85%. Data on revision procedures during a minimum of two years follow-up were included.

**Results:** The analysis encompassed 320 patients meeting inclusion criteria, with a total of 610 reconstructed breasts. Revision surgery was undertaken by 243 patients, totaling 471 individual procedures. Data were organized by breast to allow for preoperative asymmetry (Table 1). The most common procedures involved in the patients' revision surgeries were mastopexy/lift, nipple reconstruction, and fat grafting, respectively. Across the breast reconstruction classes, a trend from Class 1 to Class 3 was observed with increasing mastectomy weights and decreasing flap weights. Class 2 breasts were less likely to undergo revision surgeries. Class 1 breasts were more likely to undergo reduction, while Class 3 breasts were more likely to undergo mastopexy, fat grafting, and hybrid reconstruction.

**Conclusion:** The Northwell Classification System offers a straightforward, data-driven approach for surgeons to conceptualize breast reconstruction utilizing autologous tissue. It aids surgeons in planning and discussing a patient's DIEP flap reconstruction and identifies when a stacked or hybrid approach may be beneficial. Most patients undergo at least one revision procedure to achieve an aesthetic result after DIEP flap reconstruction, and this system helps anticipate the type of necessary revisions to optimize the result. Moreover, it provides patients with a clearer framework to understand the nuances of their reconstructive approach compared to that of other patients.

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## **Evaluation of Intraoperative Neuromuscular Blocking Agents on Postoperative Pulmonary Complications in Patients Undergoing DIEP-Free Flap Breast Reconstruction**

Abstract Presenter: Natasha Barone MDCM, Msc

Abstract Co-Author(s): Ehud Fliss, Siba Haykal MD, PhD, FRCSC, FACS

**Purpose:** During surgery, neuromuscular blocking agents (NMBA) are used to facilitate endotracheal intubation and to prevent muscle fibre contractions that may interfere with surgical dissection. Literature regarding the use of NMBAs intraoperatively and the risk of developing postoperative pulmonary complications (PPCs) remains controversial. This study investigates whether intraoperative NMBA increases the risk for PPCs in DIEP-free flap breast reconstruction patients.

**Method:** The University Health Network Quality Improvement Review Committee approved this retrospective observational chart review (ID#QIRC23-0609). All adult females at high risk or diagnosed with breast cancer who underwent a DIEP post-mastectomy between January 2018 and December 2022 at Toronto General Hospital were eligible for inclusion. Extracted data were statistically analyzed in Python, version 3.6.9; p-value <0.05 was considered statistically significant. Kruskal-Wallis and Fisher's exact tests were used for continuous variables, Chi-squared tests for binary variables.

**Results:** 503 patients with a median age of 51 [45.0,57.0] years were included. Most patients underwent immediate breast reconstruction n=318 (63.5%) and had bilateral DIEPs n=297 (59.3%). Ten patients developed PPCs. There was no significant difference in rocuronium dose (no PPCs;170mg [140.0, 218.8], PPCs; 182.5mg [155.0, 197.5, p=0.905), time from the last rocuronium dose to the end of surgery (no PPCs; 169.5min [122.8, 226.0], PPCs; 153min [120.2, 181.5], p=0.51) or number of rocuronium doses received (No PPCs; 6.0 doses [4.0,8.0], PPCs; 7.0 doses [5.0,8.0], p=0.456) between groups. No difference was found in cardiac events (p=0.997), pulmonary embolism (p=1), reoperation (p=1), flap loss (p=1) or other postoperative complications (p=0.585).

**Conclusions:** Intraoperative use of NMBAs does not increase the risk of developing PPCs and these patients do not have an increased risk of developing further postoperative complications.

**Teaching Objectives:** Discuss the relationship between NMBAs and the risk of postoperative pulmonary complications.

### **A four-step guide to correct prepectoral breast implant flipping**

Abstract Presenter: Andrew Emanuels MD

Abstract Co-Author(s): Khaled Alameddine MD, Amela Dudakovic, Annika Balekos, Aparna Vijayasekaran MBBS

**Introduction:** Anterior-posterior flipping of a breast implant can result in suboptimal aesthetics and emotional distress after prepectoral breast reconstruction. With use of smooth round implants, providers require education regarding the risk factors associated with implant flipping and strategies to correct implant flipping in the clinical setting. Risk factors for implant flipping include use of smooth, round, highly cohesive, and large implants with high projection. Implant flipping is often detected by the patient after a change in shape of the breast that may be associated with discomfort. Due to the flattened posterior aspect of the implant sitting against the mastectomy flap, patients experience flattening of the face of the breast with contour irregularities of the superior and inferior poles. The purpose of this study is to present a novel four-step technique to correct implant flipping with minimal discomfort that can be easily implemented by providers in the clinical setting.

**Methods:** 1) The patient is placed in an exam chair or standing while bending forward at the waist to about 45 degrees  
2) The provider then applies equal and direct pressure on the lateral and medial sides of the implant to decrease the flatness of the posterior aspect of the implant that abuts the mastectomy flap.  
3) With pressure applied, the provider then presses the medial aspect of the implant towards the chest wall while pulling the lateral aspect of the implant towards the center of the breast mound.  
4) In the transition from step 2 to step 3, the providers hands should move from the lateral and medial poles of the breast to the superior and inferior poles of the breast. Examine the breast to ensure the implant is in the correct orientation. Multiple attempts

may be needed to correct the flipping of the implant.

**Results:** Successful implant flipping is demonstrated in pre-procedural and post-procedure photographs in three patients. The method of implant flipping is demonstrated in a video.

**Conclusions:** Breast implant flipping is distressing for patients after prepectoral breast reconstruction and can result in suboptimal aesthetics. Surgical pocket control with possible implant exchange remains the gold standard to correct a flipped implant; however, not all patients desire or warrant surgical intervention for correction of the breast pocket. The implant can be safely manipulated in clinic with minimal pain to restore its original placement using a simple four-step manipulation.

## **Nerve Reconstruction in Alloplastic Breast Reconstruction: Expanding the Indications for Breast Reinnervation**

Abstract Presenter: Elizabeth Moroni MD

Abstract Co-Author(s): Casey Zhang, Janina Kueper MD, Zhazira Irgebay MD, Elizabeth Bailey MD, Andrea Moreira MD

**Introduction:** Loss of sensation after mastectomy can be devastating for patients' quality of life, and even a risk for injury. Prior studies have shown successful reinnervation in autologous breast reconstruction, but this has not been widely studied in implant-based reconstruction, which is more challenging due to the frequent absence of a distal nerve stump target for reinnervation.

**Methods:** Our group began performing nerve reconstruction in conjunction with breast reconstruction following mastectomy in April 2021. From April 2021-May 2022, all patients who underwent nerve reconstruction with implant-based breast reconstruction were followed postoperatively with the Semmes Weinstein monofilament testing as well as the BREAST-Q Sensation Module.

**Results:** Sixty-five patients were included in the analysis, representing 113 breasts. Fifty-eight of these patients (106 breasts) were nipple-sparing mastectomies. Most patients (n=34) underwent Direct-to-Implant (DTI) reconstruction, while 24 underwent staged alloplastic reconstruction with a tissue expander and 8 underwent autologous reconstruction. Breast resection volume ranged from 122 to 1358g, with mean

intercostal nerve dissection 5.2cm (range 0-16cm). On average, a 440cc implant was used for DTI reconstruction (range 210-755cc); if a tissue expander was placed, on-table fill averaged 400cc (range 250-600cc). Using the BREAST-Q sensation module and Semes Weinstein monofilament testing, we observed improved sensation over time, with no abnormal sensation or pain.

**Conclusions:** While more validated tools are necessary to assess the overall quantitative return of breast sensation after nerve reconstruction, our data suggests positive impact of breast sensation on patient quality of life which increases with time from mastectomy.

### **Evaluating Temperature Sensitivity of the Reconstructed Breast: Alloplastic Versus Autologous Reconstruction**

Abstract Presenter: Marcos Lu Wang MD

Abstract Co-Author(s): Ashley Zhang, Sophia Arbuiso, Chase Alston, Isaiah Rhodes, David Otterburn MD

**Introduction:** Advances in the early detection and treatment of breast cancer have altered the landscape of disease prognosis dramatically, with a five-year relative survival rate of 91% (1). Many women are living long lives with breast cancer or in remission, bringing forth the importance of survivorship care and treatment longevity. Anesthesia and loss of protective sensation of reconstructed breasts is becoming increasingly recognized as a problem. Reports of accidental burns in insensate reconstructions emphasize the importance of understanding and optimizing the recovery of breast sensation, especially temperature sensitivity (2). Previous studies from our group found superior tactile sensitivity in autologous breast reconstruction compared to device-based reconstruction (3). In this study, we build on our prior work by investigating the regional pattern of temperature sensitivity in alloplastic and autologous breast reconstruction.

**Methods:** Women undergoing mastectomy with immediate two-stage alloplastic reconstruction or neurotized deep inferior epigastric perforator (DIEP) flap reconstruction were prospectively followed. Temperature testing was performed by blinded patient identification of a heat pack or a cold pack on five different regions of the breast. All reconstructed breasts were grouped based on surface area, and statistical analysis was performed in R to compare hot and cold sensitivity between the two types of reconstruction.

**Results:** 100 patients (181 breasts) were included: 79 breasts with alloplastic and 102 breasts with autologous reconstruction. There were no differences in preoperative temperature sensitivity between the two groups, nor between regions of the breast ( $p>0.05$ ). The average follow-up time for the alloplastic group was 16.34 months, and the average follow-up time for the autologous group was 14.24 months. Postoperatively, heat and cold sensitivity were the least affected in the superior and medial regions of the breast and the most affected at the nipple-areolar complex (NAC). Cold sensitivity was comparable between the two reconstruction types across all surface areas ( $p>0.05$ ), with the only difference in heat sensitivity in the superior regions of breasts with a surface area greater than 250 cm<sup>2</sup> (100% in alloplastic vs. 47.6% in autologous,  $p=0.01$ ). In a sub-analysis of immediate and delayed DIEP flaps, immediate flaps had improved heat sensitivity at the NAC (38.3% vs. 10.0%,  $p=0.037$ ).

**Conclusion:** Both hot and cold sensation of the reconstructed breast are most affected at the NAC. Whilst neurotized autologous flaps have superior recovery of pressure sensation compared to alloplastic reconstruction, the same pattern was not seen with recovery of temperature sensation. These findings suggest distinct mechanisms of recovery of these two sensory modalities; further study is ongoing to elucidate the timeline of temperature sensitivity recovery.

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## **From 0 to 100: Delayed Direct to Implant Breast Reconstruction, An Alternative to Tissue Expansion**

Abstract Presenter: Nicole Le MD, MPH

Abstract Co-Author(s): Kristen Whalen MD, Amra Olafson MD, Brandon Foley MD, Allison Miscik MD, Eric Clayman MD, Nicholas Panetta MD, FACS, Lauren Kuykendall MD, Paul Smith MD

**Introduction:** Implant based reconstruction is not always feasible when mastectomy flap viability is poor. Rather than returning to the operating room for staged breast reconstruction with tissue expansion (TE), patients may instead opt for delayed direct to implant (dDTI) reconstruction. This study aimed to assess the feasibility of dDTI after patients "go flat" after their mastectomy.

**Methods:** Patients unable to undergo breast reconstruction at the time of their mastectomy and who later underwent implant placement without tissue expanders between 2022 and 2024 were included in this study. These patients were compared to patients who underwent tissue expander to implant based reconstruction. A loose BMI and radiation-matched subsample was created for subanalysis.

**Results:** A total of 66 patients or 103 breasts were included in the study (77 TE and 26 dDTI breasts). The average age was  $48 \pm 11$  years, and average BMI was  $27.2 \pm 5.3$  kg/m<sup>2</sup>. The mean time between mastectomy and dDTI was  $132.8 \pm 182.2$  days. dDTI had less complications than TE (4.8% vs 32.1%,  $p = 0.01$ ). Patients with TE had significantly higher odds of having complications compared to dDTI (odds ratio, 9.4 [1.2 – 74.3],  $p = 0.03$ ).

**Conclusions:** dDTIs appear to be a safe alternative to tissue expansion, especially when implant based reconstruction is not feasible due to poor blood supply on SPY angiography. This technique saves the patient, at minimum, an additional surgery and multiple clinic visits that would have been required if tissue expanders were used.

## **A Clinical Prediction Model in Prognosticating Salvage of the Infected Prosthesis in Alloplastic Breast Reconstruction**

Abstract Presenter: Mariana Gutierrez Salazar MD

**Purpose:** Periprosthetic infection (PPI) is a rare complication associated with alloplastic breast reconstruction resulting in reconstructive failure, delay of adjuvant therapies, and re-operations. Despite multiple observational cohort studies, the optimal PPI management remains unclear. The aim of this study was to develop a clinical prediction tool to guide management of PPI.

**Methods:** A multicenter retrospective cohort study was conducted. Consecutive breast cancer patients who underwent immediate alloplastic breast reconstruction between 2010-2020 were included. Data was collected including patient, oncologic, and reconstructive factors for patients whose postoperative course was complicated by either cellulitic or periprosthetic infection. Two models were created for prediction of progression from cellulitis to PPI and from breast infection to reconstructive failure.

**Results:** A total of 1468 patients (2165 breasts) were included. The incidence of infection was 7.1% (n=145). The implant reconstruction was salvaged in 67.1% (n=104) of cases. The first model, predicting progression from cellulitis to periprosthetic infection, had good predictive accuracy with an AUC of 0.61 (95% CI 0.53-0.70;  $p<0.001$ ). The second model, predicting progression to reconstructive failure had good predictive accuracy with an AUC of 0.79 (95% CI 0.71-0.87;  $p<0.001$ ). Models were converted into risk stratification tools where five clinical variables were identified for a prediction scoring model with weighted points for each tool.

**Conclusions:** This study presents novel clinical prediction tools with good predictive accuracy. Application of these prediction tools can assist the clinician in making evidence-based treatment decisions for treatment of PPI following alloplastic breast reconstruction. Future research will aim to prospectively validate treatment algorithms and improve reconstructive success.

**Learning Objectives:** To identify prognostic factors in the progression of breast cellulitis to PPI and reconstructive success following PPI. To discuss how these prognostic factors can be applied to guide clinical management of breast infection following alloplastic breast reconstruction.

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## **The Waist-to-Hip Ratio as a Predictor of Complications in Autologous Breast Reconstruction**

Abstract Presenter: Nirbhay Jain MD

Abstract Co-Author(s): Kasra Rahmati, Michael Delong MD, Jaco Festekjian MD

**Introduction:** Mastectomy with breast reconstruction is an important component of comprehensive breast cancer care. Though commonly with tissue expanders, a more natural breast is often found with free flap reconstruction. Understanding the risk profile of patients for free flap surgery is critical. Common risk stratification tools, include the frailty index, sarcopenia, and the body mass index (BMI). The BMI is especially controversial. The waist-to-hip ratio, based on the theory that central adiposity (intra-abdominal adiposity) has been shown to be more predictive of complications than the BMI in the medical literature. We sought to prospectively determine if the waist-to-hip ratio is superior to the BMI in predicting complications in breast reconstruction.

**Methods:** Patients who were referred to the senior author for autologous breast reconstruction were included. Demographic data were collected. Body morphometric data were recorded. All flaps were deep inferior epigastric flaps anastomosed to the internal mammary vessels. A minimum six-month follow up was required, with complications recorded, including infection requiring an additional course of antibiotics or surgical intervention, symptomatic fat necrosis, poor wound healing requiring surgical intervention, loss of reconstruction, and death.

The BMI was calculated by the standard methodology. The waist-to-hip ratio was calculated as waist circumference at the umbilicus (cm)/hip circumference at the widest

point (cm). Multivariate regression was performed to determine which variables were independent predictors of complications. All preoperative measures of risk, including frailty index, BMI, waist-to-hip, waist-to-height, and body surface area, were included as covariates.

**Results:** A total of 41 patients were included in this study, with 12 (29%) having complications. A majority of these were symptomatic fat necrosis; one patient had wound difficulties requiring surgery. Demographic data, including the BMI, age, waist-to-height ratio, modified frailty index, and body surface area were statistically equivalent whether a complication was present or not. The waist-to-hip ratio was 0.88 for patients without complications and 0.96 with complications. On multivariate regression, the waist-to-hip ratio was the only significant morphometric factor ( $p = 0.047$ , OR 22.5) with a ratio of 0.85 correlated to a 50% risk. Above this threshold, 35% of patients had a complication, compared to 10% below. The BMI did not correlate with complications.

**Conclusion:** The waist-to-hip ratio is a body morphometric measurement that provides a superior prediction of complications in our series of tissue expander-based reconstruction patients, suggesting that it should replace the BMI in preoperative measurements and in patient counseling.

### **Risk factors associated with prolonged hospital length-of-stay after post-mastectomy free flap breast reconstruction: A population-based cohort study**

Abstract Presenter: Oluwatobi Olaiya MD

Abstract Co-Author(s): Evan Fang, Jessica Gormley MD, Lucas Gallo MD, Christopher Coroneos MD, Sophocles Voineskos MD, Mark McRae MD, FRCS(C)

**Purpose:** Inpatient length of stay is a critical metric for healthcare efficiency. Understanding risk factors for prolonged LOS (pLOS) enables better preparation and planning for breast reconstruction, improving patient satisfaction and outcomes. This study aims to identify risk factors associated with pLOS in patients undergoing breast reconstruction.

**Methods:** This is a retrospective cohort study including patients undergoing free tissue postmastectomy breast reconstruction from 2005 to 2020 in the province of Ontario, Canada (population 14 million). Patients were identified from a prospectively maintained administrative database stored at the Institute for Clinical Evaluation Sciences. Patients

were dichotomized according to whether they encountered an extended postoperative hospital LOS, defined as a stay greater than the 95th percentile for the cohort ( $\geq 8$  days). Univariate and multivariate logistic regression analyses identified risk factors associated with pLOS.

**Results:** Among the 2,339 patients in the study, 121 experienced pLOS. Significant factors associated with a pLOS included year of reconstruction (aOR [adjusted odds ratio] 0.9, 95% confidence interval [CI] 0.81 to 0.90,  $p < 0.0001$ ), reconstruction at non-teaching hospitals (aOR 2.7, 95% CI 1.6 to 4.4,  $p < 0.0001$ ), lower neighbourhood income quintile (quintile 1 v. quintile 5: aOR 3.7, 95% CI 1.5 to 8.9,  $p=0.004$ ), and higher levels of social deprivation (quintile 5 v. quintile 1: aOR 2.7, 95% CI 1.1 to 6.3,  $p=0.025$ ). Conversely, age, Charlson comorbidity index, rurality, and local health integration network (LHIN) affiliation showed no significant correlation with prolonged LOS.

**Conclusion:** Our study indicates that pLOS after breast reconstruction in Ontario is predominantly influenced by socio-economic and institutional factors, notably treatment in non-teaching hospitals and lower socio-economic status. These findings highlight the importance of comprehensive care planning that addresses medical and socio-economic needs.

### **“Who am I trying to fool, God or myself?”: A Qualitative Analysis of Sociocultural Attitudes and Perceptions about Breast Reconstruction in sub-Saharan Africa**

Abstract Presenter: Brigit Baglien MD

Abstract Co-Author(s): Natalie Guzman, Eden Kassa Dr., Ishmael Kyei, Mahteme Bekele Muleta, Mary Byrnes PhD, Adeyiza Momoh MD

**Introduction:** Breast cancer is the second leading cause of cancer-related mortality among women in sub-Saharan Africa (SSA), where low survival rates are in part due to late presentation of women with advanced stage disease. As fear of mastectomy has been suggested to be the most significant factor linked to delays, it remains unknown if the availability of breast reconstruction has the potential to ameliorate that fear and encourage earlier presentation (1). Therefore, our study sought to explore the sociocultural attitudes and perceptions of breast reconstruction in SSA women with breast cancer.

**Methods:** We designed an interpretive description, a noncategorical qualitative method

suited for applied healthcare research to address our question. Women were eligible for our study with a diagnosis of breast cancer (stage 0-III) and were recruited from breast cancer clinics at St. Paul's Hospital Millennium Medical College in Addis Ababa, Ethiopia and Komfo Anokye Teaching Hospital in Kumasi, Ghana. We conducted semi-structured in-person interviews in English, Amharic and Twi utilizing the assistance of native interpreters. Narratives were inductively analyzed in a team based iterative approach.

**Results:** 45 total women (20 from Ethiopia, 25 from Ghana) participated in our study. Approximately half of the women had undergone mastectomy at the time of the interview. Our findings highlighted complex, multifaceted cultural attitudes surrounding breast reconstruction in this population. We identified three major themes that shaped women's perceptions. First, women held a dichotomous view of their body in terms of function versus aesthetics. Some saw breasts as purely utilitarian but would later describe the emotional impact of mastectomy and their view that the restoration of "their self, their image... and their confidence" could be achieved with breast reconstruction. Second, women projected age and life stage as important factors in the appropriateness of breast reconstruction. Women tended to think that younger women, or those "looking for a husband" would be better suited to achieve the social benefits from reconstruction. Finally, the high cost and inaccessibility of medical care underscored a reluctance towards further utilization of healthcare resources. The idea of a complication leading to snowballing medical needs and fees was a prohibitive risk for many women. Importantly, our findings could be tempered by an underlying lack of education or awareness of breast reconstruction shaping women's initial reactions.

**Conclusion:** As initiatives to improve global surgical capacity become more widespread within the plastic surgery community, we caution providers to think carefully about the deep complexities underlying the current landscape of breast cancer treatment. Strategies to better serve this population will involve patient education initiatives combined with further understanding of culturally held beliefs about bodies, disease, and the existing inequalities in the healthcare system.

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## **Correlating SOZO L-Dex scores with ICG-Lymphography for Lymphedema Assessment**

Abstract Presenter: Ashraf Patel MD

Abstract Co-Author(s): Telisha Tausinga MD, Fatma Tuncer MD

**PURPOSE:** Lymphedema continues to affect an increasing number of patients, especially as rates of lymph node biopsy and dissection increase for oncologic treatment.(1) Lymphedema in the United States is rarely diagnosed until the patient develops symptoms and access to providers who specialize in lymphedema treatment remains limited for many patients. ImpediMed's SOZO device is a tool advertised to help identify patients at risk for developing lymphedema earlier on through bioimpedance (L-Dex) scores.(2) Formal lymphedema evaluation at most lymphedema centers involves more invasive testing such as indocyanine green (ICG)-lymphography, magnetic resonance lymphangiography, or lymphoscintigraphy. These tests allow for direct visualization of lymphatic function, but are more invasive, expensive, and inaccessible for many patients.(3) We sought to compare bioimpedance (L-Dex) scores to results seen after ICG lymphography to study whether L-Dex scores accurately correlate with lymphedema diagnosis and severity.

**METHODS:** A retrospective chart review was conducted utilizing patient encounter information from a single plastic surgeon. Patient encounters dated from 2022 to 2024 were considered. Of 1,800 individual patients, 38 had undergone SOZO testing with a resulting bioimpedance score. Of those 38, 10 patients underwent formal ICG-lymphography. Lymphography scores were categorized on a scale of 0 to 5; 0: linear pattern, 1: delayed linear pattern; 2: dermal backflow (DBF) in 1 site, 3: DBF in >2 sites, 4: stardust pattern, 5: diffuse pattern. Data analysis included creating a trendline to determine whether correlation existed between L-Dex scores and lymphedema severity seen on ICG-lymphography.

**RESULTS:** Of the ten patients, nine were females having undergone mastectomy for breast cancer and one male patient had undergone resection for melanoma. Of the nine patient's status post mastectomy, six had undergone axillary lymph node dissection. Of all 10 patients, eight had received radiotherapy. Age at time of SOZO ranged from 38 to 75 years. L-Dex scores varied between -9.7 to 27.0. ICG lymphography scores varied from 0 to 5. A scatterplot and line of best fit were generated, resulting in an R<sup>2</sup> of 0.008.

**CONCLUSION:** Although the SOZO device is an accessible and cost-effective tool, we found that bioimpedance scores obtained from SOZO did not correlate with

lymphedema severity seen on ICG-lymphography ( $R^2=0.008$ ). Development of additional screening tools that are affordable and widely accessible will be useful in identifying patients at risk for developing lymphedema and allowing for earlier intervention. Such tools will also assist in determining which patients would benefit from undergoing more invasive and costly testing, like ICG-lymphography, which may help decrease overall healthcare costs and improve healthcare equity.

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## Erector Spinae Nerve Block vs Local Anesthetic on Perioperative Opioid Use and Pain in Reduction Mammoplasty

Abstract Presenter: Chandler Hinson

Abstract Co-Author(s): Brandon Rosser MD, Ronald Brooks MD

**Background:** Macromastia can be a life-long significant source of both physical and emotional pain. Definitive surgical treatment of macromastia is achieved with the reduction mammoplasty, or breast reduction. In 2020, 97,320 breast reductions were completed for reconstructive and aesthetic patients. Patients undergoing breast reduction require adequate pain control in the perioperative period, often requiring narcotics. Provider over-reliance on narcotics to control pain has long been implicated in the rise of the opioid epidemic. Preoperative regional anesthesia offers another pathway to limit perioperative pain while potentially decreasing the need for narcotic use. The erector spinae plane (ESP) nerve block is a regional anesthetic technique involving the interfascial injection of local anesthetic below the erector spinae muscle at the origin of the dorsal and ventral rami. ESP nerve blocks at the level of T5 have been shown to



provide appropriate analgesia over the T1-L3 dermatomes. Alternatively, local anesthetics such as a long-acting bupivacaine solution (LLAB) can be injected superficially at the incision site to provide analgesia. This study investigates the effect that an ESP nerve block has on breast reduction patients' pain and opioid use before, during, and after surgery compared to LLAB injection.

**Methods:** A retrospective chart review was completed of patients undergoing breast reduction at a single tertiary care hospital system from March 1, 2021 through March 1, 2022. Of 98 patients, 51% (n=50) received a perioperative ESP nerve block while 49% (n=48) received only LLAB. Patient opioid usage was determined by review of their operative records and Post Anesthesia Care Unit (PACU) records. All narcotic use in the perioperative period was recorded and standardized to morphine milligram equivalent (MME) units to account for use of varying opioids. Additionally, subjective pain scores (0-10 scale) in the PACU were reviewed and analyzed. These values were compared using two sample z-tests.

**Results:** Patients in the ESP group received significantly less intraoperative narcotics compared to the LLAB group (33.45 MME vs. 89.77 MME,  $p<0.001$ ), despite no significant difference in preoperative opioids administered (27.75 MME vs. 31.50 MME,  $p\text{-value} = 0.164$ ). There was no significant difference in postoperative opioid requirements in the ESP group compared to LLAB group (22.46 MME vs. 31.38 MME,  $p=0.058$ ). Average subjective pain scores in the PACU were significantly decreased (4.32 vs. 6.04,  $p<0.001$ ).

**Conclusion:** This study provides evidence of the substantial benefits of incorporating an ESP nerve block into the perioperative management of breast reduction surgeries. This regional anesthesia technique led to a significant reduction in the need for intraoperative narcotics. Patients who received the ESP block also reported lower subjective pain scores in the immediate postoperative period, indicating improved pain control. Though there was no significant decrease in postoperative opioid requirements in the ESP group (22.46 MME vs. 31.38 MME,  $p=0.058$ ), this may be due to a Type II error. Implementing ESP nerve blocks as a standard component of Enhanced Recovery After Surgery (ERAS®) protocols holds the potential to improve the perioperative experience for breast reduction patients, ultimately contributing to improved clinical outcomes and a favorable societal impact.

# Optimizing Recovery in Breast Reductions: Implementation of Enhanced Recovery After Surgery (ERAS) Protocol at a Veterans Affairs Medical Center

Abstract Presenter: Tiffany Lee

Abstract Co-Author: Quintessa Miller MD, FACS

**Background:** Enhanced recovery after surgery (ERAS) protocols are evidence-guided protocols that have improved elements of perioperative outcomes.<sup>(1,2)</sup> ERAS protocols have demonstrated significant success across multiple surgical fields; however, a protocol has only recently been tailored specifically for breast surgeries.<sup>(2,3)</sup> Implementing ERAS for breast reductions has yet to be evaluated in the veteran population. This study compared outcomes of breast reductions pre and post ERAS implementation at a Veterans Affairs Medical Center (VAMC).

**Methods:** A retrospective analysis was conducted on patients who underwent reduction mammoplasty with CPT code 19318 over a 5-year period, from November 2018 to January 2024. Patients were stratified into pre and post ERAS implementation cohorts, and post-operative outcomes were compared across the groups. A total of 80 patients were identified; 55 in the pre-ERAS implementation cohort and 25 in the post-ERAS implementation cohort. Patient demographics, perioperative data, post-anesthesia care unit (PACU) times and pain scores, as well as administration of opioids were analyzed in this study.

**Results:** Patients of the post-ERAS cohort had a significantly decreased average opioid use by dosage per patient in the post-anesthesia care unit (PACU) when compared to the pre-ERAS cohort ( $p = 0.008$ ). There was a 409% decrease in the need for opioid administration during the overall post-operative period in the post-ERAS cohort when compared to the pre-ERAS cohort ( $p = 0.009$ ). The post-ERAS cohort also had significantly lower pain scores in the immediate post-operative period ( $p = 0.073$ ), as well as lower overall pain scores, calculated using the mean difference between peak pain levels in the PACU and at the time of discharge ( $p = 0.047$ ). In addition to this, the average PACU duration was significantly lower in the post-ERAS cohort when compared to the pre-ERAS cohort ( $p = 0.048$ ). The post-ERAS cohort also demonstrated a notable decrease in instances of delayed wound healing when compared to the pre-ERAS cohort. Overall, 45-day major complication rates, emergency room visits, and unplanned reoperations did not differ significantly across cohorts.

**Conclusion:** ERAS should be considered as the standard approach for perioperative

care for our veteran population. Notably, reducing opioid use holds particular importance amid the opioid epidemic, which disproportionately affects the veteran population. Since the implementation of the ERAS protocol to breast reduction patients, significant improvements have been observed in the veteran population. There has been a marked reduction in opioid consumption, enhanced postoperative pain management, and a decrease in instances of delayed wound healing. Furthermore, the implementation of the ERAS protocol has enhanced the utilization of operating room (OR) resources, evidenced by the reduced PACU durations and quicker OR turnover rate.

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## **Prophylactic Absorbable Antibiotic Beads for Prepectoral Implant-Based Breast Reconstruction: A Single Institution Early Experience**

Abstract Presenter: Shahnur Ahmed MD

Abstract Co-Author(s): John Hajj, R. Jason VonDerHaar MD, Mithun Sinha PhD, Carla Fisher, Mary Lester MD, Al Hassanein MD, MMSc, FACS

**Background:** Infection after implant-based breast reconstruction remains challenging. Rates of infection have been reported to be up to 24%. Best clinical practice indicates prophylactic oral antibiotics are ineffective at preventing infection. Absorbable antibiotic beads have been routinely used in other surgical subspecialties such as orthopedic and vascular procedures for continuous local antibiotic delivery to the surgical site when implants are placed. We previously have published that biodegradable calcium sulfate antibiotic beads normalized incidence of infection when used prophylactically for a high-risk patient population. The purpose of this study is to evaluate the effect of prophylactic biodegradable antibiotic beads when used non-selectively for all prepectoral immediate

tissue expander (TE) reconstruction.

**Methods:** A single-center retrospective review was performed for patients who underwent mastectomy and immediate prepectoral TE reconstruction on the same day (2018-2024). Patients were divided into two groups: Group 1 received absorbable antibiotic beads and was compared to Group 2 (control) who did not receive antibiotic beads during prepectoral implant-based reconstruction following mastectomy. For Group 1, absorbable calcium phosphate beads were reconstituted with 1 gram vancomycin and 240 mg gentamicin. Demographic data, body mass index (BMI), diabetes, smoking status, and breast cancer treatment (chemotherapy, radiation) were recorded. Postoperative complications including skin necrosis, surgical site infection, implant loss, time to development of skin necrosis or infection were assessed as outcome variables.

**Results:** The study included 284 patients (487 TEs) who underwent prepectoral tissue expander breast reconstruction following mastectomy. Group 1 had 28 patients (53 tissue expanders) who received biodegradable antibiotic beads. There were 256 patients (434 tissue expanders) in Group 2. The average age of Group 1 was  $49.5 \pm 10.5$  years old compared to  $48.2 \pm 10.6$  years ( $p=0.5093$ ). Group 1 had an average BMI of  $29.4 \pm 8.1$  kg/m<sup>2</sup> compared to  $29.0 \pm 6.7$  kg/m<sup>2</sup> in Group 2 ( $p=0.7859$ ). Diabetes was present in 10.7% (3/28) in Group 1 compared to 7.4% (19/256) in Group 2 ( $p=0.4647$ ). Active smoking was present in 10.7% (3/28) in Group 1 compared to 6.3% (16/256) in Group 2 ( $p=0.4145$ ). There was 25% (7/28) of Group 1 who received neoadjuvant chemotherapy compared to 26.9% (69/256) of Group 2 patients ( $p=1$ ). Adjuvant radiation was received in 17.8% (5/28) of Group 1 patients compared to 27.3% (70/256) of Group 2 ( $p=0.3685$ ). Skin necrosis occurred in 5.7% (3/53 TEs) of Group 1 compared to 3.9% (17/434 TEs) in Group 2 ( $p=0.469$ ). Surgical site infection (SSI) was present in 0% (0/53 TEs) Group 1 compared to 5.5% (24/434 TEs) in Group 2 ( $p=0.0944$ ). Tissue expander loss occurred in 0% (0/53 TEs) in Group 1 patients compared to 9.4% (41/434 TEs) in Group 2 ( $p=0.015$ ). The mean follow-up time was 63 days.

**Conclusion:** Prophylactic biodegradable antibiotic beads used during immediate tissue expander reconstruction decreased implant loss rate. There were no occurrences of surgical site infection in the antibiotic bead group. Antibiotic beads may potentially decrease complications in immediate tissue expander reconstruction when used non-selectively for all patients.

## **Establishing a Foundation for Assessing the Impact of Breast Oncologic Surgery and Reconstruction on Women in sub-Saharan Africa: Normative Data for Patient Reported Outcomes in Women without Breast Cancer**

Abstract Presenter: Brigit Baglien MD

Abstract Co-Author(s): Nishant Ganesh Kumar MD, Sarah Kennedy MD, Mahteme Bekele Muleta, Adeyiza Momoh MD

**BACKGROUND:** Breast cancer is a leading cause of mortality amongst women in sub-Saharan Africa (SSA). As such, optimizing outcomes for treatment and reconstruction is a global health priority. The validated BREAST-Q has been instrumental in improving our understanding of breast related quality of life with surgical treatment and reconstruction. Currently, normative data for interpreting BREAST-Q results is limited to high income countries (HICs). This study seeks to evaluate baseline breast-related quality of life (QOL) in SSA women without breast cancer and compare to previously published normative values to guide future surgical research and targeted treatment paradigms.

**METHODS:** Women in Ghana, Nigeria and Ethiopia aged 18 years and older with no history of breast cancer or breast surgery were recruited from breast cancer clinics at academic institutions to complete the BREAST-Q preoperative mastectomy module. Multivariable regression was performed to identify correlates between sociodemographic variables and BREAST-Q scores. Comparisons were also made between normative data from the SSA populations and those published in other HICs.

**RESULTS:** Normative BREAST-Q scores were obtained from a total of 453 women (169 Ghanaian, 210 Nigerian, and 74 Ethiopian) with mean age of  $25.7 \pm 7$  years and BMI of  $26 \pm 6$  kg/m<sup>2</sup>. BREAST-Q scores were as follows: satisfaction with breasts,  $64 \pm 26$ ; psychosocial well-being,  $63 \pm 23$ ; sexual well-being,  $57 \pm 26$ ; and physical well-being,  $68 \pm 16$ . Significant differences in scores were found between countries in SSA. Compared to scores published in the United States, SSA women scored higher in breast satisfaction (64 vs 58,  $p < 0.001$ ), and lower in psychosocial (63 vs 71,  $p < 0.001$ ) and physical well-being (68 vs 93,  $p < 0.001$ ).

**CONCLUSION:** This study establishes normative values for the BREAST-Q preoperative mastectomy module in a group of women in SSA without breast cancer and found significant variability globally and between countries within the same region. Our findings provide a foundational context to understand the effects of breast cancer and guide future research to enhance counseling, education, and methods for the

delivery of wholistic breast cancer care to millions of women in the region.

## **Navigating mesh choices in implant-based breast reconstruction: a comprehensive complication analysis**

Abstract Presenter: Abigail Royfman

Abstract Co-Author(s): Krysta Orminski MD, Andrea Moreira MD, Suzanne Coopey, Brian Chen MD

**Introduction:** Each year in the United States, over 100,000 women undergo mastectomy with breast reconstruction.<sup>1</sup> Approximately 81% of women undergoing reconstruction elect to undergo implant-based reconstruction (IBR).<sup>2</sup> Mesh is often employed to support and provide coverage for the implant. There are many mesh options in the market including acellular dermal matrix (ADM), xenograft-based mesh, or synthetic meshes. Studies comparing their safety and costs are limited in their ability to guide surgeons in mesh selection.<sup>3-5</sup> We aim to compare complication profiles between various meshes used in breast reconstruction.

**Methods:** We conducted a retrospective review from December 2021 to September 2023 of patients undergoing IBR. Patients received either ADM in the form of Alloderm or FlexHD, GalaFLEX or Ovitex. The resections were either nipple sparing mastectomy (NSM) or skin sparing mastectomy (SSM). We recorded and analyzed variables such as patient characteristics, complications, complication types, treatment modalities, and implant loss.

**Results:** There were 164 patients (274 IBR) included in our study period. There were no differences in patient characteristics amongst mesh types. We used GalaFLEX in 55 patients (98 breasts), Ovitex in 52 patients (98 breasts), and ADM in 57 patients (78 breasts).

Compared with ADM, GalaFLEX exhibited lower rates of overall complications ( $p = 0.006$ ), necessity for operating room (OR) procedures ( $p = 0.008$ ), and implant loss ( $p = 0.001$ ) compared to other meshes. Outcomes were not different between Ovitex and ADM.

In a direct comparison between Ovitex and GalaFLEX, Ovitex exhibited a significantly worse complication profile, with significance in major complications (14% vs 5%,  $p = 0.033$ ), more OR procedures (12% vs 2%,  $p = 0.014$ ) and implant loss (12% vs 0%,  $p = 0.005$ ).

**Conclusion:** In summary, GalaFLEX stands out with a significantly lower rate of implant loss compared to other meshes. Ovitex, while not differing significantly from ADM, exhibits a markedly worse complication profile when directly compared to GalaFLEX, particularly in OR procedures and implant loss. This information should be taken into account in considering healthcare costs and burden to patients when selecting mesh to use for IBR.

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## **Association of Neoadjuvant Versus Adjuvant Chemotherapy on Outcomes in Immediate Pre-Pectoral Tissue Expander Based Reconstruction Following Mastectomy: A Retrospective Review**

Abstract Presenter: Justin Dang MD

Abstract Co-Author(s): Maral Demirjian, Lorna Kwan, Michael Delong MD

**Purpose:** Neoadjuvant chemotherapy (NACT) is becoming increasingly used in the treatment of breast cancer and confers several advantages compared to adjuvant chemotherapy (ACT) such as the ability to shrink a tumor prior to surgical excision,

therefore increasing the rate of breast conserving therapy (BCT) and improving cosmetic outcomes and quality of life (1). NACT has the potential to adversely affect the immune system and induce a leukopenia state which may leave patients prone to infectious complications during mastectomy and reconstruction. There is a paucity of literature describing the impact of NACT and leukopenia on TE-based reconstructive outcomes. Thus, we performed a retrospective review to investigate the impact of NACT on outcomes for breast cancer patients at UCLA undergoing immediate pre-pectoral TE-based breast reconstruction.

**Materials and Methods:** This was a single-center, retrospective review of all breast cancer patients at UCLA Ronald Reagan Medical Center between January 2018 and September 2022 who underwent breast reconstruction with immediate pre-pectoral TE placement. Patients were divided into NACT, ACT, and no chemotherapy groups as well as leukopenia ( $WBC \leq 4500$ ) and no leukopenia ( $WBC > 4500$ ) at the time of mastectomy and immediate reconstruction. Outcome measures included rates of major complications, explantation with and without replacement, reoperation, infection, hematoma, seroma, necrosis, and rupture. Chi-square (or Fisher's exact) test was used for categorical variables and Kruskal-Wallis test was used for continuous variables.

**Results:** 295 patients were included in our review. There were no statistically significant differences between patients undergoing NACT, ACT, or no chemotherapy with regards to race/ethnicity, BMI, laterality, comorbid diabetes mellitus, tobacco use, postoperative antibiotic usage, use of ADM, expander fill volume, expander manufacturer, implant fill, or implant volume ( $p > 0.05$ ). Patients who underwent NACT experienced fewer major complications compared to patients undergoing ACT or no chemotherapy (14.1% vs 41.8% and 28.5% respectively,  $p < 0.01$ ) and had lower reoperation rates (12.8% vs 39.3% and 26.8% respectively,  $p < 0.01$ ) following TE placement; there were no statistically significant difference between explantation rates (4.7% vs 8.9% and 14.4% respectively,  $p > 0.05$ ), major infection rates (4.6% vs 5.4% and 11.8% respectively,  $p > 0.05$ ), or rates of capsular contracture (9.3% vs 5.4% and 2.6% respectively,  $p > 0.05$ ). There were no statistically significant differences in rates of hematoma, seroma, necrosis, or rupture ( $p > 0.05$ ) between groups. There were no statistically significant differences in outcomes following implant exchange between groups ( $p > 0.05$ ). Compared to patients without leukopenia, patients with leukopenia experienced lower rates of major infections (9.7% vs 0%,  $p < 0.05$ ) but higher rates of hematoma formation (3.8% vs 12.8%,  $p < 0.05$ ) following TE placement, however there were no statistically significant differences in rates of major complications, explantation, reoperation, capsular contracture, seroma, or necrosis ( $p > 0.05$ ).

**Conclusion:** NACT is an important component of modern breast cancer treatment. We



found that patients undergoing NACT experienced fewer major complication rates and reoperation rates following TE placement compared to those undergoing ACT or no chemotherapy. Additionally, leukopenia did not pose increased risk of major complications. Therefore, NACT and leukopenia should not be considered contraindications when considering pre-pectoral TE-based breast reconstruction.

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## **GLP 1 receptor agonist effect on wound healing in cosmetic breast surgery**

Abstract Presenter: Nathan Booth DO

Abstract Co-Author(s): Rijul Maini, Jamie Hall MD, Rebecca Weber, Jennifer Orellana, Dunya Atisha MD, Donna Tepper MD

**Background:** According to the FDA Adverse Event Reporting System (FAERS), GLP-1 agonists have potential risks of alopecia, aspiration, or suicidal ideation(1). Due to the consequences of delayed gastric emptying and pulmonary aspiration under anesthesia, the American Society of Anesthesiologists suggest holding GLP-1 agonists prior to surgery (2). However, no studies to date have investigated the relationship between GLP-1 agonist use and post-operative wound healing complications in plastic surgery. The purpose of this study is to investigate trends in post-operative complications following mammoplasty reductions in patients on GLP-1 agonists versus in patients who are not.

**Methods:** Sample population included 321 mammoplasty reduction patients who underwent surgery at Henry Ford Medical Center from 2020-2022. Seven patients were on GLP-1 agonists. Ninety seven patients had postoperative complications, 3 of which were GLP-1 agonist users. Of 314 control patients, 94 had complications, 8 of which had diabetes. Logistic regression analysis was conducted with R (3) to determine if there was an association between GLP-1 agonist use and postoperative wound healing complications. The analysis included variables GLP-1 agonist use and diabetes status. The "logistf" function was used to fit the logistic regression model using Firth's bias

reduction method. Likelihood ratio test and Wald tests were included. P-value less than 0.05 was considered statistically significant.

**Results:** The Likelihood Ratio Test and Wald Test indicated the model as a whole demonstrated statistical significance. The significant likelihood ratio test statistic of 390.833 and p value < 0 indicated that inclusion of variables GLP-1 use and diabetes status were significant predictors that improve the fit of the logistic regression compared to a model without the predictors present. The analysis indicated GLP-1 agonist use to have a 3.91 times higher log-odds of postoperative complications. However, the variables alone are not statistically significant as the individual coefficients had a p-value greater than .05 with wide confidence intervals, possibly attributed to small sample size.

**Conclusion:** Based on the initial results of this ongoing study, GLP-1 agonist use may potentially impact the likelihood of postoperative wound healing complications. The combination of variables GLP-1 agonist use and diabetes status in the logistic regression model demonstrated statistical significance when predicting wound healing complications. Given the small sample size, the impact of GLP-1 agonists alone on postoperative wound healing requires cautious interpretation. Our study is ongoing, looking at breast reduction patients from 2023 as GLP-1 agonist medications rise in popularity.

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## Implant-associated Lymphoid Neoplasms

Abstract Presenter: Cindy Vu

Abstract Co-Author(s): Jeong Hyun Ha MD, Jagmeet Arora, Jamasb Sayadi, Gordon Lee MD, Nada Khattab MD

**Purpose:** The Oppenheimer effect, described in 1948, signaled the beginning of awareness regarding the potential association between implants and tumorigenesis. Subsequent attention arose in the mid-1990s, particularly with the association of breast implants and lymphomas, predominantly breast implant-associated anaplastic large cell lymphoma (BIA-ALCL). To date, many isolated reports have emerged documenting cases of prosthetic implant-associated lymphoid neoplasms beyond BIA-ALCL. This study aims to comprehensively review all implant-related lymphoid neoplasms.

**Methods:** A scoping review was conducted using PRISMA guidelines. PubMed and Embase were searched to broadly identify a large body of biomedical articles in which both cancers and prostheses/implants/devices were subjects. After preliminary screening, articles pertaining to lymphoid neoplasms at mammary and non-mammary sites were identified. BIA-ALCL was excluded for our review due to the extensive literature currently available on this topic.

**Results:** Our search yielded 14,613 articles of which 79 articles were included in this review. Following data extraction, 108 patients were found to have implant-related lymphomas beyond the scope of BIA-ALCL. The predominant type across all systems is B cell lymphoma (82%), most commonly Diffuse large B cell lymphoma, with notable instances of EBV positivity (40% of all cases). Following mammary lymphoid tumors (30%), bone (27%) and vascular (26%) are the most common locations. Seroma, rupture, and capsular contracture are significantly associated with breast prostheses, while infections, screw loosening, and thrombosis/aneurysm are associated with bone and vascular prostheses, respectively. The time from implantation to diagnosis (latency period) is notably longer in breast implant-related lymphomas compared to lymphomas associated with gluteal implants ( $p=0.03$ ), a median of 14 versus 5 years respectively. Three lymphoma cases were linked to dermal fillers, and one case was associated with laparoscopic adjustable gastric band. In the majority of cases, the tumors are localized, non-mass forming, and detected in early stages, with favorable treatment outcomes and low recurrence rates following surgical removal. However, exceptions exist, such as Marginal zone lymphoma where 50% spread to infiltrate the bone marrow.

**Conclusion:** To our knowledge, this is the first scoping review on lymphoid neoplasms

associated with prostheses and implants of all types. While implant-associated lymphoid neoplasms beyond BIA-ALCL have been documented in numerous individual case reports, their prevalence has not received widespread recognition to date. Future research should continue to document cases and unravel their underlying mechanisms, clinical courses, and potential treatments. In cases of pathologies associated with implants, especially those that show resistance to treatments, it may be beneficial to consider malignancies as a potential differential diagnosis.

## **Utilization of Artificial Intelligence to Improve Equitable Healthcare Access for Breast Implant Patients**

Abstract Presenter: Louisa Ragsdale MD

Abstract Co-Author(s): Aurora Kareh MD, Rohun Gupta MD, Katherine Rodby MD

**Introduction:** The recently mandated US Food and Drug Administration (FDA) patient decision checklists were developed with the goal of improving the informed decision making process for patients considering breast implants. Yet, prior research by our group has demonstrated that these checklists are written at reading levels far in excess of that recommended by the National Institutes of Health and the American Medical Association (1). Patients considering breast implants are required to sign these forms prior to surgery, even if they have little to no comprehension of their contents. This study aims to improve the accessibility, and therefore the utility, of the mandated FDA patient literature for the average breast implant patient using the assistance of artificial intelligence (AI).

**Methods:** Patient decision checklists were obtained from the three most utilized breast implant manufacturers in the United States— Allergan, Mentor, and Sientra. Using these checklists as source material, AI was asked to synthesize a novel patient decision checklist, written at the 6th grade reading level. The generated checklist was then edited by plastic surgeons for both formatting and content. Readability analysis of the mandated checklists and the AI assisted checklist was performed using the Flesch Reading-Ease Score, Flesch-Kincaid Grade Level, Gunning-Fog Index, Coleman-Liau Index, Simplified Measure of Gobbledygook, and Automated Readability Index. Further textual analysis included sentence count, word count, number and percentage of complex words, average number of words per sentence, and average number of syllables per word.

**Results:** The readability of the AI assisted checklist was consistent with a 6th grade reading level. The readability of the Allergan, Mentor, and Sientra patient checklists correlated with a college reading level. Comparison of average Sientra, Mentor, and Allergan grade level indices to that of the Chat-GPT assisted checklist using one-sample two-tailed t testing revealed the FDA mandated documents to be written at significantly higher reading levels than that of the AI-assisted checklist ( $p < 0.0001$ ). Analysis of the FDA-mandated documents and the ChatGPT-assisted checklist similarly revealed significant differences in overall text composition. Average sentence count, word count, complex word count and percentage, average number of words per sentence, and average number of syllables per word were all higher in the FDA-mandated group relative to the ChatGPT-assisted checklist.

**Conclusion:** The currently mandated breast implant patient checklists are written at a college reading level and are inaccessible to the average patient. We propose a new patient decision checklist, generated with the assistance of artificial intelligence, in order to improve healthcare access within plastic surgery. This simplified material can be used as an adjunct to the current checklists in order to improve shared decision making.

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## **Addressing the Knowledge Gap: The Impact of Verzenio on Post-Mastectomy Breast Reconstruction**

Abstract Presenter: Luis Camacho MD

Abstract Co-Author(s): Rami Elmorsi MD, Danielle Rogan, Christopher Richter, Karan Hooda, Aaron Chen, Arlene Correa, Mark Schaverien MD, Bryce Olenczak MD

**Introduction:** Abemaciclib, a CDK4/6 inhibitor with the brand name Verzenio, has improved treatment for hormone receptor-positive (HR-positive), human epidermal growth factor receptor 2-negative (HER2-negative) breast cancer (1). Its use has increased following FDA approval for use with endocrine therapy in patients with HR-

positive, HER2-negative, node-positive, early breast cancer at high risk of recurrence (2). Despite its proven efficacy in cancer therapy, the effects of Verzenio on the surgical outcomes of post-mastectomy breast reconstruction are not well understood. This study aims to assess the impact of Verzenio on surgical outcomes in order to inform integrated cancer care strategies.

**Methodology:** This retrospective cohort study, conducted at a single center from January 2016 to September 2023 with IRB approval, included patients with HR-positive, HER2-negative breast cancer who underwent mastectomy and immediate breast reconstruction with a tissue expander while undergoing treatment with Verzenio. A 2:1 propensity score-matched control group was established. Data analysis focused on demographics, treatment characteristics, and postoperative outcomes, with the primary outcome being the incidence of surgical complications. Statistical analyses were performed using SPSS v26.0.

**Results:** The study included 135 patients, divided into 43 in the Verzenio group and 92 in the non-Verzenio group. Demographics were comparable between groups. Both cohorts predominantly exhibited invasive ductal carcinoma treated surgically with skin-sparing mastectomy. The Verzenio and non-Verzenio groups had similar incidences of readmission and unplanned surgeries. Notably, the Verzenio group had a higher incidence of mastectomy skin flap necrosis (MSFN). This association persisted in univariable regression analysis ( $p = 0.008$ ). Further adjustment in multivariable regression analysis, controlling for confounding variables, continued to demonstrate a significant impact of Verzenio on the incidence of MSFN ( $p = 0.005$ ).

**Discussion:** Medical treatment options for patients with breast cancer are rapidly evolving with the development of targeted biological therapies. This study demonstrates that Verzenio, despite increasing the risk of MSFN, does not significantly alter the incidence of surgical complications requiring hospital readmission, return to the operating room or reconstructive failure. Understanding how advances in breast cancer treatment impact the process of breast reconstruction is critical to providing individualized, patient centered informed consent.

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## **Performance of Human and Porcine Derived Acellular Dermal Matrices in Breast Reconstruction: A Clinical and Histologic Evaluation**

Abstract Presenter: Erin O'Rourke MD

Abstract Co-Author(s): Allen Gabriel MD, FACS, G. Patrick Maxwell MD, John Harper

**Background:** Human acellular dermal matrices (ADMs) remain the most used matrices in prosthetic breast reconstruction. Availability and costs may limit their use in prepectoral reconstruction, which requires large amounts of ADM. Thus, alternative matrices are being explored. The purpose of this study is to demonstrate the safety and efficacy of a human-porcine ADM construct through clinical outcomes and histologic evidence of graft integration.

**Methods:** This is a retrospective study of patients who underwent ADM-assisted, prepectoral, expander/implant breast reconstruction who received both human and porcine dermal matrices in the same breast. Biopsies of both ADMs were obtained at expander/implant exchange and evaluated for cellularization, vascularization, and inflammation. Postoperative complications were retrieved from patient records.

**Results:** 59 patients (116 breast reconstructions) were included in the study. Mean follow-up time was 6.7 ( $\pm$  0.56) years; minimum follow-up was 5 years. The any-complication rate was 8.6%. This included 8 cases of skin necrosis (6.9%), 2 cases of seroma (1.7%), 2 cases of expander/implant exposure (1.7%), and 3 cases of return to the operating room (2.6%). Of the 8 cases of skin necrosis, 3 were major requiring a return to the operating room. Of these 3 cases of major skin necrosis, 2 also had prosthesis exposure which were salvaged. The 2 cases of seroma were resolved in the office. There were no incidences of surgical-site infection, hematoma, clinically significant capsular contracture (Grade 3 or 4), or expander/implant loss (reconstructive failure). All complications occurred within the first year.

A total of 138 ADM biopsy specimens (66 human and 72 porcine) were obtained from 38 patients at implant exchange. H&E staining of biopsy specimens revealed fibroblast in-growth in 95.5% of the human grafts and 81.9% of the porcine grafts ( $P = 0.013$ ). There was also a significantly higher presence of capillary in-growth in human versus porcine grafts (72.7% vs 36.1%;  $P = 0.00002$ ). Intra-graft inflammation was present in 25.8% of human grafts versus 44.4% of porcine grafts ( $P = 0.022$ ). Despite these differences, there were no cases of graft rejection, capsular contracture, or

expander/implant loss. All grafts appeared to be integrated within the host tissue on visual inspection.

**Conclusions:** Breasts reconstructed with human-porcine ADM constructs had a low rate of postoperative complications, similar to previously reported rates for prepectoral reconstructions with human ADM only (7.6%) or with P4HB-human ADM constructs (6.4%).<sup>1</sup> Despite the observed differences in biologic response between the grafts on histologic evaluation, there was no evidence of porcine graft failure or rejection at the time of implant exchange/biopsy. We postulate that the histological differences likely resolved over time, allowing the porcine ADM to integrate within the host tissue without eliciting a clinically significant foreign body response. In summary, our study suggests that porcine derived ADM performs in a similar manner to human derived ADM and may be a feasible alternative to human ADMs in prepectoral breast reconstructions.

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### **Outcomes Associated with Volumetric Mismatch Between Implant Size and Mastectomy Weight in Direct-to-Implant Breast Reconstruction**

Abstract Presenter: Katherine Carruthers MD

Abstract Co-Author(s): Katya Remy MD, Eleanor Tomczyk MD, Krishna Vyas MD, PhD, MHS, William Gerald Austen Jr., MD

**Introduction:** The treatment of breast cancer has evolved from radical mastectomy to nipple sparing mastectomy (NSM) with direct-to-implant (DTI) breast reconstruction. However, postoperative complications are not uncommon and can significantly impact reconstructive outcomes and patient quality of life. NSM with DTI breast reconstruction involves the removal of breast tissue with preservation of the nipple-areola complex (NAC) and skin envelope, creating a pocket for implant placement. When the mastectomy weight is greater than the chosen implant, a volumetric mismatch occurs creating a potential dead space. Dead spaces have shown to predispose to seromas and infections in other reconstructive procedures. The role of volumetric mismatch on the development of complications in breast reconstruction is unknown. Therefore, this study aimed to determine whether volumetric mismatches in NSM with DTI breast



reconstruction predispose patients to postoperative complications.

**Methods:** A multicenter retrospective study was conducted of patients who underwent NSM with DTI breast reconstruction between 1990 and 2023. Data included patient demographics, comorbidities, reconstructive history, surgical technique, mastectomy weight, implant size, volumetric mismatch (mastectomy weight minus implant size) as well as postoperative complications. Complications included explant, infection (requiring antibiotics or reoperation), seroma (requiring aspiration), hematoma (requiring reoperation), skin necrosis (requiring revision) and wound dehiscence (requiring revision). A receiver operating characteristic (ROC) analysis was conducted to identify the volumetric mismatch cut-off with the highest sensitivity and specificity in predicting complications. Bivariate, univariable and multivariable logistic regression analyses were performed.

**Results:** A total of 1004 patients who underwent 1460 NSM with DTI breast reconstructions were included. The average mastectomy weight was 457.7 g ( $\pm 219.1$  g), implant size 406.9 cc ( $\pm 154$  cc) and volumetric mismatch 50.0 ( $\pm 110.2$ ). The mean follow-up duration was 19.7 months. Overall complication rate was 9.2% and included explant (3.2%), seroma (4.0%), infection (2.2%), hematoma (1.7%), skin necrosis (2.2%) and wound dehiscence (1.0%). A volumetric mismatch of  $\geq 95$  was associated with significantly higher rates of overall complications (10.1% versus 5.9%,  $p < 0.05$ ), seroma (6.9% versus 2.4%,  $p < 0.05$ ), infection (4.5% versus 1.6%,  $p < 0.05$ ), explant due to infection (3.2% versus 0.6%,  $p < 0.05$ ), and wound dehiscence (3.1% versus 0.2%,  $p < 0.05$ ). Upon multivariable logistic regression for any complication, significance was maintained for volumetric mismatch as a significant risk factor (OR 2.7, 95% CI 1.3-5.7,  $p = 0.01$ ).

**Conclusions:** For patients undergoing NSM and DTI reconstruction, a volumetric mismatch may increase the risk of seroma, infection, explant, and wound dehiscence. Knowing this, plastic surgeons may choose to match their implants more evenly to the mastectomy weight or opt for skin sparing mastectomies when a mismatch would otherwise be unavoidable.

# Use of Machine Learning for Identification of Risk Factors in the Development of Breast Cancer-Related Lymphedema

Abstract Presenter: Stefanos Boukovalas MD

Abstract Co-Author(s): Devin Clegg MD, Jeremy Watts, Vasileios Maroulas, Anahita Khojandi

**Introduction:** Breast cancer-related lymphedema (BCRL) is a chronic and incurable disease impacting approximately 20% of breast cancer patients. Accurate prediction of BCRL is critical for patient education and potential implementation of preventative modalities, such as immediate lymphatic reconstruction following axillary lymph node dissection. Previous studies have identified risk factors associated with the development of BCRL, primarily using logistic regression models. Machine learning (ML) can outperform traditional statistical methods by discovering nonparametric interaction between risk factors and weighing different features to describe their importance to the predictive model. The goal of this study was to apply different ML approaches for prediction of BCRL and compare their performance.

**Methods and materials:** A retrospective cohort study was conducted involving women with breast cancer who underwent mastectomy at a single institution from January 2015 to June 2022. BCRL diagnosis was confirmed by a certified lymphedema therapist. All patients had a minimum follow-up period of 1.5 years post-mastectomy. The authors compared 4 ML algorithms (logistic regression, random forest, support vector machine, and Naïve Bayes) to predict development of BCRL. Accuracy, recall, precision and F1 score were calculated for each algorithm and compared using t-test. Additionally, Shapley Additive Explanation Analysis (SHAP) was performed to characterize the magnitude and directionality of the identified risk factors.

**Results:** A total of 365 patients were included in the study. The mean age was 56 years, and the mean body mass index (BMI) was 29. Eighty-one patients (22%) developed BCRL. All machine learning models performed comparably well, with the random forest having the best overall performance (accuracy:  $88.5 \pm 3.8\%$ , recall:  $79.0 \pm 14.0\%$ , precision:  $51.8 \pm 10.1\%$ , and F1 score:  $61.3 \pm 10.0\%$ ). Further analysis demonstrated that the random forest model prioritizes lymph node stage, number of lymph nodes removed, radiation therapy, surgery type, axillary dissection, age at diagnosis, BMI, chemotherapy, tumor stage, and breast cancer histological type as top features to predict BCRL.

**Conclusions:** This study shows that ML methods can be utilized for individualized

prediction of BCRL and outperform traditional descriptive statistical models. Continued training of the ML algorithms with more data will allow for development of more robust predictive models that could be applied in clinical practice.

**Single-Surgeon; Four-Year Consecutive 677 (1,354 Breasts) Patient Case Series:  
Extended Indications and Recommendations for Use of P4HB (GalaFLEX) in  
Aesthetic and Reconstructive Breast Surgery**

Abstract Presenter: Jerry Chidester MD

Abstract Co-Author: Carden Reynolds

**Background:** Bioabsorbable scaffolds have been utilized in breast reconstructive surgery for many years, but more recently, materials like Poly-4-Hydroxybutyrate (P4HB, GalaFLEX & GalaFLEX LITE; BD, Franklin Lakes, NJ) have become more readily accessible to surgeons and patients in the aesthetic realm. Previous reports have demonstrated low complication rates but with smaller sample sizes, a shorter duration of follow-up and multiple surgeons in their series.

**Objectives:** We determine to demonstrate both the safety and low complication rates over time when utilizing P4HB in varying elective (off-label) breast procedures, including: primary breast augmentation (submuscular and subfascial); revision breast augmentation / implant exchange; and complex pocket control cases (i.e. inferior implant displacement or "bottoming out," lateral displacement, symmastia correction, recurrent capsular contracture). Additionally, we demonstrate its safety and utility in reconstructive cases, including: implant based breast reconstruction; reduction mammoplasty; tuberous breast deformity; and Poland's Syndrome.

**Methods:** Between October 2019 and October 2023, a single surgeon conducted a total of 677 consecutive cases utilizing P4HB (total 1354 pieces of GalaFLEX and GalaFLEX LITE). Our preliminary findings from a randomized retrospective chart analysis sample reveal promising outcomes. All patients were female. Age range was 21 to 66 years, with the average age of 35. BMI range was 18 – 36, with an average BMI of 25.3. Mean follow-up was 6 months with longest follow-up of 4 years. There were 5 cases performed in 2019, 116 in 2020, 169 in 2021, 207 in 2022, and 180 in 2023. We randomly sampled 250 patients from our in-depth chart review across the four-year period to analyze major (5%) and minor (10%) complication rates. The most common minor complication (i.e., no return to operating room) was palpability with the original P4HB (GalaFLEX). Additionally, occasional sharp pain along the P4HB (GalaFLEX and GalaFLEX LITE) was another complaint but all resolved without intervention by 180-days post-surgery. Major complications were few but required surgical intervention for waterfall deformity, implant malposition, and breast asymmetry. This occurred in 5% of the 250 sampled patients and primarily in the years of 2020 – 2022. No cases of P4HB infection or hematoma were reported in this case series. Furthermore, our preliminary findings suggest a positive trend toward decreasing major and minor complication rates when there is continued use over time by the surgeon of P4HB. This underscores the importance of consistent use and technical expertise with P4HB.

**Conclusion:** Our consecutive case series of P4HB utilization in 677 patients from a single surgeon over a four-year period is the largest to date in the world. Our findings highlight the enduring success and satisfaction achieved through P4HB utilization in elective aesthetic and reconstructive breast surgery. The material's contribution to increased soft tissue

integrity is a key factor in its long-term success, reinforcing its position as a reliable and effective choice in plastic and reconstructive surgeries.

**Artificial Intelligence-based long term evaluation of lower pole stability in 72 consecutive cases of Augmentation Mastopexy with P4HB scaffold as internal bra support.**

Abstract Presenter: Giovanni Bistoni MD

Abstract Co-Author: Francesco Sofo MD

**Background:** Despite a variety of excision patterns, pedicles and implement of supporting techniques, recurrent ptosis and bottoming out with lower pole overstretch remain unsolved problems after mastopexy(1). It is indeed unrealistic to entrust the same compromised native soft tissue to maintain the shape of the rejuvenated breast in the long term, especially in the setting of concurrent implant positioning(2). Following the authors' encouraging experience(3), internal support with P4HB scaffold was extended to all patients undergoing augmentation mastopexy with smooth implants in a subfascial plane.

**Objectives:** The authors sought to evaluate lower pole stability after augmentation mastopexy with the adjunct of P4HB scaffold (GalaFLEX) by analyzing lower pole curvature and breast volume redistribution at different time point. Further analysis included correlation between implant size or type of surgery (primary versus revisional) and lower pole stretch.

**Methods:** 72 consecutive patients undergoing augmentation mastopexy with round smooth implants in a subfascial plane from March 2020 to December 2023 and a 1 year minimum follow up were included in the study. Arbrea Breast Software, an artificial intelligence-based 3D simulator was used to measure the curvilinear distance between nipple to inframammary fold (lower pole arch) and breast volume. Lower pole stretch was determined as the percentage increase from 6 weeks to each post operative time. The ratio between lower pole and total breast volume (lower pole ratio=LPR) was used to assess volume redistribution.

**Results:** Mean follow up was 24,8 months with the longest being of 45 months. No recurrent ptosis, bottoming out, implant displacement or capsular contracture were reported. Mean lower pole stretch was 5.39% and 8.04% at 6 and 12 months

respectively, with substantial stability at 3 years (9,4%). Overall breast volume decreased by  $\square$  10%, redistributing towards the lower pole in the first year (LPR=0.45 at 6 weeks vs 0.49 at 12 months), showing satisfactory volume distribution in the longer term (LPR= 0.52 at 2 and 3 years). Larger implants showed a trend towards longer LPA's elongations, although not significantly so ( $p>0.05$ ). Secondary cases (26 patients) showed smaller LPA's elongation at 1 year (8.73%vs6.83%), not reaching statistical significance ( $p>0.05$ ).

**Conclusions:** Our datas support GalaFLEX's protective role against lower pole stretch in the first year and beyond, even in the setting of concurrent subfascial breast augmentation with smooth implants, this being the largest published series reporting such long-term results.

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## Breast Implants and the Risk of Squamous Cell Carcinoma of the Breast

Abstract Presenter: Fabio Santanelli di Pompeo MD, PhD

Abstract Co-Author: Michail Sorotos MD, PhD

Squamous cell carcinoma can originate either primarily from the breast parenchyma (PSCCB) or from the periprosthetic capsule in individuals with breast implants (BIA-SCC). A comprehensive literature review aimed to identify all cases of PSCCB and BIA-SCC, assessing prevalence, incidence rate (IR), and risk. Using specific keywords, studies published up to November 2023 were searched across PubMed, Web of Science, Google Scholar, and the Cochrane Library.

The cases retrieved from the literature served as the numerator for PSCCB and BIA-SCC, while the denominator for PSCCB comprised the female population aged 18 to 99 and for BIA-SCC the population with breast implants. A total of 219 papers were included, featuring 2,250 PSCCB cases and 30 BIA-SCC cases. The prevalence of PSCCB was 2.0 per 100,000 individuals (95%CI 0.2:100,000 to 7.2:100,000) with a lifetime risk of 1:49,509 (95%CI 0.2:10,000 to 5.6:10,000). BIA-SCC prevalence was 0.61 per 100,000 (95%CI 0.2:100,000 to 1.3:100,000), with a lifetime risk of 1:164,884 (95%CI 0.2:100,000 to 5.6:100,000).

Comparatively, BIA-SCC prevalence was 3.33 times lower than PSCCB, while BIA-ALCL prevalence was 3.84 times higher than Primary Breast ALCL. In assessing BIA-SCC risk against BIA-ALCL, the prevalence of 1:164,910 for individuals with breast implants (regardless of texture) was found to be 180 times lower than the BIA-ALCL prevalence of 1:914 for patients with textured implants. BIA-SCC occurs less frequently than PSCCB and considerably less than BIA-ALCL. The association between textured implants and BIA-SCC cases underscores the importance of patient education regarding uncommon and rare risks associated with breast implants. Ongoing vigilance, research, and strengthened reporting systems are imperative.

### **A simple classification and a one stage correction of hypoplastic–tuberous breast with the muscle splitting dual plane breast augmentation technique, round silicone implants and the Northwood Index.**

Abstract Presenter: Evangelos Keramidas MD FEBOPRAS

**Background:** We believe that one or two abnormalities are presented in hypoplastic tuberous breast:

a. Herniation of breast tissue through the nipple – areola complex and/or skin shortening at the level of Inframammary Fold (IMF).

We describe a new technique which combines the Northwood index and the muscle-splitting dual plane (MUST technique) breast augmentation technique

**Materials and Methods:** We used the Northwood Index (NI) as described by Dr Pacifico in 2005. The NI is the ratio derived between the areola herniation to areola diameter, in the true lateral view photo of the breast. The herniation is measured in cm and it is the maximum anteroposterior distance between the base of the nipple and the edge of the areola. The diameter is measured in cm at the maximum diameter of the



areola. When the index was above 0.3, we performed peri-areola tightening with CV-3 stitch and relaxing incisions at the lower pole of the constricted lower pole of the breast. When the Index was below 0,3 we did only the relaxing incisions. In all patients we use round silicone implants to restore the volume and the muscle-splitting dual plane technique (MUST) for the pocket dissection. The MUST technique includes subfascial pocket at the lower part of the breast and division of the pectoralis muscle in 3 different levels depending on the volume of the implant. Level 1: for implants >350cc we divide the pectoralis muscle at the projected level of the lower border of the nipple areola complex in the surface of the pectoralis major muscle. Level 2: for implants between 350-200cc we divide the pectoralis muscle at the projected level of the nipple in the surface of the pectoralis major muscle and Level 3: for implant <200cc we divide the pectoralis muscle at the level of the upper border of the areola complex. Moreover, we classified the tuberous breast very simply in to two types. Type A when the NI is more than 0.3 and Type B when the NI is less than 0.3. From March 2007 to October 2022, we have performed the aforementioned technique in 121 tuberous breasts. Mean age of patient was 27.5 years old. Mean follow-up was 7 years.

**Results:** All patients reported high levels of satisfaction. 5 patients had scar revision. 8 patients had suture exposure in the nipple. Slight recurrence of the deformity was observed in 7 patients. One patient developed infection and we removed the implant.

**Conclusions:** We advocate a one-stage surgical correction of tuberous breast. Based on the Northwood index we describe two types of hypoplastic tuberous breast. According to this classification we can decide easily whether we will perform peri-areola correction or not and with the MUST technique we can achieve the best expansion of the lower pole of the tuberous breast having the upper pole of the implant covering by the muscle.

### **Acellular Dermal Matrix without Basement membrane in Immediate Prepectoral Breast Reconstruction: A Prospective, Randomized Controlled Trial**

Abstract Presenter: Hyun Ho Han MD, PhD

Abstract Co-Author: Woo Yeon Han MD

**Background:** The acellular dermal matrix (ADM) has become popular in various reconstructive surgeries of different regions. There are different needs depending on the

clinical applications including breast, abdominal wall, and any other soft tissue reconstruction. Removal of the basement membrane (BM), which consists of collagen fibers, may help achieve natural and soft breast reconstruction that require highly elastic ADMs. Given the lack of knowledge of the effectiveness of the ADM without the BM, we compared the clinical outcomes of ADMs with and without BM in breast reconstruction.

**Methods:** We conducted a prospective, single-blinded, randomized controlled trial to evaluate differences in clinical outcomes. The patients were randomized into ADM with BM and without BM groups. Both groups underwent immediate prepectoral direct-to-implant breast reconstruction. Demographics, surgical outcome, and breast shape change using nipple position were compared between the two groups.

**Results:** A total of 56 patients were divided into two groups: ADM with BM (n=30, 53.6%) and ADM without BM (n=26, 46.4%). Clinical and surgical demographics were similar between the two groups. The authors detected no statistically significant differences in the overall rate of complications and breast shape change between the two groups. However, the rate of seromas was higher in the ADM with BM group than that in the ADM without BM group (10% vs. 0%,  $P=0.09$ ).

**Conclusion:** The two groups showed similar surgical outcomes. The use of ADM without BM in implant-based breast reconstruction was safe with its mechanical properties of lower tensile strength and higher elasticity.

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## **Assessing the Efficacy of the MIAMI Protocol - Minimizing Infection After Mastectomy with Implants- A Comprehensive One-Year Analysis**

Abstract Presenter: Federico Perez Quirante MD

Abstract Co-Author(s): Anshumi Desai MD, Emily Finkelstein MD, Meaghan Clark, Carolina Padilla, Wrood Kassira MD, Devinder Singh MD, Juan Mella-Catinchi MD, MPH, Zubin Panthaki MD, Sara Danker MD

**Background:** Reported rates of infection following implant-based breast reconstruction (IBBR) range from 1-35% (1). Despite this relatively high rate, there is no consensus regarding optimal practices for IBBR such as the type or duration of antibiotic prophylaxis, which has led to a wide variety of adopted protocols in plastic surgery practice. Quality improvement (QI) projects have long-standing evidence of efficacy in surgery, however, only a handful of previous QI projects have been documented that specifically target the reduction of complications after breast reconstruction. The purpose of this study is to present the outcomes from the MIAMI protocol (Minimizing Infection After Mastectomy with Implants), a self-manufactured QI project to standardize preoperative, intraoperative, and postoperative breast reconstruction protocol at our institution.

**Methods:** The MIAMI protocol was instituted in December 2022, at both the University of Miami and Jackson Memorial Hospital Systems. Incidence of infection, wounds, hematoma, seroma, flap necrosis, reoperation rates for a complication, and implant loss following IBBR were evaluated for six faculty members and compared between a period before the start of the protocol (December 2021 to November 2022) and after the implementation of the protocol (December 2022 to November 2023). The protocol included standardization in the preoperative area, during surgery, and postoperative. Standardization did not include post-discharge antibiotic type or duration.

**Results:** 749 IBBR procedures were included; 360 (48%) of which were performed prior to the start of the MIAMI protocol, and the remaining 389 procedures (52%) were performed after the protocol was implemented. The mean patient age throughout the study period was 51.9 years [SD 11.27] and the mean BMI was 26.7 [SD 5.04] kg/m<sup>2</sup>. The implementation of the MIAMI protocol evidenced a substantive decrement in the

total infection rate, with a reduction from 58 cases (16%) pre-protocol to 43 cases (11.1%) post-protocol implementation ( $p=0.04$ ). Major infections observed a decline from 44 (12.2%) to 36 (9.2%) ( $p=0.19$ ). Minor infections reduced from 14 (3.9%) to 8 (2.1%) ( $p=0.14$ ). The incidence of hematoma decreased marginally from 14 (3.9%) to 10 (2.6%) ( $p=0.31$ ). Seroma formation reduced from 50 (13.9%) to 41 (10.5%) ( $p=0.16$ ). The occurrence of minor wounds (less than 1 cm) reduced from 60 (16.7%) to 62 (15.9%) ( $p=0.79$ ). Major wound complications (1 cm or more) declined from 48 (13.3%) to 37 (9.5%) ( $p=0.09$ ). Rates of flap necrosis, re-operation, and implant loss, which were (3.6%), 53 (14.7%), and 48 (13.3%) pre-protocol, respectively, shifted to 11 (2.8%), 50 (12.8%), and 38 (9.7%) post-protocol indicating that these reductions occurred however not statistically significant.

**Conclusion:** Standardization of preoperative, intraoperative, and postoperative procedures for breast reconstruction had a significant impact on surgical outcomes at our institution, regardless of no consistent standardization for post-discharge antibiotics. This resulted in a statistically significant decrease in overall infection rates and a downward trend of all other complications as well. This represents an opportunity for a multi-institutional study with a longer follow-up period.

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#### **Ingress Time in ICG Angiography: A Predictor of Skin Flap Necrosis in Immediate Implant-Based Breast Reconstruction**

Abstract Presenter: Jongkoo Lee

Abstract Co-Author: Kyong-je Woo MD

**Introduction:** Immediate implant-based breast reconstruction (IIBR) is a common procedure following mastectomy, offering patients expedited restoration of breast aesthetics and function. However, complications such as mastectomy flap necrosis (MFN) pose significant challenges to successful outcomes. Indocyanine green (ICG) angiography has emerged as a promising tool for assessing flap perfusion intraoperatively. Rapid ingress is a characteristic of a normal perfusion of a flap in ICG angiography. This study aimed to determine optimum cut-off value of ingress time in ICG angiography to predict skin flap necrosis in IIBR.

**Methods:** Consecutive patients undergoing IIBR and intraoperative ICG angiography between June 2021 and December 2022 were included. Video recordings captured fluorescence enhancement of mastectomy skin flaps using a near-infrared camera. Ingress time, defined as the duration for ICG to reach the entire incisional margins, was measured. Receiver operating characteristic (ROC) analysis determined the optimal ingress time cut-off for predicting full-thickness necrosis.

**Results:** Out of 203 patients included, 33 (16.3%) developed full-thickness necrosis. The mean ingress time was significantly longer in the necrosis group compared to the no-necrosis group (104.6 vs. 47.6 seconds, respectively;  $p < 0.001$ ). ROC analysis identified an optimum ingress time cut-off of 58 seconds, with a sensitivity of 93.9% and specificity of 74.1%. Multivariable logistic regression confirmed that patients with ingress time longer than 58 seconds had significantly higher odds of developing full-thickness necrosis (OR 36.82;  $p < 0.001$ ).

**Conclusion:** Ingress time measured via ICG angiography demonstrates promising potential as a predictive metric for full-thickness necrosis in IIBR. A threshold of 58 seconds or longer was associated with increased odds of necrosis development. This study highlights the importance of intraoperative perfusion assessment in optimizing surgical outcomes and guiding clinical decision-making in immediate breast reconstruction procedures. Further research is warranted to validate these findings and refine the clinical application of ingress time in predicting postoperative complications.

## **Negative Pressure Wound Therapy with Instillation Decreases Interval to Final Reconstruction in Breast Implant Salvage**

Abstract Presenter: Shahnur Ahmed MD

Abstract Co-Author(s): Luci Hulsman, Folasade Imeokparia, Kandice Ludwig, Carla Fisher, R. Jason VonDerHaar MD, Mary Lester MD, Al Hassanein MD, MMSc, FACS

**Background:** Infection in implant-based breast reconstruction is problematic and occurs in up to 22%. Traditionally, infected implants are removed for several months prior to replacement with either an implant or tissue expander (TE) resulting in delay of breast reconstruction. The purpose of this study is to assess outcomes of a new salvage pathway of infected breast prosthetics with device removal, subsequent placement of negative pressure wound vacuum therapy with instillation and dwell (NPWTi-d), and early-staged replacement of a TE/implant within a few days.

**Methods:** A single-center retrospective review was performed for breast cancer patients who underwent implant-based reconstruction (2018 to 2023). Patients who had infection or exposure of a TE/implant requiring removal of the device were included in the study. Patients were divided into two groups. Group 1 (NPWTi-d) was managed with implant removal, placement of NPWTi-d in the breast pocket until clinical improvement, followed by repeat washout with replacement of the TE/implant. Group 2 (control) underwent traditional TE/implant removal and no NPWTi-d. Demographic information was recorded. Outcome variables included postoperative infection (leading to TE/implant loss or hospitalization for intravenous antibiotics), skin necrosis, type of breast prosthetic during salvage, reinfection after TE/implant salvage, time interval without a TE/implant following explantation, and time to final implant-based reconstruction.

**Results:** The study included 47 patients (76 TE/implants). There were 13 patients (16 TE/implants) in Group 1 and 34 patients (60 TE/implants) in Group 2. The average age was  $44.2 \pm 9.3$  years old in Group 1 compared to  $50.7 \pm 12.1$  years-old in Group 2 ( $p=0.0956$ ). The mean body mass index was  $33.5 \pm 7.0$  kg/m<sup>2</sup> in Group 1 compared to  $31.6 \pm 6.2$  kg/m<sup>2</sup> in Group 2 ( $p=0.5022$ ). Neoadjuvant chemotherapy was administered to 38.5% (5/13) of Group 1 patients compared to 26.5% (9/34) of Group 2 ( $p=0.4816$ ). There were 30.8% (4/13) of Group 1 who received adjuvant radiation compared to 23.5% (8/34) of Group 2 patients ( $p=0.7129$ ). The average time interval of TE/implant-free days was  $2.5 \pm 1.2$  days in Group 1 compared to  $134.6 \pm 78.5$  days in Group 2 ( $p=0.0001$ ). Final breast reconstruction using implants occurred in 92.3% (12/13) of Group 1 compared to 32.4% (11/34) of Group 2 patients ( $p=0.0003$ ). There were no patients (0/13) in Group 1 who declined further reconstruction following TE/implant loss compared to 38.2% (13/34) of Group 2 patients (0.0094). The success rate (no surgical site infection within 90 days) of implant salvage was 81.3% (13/16 implants) in Group 1. The time interval to final implant-based breast reconstruction was  $69.0 \pm 69.7$  days in Group 1 compared to  $225.6 \pm 93.6$  days in Group 2 ( $p=.0001$ ). The mean follow-up time was 324.5 (range 105-637) days in Group 1 and 486.8 (range 131-931) days in Group 2.

**Conclusion:** A breast implant salvage pathway with removal of the infected device, NPWTi-d placement, and early replacement of the TE/implant was successful in 81%. Patients experienced less implant-free days by 132 days and faster time to final reconstruction by 156 days compared to those managed with traditional device removal. Patients who underwent this salvage pathway were less likely to abandon completing breast reconstruction.

## **Predictors of Explantation of the Infected Breast Expander: An analysis of 180 Breasts**

Abstract Presenter: Rami Elmorsi MD

Abstract Co-Author(s): Allison Seitz MD, Klara Sputova MD, Sahil Kapur MD, Mark Villa MD, Joani Christensen MD

**Introduction:** Post-mastectomy breast reconstruction often involves a multistage process beginning with tissue expander placement to create adequate skin flap surface area. Despite the benefits, expander infections can occur, posing significant challenges including delay or alteration of adjuvant therapy, prolonged reconstructive timeframes, and increased costs. While medical treatments are often employed to salvage infected expanders, surgical interventions may become necessary. Herein, we aim to identify risk factors indicative of an impending explantation in infected breast expanders.

**Methods:** This retrospective cohort study examines expander infections occurring at our center between 2017 and 2019. Patients were identified using CPT codes for tissue expander placement and ICD codes for infection and electronic medical records were reviewed, collecting data on patient demographics, cancer characteristics, medical and surgical cancer treatments, reconstructive procedures, relevant history of breast surgeries, treatments administered for the infected expander, and the final outcomes of each expander. We also assessed the impact of the red breast antibiotic protocol, which constitutes an oral regimen (Minocycline/Linezolid, Ciprofloxacin, and Rifampin) and an intravenous regiment (Minocycline/Vancomycin/Daptomycin, Meropenem/Cefepime, and Rifampin)

**Results:** In the study period, we identified 180 cases of expander infections, among which 29% (n=53) necessitated explantation. There was no significant association between type of antibiotic regimen and explantation (29.9% versus 28.3% explantation rates in red breast protocol and non-red breast protocols,  $p=0.828$ , respectively). Prior

chemotherapy and radiotherapy were also insignificant in association with expander explantation in this population ( $p = 0.41$  and  $0.77$ , respectively). On the other hand, explantation was significantly associated with higher BMI (median, Interquartile range =  $30.4$  ( $27.7$ - $34.0$ ) versus  $28.6$  ( $24.6$ - $31.7$ ),  $p = 0.01$ , in explanted versus non-explanted expanders, respectively), breast cancer histology ( $64\%$  versus  $42\%$  versus  $20\%$  versus  $16\%$  explantations in invasive lobular carcinoma, invasive ductal carcinoma, ductal carcinoma in-situ, and no cancer histologies,  $p < 0.001$ , respectively), and breast cancer stage ( $p < 0.001$ ). Multivariate binary logistic regression analysis revealed that BMI (Odds Ratio =  $1.2$ ,  $p < 0.001$ ), expander volume (Odds Ratio =  $0.997$ ,  $p = 0.003$ ), and breast cancer stage (Odds Ratio =  $12.2$ ,  $p < 0.001$  in Stage III) independently predicted explantation, while prior chemotherapy and radiotherapy were insignificant.

**Conclusion:** Our analysis underscores the significance of prompt and aggressive management in patients with expander infections, particularly those with higher BMI and advanced breast cancer stage. Notable, the latter was the most prominent risk factor for ultimate explantation, where stage III patients had 13-times the odds of explantation compared to those who had a prophylactic mastectomy.

## **Nomogram-Based Approach for Predicting Complication Risks Following Prepectoral Direct-to-Implant Breast Reconstruction**

Abstract Presenter: Juyoung Bae MD, PhD

Abstract Co-Author: Kyeong-Tae Lee MD

**Background:** Despite a recent marked increase in the use of prepectoral direct-to-implant (DTI) breast reconstruction, concerns persist regarding the potential for elevated complication risks associated with this method. This has led to a cautious approach in adopting the technique; however, the decision-making process has been primarily based on empirical grounds, with lacking solid evidence. Identifying risk factors for adverse outcomes and utilizing them for selection would be ideal; however, previous studies have been prone to selection bias due to their focus on selected populations. This study aimed to construct a nomogram to predict the likelihood of postoperative complications following prepectoral DTI breast reconstruction, employing it in all patients without a selective process.

**Methods:** Prepectoral DTI breast reconstruction was performed on all consecutive patients who were determined to be eligible for immediate implant-based reconstruction



between August 2019 and March 2023. To identify significant predictors of complications with an incidence greater than 5%, data was partitioned into training and validation sets in a 7:3 ratios. All candidate predictors were included in the least absolute shrinkage and selection operator-penalized regression model. Using Generalized Linear Models, a predictive model was constructed, and a nomogram was developed. For complications with an incidence of less than 5%, Firth's bias-reduced logistic regression analysis was employed to construct the prediction model. Five-fold cross-validation was applied to all model. For all complications, the area under the curve (AUC) was evaluated.

**Results:** In total, 433 breasts (362 patients) were analyzed. There were 149 cases (34.4%) of complications within 90 days after surgery, including 92 (21.2%) with delayed wound healing, 42 (9.7%) with wound revision, 14 (3.2%) with seromas, 4 (0.9%) with hematomas, and four (0.9%) with infections. Removal of implant due to complications developed in 15 cases (3.5%) in a median follow-up period of 13 months. Using patient demographics including age, body mass index and prior radiation history, and operation-related variables including mastectomy incision pattern and implant profiles, prediction models showing promising accuracy were created for early complications (AUC = 0.724), delayed wound healing (AUC = 0.682), wound revision (AUC = 0.717), seroma (AUC = 0.768) and hematoma (AUC = 0.697). Especially the prediction model for infection showed the highest AUC level of 0.849.

**Conclusion:** The findings of the current cohort study, which included consecutive patients without a selection process, suggests that the prepectoral DTI appears to be quite safe. These nomograms could potentially predict complications following prepectoral DTI breast reconstruction and contribute to evidence-based patient selection, thereby optimizing outcomes.

## **Intraoperative Predictors of Salvage in Infected Breast Implants: A Retrospective Study**

Abstract Presenter: Makenna Ash

Abstract Co-Author(s): Owen Brown MD, Angela Cheng MD, Grant Carlson MD, Albert Losken MD, Peter Thompson MD

**Purpose:** Infectious complications associated with implant-based breast reconstruction (IBBR) can be devastating and may lead to reconstructive failure. While there are

known demographic risk factors for reconstructive failure, few studies have identified intraoperative findings that predict failure after attempted salvage.

**Methods:** Patients undergoing IBBR with acellular dermal matrix (ADM) between January 2017 and July 2023 were included (n=837). Intraoperative records of patients who developed a major infection (that required intravenous antibiotics +/- surgical intervention) were reviewed. Dictated intraoperative findings specifically reviewed included status of ADM incorporation, qualitative descriptors of pocket fluid (e.g., "purulent", "murky", "serous") and other intraoperative findings such as hypergranulation tissue or defined capsular rind. Reconstructive salvage denoted any operative intervention not resulting in device explantation (i.e., washout and device replacement/exchange). Reconstructive failure denoted device explantation at any timepoint (i.e., index washout or later date).

**Results:** Of 837 patients, 11.9% developed infection (n=100) and 8% developed a major infection (n=71). The average post-operative day of infection was 31.2 (STDEV = 27.6) History of prior breast radiation, bilateral reconstruction, and postoperative seroma were significantly associated with the development of any infection (OR of 1.72 [p=0.05], 2.81 [p=0.003], and 5.18 [p=0.001]). Bilateral reconstruction and postoperative seroma were significantly associated with development of major infections, with odds ratios of 2.36 and 6.51 (p=0.03, p=0.01). Bilateral reconstruction and postoperative seroma were also significantly associated with implant failure due to infection (OR 2.91 [p=0.02] and 5.51 [p=0.001], respectively).

Overall, the rate of reconstructive failure was 53.5% (n=38) and the rate of implant salvage was 46.5% (n=33). Of these, 8% (n=6) had successful treatment with IV antibiotics alone, 38% (n=27) were salvaged with operative intervention, 28.2% (n=20) failed without salvage attempt, and 25.4% (n=18) underwent salvage attempt but ultimately failed due to subsequent infection. Grossly unincorporated ADM was found intraoperatively in 51% of patients. Unincorporated ADM was significantly associated with reconstructive failure (OR 5.4, p=0.02). Of the available microbial culture data, 78% of were positive, most commonly MSSA, MRSA, Serratia, Enterobacter, or Proteus. Serratia infection, prior hematoma, and gram-negative infection were also associated with reconstructive failure, but these finding did not achieve statistical significance. Subjective description of fluid character (murky, purulent) was not correlated with outcome.

When comparing patients who had success of operative salvage to patients who eventually failed an attempt at salvage, 38% of patients with successful salvage had unincorporated ADM compared to 77% of patients who ultimately failed reconstruction.

Unincorporated ADM at the time of index washout was significantly associated with failure of the salvage attempt ( $p=0.007$ ).

**Conclusion:** In the setting of infection, the presence of unincorporated ADM within the mastectomy cavity during operative attempt at device salvage was significantly associated with eventual reconstructive failure. Surgeons should be aware that this finding may portend poor outcomes for patients. These results may be useful in informing intraoperative decision making.

### **6-year Results of Simultaneous Explantation and No Vertical Scar Auto Projecting Mastopexy With or Without Fat Grafting**

Abstract Presenter: Gary Horndeski MD

**Purpose:** Failed augmentation necessitates a surgical alternative to achieve aesthetic and functional desires without implants. The purpose of this study is to present 7-year results of an alternative explantation and mastopexy that is not mechanically dependent on skin envelope tightening, without vertical scars nor foreign materials.

**Method:** Thirteen women underwent explantation and mastopexy in 2017 by one surgeon. Imaging was used to determine volume. Implant volume was determined from records or estimated by bra size change. Chest and breast dimensions are measured. These parameters and women's desire are used to design a surgical blueprint determining the almond shaped incision, internal cone and external breast. The almond pattern containing the areola is incised partial thickness then deepithelized. The almond's cephalad border is incised full thickness, the cephalad flap is elevated and the implant is removed. One centimeter cephalad to the almond's caudal border, the deepithelized dermis is incised partial thickness, extending its entire width. The deepithelized dermis is rotated into an oblique cone. Two long and one short straps are elevated from the cone base, leaving deep dermis intact. The long straps transfer weight, transpose, reshape and increase breast projection. The short strap defines cleavage. The cephalad flap is advanced over the cone and the areola is delivered through a hole. Simultaneously fat grafting was injected in the pectoralis major muscle or in the cephalad flap. Secondary fat grafting was directed outside and inside the cone.

**Experience and Results:** A retrospective review from 38% of women was obtained at a mean follow up of 73 months. The mean age at explantation was 54 years and the

mean implant volume was 370 cm<sup>3</sup>. Explantation was performed in 40% for ruptured implants, 40% for cosmetic reasons and 20% for migraines. A hematoma required re-operation in one woman. Minor complications were dog ears, suture erosion, hard spots that resolved and left breast numbness. Two of thirteen women underwent simultaneous fat grafting and one secondary fat grafting. She was initially satisfied but became dissatisfied at 7 years. Results were excellent in 40%, good in 40% and fair in 20%. Quality of life improved in 100% and 100% would do it again. Nipple sensation increased in 60% and unchanged in 40%. Breast position, shape, projection and feel improved in 100%, 80%, 60% and 80% respectively. Breast symmetry was better in 60% and worse in 40%. Appearance in clothing and naked improved in 100% and 60% respectively. Sixty percent appeared thinner and 50% wore clothing they couldn't previously. Eighty percent could go braless. The areola and inframammary scars were acceptable in 100% and 0% requested revisions. Vertical scars prevented 60% from selecting other techniques. Sixty percent reported "being rid of implants" was their best result.

**Conclusion:** The almond pattern eliminates vertical scars and T junctions, while concealing scars at the areola-cutaneous junction and near the new inframammary fold. Explantation and auto projecting mastopexy has a high satisfaction rate and long-lasting results. Simultaneous and secondary fat grafting were unable to satisfy explantation volume loss.

### **Does Implant-Plane Affect Complications and Long-Term Rates of Revision in Breast Reconstruction? A Propensity Matched Analysis In a 10-Year Single-Surgeon Cohort**

Abstract Presenter: Lana Mamoun

Abstract Co-Author(s): Nikita Kadakia MD, Erin O'Rourke MD, Michael Boctor MD, Janine Myint MD, Hahns Kim MD

**Background:** Prepectoral plane for immediate implant-based breast reconstruction (IBBR) is gaining popularity. Variable data exists on differences in outcomes of prepectoral and subpectoral IBBR. Through our robust analysis in a large matched single-surgeon cohort, we aim to assess the postoperative and long-term outcomes of prepectoral versus subpectoral IBBR.

**Methods:** A retrospective review was conducted to identify patients who underwent immediate IBBR between 2013 to 2022 by a single surgeon at our institution. Patients were grouped into two groups, subpectoral versus prepectoral, and propensity score matched to control for comorbidities, and intraoperative variables. Immediate and long-term postoperative outcomes were analyzed.

**Results:** A total of 423 breast reconstructions were included (284 subpectoral and 139 prepectoral). After propensity score matching for comorbidities, adjuvant radiation, mastectomy (prophylactic vs therapeutic), and tissue expander use, 103 subpectoral and 103 prepectoral were analyzed for differences. The average follow-up time was 377.8 days (range, 31 to 1680 days). The subpectoral group had a significantly longer length of stay than the prepectoral group (1.48 days versus 0.4 days;  $p < 0.001$ ). In the matched cohorts, the prepectoral group had a higher rate of seromas (9.7% versus 21.8%;  $p = 0.02$ ). However, there was no significant difference in rates of explantation (12.6% versus 11.9%;  $p = 0.87$ ), hematoma (4.9% versus 3.0%,  $p = 0.72$ ), skin or nipple necrosis (9.7% versus 11.0%;  $p = 0.76$ ), or major (10.7% versus 9.1%;  $p = 0.71$ ) and minor (3.9% versus 5.9%;  $p = 0.54$ ) infections. For long-term outcomes in the matched cohort, there was no significant difference in the rate of capsular contracture (5.8% versus 1.0%;  $p = 0.12$ ), fat necrosis (1.95% versus 3.0%,  $p = 0.68$ ), and overall breast revision surgeries (43.7% versus 36.1%,  $p = 0.27$ ). In the matched cohorts, fat grafting rates were significantly higher in the subpectoral group (24.3% versus 12.9%;  $p = 0.04$ ). Subgroup analysis of radiated breasts showed no significant differences between reconstruction planes in long-term complications, breast revision surgeries (41.9% versus 35.5%;  $p = 0.58$ ) and fat graft rates (12.5% versus 6.1%;  $p = 0.48$ ).

**Conclusion:** Despite higher rates of seroma formation in the prepectoral group, the rate of major postoperative complications like explant, major infections, and long-term outcomes are similar for prepectoral and subpectoral IBBR, including patients receiving adjuvant radiation therapy. Additionally, prepectoral IBBR is associated with a shorter duration of hospital stay and secondary fat grafting. With appropriate patient selection, prepectoral IBBR may provide comparable results.

## **Bottoming Out: A Comparative Analysis of the Gravitational Effect on Silicone and Saline Breast Implants**

Abstract Presenter: Mitchell Gauger MD

Abstract Co-Author: Dennis Hammond MD

**Introduction:** Bottoming out is a well described phenomenon in both reconstructed and augmented breasts using implants. Over time, the soft tissue of the breast loses its structural integrity under the weight of a breast implant and the force of gravity. This causes preferential expansion of the breast's lower poles and can lead to implant malposition, nipple malposition, patient discomfort, and need for revision. This phenomenon happens with both saline and silicone breast implants, but many plastic surgeons anecdotally believe the frequency of bottoming out is greater with the use of saline implants. No comparative mechanical studies have been done to investigate this experience, however. Our hypothesis is that saline implants have a higher rate of bottoming out, as they impart more force on their surroundings compared to silicone implants. This study aims to develop a model of bottoming out, by examining the vertical force of silicone and saline breast implants dropped on to a force plate at varying heights.

**Methods:** Three silicone implants (Mentor MemoryGel Smooth Round High Profile Memory Gel: 250cc, 450cc, 650cc) and three saline implants (Mentor Smooth Round High Profile Saline: 250cc-300cc, 420cc – 500cc, 630cc-750cc) were chosen to act as matched comparisons. Silicone implants were weighed, and each corresponding saline implant was filled with saline solution to match the weight of the silicone implant. Implants were dropped from varying heights onto a force plate, and the vertical force of impact ( $F_z$ ) in Newtons was recorded. Each implant was dropped five times from the varying heights and the force averaged. Implants were dropped from 5cm, 10cm, 15cm, 20cm, 25cm, and 30cm to simulate the spectrum of vertical variation that a breast implants feels through normal day to day activities (i.e, walking, running, jumping). Repeated measure ANOVA was utilized to analyze the 3 main factors (material, implant weight, and drop height) and their interactions.

**Results:** Saline implants at all three weights, and from all five drops heights, imparted more vertical force on the force plate when compared to their matched silicone implant. The difference in force ( $F_z$ ) was found to be statistically significant at each implant weight and from all drop heights.

**Conclusion:** Saline implants, when dropped from varying heights impart more vertical

force compared to weight matched silicone implants. The inherent properties of silicone in a breast implant act as a shock absorber and translate less force onto its surroundings, particularly in the vertical dimension. This serves as an explanation for why bottoming out is anecdotally reported more with saline implants compared to silicone implants. These findings have significant implications when selecting the appropriate breast implant for a patient. Further studies are needed for clinical correlation.

### **Sensing the Difference: A Comparison of Objective and Subjective Tools in Assessing Sensory Preservation Following Reduction Mammoplasty**

Abstract Presenter: Malini Chinta MD

Abstract Co-Author(s): Sophia Arbuiso, Sophia Salingaros, Lujain Al-Emadi, Ashley Zhang, Kevin Pain, Isaiah Rhodes, Chase Alston, David Otterburn MD

**Purpose:** There has been notable interest in understanding changes in sensory recovery following reduction mammoplasty given its significance in post-operative patient satisfaction (1). Several techniques are used to assess changes in sensation including Semmes-Weinstein monofilament testing, transcutaneous mechanical stimulation, and pressure-specified sensory testing. Given this array of techniques, there is currently no universally accepted method for reporting post-operative sensation in reduction mammoplasty, underscoring the absence of a standardized approach. In this study, we aimed to elucidate the differences in objective and subjective measurements of sensory recovery after reduction mammoplasty and how those measurements relate to patient-reported satisfaction.

**Methods:** A systematic review was conducted using PRISMA methodology to identify all studies that report preoperative and postoperative sensation and patient satisfaction following reduction mammoplasty. Six databases including Scopus, Embase, and MEDLINE were searched using the OVID engine to identify all relevant articles published through October 2023. Each article that populated was screened by two independent reviewers. Patients who had reported either preserved or increased sensation of the breast and nipple areolar complex (NAC) as well as those who reported excellent, good, acceptable, or fair satisfaction were recorded from each article identified.

**Results:** Of the 1,294 articles reviewed, 39 articles met inclusion criteria. A total of 33 articles provided the data required to perform a quantitative analysis, three of which used objective measures of sensation (9.09%) and 30 of which used subjective measures (90.91%). Of the studies that used subjective measures of reporting sensory outcomes, an average of 75.96% (SD=7.07) of patients had preserved or increased sensation following reduction mammoplasty, which was significantly lower than the percentage of patients that were satisfied with the overall procedure (mean=86.49%, SD=13.82) ( $p=0.032$ ). Studies that used objective measures of reporting sensory outcomes, reported similar levels of sensation (mean=92.42%, SD=7.07) and satisfaction (mean=94.33%, SD=9.81) following reduction mammoplasty ( $p=0.80$ ).

**Conclusion:** Our analysis demonstrated that higher sensation scores were recorded following reduction mammoplasty when using objective measurements as opposed to subjective measurements. In the present literature, we identified few studies that use an objective means of recording sensation outcomes after mammoplasty reduction. This highlights the current paucity in objective sensation data and emphasizes the need for incorporation of objective sensation measurements in future studies. These data suggest that subjective patient-reported or physician-reported measures of sensation may be an underrepresentation of the true degree of sensory recovery and highlights the importance of standardizing sensation measurements. Objective measures should be utilized as the gold standard, so that sensation data can be most accurately reported and disseminated in the literature.

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## **Evaluation of Nipple Reconstruction on Long-Term Patient Satisfaction**

Abstract Presenter: Jacob Levy MD

Abstract Co-Author(s): Min Ji Kim, Nima Khavanin MD, Sameer Massand MD, Lillian Boe, Babak Mehrara MD, Jonas Nelson MD, Evan Matros MD, Carrie Stern MD

**Introduction:** Previous literature suggests that nipple-areolar complex (NAC) reconstruction improves patient satisfaction following breast reconstruction.<sup>1,2</sup> While



current literature highlights the positive impact of NAC reconstruction on patients' quality of life, there has yet to be a study that includes the pre-NAC reconstruction score and directly compares patients who underwent NAC reconstruction and those who did not opt for the procedure. This study aims to compare long-term patient-reported outcomes between patients who opt for NAC reconstruction and those who do not using the BREAST-Q.

**Methods:** A single-center, retrospective analysis of patients who underwent skin-sparing postmastectomy breast reconstruction between 2018 and 2021 was performed. NAC reconstruction included local skin flaps, grafts, and tattoos. The following BREAST-Q domains were reviewed: Physical Well-being of the Chest, Satisfaction with Breasts, Psychosocial Well-Being, and Sexual Well-Being. Scores at the following time points were collected: T0 (preoperative, before mastectomy) and T1. T1 was defined as 1 year after breast reconstruction for those without NAC reconstruction and 1 year after NAC reconstruction for the intervention cohort. A score difference of 4 was considered to be the minimally clinically important difference (MCID).

**Results:** 2,858 skin-sparing breast reconstruction patients were included, of which 1796 (63%) patients did not undergo NAC reconstruction, and 1,062 (37%) did elect for NAC reconstruction.

At T1, patients who underwent NAC reconstruction reported statistically and clinically higher BREAST-Q scores. This included higher scores for Physical Well-being of the Chest (65 [IQR: 55, 78] vs. 59 [49, 71],  $p < 0.001$ ); Satisfaction with Breasts (71 [59, 93] vs. 66 [53, 83],  $p < 0.001$ ); Psychosocial Well-Being (80 [68, 92] vs. 76 [60, 92],  $p < 0.001$ ); and Sexual Well-Being (56 [43, 66] vs. 50 [39, 66],  $p = 0.002$ ).

Differences in BREAST-Q scores between preoperative and 1-year postoperative time points were measured ( $\Delta T1-T0$ ). The change in scores was significantly different between the NAC reconstruction cohort and control cohort, favoring the NAC reconstruction cohort in all 4 BREAST-Q domains: Physical Well-being of the Chest (0 [IQR: -12, 13] vs. -7 [-20, 8],  $p < 0.001$ ); Satisfaction with Breasts (0 [-16, 14] vs. -4 [-20, 9],  $p = 0.023$ ); Psychosocial Well-Being (4 [-3, 18] vs. 1 [-13, 13],  $p = 0.008$ ); and Sexual Well-Being (7 [-8, 21] vs. 0 [-15, 16],  $p = 0.004$ ).

**Conclusion:** After skin-sparing mastectomy breast reconstruction, patients opting for NAC reconstruction reported statistically and clinically higher satisfaction in all four BREAST-Q domains. Patients may benefit from more in-depth conversations with their providers about NAC reconstruction's positive impact on their overall quality of life.

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## Prophylactic Buried Dermal Flap: A Simple Method to Enhance Comprehensive Axillary Reconstruction after Lymph Node Dissection

Abstract Presenter: Kasra Fallah MD

Abstract Co-Author(s): Shahnur Ahmed MD, Andrew Venardi MD, Luci Hulsman, Carla Fisher, Kandice Ludwig, Mary Lester MD, Al Hassanein MD, MMSc, FACS

**Background:** Lymphedema is characterized by progressive limb enlargement and affects around 5 million individuals in the United States. The most common etiology is breast cancer related lymphedema, which occurs in 30% of patients following axillary lymph node dissection (ALND). Immediate lymphatic reconstruction (ILR) can be performed at the time of ALND to decrease the risk of lymphedema by micro surgically anastomosing disrupted, afferent lymphatics to veins in the axilla. However, a dead space with soft tissue deficiency still exists, which can result in axillary tightness. This pilot study presents a novel method of comprehensive axillary lymphatic reconstruction following ALND using a buried dermal flap to eliminate axillary dead space and provide vascularized tissue with intact subdermal lymphatics.

**Methods:** A single-center retrospective review was performed to assess patients with breast cancer who underwent unilateral mastectomy and ALND without immediate reconstruction from January 2018 to December 2023. Patients were included if they had ILR attempted and were divided into two groups: Group 1 had ILR alone and Group 2 had ILR with the buried dermal flap. ILR was completed using standard techniques previously described to perform lymphovenous anastomosis for disrupted lymphatics in the axilla. The technique of our buried dermal flap involves harvesting a "random pattern" pedicled flap with a length-to-width ratio of approximately 2:1 from the

inferolateral edge of the mastectomy incision. The flap is de-epithelialized and transposed over the ILR and axillary dissection dead space. Indocyanine green (ICG) lymphangiography is used to confirm intact subdermal flap lymphatics. Two sample t-tests and chi-squared tests were performed for statistical analysis.

**Results:** There were 28 patients included in this study: 18 patients in Group 1 and 10 patients in Group 2. Patient demographics ( $p = 0.53$ ), comorbidities ( $p = 0.83$ ), and breast cancer type ( $p = 0.66$ ) were similar between the two groups. The primary indication for mastectomy with ALND was inflammatory breast carcinoma. There was no statistically significant difference in the mean number of lymphovenous anastomoses performed (1.6 vs. 1.7,  $p = 0.75$ ). Mean operative time of  $224.4 \pm 51.9$  minutes in Group 1 was similar to  $223.9 \pm 32.9$  minutes in Group 2 ( $p = 0.97$ ). None of the patients in Group 2 have developed any signs of lymphedema at 3-month follow up.

**Conclusion:** This study introduces a novel method of comprehensive axillary reconstruction following ALND using a buried dermal flap that is inset into the axilla over the ILR. The flap adds minimal operative time, which was not statistically significant. We propose that it is an efficient accessory procedure to augment ILR by providing supplementary intact lymphatic channels to the area of lymphatic injury, while obliterating the axillary dead space. Lymphangiogenesis to the flap may theoretically provide another outlet for lymphatic drainage, and the soft tissue can minimize axillary tightness. Future study includes analyzing outcome data in this patient population at follow up visits.

### **Achieving Textbook Outcomes in Bilateral DIEP Flap Breast Reconstruction: Does a Co-Surgeon Matter?**

Abstract Presenter: Robert DeVito MD

Abstract Co-Author(s): Colby Newson MD, Benjamin Ke, Jessica Pawly MD, Scott Hollenbeck MD, FACS, Chris Campbell MD, FACS, John Stranix MD

**Introduction:** It is essential to examine predictors of ideal outcomes in surgery. "Textbook outcomes" are optimal surgical results based on multiple quality measures. It is also important patients have access to trusted centers that consistently produce high quality surgical outcomes.

**Methods:** A retrospective review of all bilateral DIEP flap breast reconstructions at our institution from 2017 to 2022 was performed. Criteria for "textbook outcome" were OR time within one standard deviation of institutional average or less, length of stay

**Results:** Textbook outcomes occurred at a significantly higher rate in the co-surgeon cohort compared to the single surgeon cohort (79% vs. 57%,  $p = 0.025$ ). The average OR time was significantly shorter in the co-surgeon cohort compared to the single surgeon cohort (403 minutes vs. 572 minutes,  $p < 0.0001$ ), and elevated OR time was the most common reason for not achieving a textbook outcome. There were no differences in the other criteria for a "textbook outcome".

**Conclusion:** Textbook outcomes in bilateral DIEP flap breast reconstruction are achieved at significantly higher rates with a co-surgeon. This is primarily due significantly shorter OR times. Further research into factors affecting textbook outcomes is needed.

### **Use of Prophylactic Montelukast in Prevention of Repeat Capsular Contracture after Capsulectomy and Implant Exchange**

Abstract Presenter: Patrick O'Connor MD

Abstract Co-Author(s): Kiara Singer DO, Vincent Kaykaty DO, Marilyn Ng MD

**Background:** Despite advances in technology and techniques of the last 50 years, capsular contracture remains one of the most common complications after the placement of breast implants for both cosmetic and reconstructive surgery.<sup>1</sup> Montelukast and other leukotriene receptor antagonists have been suggested as a possible treatment, with improvement in both prevention and treatment of capsular contracture.<sup>2,3</sup> However, most in vivo studies concern patients undergoing cosmetic augmentation.<sup>4,5</sup> This study sought to explore capsular contracture in high-risk patients, including those with previous breast reconstruction at risk for recurrent capsular contracture.

**Methods:** A single institution, IRB-approved, retrospective study was performed. Data were collected on all patients that underwent peri-implant capsulectomy and implant replacement from 2019 to 2023 by a single surgeon. Patients were grouped into two cohorts: those who started montelukast prophylactically, and who did not. All patients underwent a similar surgical technique, including capsulectomy and implantation with or

without acellular dermal matrix using a "no-touch" technique. Patients were offered prophylactic montelukast therapy. The patients that received montelukast prophylactically did so during a three-month trial period. Prophylactic montelukast therapy was started within one month of surgery. Demographic data were collected on all patients, and the primary outcome was measured as Baker capsule grade at the preoperative visit, 3 months postoperatively, and at most recent follow up.

**Results:** A total of 35 patients met inclusion criteria for the study. The prophylactic montelukast cohort held 13 patients who agreed to therapy. The control cohort consisted of 22 patients. Preoperative and intraoperative characteristics showed no significant differences in demographic data, exposure to risk factors such as chemotherapy or radiation, location of initial implant, implant size, and use of acellular dermal matrices. There was a significant difference in both Baker grade at the three month follow up after capsulectomy and implant exchange for patients taking prophylactic leukotriene (1.54 vs 2.09,  $p=0.04$ ), as well as the absolute reduction in Baker grade from preoperative grade to final grade (2.45 vs 1.58,  $p<0.01$ ). Eight patients in the non-prophylactic cohort began taking montelukast therapy as treatment for capsular contracture, starting several months after their surgery. There were no reports of side effects in 21 patients taking montelukast. There was no significant difference in the use of indefinite montelukast therapy.

**Conclusion:** The present study indicates possible positive outcomes for montelukast therapy in prevention of capsular contracture for high-risk. The present study is limited by its size and retrospective nature. Larger, prospective studies are imperative to ascertain the efficacy of leukotriene receptor antagonists before advocating their widespread use alongside surgical intervention of severe capsular contracture.

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## **Assessing Lymphedema Following Autologous Breast Reconstruction: Can Timing of Procedure Reduce its Severity and Financial Burden?**

Abstract Presenter: Ethan Fung

Abstract Co-Author(s): Maheen Akhter MD, Shannon Francis, Dylan Singh MD, Claudy Sarpong, Ashtyn Moser, Kassandra Carrion, Oscar Manrique, MD, CPE, FACS, Dung Nguyen MD, Rahim Nazerali MD

**Background:** Post-mastectomy lymphedema syndrome (PMLS) is a chronic condition characterized by extremity and torso swelling, impacting many who undergo mastectomy. Autologous breast reconstruction (ABR) has been shown to reduce the incidence and severity of PMLS, although it is still highly prevalent and burdensome. The management of PMLS can be very costly to patients long-term. We aimed to compare PMLS complications and costs among patients who underwent immediate, delayed-immediate, and delayed ABR to determine whether timing of reconstruction impacts burden of care in PMLS.

**Methods:** Merative™ MarketScan® Research Databases were queried for women aged 18 years and older with a history of mastectomy and subsequent PMLS diagnosis from 2007 to 2019. Patients were stratified by the timing of their ABR relative to mastectomy. They were then evaluated for the severity of disease, as shown by complications secondary to PMLS and the rates of non-operative and operative management. The cost of care associated with these complications, procedures, and visits were also examined. Differences between groups were determined using one-way ANOVA and associations were determined via multivariate logistic regression models.

**Results:** A total of 11,491 subjects were included in the study. Most subjects with

PMLS had undergone mastectomy without subsequent breast reconstruction (93.1%). Of those who pursued ABR, most underwent immediate reconstruction (5.2%), followed by delayed-immediate (1.3%), and delayed (0.3%) ABR. Immediate ABR patients had the highest rates of diabetes ( $p = 0.003$ ) and obesity ( $p = 0.051$ ). Among complications secondary to PMLS, those who underwent immediate ABR most often developed lymphangitis ( $p = 0.016$ ). Other PMLS complications, including cellulitis, lymphadenitis, deep vein thrombosis, and superficial infection, were observed at similar rates among the three groups. Delayed-immediate ABR patients required the least non-operative management for PMLS ( $p = 0.012$ ) and had decreased odds of undergoing non-operative management (OR = 0.57, 95% CI: 0.39-0.85). In contrast, delayed ABR patients required the most operative management for PMLS ( $p = 0.046$ ), particularly for suction-assisted lipectomy ( $p < 0.001$ ). Across all three groups, there were no significant associations between the timing of ABR and the likelihood of undergoing vascularized lymph node transfer (VLNT) or lymphovenous bypass (LVB) for operative management of PMLS. The overall cost of care for both operative and non-operative management of PMLS did not significantly differ based on the timing of ABR.

**Conclusion:** Our study concludes that the timing of ABR relative to mastectomy does not significantly impact the severity and cost of PMLS. However, slight variations in the rate of complications secondary to PMLS are evident between the three groups, as are variations in the need for non-operative and operative management. Further characterization of the patient population may provide context towards any socioeconomic imbalances that drive these outcomes. Importantly, our findings revealed that the bulk of expenses related to PMLS are attributed to the cost of undergoing conservative management, including occupational therapy visits, diagnostic imaging, and bandaging supplies or compression garments. In summary, we recommend prioritizing early diagnosis and management of PMLS to prevent exorbitant health and financial burdens, irrespective of ABR timing.

## **Phase 1: Social Determinants of Health in Breast Reconstruction Outcomes**

Abstract Presenter: Diana Griffin

Abstract Co-Author(s): Tokoya Williams MD, Bradley Melnick, May Li, Abigail Uryga, Abbey Landini, Angelica Bartler, Robert Galiano MD

**PURPOSE:** New surgical techniques are giving patients and physicians more procedural options for post-mastectomy breast reconstruction (BR). There are two

major categories for BR type: implant based & autologous flaps. The rate of post-mastectomy BR has also slowly increased over the past decade, resulting in improved cosmetic outcomes, increased psychological well-being, and increased quality of life. However, the rate of BR and medical comorbidities continues to differ significantly among White, Black, Latina, and Asian patients. There exists limited research on the intersection of BR Patient Reported Outcomes (PROs) and the following four factors: 1) Social Determinants of Health (SDH) 2) Race 3) BR Type 4) Complications.

This study aims to assess the impact of SDH, race, and type of BR on complication profiles and on PROs. Phase 1 of this study specifically explores the impact of SDH and race on PROs.

**METHODS:** Patients who underwent a breast reconstruction post-mastectomy from January 2011 to February 2024 and present to the Northwestern Plastic Surgery Clinic are recruited prospectively to fill out two validated BREAST-Q Reconstruction Module Pre- and Postoperative Scales: Psychosocial Well-Being and Satisfaction with Breasts. Additional survey responses include race/ethnicity, income, insurance, housing status, transportation and food access, safety, address, & health literacy. The correlation between these factors with PROs is assessed. Participant addresses are converted to 2022 National Social Vulnerability Index (SVI) and domicile-to-clinic distance is calculated. SVI scores range from 1 to 1,000 with higher scores indicating greater socioeconomic disadvantage. A total of 31 patients were recruited for phase 1.

**RESULTS:** Respondents identified as African American (AA)/Black (5), Hispanic/Latino (2), White (23), and Asian (2). Thirty participants reported addresses within 140 miles of the clinic, with one respondent reporting an address 987 miles away. No significant correlations were found for the group at large between distance traveled, SVIs, and BREAST-Q subscale scores. However, the SVI comparisons indicate that AA/Black respondents were twice as likely to come from disadvantaged neighborhoods compared to other respondents. The data show, for AA/Black individuals, there may be a correlation between distance travelled versus SVI, Well-Being, and Satisfaction with Breasts, indicating that those respondents further away were more likely to be from disadvantaged neighborhoods yet more satisfied with the results of the surveys than non-AA/Black respondents. Similarly, there was a positive influence between SVI versus Psychosocial Well-Being and versus Satisfaction with Breasts noted for AA/Black respondents while non-AA/Black participants had the opposite experience.

**CONCLUSION:** Despite no significant correlations between distance traveled, SVI, or BREAST-Q scores for the group at large, this study confirms further investigation into SDH influence will be beneficial. While previous studies have focused on the impact of



race, Phase 1 analysis indicates that research should consider domicile socioeconomic factors as perhaps a greater influence for identifying driving factors of BR satisfaction. Phase 1 was intended to identify key factors for consideration in subsequent research. We hope to eventually provide insight into unique challenges of racial minorities navigating the BR pathway, which may inform interventions for improving surgical outcomes of women of color.

## **Prepectoral, Direct-to-Implant Breast Reconstruction: The Role of Vascular Delay and Autologous Dermal Flaps in the Setting of Obesity and Breast Ptosis**

Abstract Presenter: Caitrin Curtis MD

Abstract Co-Author(s): Mary Duet MD, Adam Katz MD

**Background:** Direct-to-implant prepectoral breast reconstruction is becoming increasingly favored (Safran et al., 2019). The reliability and safety of variables such as timing and device placement in this setting continue to evolve in the literature. These considerations are even more controversial in the setting of obesity and breast ptosis due to a concern for increased perioperative morbidity (Bonomi et al., 2019). The goal of this study was to review surgical outcomes after direct to implant, prepectoral breast reconstruction in a patient population with a wide range of body mass indices (BMI).

**Methods:** A retrospective review of patients who underwent prepectoral, direct-to-implant breast reconstruction from May 2019 – July 2022 by a single surgeon was conducted. Patient demographics, medical history, operative course, and postoperative complications were reviewed. Major complications were defined as instances necessitating a return to the operating room. Patients were categorized by BMI, with subgroups of less than or greater than 30 kg/m<sup>2</sup>. An additional analysis of patients who underwent skin reducing mastectomy was performed.

**Results:** Thirty-one patients (54 breasts) were included, with an average BMI of 30 kg/m<sup>2</sup>. Mastectomy types comprised wise pattern skin reducing including elevation of an inferiorly based adipodermal flap (55%), skin sparing (33%), and nipple sparing (9%). Immediate reconstruction was performed in 58% of cases, while 42% required a vascular delay (greater than 2 weeks, but less than 30 days). Sixteen patients had a BMI less than 30 kg/m<sup>2</sup>, while 15 patients had a BMI greater than 30 kg/m<sup>2</sup>. Major complication rates were comparable in the lower BMI and higher BMI groups at 32% and 20%, respectively. In the skin reducing mastectomy analysis, major complication

rates of the lower and higher BMI groups were 38% and 13%, respectively.

**Conclusions:** Our study demonstrates that prepectoral direct-to-implant breast reconstruction is a viable option for patients with varying body mass indices, including those with a BMI greater than 30 kg/m<sup>2</sup>. Despite concerns about increased perioperative morbidity in this population, our findings suggest that complication rates are comparable to those reported in the literature (Castagnetti et al., 2022), (Safran et al., 2021). Further research is necessary to validate these findings and provide more robust evidence regarding the outcomes of prepectoral reconstruction in patients with obesity and breast ptosis.

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## **Dose the Omission of Cefazolin in Irrigation Solution Affect Outcomes in Prepectoral Direct-to-Implant Breast Reconstruction?**

Abstract Presenter: Jongkoo Lee

Abstract Co-Author: Kyeong-Tae Lee MD

**Introduction:** Breast reconstruction surgery, particularly implant-based procedures, often involves the use of a triple-antibiotics irrigation solution to reduce the risks of infection and capsular contracture. However, concerns have arisen regarding the continued efficacy of cefazolin, a key component of this solution, due to the emergence of cefazolin-resistant gram-positive bacteria. This study aims to assess the safety and efficacy of excluding cefazolin from the triple-antibiotics irrigation regimen in prepectoral direct-to-implant breast reconstruction.

**Method:** A retrospective analysis was conducted on patients who underwent immediate prepectoral direct-to-implant breast reconstruction between September 2020 and April 2022 at Samsung Medical Center. Patients were categorized into two groups based on the irrigation solution utilized during surgery: the triple-antibiotics group, consisting of cefazolin, gentamycin, and povidone-iodine, and the dual-antibiotics group, which omitted cefazolin but included gentamycin and povidone-iodine. Data regarding postoperative complications, including infections and capsular contracture, were collected. Statistical analyses were performed to compare complication rates between the two groups and to evaluate the independent associations between irrigation type and adverse outcomes.

**Result:** A total of 445 cases were included in the analysis, with 126 cases in the triple-antibiotics group and 319 cases in the dual-antibiotics group. The mean follow-up period was 12 months. Overall, complications occurred in 28.3% of cases, including 2.7% infections and 7.2% capsular contracture. However, there was no significant difference in complication rates between the two groups. Multivariable analysis further confirmed that irrigation type was not associated with the development of overall complications, infections, or capsular contracture.

**Conclusion:** The exclusion of cefazolin from the triple-antibiotics irrigation solution did not appear to increase the risks of infection or capsular contracture in prepectoral direct-to-implant breast reconstruction. These findings suggest that cefazolin may not be indispensable in irrigation solutions for this procedure. However, further long-term studies are warranted to validate the safety and efficacy of omitting cefazolin and to

provide more comprehensive insights into the optimal antimicrobial regimen for breast reconstruction surgeries.

## **Impact of Animation Deformity on Patient-Reported Breast Reconstruction Outcomes: A Comparison of Subpectoral vs. Prepectoral Planes**

Abstract Presenter: Ryoko Hamaguchi MD

Abstract Co-Author(s): Nicholas Leung, Olivia Ford MD, Tanujit Dey PhD, Yoon Chun MD

**Purpose:** Implants are the most common method of post-mastectomy breast reconstruction in the United States. The ideal plane and position of tissue expander/implant placement has become a critical consideration in surgical decision-making between the surgeon and patient. While prepectoral implant-based reconstruction (IBR) has recently become popularized to avoid animation deformity (AD) typically associated with subpectoral IBR, there is a paucity of high-quality evidence comparing outcomes and impact specifically on patient satisfaction. This study aims to evaluate the impact of AD on patient-reported outcomes (PRO) by comparing two-stage prepectoral vs. subpectoral reconstruction.

**Methods:** In this retrospective study, patients who underwent two-stage tissue expander to implant breast reconstruction between August 2019 to December 2022 were divided into prepectoral or subpectoral groups; and demographics, co-morbidities, and complication data were collected. Eligible patients were asked to complete the BREAST-Q Animation Deformity scale and Reconstruction-Postoperative modules. Mean and standard deviation were used to report descriptive statistics. A t-test was used to assess differences in scores between the two groups.

**Results:** Among 82 patients, 33 and 49 patients underwent two-stage prepectoral and subpectoral IBR, respectively, with comparable complications and revision rates. As expected, the subpectoral cohort had a lower (worse) Animation Deformity Scale score compared to prepectoral ( $72 \pm 19$  vs.  $83 \pm 15$ ,  $p=0.004$ ), consistent with greater AD. Interestingly, despite the difference in AD PRO between the two groups, there was no statistically significant difference in BREAST-Q scores for Satisfaction with Breasts ( $p=0.3$ ), Physical Well-Being: Chest ( $p=0.8$ ), or Satisfaction with Implants ( $p=0.065$ ). However, Psychosocial Well-Being and Sexual Well-Being scores were significantly higher in the prepectoral cohort ( $p=0.019$  &  $p=0.009$  respectively).

**Conclusions:** Although animation deformity is associated with subpectoral IBR, it does not appear to impact overall breast reconstruction satisfaction based on PRO. However, prepectoral IBR demonstrated higher psychosocial and sexual well-being scores. While requiring further investigation, this work provides valuable data to enhance informed decision-making regarding the optimal IBR tissue plane and demonstrates the need for thoughtful risk-benefit analysis by incorporating both clinical factors and PRO.

## **Reducing the Cost of Mastectomy with Reconstruction Using a Goldilocks Mastectomy Technique**

Abstract Presenter: Kerry Gaffney MD

Abstract Co-Author(s): Elsa Chahine MD, Austin Olano, Aneesh Bahadur, Salvatore Nardello, Christopher Homsy MD, Abhishek Chatterjee MD,MBA, Sarah Persing MD, MPH

**Purpose:** The Goldilocks mastectomy (GM) utilizes a Wise-pattern skin excision creating a de-epithelized inferior dermal flap that can act as a replacement for acellular dermal matrix (ADM) products. In this case series, both autologous and implant reconstructive options were included with the aim to present how our modifications have decreased cost without sacrificing surgical outcomes.

**Methods:** A retrospective review was performed for all patients who underwent a mastectomy from April, 2022 to December, 2023, both traditional and goldilocks procedures. No patients were excluded based on age, co-morbidities, or BMI. Primary outcomes were the raw cost of the procedure and complications rates.

**Results:** A total of 52 patients (91 breasts) were included in this study, with 36 undergoing a GM. Average age was 48 years and average BMI was 27.6 kg/cm<sup>2</sup>. Half the patients (47%) had delayed implant reconstruction, 33% had delayed autologous free-flap reconstruction with the remainder undergoing immediate autologous reconstruction. ADM was required in 33% of patients undergoing traditional mastectomy with an average raw cost of \$18,414. The GM cohort utilized ADM in 12% of cases leading to an average cost of \$7,462 demonstrating a significant difference ( $p < 0.001$ ). Only 4 out of the 36 GM (11%) patients experienced clinically significant complications.

**Conclusion:** The Goldilocks mastectomy using an inferior dermal pedicle is a safe

technique that provides an optimal mastectomy pocket for breast reconstruction by using autologous tissue for prosthesis coverage, which significantly decreases the overall price of the procedure without compromising surgical outcomes.

## **Results of 552 cases of therapeutic mammoplasty for breast tumors**

Abstract Presenter: Alexandra Grubnik MD

Abstract Co-Author: Edward Lee MD

**Background:** Therapeutic mammoplasty (TM) for breast tumors is a widely practiced and versatile oncoplastic technique. The aim of our review was to analyze oncological and aesthetic outcomes over a 7 year period.

**Materials and Methods:** Retrospective chart review of 552 patients who underwent TM from June 2015 to December 2021 with the author was completed. Data recorded included demographics, surgical techniques, operative time, risk factors, histological findings and details of adjuvant therapy. Wound healing risk factors assessed included smoking, obesity, diabetes, adjuvant therapy. Outcome measures included complication rate (early and late), duration of follow up, recurrence rate, mortality rate, cosmetic results, and patient satisfaction. Primary chemotherapy was used to downsize large tumors. Intra-operative margin assessment was performed in all patients with breast cancer. Cosmetic outcomes were assessed by evaluation of photographs by an independent review panel.

**Results:** 87% of the patients underwent TM for breast cancer, 13% had benign tumors. 118 (21.4%) of the cancer patients received primary chemotherapy. Intraoperative radiation therapy (IORT) was performed in 111 (20.1%) of patients. Mean tumor size was 15.9 mm. Mean resection weight was 259 g. Mean margin taken was 16 mm. Back to OR rate was 1.6% (9 cases). Contralateral occult disease was identified in 11 cases (2.2%). Early complication rate (<2 months) was 2.9% (16 cases). Late complication rate (> 2 months) was 5.7% (31 cases). Mean follow up was 42 months. Recurrence rate was 3.8%. Mortality rate was 3.1%. Overall survival was 96.4% and disease-free survival 94.2%. Excellent and good aesthetic results were achieved in 93.8%. Patient satisfaction was 92%.

**Conclusion:** TM is a versatile technique that can safely address tumors in all breast quadrants due to multitude of available pedicles. It is an oncologically appropriate and cosmetically favorable technique. Primary chemotherapy allowed for TM in patients with

large tumor-to-breast ratio at presentation. Intraoperative margin assessment was imperative for increasing re-operation rates. TM addresses breast ptosis, asymmetry, and improves breast contour which results in high patient satisfaction due to improved breast appearance.

## **Evaluating the Accuracy of 3D Modelling Using VECTRA for Breast Augmentation**

Abstract Presenter: Elisabeth Lorange MD

Abstract Co-Author(s): Noah Oiknine, Gabriel Bouhadana MD, Msc, Daniel Borsuk MD, MBA, FRCSC, FACS

**Purposes:** Breast augmentation is one of the most performed surgical procedures in the field of plastic surgery, yet it is associated with a significant re-operation rate of 15% to 20% within three years. This underscores issues with patient education, implant selection, and pre-operative planning (1). Recent advancements in 3D imaging, such as VECTRA 3D, enhance breast augmentation simulations, assisting both patients and surgeons in preoperative planning. This study evaluated the accuracy of VECTRA 3D volume and linear measurements simulations compared to postoperative outcomes and examined how demographics and surgical factors influence accuracy. Validating the tool's precision would significantly enhance the doctor-patient partnership, patient education, and ultimately patient satisfaction (2).

**Methods:** A prospective cohort study was conducted from January 2021 to December 2022, involving 78 patients and 154 breasts whose primary breast augmentation surgeries were simulated using VECTRA 3D's algorithm. A predictive volumetric accuracy analysis was performed, with a precision threshold set at  $\pm 10\%$  of the postoperative volume (3).

**Results:** 73% of breasts were accurately predicted within  $\pm 10\%$  error, with an absolute difference between methods of 39.44cc or 7.52%. Postoperative breast volume averaged 521.2cc, while forecasted volume was 529.2cc, with a 1.49% relative volume difference (p-value = 0.07), indicating slight overestimation. Precision decreases with larger postoperative breasts (>650cc). Notably, Nipple-IMF measurement had the highest difference (8.7%,  $p < 0.001$ ), while Sternal-Nipple had the lowest (2.4%,  $p = 0.64$ ). BMI and preoperative breast volume influenced accuracy.

**Conclusion:** VECTRA 3D is generally reliable for forecasting postoperative breast volumes. Accuracy declines as the volume of postoperative breast augmentation increases. Surgeons should consider BMI and preoperative breast volume when using this tool. VECTRA remains valuable for patient consultations, improving education, communication, and surgical outcomes.

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## **Craniofacial/ Head and Neck**

### **Bone to Soft Tissue Changes Following Box Osteotomy and Facial Bipartition for Surgical Correction of Hypertelorism: A Three-dimensional Analysis**

Abstract Presenter: Idean Roohani

Abstract Co-Author(s): Tayla Moshal, Sasha Lasky, Marah Jolibois, Eric Nagengast MD, Jeffrey Hammoudeh MD, Mark Urata MD

**PURPOSE:** Box osteotomy (BO) or facial bipartition (FB) are used for the surgical correction of hypertelorism. Both procedures have been shown to successfully reduce interdacryon distance and the overlying soft tissue. There is a paucity in the literature assessing the degree to which bony resection translates into soft tissue movement. This study analyzes the bony and soft tissue changes achieved with BO and FB.

**METHODS:** A retrospective review was conducted evaluating patients who underwent BO or FB at our institution from 2005-2023. Demographics, medical history, and perioperative data were recorded. Correction of the interdacryon distance and intercanthal distance were measured on pre- and post-operative computed tomography scans. Three-dimensional craniometric data was derived using Mimics software. Paired and Independent t-tests were utilized. The ratio of bone-to-soft tissue change was



computed by calculating the change in the intercanthal distance for every 1mm change in the interdacryon distance.

**RESULTS:** Twenty-nine patients were included, of which 20 underwent FB and 9 BO. There was a significant improvement in the interdacryon distance (28.8mm to 22.1mm;  $p<0.001$ ) and intercanthal distance (43.5mm to 38.2mm;  $p<0.001$ ) for FB patients. Similarly, there was a significant improvement in the interdacryon distance (37.1mm to 25.8mm;  $p<0.001$ ) and intercanthal distance (47.7mm to 39.9mm;  $p<0.001$ ) for BO patients. The percent change in the interdacryon distance was 22.4% (FB) and 30.4% (BO;  $p=0.017$ ), whereas the percent change in the intercanthal distance was 11.0% (FB) and 14.7% (BO,  $p=0.193$ ). The ratio of bone-to-soft tissue change was 1-to-0.8 across both cohorts (BO: 1-to-0.9, FB: 1-to-0.7;  $p=0.502$ ).

**CONCLUSIONS:** Box osteotomy and facial bipartition effectively correct hypertelorism, demonstrating significant bone and soft tissue changes. Our findings revealed that 1mm of interorbital bone resection correlated with 0.8mm change in the overlying soft tissue for both hypertelorism-correcting procedures.

## **A Geographic Needs Assessment for Approved Cleft Care in the United States**

Abstract Presenter: Matthew Parham

Abstract Co-Author(s): Austin Williams, Sarah Layon, Heather Burns MD, Amjed Abu-Ghname MD, Larry Hollier, MD

**Background:** Geographic Information Systems (GIS) have evolved as a powerful tool for characterizing epidemiological trends, patterns of care utilization, and limitations in care access. Patients with cleft lip and/or palate (CL/P) require long-term care, with numerous surgeries and therapies to treat the aesthetic and functional consequences of their diagnosis (1). Access to appropriate and timely cleft care depends on a variety of factors. In addition to physical distance, cleft epidemiology, race, financial disparities, and social history can negatively affect a patient's ability to receive care. In this study we utilize population level analysis and GIS to generate a demand index for approved cleft care within the United States (US).

**Methods:** All births between 2018-2022 were queried from the National Vital Statistics System (NVSS) Restricted-Use Vital Statistics Data. For each US county, CL/P birth prevalence per 10,000 births and population density were calculated. The Social

Vulnerability Index (SVI) was utilized to account for the degree of social inequality for each county (2). Approved cleft centers were identified from the ACPA website and geocoded to calculate driving distances between county centroids and the nearest center. Birth prevalence, population density, SVI, distance to the nearest center, and centers within a 50km radius were used to generate a composite score of cleft demand.

**Results:** Nine hundred and seventy counties had a score less than 25, 1930 counties had scores between 25 and 49.99, 172 counties had scores between 50 and 74.99, and 59 counties had scores between 75 and 100. The highest scoring county, Bibb County, GA had a CL/P birth prevalence of 16.2 per 10,000 births, population density of 241.46 persons per km<sup>2</sup>, distance to the nearest cleft center of 207.69 km, and an SVI of 0.96. Nevada (83.6), Montana (76.0), and Georgia (74.1) were the states with the highest average demand scores.

**Conclusions:** Understanding the interplay between the numerous spatial and non-spatial barriers to care is crucial to optimize care delivery. Our composite score quantifies cleft burden, socioeconomic disadvantage, and geographic barriers to provide a measure of the of demand for approved cleft care in each US county. By describing the geospatial relation of these barriers, our study demonstrates the power of GIS for identifying areas with limited access to approved cleft care teams. Demand indices, like this, have demonstrated a variety of applications in health policy, research, and administration to expand access to patients not covered by local supply (3). Utilizing these score components can help tailor future ACPA interventions, outreach efforts, and planning of cleft care centers.

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## **Fever Following Open Surgical Repair of Craniosynostosis**

Abstract Presenter: Ambroise Gilles MD

Abstract Co-Author(s): Madison Oxford, Andrea Hiller MD, Elias Rizk, Thomas Samson MD,  
Destin Groff MD

**Background:** Post-operative fever is a known complication following open surgical repair of craniosynostosis. However, its etiology, risk factors, and clinical significance is poorly understood. This often results in additional work-up and patient cost. The aim of this study is to address the incidence, potential risk factors, and subsequent complications associated with fever following open surgical repair of craniosynostosis.

**Methods:** A retrospective review of all patients who underwent open surgical correction of craniosynostosis at Hershey Medical Center between January 2017 and December 2022 was performed. Post-operative hyperthermia was defined as a temperature above 38°C. Logistic regression and Wilcoxon rank-sum tests were performed for analyses.

**Results:** Of the 75 patients included, 23 (30%) developed a post-operative fever. Average time to onset was 25 hours after surgery (range: 0.5-54hr) with an average time to maximum temperature of 30.96 hours (range: 1.5-54.5hr). Maximum temperatures ranged from 38.2-39.6°C with an average of 38.6°C. Only one child underwent an infectious work-up including CBC, urinalysis, respiratory viral panel, COVID19, chest X-ray and head imaging with no infectious source identified. Only one child was given prophylactic post-operative antibiotics due to multiple concurrent procedures. The other 22 children in the fever group had resolution of the temperature with Tylenol alone within 14.75 hours from fever onset, on average. Of the patients who developed a fever, 5 (27.1%) sustained iatrogenic dural violation during surgery. There was no association between intraoperative durotomy ( $p=0.52$ ), estimated blood loss ( $p=0.42$ ), intra-operative blood administration ( $p=0.68$ ), weight ( $p=0.39$ ), or age ( $p=0.19$ ) and development of post-operative fever. Fever development was not associated with development of post-operative complications within one year, return to operating room, 30-day readmission ( $p=0.38$ ) or increased hospital length of stay ( $p=0.20$ ).

**Conclusions:** Approximately 1/3 of children developed post-operative fever following open surgical repair of craniosynostosis. These fevers resolved spontaneously or with the aid of Tylenol. Intraoperative durotomy, EBL, and blood administration were not associated with fever. Post-operative fever was not associated with post-operative complications or 30-day readmission. These results support hyperthermia as part of the

natural post-operative course of craniosynostosis repair. They also provide support for withholding routine fever work-up to decrease unnecessary testing and financial burden, unless otherwise clinically warranted.

## **Long-Term Effects of Presurgical Nasoalveolar Molding on Sagittal Midface Growth in Patients with Unilateral Cleft Lip and Palate: A Systematic Review and Meta-Analysis**

Abstract Presenter: Tayla Moshal

Abstract Co-Author(s): Idean Roohani, Marah Jolibois, Sasha Lasky, Artur Manasyan, Priyanka Naidu MD, Naikhoba Munabi MD, Mark Urata MD, Jeffrey Hammoudeh MD, William Magee, III MD, DDS

**Background:** Nasoalveolar molding (NAM) has been used to optimize outcomes in patients with cleft lip and palate (CLP) deformities, particularly for those with wider clefts. While this presurgical intervention has been associated with improved surgical outcomes, its effect on long-term postoperative outcomes, such as midface hypoplasia (MFH), is poorly understood. This study analyzes aggregate cephalometric data to assess long-term MFH among patients with complete unilateral CLP (CUCLP) who undergo NAM.

**Patients and Methods:** A systematic review was conducted following PRISMA guidelines. Studies reporting cephalometric measurements from lateral radiographs of patients with repaired CUCLP who underwent presurgical NAM versus no-PSIO (control) were included. Studies of bilateral cleft cases or unoperated clefts were excluded. Cephalometrics were assessed by pooled analysis and meta-analysis.

**Results:** A total of 2,063 articles were identified; five met the inclusion criteria. Post-operative cephalometrics were reported for 381 patients (176 NAM, 205 no-PSIO) at an average age of  $9.7 \pm 2.9$  years. Pooled analysis of the NAM and no-PSIO cohorts revealed that the NAM cohort had significantly smaller SNA angles ( $76.5^\circ \pm 6.7^\circ$  vs.  $78.2^\circ \pm 4.0^\circ$ ;  $p < 0.001$ ) and smaller ANB angles ( $1.4^\circ \pm 5.1^\circ$  vs.  $3.3^\circ \pm 2.8^\circ$ ;  $p = 0.002$ ). A subanalysis of patients with cephalometrics at eight years or older was performed ( $n = 249$  patients,  $11.7 \pm 4.0$  years). Compared to controls, the NAM cohort had significantly smaller SNA angles ( $74.6^\circ \pm 8.0^\circ$  vs.  $77.6^\circ \pm 4.4^\circ$ ;  $p < 0.001$ ) and smaller ANB angles ( $-0.8^\circ \pm 6.0^\circ$  vs.  $5.2^\circ \pm 3.7^\circ$ ;  $p < 0.001$ ). Meta-analysis further demonstrated that NAM was associated with a smaller SNA angle (Mean Difference [MD]  $-2.32$ ,  $[-3.8$  to  $-0.84]$ ;  $p < 0.01$ ) and ANB angle (MD  $-2.60$   $[-3.72$  to  $-1.48]$ ;  $p < 0.01$ ).

**Conclusion:** This study reveals that patients with CUCLP treated with presurgical NAM had greater MFH than those without PSIO treatment. Before opting for NAM, clinicians should consider the potential sagittal growth restrictions experienced by patients with CLP, evaluate severity, and balance the need for NAM with the possible need for future orthognathic surgeries. Further evaluation of other interventions along the cleft care timeline for their effect on MFH is warranted, as this study only assesses one presurgical treatment modality.

## **Pediatric Head and Neck Free Flap Reconstruction: A 6-Year Experience**

Abstract Presenter: Austin Williams

Abstract Co-Author(s): Brody King MD, Daniel Wang, Ricardo Alfaro Zeledon, Marco Maricevich MD,

William Pederson MD, Edward Buchanan MD, Amy Xue MD, Renata Maricevich MD

**Background:** Free flap reconstruction for pediatric head and neck defects poses unique operative and postoperative challenges. Successful reconstruction requires multidisciplinary care with consideration given to the patient's future growth and the effects of oncologic care on wound healing and repeat operations (1). This study aims to describe the reconstructive techniques and outcomes for pediatric patients undergoing head and neck reconstruction.

**Methods:** A retrospective chart review was conducted for all pediatric patients undergoing head and neck reconstruction from January 2017 to September 2023 at a tertiary pediatric hospital. Information on patient demographics, oncologic history, reconstructive approach including flap choice and recipient vessel selection, perioperative data, and complications were collected. Descriptive statistical analysis was performed.

**Results:** Of the 51 patients included in this study, 58.8% were male, and the average age was 11.7 years old (std 5.8). Oncologic defects comprised 66.7% of the cohort, most commonly in the maxilla (50.0%) and mandible (32.8%). 47.1% of oncologic defects were benign lesions, while 52.9% were malignant. Traumatic (15.7%) and congenital (13.7%) defects were also reconstructed. Free flap reconstruction was necessary in 94.1% of patients, with the most common flaps including the anterolateral thigh flap (35.4%), fibula flap (25.0%), and radial forearm flap (12.5%). The facial artery and vein were used as the recipient vessels in 72.9% of cases. Hardware, including

plates, screws, and titanium mesh was used in 56.9% of cases. Operative time averaged 8.3 hours, with 10.1 hours of total anesthesia time.

Postoperatively, 92.2% were admitted to the Pediatric Intensive Care Unit and the remainder were transferred to the floor. Return to the OR for flap compromise was required for 20.8% of patients, with flap salvage successful in 45.5% of attempts. Recipient-site dehiscence was the most common complication (22.9%), followed by recipient-site infection (4.2%), donor-site dehiscence (4.2%), hematoma (4.2%), and seroma (4.2%). Partial flap loss was seen in 14.6% of patients and total flap loss in 6.3% of patients. 11 patients (22.9%) returned to the operating room to address a complication or harvest new flap, on average 23.9 days after their initial surgery. The average ICU stay was 8.4 days, with an average length of stay of 13.9 days. The average length of follow-up was 1.6 years. Survival within this cohort is 94.1%.

**Conclusion:** Free flap reconstruction is the standard of care for pediatric head and neck oncologic, traumatic, and congenital defects. Maxillectomy and mandibulectomy are the two most common procedures requiring free flap reconstruction, with the ALT and fibula flap being the most common choice. With multidisciplinary care, both successful surgical outcomes

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## The Natural History of Mild Macroglossia in Beckwith-Wiedemann Syndrome

Abstract Presenter: Dominic Romeo

Abstract Co-Author(s): Connor Wagner MD, Manisha Banala, Dr. Benjamin Massenburg MD, Jinggang Ng, Meagan Wu, Andrew George, Eric Chien-Wei Liao MD, PhD, Jennifer Kalish, Jesse Taylor MD

**Background:** Beckwith-Wiedemann Syndrome (BWS) is a congenital overgrowth and cancer predisposition disorder that presents with macroglossia in 85% of affected patients. While roughly 25% of patients with BWS require tongue reduction surgery, the natural history of mild macroglossia is not well characterized.

**Methods:** Medical records of patients with BWS and macroglossia seen between 2004-2024 were reviewed. BWS index of macroglossia (BIG) scores were prospectively assigned. Molecular diagnoses, polysomnography (PSG) data, surgical incidence, percentage mosaicism, and clinical scores were assessed using two-tailed t-tests and multivariate linear models.

**Results:** A total of 335 patients with BWS and macroglossia were included, 176 (52.5%) males and 159 (47.5%) females. Within this cohort, 242 patients who did not require surgery in the first three years of life were followed in our clinic, 152 (45.4%) had sleep studies, and 161 (48.1%) were assigned BIG scores. Among non-surgically managed patients with two sleep studies, their obstructive apnea-hypoxia index (OAHl, 7.2 (1.8-12.7) vs. 3.9 (1.9-6.6),  $p=0.022$ ) decreased over time. Similarly, BIG score (2 (1-2) vs 1,  $p<0.001$ ) decreased over time. Both OAHl ( $r=0.323$ ,  $p<0.001$ ) and oxygen saturation percentage nadir ( $r=0.310$ ,  $p<0.001$ ) improved as patients aged. For the 116 (34.6%) patients who had surgery (median age 1.1 (0.6-2.5) years), those with upper airway obstruction were significantly younger than those with a craniodental developmental concerns (0.7 (0.3-1.4) vs 2.9 (2.0-3.8),  $p<0.001$ .)

**Conclusion:** Macroglossia can improve over time in some patients with Beckwith-Wiedemann syndrome. Patients with upper airway obstruction have surgery at a younger age than those with craniodental developmental concerns.

## **Assessing the Efficacy of ICBG with rhBMP-2 for Alveolar Bone Grafting in Patients with Cleft Lip and Palate**

Abstract Presenter: Idean Roohani

Abstract Co-Author(s): Marah Jolibois, Sasha Lasky, Tayla Moshal, Simon Youn, Mark Urata MD,  
William Magee, III MD, DDS, Jeffrey Hammoudeh MD

**PURPOSE:** Recombinant human bone morphogenetic protein (rhBMP-2) with demineralized bone matrix (DBM) has served as a viable synthetic alternative to iliac crest bone graft (ICBG) in alveolar bone grafting (ABG). Although revision rates are low with both graft materials, future dental rehabilitation requires adequate bone within the repaired alveolar cleft. This study compares graft success rates among rhBMP-2/DBM versus ICBG versus ICBG+rhBMP-2 for ABG.

**METHODS:** A retrospective cohort study was conducted for patients undergoing ABG from 2017-2023. Clinical graft success was defined as no indication for revision ABG. Successful bony bridge formation and their respective bridge thickness were assessed based on CBCT imaging taken at least six months postoperatively (average  $17.8 \pm 14.2$  months). Bridge thickness was calculated based on the height of the graft site from the cemento-enamel junction to the cleft-adjacent tooth root apex while ensuring the Hounsfield units measured in grafted areas were consistent with mineralized bone.

**RESULTS:** Among 432 patients included, 284 rhBMP-2/DBM, 196 ICBG, and 47 ICBG+rhBMP-2 index procedures were reported. The mean age at bone grafting was  $10.7 \pm 3.6$  years for ICBG+rhBMP-2 patients,  $10.2 \pm 3.2$  years for ICBG patients, and  $9.3 \pm 2.9$  years for rhBMP-2/DBM patients. The clinical graft success rate across the 527 procedures was 95.9%, with comparable success rates across all three cohorts (rhBMP-2/DBM: 95.1% vs. ICBG: 95.4% vs. ICBG+rhBMP-2: 97.9%;  $p=0.694$ ). Based on CBCT imaging, 88.9% of the ICBG+rhBMP-2 cohort had demonstrated successful bony formation, which was significantly higher compared to ICBG (89.4% vs. 65.3%;  $p=0.031$ ) and rhBMP-2/DBM (88.9% vs. 61.5%;  $p=0.023$ ). The average bridge thickness was higher in the ICBG+rhBMP-2 cohort compared to ICBG ( $7.4 \pm 2.6$  mm vs.  $4.7 \pm 1.9$  mm;  $p<0.001$ ) and rhBMP-2/DBM ( $7.4 \pm 2.6$  mm vs.  $4.4 \pm 1.2$  mm;  $p<0.001$ ).

**CONCLUSION:** Our preliminary findings demonstrate that the use of ICBG with rhBMP-2 appears to result in more bony bridge formation and greater bridge thickness. With a higher rate of bony bridge formation and bridge thickness, dental rehabilitation of the repaired alveolar cleft space with implants or orthodontic movement of existing teeth may be more feasible.

## **The Effect of Palatoplasty Technique on Orthognathic Surgery Rates: A 30-Year Review**

Abstract Presenter(s): Sasha Lasky, Asli Pekcan

Abstract Co-Author(s): Tayla Moshal, Marah Jolibois, Idean Roohani, Artur Manasyan, Eric Nagengast MD, Mark Urata MD, William Magee, III MD, DDS, Jeffrey Hammoudeh MD

**Background:** Up to 75% of patients with cleft palate require surgical correction of midface hypoplasia following palate repair. The influence of different surgical techniques



on maxillary growth remains unclear. Our study investigates the long-term impact of palatoplasty techniques on midface growth and subsequent orthognathic surgery.

**Methods:** This institutional, retrospective cohort study evaluated patients without a craniofacial syndrome who underwent primary palatoplasty with Furlow double-opposing Z-plasty or straight-line repair techniques from 1994-2023. Patients were at least 14 years of age at their most recent follow-up visit. Our primary outcome was the need for orthognathic surgery to correct midface hypoplasia.

**Results:** In total, 1,857 patients underwent palatoplasty, of which 332 met inclusion criteria (48 straight-line, 284 Furlow). Average age at last follow-up was  $18.5 \pm 2.6$  years. The orthognathic surgery rates based on Veau class were 46.7% (Veau I), 11.1% (Veau II), 60.9% (Veau III), and 70.2% (Veau IV). When comparing Furlow vs. straight-line repair, there was no significant difference in orthognathic surgery rates, even when stratified based on Veau class ( $p > 0.05$ ). Upon multivariate regression, patients with earlier repair (Odds Ratio [OR]: 0.82;  $p = 0.031$ ), Veau III (OR: 3.77;  $p = 0.002$ ), Veau IV (OR: 5.19;  $p < 0.001$ ), and more palatal fistula repairs (OR: 1.93;  $p = 0.037$ ) had increased orthognathic surgery rates.

**Conclusion:** Our findings suggest that higher cleft severity and increased surgical intervention contribute to future orthognathic surgery. However, palatoplasty technique did not influence orthognathic surgery rates. Consequently, surgeons should perform their preferred palate repair technique when considering sagittal growth restriction.

### **Efficacy of fat injection for management of velopharyngeal insufficiency (VPI), a retrospective case review**

Abstract Presenter: Rachel Pyon MD

Abstract Co-Author(s): Jaclyn Kukoff, Jason Pomerantz MD, FACS, FAAP, Alexander Lin MD

**Background & Purpose:** A relatively newer technique to treat velopharyngeal insufficiency (VPI) is autologous fat grafting to the soft palate and posterior pharyngeal wall, with the ultimate goal of reducing hypernasal resonance. This study aims to assess the efficacy of this treatment in mitigating hypernasality in patients with VPI.

**Methods:** This retrospective case review focused on two community surgeons who

performed fat injections between 2015 and 2023 on patients with cleft and non-cleft VPI. We identified 31 patients who had both preoperative and postoperative speech scores, containing a hypernasality rating by a cleft team speech-language pathologist. Hypernasality ratings were converted to an adapted scale of 0-3, ranging from balanced resonance to severe hypernasality. Ratings were based on the Cleft Audit Protocol for Speech (CAPS) and the Cleft Audit Protocol for Speech- Augmented (CAPS-A). Speech measures such as nasal air emission and intelligibility were not consistently documented and, as a result, were not reported in this study.

**Results:** The mean length of follow-up time was 25 months. Complete resolution of VPI was achieved in 14 patients (45%); reduction in hypernasality without full resolution of symptoms was achieved in 7 patients (23%); no improvement with resonance post-injection was achieved in 10 patients (32%); and one patient demonstrated mixed resonance post-injection without a reduction in hypernasality. When comparing preop and postop speech scores in the same patient, a one-sample t-test showed a mean reduction of 0.73 (95% confidence interval -0.48 to -0.98,  $p < 0.0001$ ).

**Conclusion:** Preliminary results indicate that at our site, fat injection was effective in reducing hypernasality for patients with VPI. Future research should include additional speech measures (e.g. intelligibility ratings, speech-related quality of life, nasal air emission, etc.), rates of obstructive sleep apnea, and comparison to other surgical speech interventions (e.g. synthetic injection, Furlow palatoplasty, sphincter pharyngoplasty, and posterior pharyngeal flap).

### **Morphometric Measurements of Intraoral Anatomy in Children with Beckwith-Wiedemann Syndrome: A Prospective Study and Novel Approach**

Abstract Presenter: Dominic Romeo

Abstract Co-Author(s): Andrew George, Jonathan Sussman, Manisha Banala, Meagan Wu, Jinggang Ng, Andrew Wiemken, Jesse Taylor MD, Christopher Cielo, Jennifer Kalish

**Background:** An easy-to-use tool to objectively measure intraoral anatomy with meaningful clinical correlations may improve care for patients with Beckwith-Wiedemann syndrome (BWS), who commonly have symptomatic macroglossia.

**Methods:** Children aged 2-17 years with BWS were prospectively enrolled between

12/2021-01/2024. Digital intraoral photographs were taken, and morphometric measurements were made using ImageJ software. Relationships between morphometric measures and outcomes including BWS clinical score, percentage mosaicism, and incidence of tongue reduction surgery were examined using t-tests and multivariate linear models.

**Results:** Fifty-six morphometric measurements were obtained in 49 patients with BWS. Mouth area, width, and height differed across the BWS molecular subtypes ( $p < 0.05$ ). Right-to-left tongue width ( $p = 0.022$ ) and mouth width ( $p = 0.049$ ) were larger in those with loss of methylation at IC2 (IC2 LOM) than in other BWS variants. Patients with paternal uniparental isodisomy of chromosome 11p15 (pUPD11) had narrower mouths than others ( $p = 0.040$ ). Those with tongue reduction surgery had more tongue ridging than those without surgery ( $p < 0.01$ ). There were correlations between mouth area and BWS clinical score ( $p = 0.046$ ), tongue width and BWS clinical score ( $p = 0.040$ ), and tongue length and percentage mosaicism ( $p = 0.012$ ).

**Conclusion:** Straightforward intraoral morphometric measurements are associated with phenotypic burden in BWS. Tongue morphology varies across the BWS spectrum, with IC2 LOM presenting with wider tongues and mouths, and pUPD11 having narrower mouths. Tongue ridging is more common in those selected for surgery. Obtaining these measurements is safe and may be adopted at low costs across centers caring for children with BWS or others at risk of upper airway obstruction.

## **Trends in Spring and Traditional Distraction for the Management of Craniosynostosis**

Abstract Presenter: Ryan Khalaf

Abstract Co-Author(s): Filippo Andrea Giova Perozzo MD, Diane Jo, Mazen Al-Malak MD, Riley Marlar MD, Ying Ku DO, Adam Ghazoul, Antonio Rampazzo MD, Bahar Bassiri Gharb MD, PhD

**Background:** Distraction osteogenesis emerged as an alternative to cranial vault remodeling, permitting gradual increase of the cranial vault volume with less invasive undermining and reconstruction. Although previous studies have compared cranial vault remodeling with distraction, there has been little investigation between the use of spring or traditional rigid distractors. The aim of this study is to systematically review the

existing literature to compare spring and traditional distraction for the treatment of craniosynostosis.

**Methods:** A systematic review was performed in accordance with the PRISMA guidelines. Studies investigating cranial vault distraction osteogenesis with springs or traditional distractors were included. The data collected included patient demographics, history of previous craniofacial surgery, type of craniosynostosis, surgical procedure, distraction protocol, operative time, blood loss, length of stay, cephalic index, recurrence, secondary procedures, complications, and follow-up duration.

**Results:** Sixty-five articles, representing 2,406 patients (1,193 spring and 1,213 traditional) were included. The average follow-up duration was  $5.02 \pm 3.18$  years for springs and  $3.39 \pm 1.39$  years for traditional ( $p < 0.001$ ). Patients who underwent spring distraction were younger ( $4.8 [4.6, 5.8]$  versus  $18.7 [17.7, 19.4]$  months ( $p < 0.001$ ). Patients underwent spring distraction for sagittal ( $n=915, 77\%$ ), multisuture ( $n=187, 16\%$ ), lambdoid ( $n=26, 2\%$ ), coronal ( $n=22, 2\%$ ), metopic ( $n=20, 2\%$ ), and mixed/unspecified ( $n=23, 2\%$ ) craniosynostosis. Patients underwent traditional distraction for multisuture ( $n=215, 18\%$ ), coronal ( $n=92, 8\%$ ), sagittal ( $n=86, 7\%$ ), lambdoid ( $n=27, 2\%$ ), metopic ( $n=9, 1\%$ ), and mixed/unspecified ( $n=784, 65\%$ ) craniosynostosis. The operative time was significantly shorter for spring distraction ( $104 [78, 131]$  versus  $127 [115, 170]$  minutes,  $p < 0.001$ ) with significantly less operative blood loss ( $50 [48, 63]$  mL vs.  $300 [149, 300]$  mL,  $p < 0.001$ ) and lower percentage of patients requiring blood transfusion ( $23\% [0\%, 66\%]$  versus  $46\% [46\%, 81\%]$ ,  $p < 0.001$ ). Hospital stay was significantly shorter after spring distraction ( $2 [1.5, 4.8]$  versus  $4.2 [4, 9.4]$  days,  $p < 0.001$ ). The median preoperative cephalic index was lower in the spring cohort ( $69.2 [67.7, 70.7]$  versus  $83.5 [73.3, 94.6]$ ,  $p < 0.001$ ). The median cephalic index at last follow-up remained lower in the spring group ( $75.6 [75.2, 76]$  versus  $84.7 [80.3, 88.7]$ ,  $p < 0.001$ ). Spring distraction had a larger median increase in unadjusted intracranial volume ( $34.7\% [31.6\%, 38.1\%]$  versus  $21.0\% [16.9\%, 25.0\%]$ ,  $p < 0.001$ ). The median minor complication rate ( $2.2\% [0.6\%, 2.9\%]$  versus  $5.5\% [0\%, 16\%]$ ,  $p < 0.001$ ) and major complication rate requiring reoperation ( $7.4\% [0\%, 10.5\%]$  versus  $8.4\% [8.3\%, 15.8\%]$ ,  $p < 0.001$ ) were lower in the spring group. Infections requiring reoperation were lower in the spring group ( $0\% [0, 2\%]$  vs.  $3.5\% [0\%, 4.5\%]$ ,  $p < 0.001$ ), however device exposures requiring reoperation were not significantly different for patients who underwent spring ( $1\% [0\%, 5.1\%]$ ) and traditional ( $2.6\% [2.1\%, 3.3\%]$ ) distraction ( $p=0.13$ ).

**Conclusion:** Patients underwent spring distraction primarily for sagittal synostosis at a younger age, while patients underwent traditional distraction for multisuture synostosis at an older age. Compared to traditional distraction, spring distraction required less

operative time, resulted in less blood loss, shorter hospital stays, and lower complication rates. Patients who underwent spring distraction had larger increases in intracranial volume, although this is unadjusted for normal growth and confounded by the younger age at time of operation.

## **Investigating Outcomes Following Same-Day Discharge for Primary Cleft Palate Repair**

Abstract Presenter: Allison Diaz

Abstract Co-Author(s): Leya Groysman, Liliana Camison Bravo MD, Roberto Flores MD, David Staffenberg MD, DSc (Honoris Causa)

**Background:** Current practice for primary cleft palate repair involves performing the procedure on an inpatient basis, where patients are admitted for an overnight hospital stay. As a result of rising national health care cost and hospital burden, there has been an increasing shift towards the implementation of ambulatory surgery protocols. Same-day discharge for pediatric patients undergoing surgery has been associated with benefits including lower risk for nosocomial infection, lower rates of anxiety and psychological burden, faster return to a normal sleep pattern, and good parental satisfaction rates (1,2). However, current available literature on same-day discharge for primary cleft palate repair is limited as studies describe outpatient procedures, which may include patients kept overnight with discharge at less than 24 hours (3). Therefore, the objective of this study was to compare outcomes following primary cleft palate repair in patients discharged on the same calendar day to patients admitted for overnight stay.

**Methods:** This was a single-surgeon, retrospective review of 40 patients undergoing primary cleft palate repair performed consecutively from September 2018 to June 2023. Demographic characteristics, medications administered intraoperatively and postoperatively, 30-day readmission, reoperation, wound complication, and postoperative complication rates, and 1-year fistula rates were collected from electronic medical records. Fischer's exact test and nonparametric Mann-Whitney U tests were performed for data analysis.

**Results:** 40 total patients were identified. Following primary cleft palate repair, 20 patients were discharged on the same calendar day and 20 patients were admitted for overnight stay. There were no significant differences in rates of 30-day readmission, 30-day reoperation, 30-day wound complications, or 30-day postoperative complications between groups ( $p > 0.05$ ). Two instances of wound dehiscence on the oral surface were noted at postoperative follow-up visits within the group admitted for overnight stay (5%). These wounds healed without fistulas at 1-year follow-up, and no fistulas were reported at 1-year follow-up in either group. Preoperatively, there was a significantly higher proportion of patients admitted for overnight stay that were Veau class III (55%), as

compared to patients discharged on the same day (15%) ( $p = 0.019$ ). When comparing number of doses of specific medications received postoperatively, patients admitted for overnight stay received significantly more oxycodone at median of 2 doses (IQR 1.00 - 3.75) and acetaminophen at a median of 4 doses (IQR 3.00 - 5.00) than patients with same-day discharge with a median of 1 dose (IQR 0 - 1.0,  $p < 0.001$ ). Additionally, there was no significant difference in rates of caregiver contact with the clinic following patient discharge and prior to first follow-up between groups ( $p = 0.523$ ).

**Conclusion:** Same-day discharge following primary cleft palate repair may be safely undertaken in a low-risk patient population, resulting in similar short-term outcomes and 1-year fistula incidence as patients admitted for overnight stay.

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## A 20-Year Review of Long-Term Speech Outcomes in Patients with Syndromic Cleft Lip and Palate

Abstract Presenter: Marah Jolibois

Abstract Co-Author(s): Sasha Lasky, Idean Roohani, Sasha Lasky, Tayla Moshal, Mark Urata MD,

William Magee, III MD, DDS, Jeffrey Hammoudeh MD, Asli Pekcan

**Background:** Patients with cleft lip and palate often require surgical correction of velopharyngeal insufficiency (VPI), a condition associated with difficulty with speech and swallowing. Associated comorbidities such as a craniofacial syndrome may place patients at an increased risk of poor speech outcomes. This study evaluates our long term experience with syndromic patients undergoing palatoplasty and aims to assess their need for VPI surgery.

**Methods:** A retrospective chart review was conducted of patients with syndromic cleft lip and palate who received care at a tertiary children's hospital from 2004-2024. Patient

characteristics, syndromic diagnosis, cleft phenotype and Veau class were abstracted. The need for VPI surgery after cleft palate repair and the timing to VPI surgery were recorded. Descriptive statistics, chi-squared, and independent t-tests were conducted to analyze differences in rates of VPI surgery between various craniofacial syndromes. A Kaplan-Meier analysis was performed to compare time from cleft repair to VPI surgery between syndromes.

**Results:** A total of 207 syndromic patients were identified with 190 meeting inclusion criteria. The mean follow-up time was  $8.01 \pm 5.48$  years. The most commonly presented syndromes included 22q11.2 deletion syndrome (22q11.2DS) (n=35, 18.4%), Stickler syndrome (n=26, 13.7%), and CHARGE syndrome (n=15, 7.9%). A total of 20 (10.5%) patients had Robin Sequence (RS) associated with a craniofacial syndrome. Cleft types included 27 (14.2%) submucous cleft, 59 (31.1%) Veau I, 80 (42.1%) Veau II, 7 (3.7%) Veau III and 17 (9.0%) Veau IV. Overall, 31 (16.3%) patients underwent VPI surgery at  $4.33 \pm 3.16$  years after their initial cleft palate repair, with the highest VPI rate amongst Veau I patients. Patients with 22q11.2DS underwent VPI surgery at higher rates (45.7%) compared to Stickler syndrome (15.3%,  $p=0.013$ ), CHARGE syndrome (6.67%,  $p=0.008$ ), and other patients with isolated cleft palate (19.1%,  $p=0.044$ ). Following initial VPI surgery, only 6.2% of 22q11.2DS patients required additional VPI surgery; however, 62.5% of 22q11.2DS continued to have moderate/severe hypernasality. Kaplan-Meier analysis revealed a significantly shorter time period between cleft palate repair and VPI surgery in syndromic patients ( $p=0.044$ ), when adjusting for age at cleft palate repair, cleft phenotype (submucosal, cleft lip and/or palate), and Veau class.

**Conclusion:** This retrospective study highlights the variability in rates and timing of VPI surgery in patients with syndromic cleft lip and palate. Patients with 22q11.2DS had significantly higher rates of VPI surgery. Additionally, our data suggest an accelerated timeline between cleft palate repair and VPI surgery for syndromic patients. These findings highlight the nuanced clinical course of VPI among patients with different craniofacial syndromes, and variability in the success of speech outcomes following surgical treatment of VPI. Therefore, meticulous preoperative planning with an individualized approach to management is imperative in this population.

## **Early Cleft Palate Repair is Associated with Lower Incidence of Velopharyngeal Insufficiency**

Abstract Presenter: Eloise Stanton MD

Abstract Co-Author(s): Clifford Sheckter MD, Clifford Sheckter MD, Danielle Rochlin MD,  
H. Peter Lorenz MD, Clifford Sheckter MD

**Purpose:** The timing of primary repair in non-syndromic cleft palate remains controversial. Recent evidence suggests earlier repair is associated with a lower incidence of velopharyngeal insufficiency (VPI). We aim to evaluate these findings in a large cohort study using causal inference

**Methods:** All non-syndromic cleft palate repairs in California were extracted between 2000-2021 from the California Health Care Access and Information (HCAI) database. These cases were linked with VPI surgery following cleft palate repair based on unique identifiers. The incidence of VPI surgery was evaluated with propensity score matching. Early cleft palate repair was defined as < 7 months of age versus traditional cleft palate repair at over 11 months of age. Standardized mean differences (SMD) were measured before and after matching for potential confounders including sex, race, payer, and distance from patient home to hospital.

**Results:** 52,007 cleft palate repairs were included of which 12,169 (23.3%) were repaired early and 39,838 (76.7%) were repaired late. Early cleft palate repairs were found to have a VPI incidence of 1.2% (13/1,000), compared with 6.1% (61/1000) in the traditional repair cohort. Post-matching, the average treatment effect of early repair was a 6.3% reduction in VPI ( $p < .001$ , 95% CI -6.3- -5.4%). All covariate SMDs were less than |0.1| after matching.

**Conclusion:** Our cohort study demonstrates a significantly reduced incidence of VPI in children with primary cleft palate repair prior to 7 months of age. These findings in light of recent trial data suggest that craniofacial centers should consider early cleft palate repair in appropriate patients.



## **Frontal Sinus Volume in Normocephalic Nonsyndromic Sagittal Craniosynostosis: A Comparative Study**

Abstract Presenter: Alexander Velazquez

Abstract Co-Author(s): Michael Lebhar MD, Laura Humphries MD, Ian Hoppe MD, Jeffrey Roux

**Purpose:** This study aimed to investigate frontal sinus volume as a potential indicator of cranial compensatory growth in unoperated normocephalic nonsyndromic sagittal craniosynostosis (NNSC) patients compared to age- and sex-matched controls. Previous studies have indicated that frontal sinus volume is suppressed in unoperated craniosynostosis and may be an intracranial space conservation phenomenon.

**Methods:** Head CTs from 21 unoperated NNSC patients at our institution were utilized in this study and matched with age- and sex-matched control subjects. Frontal sinus volumes were measured using Syngo Via, and statistical analysis was performed. Inclusion criteria for patients included presence of a frontal sinus with unoperated sagittal craniosynostosis, whereas inclusion criteria for controls included presence of a frontal sinus and no craniofacial trauma. Pearson correlation coefficient and significance values were calculated to evaluate the relationship between frontal sinus volume and craniosynostosis.

**Results:** Six of 21 patients with NNSC were found to have presence of frontal sinus volumes, compared to controls where all patients had presence of a frontal sinus. When compared to age-sex matched controls, our analysis revealed a Pearson correlation coefficient of 0.993 and a high significance of  $p < 0.001$ , indicating a strong association between decreased-to-absent frontal sinus volume in unoperated normocephalic nonsyndromic sagittal craniosynostosis patients.

**Conclusion:** The findings of this study demonstrate a correlation between decreased-to-absent frontal sinus volume in patients with NNSC in comparison to normal controls. These findings highlight the potential utility of frontal sinus volume as a diagnostic tool in identifying the degree of compensation that the skull has undergone in nonsyndromic sagittal craniosynostosis

## **Comparing Pre- and Post-Operative Refraction Following Cranial Vault Remodeling for Craniosynostosis**

Abstract Presenter: Hanna Pfershy

Abstract Co-Author(s): Benjamin Kowalske, Reece Moore MD, Cuyler Huffman, John Girotto MD

Brooke Geddie, Anna Carlson MD

**Introduction:** Craniosynostosis can lead to anatomic deformation of the cranial vault, skull base, and orbits. Select phenotypes of craniosynostosis are associated with ophthalmologic comorbidities including strabismus, refractive changes, and anisometropia. Prior studies have shown refractive values to decrease post-operatively(1). The objective of this study is to determine the incidence of ophthalmologic comorbidities and compare the severity of refractory errors before and after cranial vault remodeling (CVR) for craniosynostosis.

**Methods:** Retrospective review of patients who underwent surgical correction for craniosynostosis with perioperative ophthalmology exams was conducted. Data points gathered included gender, race/ethnicity, craniosynostosis phenotype, surgical approach, surgical repair technique, syndromic, second craniosynostosis surgery required, strabismus type, refractory errors, development of amblyopia, and development of anisometropia. Cycloplegic refraction data was collected and subdivided into pre-operative, early post-operative (1 month to 6 months), and post-operative (1 year to 3 years) periods. A between subjects repeated measure ANOVA was performed comparing the pre-operative to early post-operative refraction, pre-operative to 2-year post-operative refraction, and early post-operative to 2-year post-operative refraction for the variables noted above. Paired T-tests were conducted to assess postoperative changes in refraction.

**Results:** Our cohort included 168 patients and was 68% male and 80% white. The average age at repair was 11 months and 11% had a diagnosis of syndromic craniosynostosis. The most common craniosynostosis phenotype was sagittal (46%), followed by metopic (23%), unicoronal (11%), multisuture (9%), bicoronal (7%), and lambdoid (3%). Of all patients, 27% had strabismus, 60% of strabismus was a form of exotropia/exophoria, and 95% of the cohort had refractory errors- 40% had hyperopia alone and 41% had hyperopic astigmatism. Overall, 14% of the cohort developed amblyopia and 4% developed anisometropia.

Results of the ANOVA showed no statistically significant difference in refraction changes between any of the variables for either the pre-operative to 6-month post-

operative, pre-operative to 2-year post-operative, or the early post-operative to 2-year post-operative comparison. Paired t-tests showed that when all children were combined, refraction decreased by -0.44 ( $p<0.01$ ) from the pre-operative to 1-year post-operative period and by -0.83 ( $p<0.01$ ) from the pre-operative to 3-year post-operative period. There was no difference in refraction from the early post-operative period to the 1-, 2-, or 3-year post-operative period.

**Conclusion:** Post-operative changes in refraction occur in children with craniosynostosis up to at least 3 years post-operatively. This study supports that there are no patient-specific variables available for predicting postoperative refractory changes in this patient population. The collected data re-emphasizes the need for long-term ophthalmology follow-up and integration of ophthalmology onto multidisciplinary craniosynostosis care teams for all children with craniosynostosis to identify development or alteration in ophthalmologic comorbidities.

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## **A Cost-Effectiveness Analysis Comparing Early Cleft Lip Repair and Traditional Lip Repair**

Abstract Presenter: Idean Roohani

Abstract Co-Author(s): Sasha Lasky, Marah Jolibois, Tayla Moshal, Dylan Choi MD, Mark Urata MD

William Magee, III MD, DDS, Jeffrey Hammoudeh MD

**PURPOSE:** Early cleft lip repair (ECLR) is a safe and effective strategy for improving oronasal symmetry without nasoalveolar molding (NAM). Leveraging the anatomic plasticity of the neonatal skeleton, ECLR is hypothesized to reduce the burden of secondary procedures compared with traditional lip repair (TLR). The burden of these additional procedures places emotional, physical, and financial strain on patients, families, and the healthcare system. This study compares the long-term financial impact of ECLR and TLR±NAM.

**METHODS:** A retrospective cohort study was conducted on all patients with non-

syndromic unilateral cleft lip who underwent primary lip repair by three craniofacial surgeons between 2004–2023. Exclusion criteria were bilateral cases, CL repair at older than 6 months of age, or less than 2 years of follow-up. Data on patient demographics, cleft characteristics, and revision surgeries were collected. Patients undergoing ECLR were compared to TLR±NAM with coarsened exact matching for cleft characteristics and surgeon. Hospital and physician costs were determined based on total charges for each intervention using institutional data. A budget-impact model was constructed to simulate the long-term costs associated with each cohort. One-way and probabilistic sensitivity analyses were used for cost analysis. The associated costs for ECLR and TLR were calculated and adjusted to 2023 United States dollars.

**RESULTS:** A total of 1,184 patients underwent primary cleft lip repair, of which 358 patients (145 ECLR, 47 TLR+NAM, 166 TLR-NAM) were eligible for the matching process. After matching, 130 patients (65 ECLR, 20 TLR+NAM, 45 TLR-NAM) were included. The mean follow-up time across all patients was 6.1±3.4 years. The median gestationally-corrected ages of the ECLR and TLR±NAM cohorts were 0.9 months and 3.3 months, respectively ( $p<0.001$ ). The mean number of preoperative appointments for the ECLR and TLR±NAM cohorts were 1.1±0.3 (range 1–3) and 2.6±4.0 (range 1–17), respectively ( $p=0.002$ ). The ECLR cohort had a significantly lower overall revision rate (10.7% vs. 26.9%,  $p=0.001$ ). Stratifying based on NAM utilization, the ECLR cohort demonstrated persistently lower revision rates (12.3% ECLR vs. 40.0% TLR+NAM vs. 51.1% TLR-NAM,  $p<0.001$ ). The total cost of ECLR was estimated to be \$45,776 vs. \$51,389 for TLR±NAM, resulting in \$5,557 cost savings per patient. Probabilistic sensitivity analysis found ECLR to be cost-effective over TLR 94.1% of the time.

**CONCLUSIONS:** Early cleft lip repair was found to be cost-effective over traditional methods 94.1% of the time, saving approximately \$5,557 in costs per patient. Our findings suggest that early cleft lip repair has the potential to decrease the burden of healthcare costs and secondary procedures for patients and families.

### **Radiographic Evaluation of Fronto-orbital Relapse in Unicoronal Synostosis: A Comparison of Patients with and without Postoperative Helmet Therapy**

Abstract Presenter: Sasha Lasky

Abstract Co-Author(s): Marah Jolibois, Idean Roohani, Tayla Moshal, Erin Wolfe MD, Naikhoba Munabi MD, Jeffrey Hammoudeh MD, Mark Urata MD

**Purpose:** This study evaluates the effect of postoperative helmet therapy (PHT) on long-term fronto-orbital symmetry and relapse outcomes in patients with unicoronal synostosis.

**Methods:** Patients with unicoronal synostosis who underwent cranial vault remodeling and fronto-orbital advancement (CVR+FOA) between 2004-2023 were reviewed retrospectively. Patients with computed tomography (CT) imaging >3 months from CVR+FOA were included. Patients with and without PHT were compared to assess symmetry and surgical relapse of the fronto-orbital region. Mimics software (Materialise, Leuven, Belgium) was used to measure cranial anthropometrics from CT images. To measure anterior fronto-orbital position, a point was placed along the frontal bandeau at the mid-orbit of each hemisphere and the distance in relation to the coronal plane was measured. Fronto-orbital symmetry was calculated as the difference in anterior fronto-orbital position of the left and right hemispheres. Paired t-tests compared this symmetry measurement in the PHT vs non-PHT groups.

**Results:** Twenty-four patients met inclusion criteria (12 PHT, 12 non-PHT). Patients were followed for  $6.80 \pm 4.92$  years. Average time from CVR+FOA to relapse evaluation (CT measurements) was  $43.95 \pm 45.14$  months. Patients with PHT had increased fronto-orbital symmetry compared to patients without PHT, trending towards significance ( $5.03 \pm 4.15\text{mm}$  vs  $2.74 \pm 1.71\text{mm}$ ,  $p=0.092$ ). One patient without PHT required surgery for relapse. No patients with PHT required surgery for relapse.

**Conclusions:** Radiographic data suggests that postoperative helmet therapy in patients with unicoronal synostosis may increase long-term fronto-orbital symmetry. Future studies will seek to increase cohort size to determine definitive significance.

### **Characterizing the influence of guiding elastics on treatment duration in bimaxillary cleft orthognathic surgery**

Abstract Presenter: Ryan Badiie MD

Abstract Co-Author(s): Daniella Cordero MD, Dr. Srinivas Susarla MD, DMD, MPh

**BACKGROUND:** Following bimaxillary orthognathic surgery, postoperative orthodontics are essential to facilitating tooth movement and refining final occlusion. Guiding elastics are an important component of this, helping the resting length of the musculature, connective tissue, and bones adapt to their new position.<sup>1</sup> Accordingly, most centers opt for a 2-6 week course of elastics postoperatively, typically initiated with placement at

the end of surgery.<sup>2</sup> However, some patients, such as those with behavioral challenges, airway compromise, or medical conditions such as seizure disorders, may not be able to have elastics placed during surgery and have delayed initiation of elastic therapy. The purpose of this work was to evaluate whether delay in initiation of elastic therapy after surgery prolonged the time to achieving the desired occlusion in patients with cleft palate undergoing bimaxillary orthognathic surgery.

**METHODS:** This prospective cohort study included patients who underwent bimaxillary orthognathic surgery with a single surgeon at a tertiary academic center over a three-year period. The primary study variable was the use of guiding elastics (6 oz. heavy in a class II or class III pattern based upon the initial diagnosis) post-operatively, with initiation either immediately post-operatively (placed in the OR and maintained throughout early healing) or delayed post-operatively (no elastics placed in the OR and elastic therapy initiated at 2 weeks post-operatively and then maintained thereafter). Patients in the latter group had delayed elastics initiation due to behavioral issues, concern for airway obstruction, or other complicating medical conditions (e.g., active seizure disorder). Patients were followed weekly for the first six weeks after surgery. Demographics, perioperative clinical data, and cephalometric measurements were abstracted from the medical record. The primary outcome was the whether the desired occlusion was able to be achieved within 6 weeks of surgery and the time to achieving the desired occlusion.

**RESULTS:** Thirty-four patients were identified and met the study criteria. The mean age was  $18.5 \pm 2.0$  years, and 19 (55.6%) subjects were female. Twenty-two subjects had class III skeletal malocclusions; 12 subjects had class II skeletal malocclusions. Segmental maxillary osteotomies were performed in 9 subjects. Cleft severity was distributed as follows: Veau 2 (10), Veau 3 (17), Veau 4 (7). Twenty subjects had elastic therapy initiated immediately after surgery and fourteen subjects had elastic therapy initiated at 2-weeks post-operatively. All patients achieved the planned occlusion within 6 weeks post-operatively. There were no significant differences between the groups with regard to age, gender, type of malocclusion, segmental osteotomy, or cleft type ( $p > 0.10$ ) Patients with immediate elastics achieved the planned occlusion at  $2.1 \pm 0.8$  weeks post-operatively, compared to  $4.6 \pm 1.3$  weeks post-operatively for those with delayed initiation of elastic therapy ( $p < 0.01$ ).

**CONCLUSIONS:** In patients with a history of cleft palate undergoing bimaxillary orthognathic surgery, the desired occlusion can be achieved within 6 weeks of surgery whether guiding elastics are placed immediately after surgery or in a delayed fashion. Delayed initiation of post-operative guiding elastics increases the time to spontaneously achieving the planned occlusion by an average of 2.5 weeks.

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## **Surgical Management of Craniofacial Localized Scleroderma in Pediatric Patients Over 10 Years**

Abstract Presenter: Ricardo Alfaro Zeledon

Abstract Co-Author(s): Heather Burns MD, Alexandra McLennan, Tanir Moreno MD  
Kelly Schultz MD, Renata Maricevich MD

**Goals/Purpose:** Juvenile localized scleroderma (JLS) is a rare connective tissue disease associated with craniofacial deformities. Surgical intervention seeks to restore facial symmetry through the reconstruction of affected hard and soft tissues. This retrospective study features a case series of JLS patients treated with diverse surgical techniques, providing a comprehensive analysis of outcomes.

**Methods/Technique:** A retrospective analysis encompassed 21 patients diagnosed with craniofacial scleroderma who underwent reconstructive procedures at a tertiary pediatric hospital between January 2012 and October 2023. Data, comprising patient characteristics, disease progression, medical interventions, primary and adjuvant procedures, complications, and follow-up status were collected.

**Results/Complications:** Parry-Romberg syndrome (PRS) was the predominant diagnosis (n=14), followed by linear scleroderma (en coup de sabre [ECDS]) (n=2), and localized morphea in (n=2). Patients exhibited an average age of  $14.5 \pm 5.2$  years, a disease duration of  $7.4 \pm 7.8$  years, and a remission period of  $4.8 \pm 4.9$  years prior to their initial surgery. A third of patients (n=7) were taking disease-modifying medication at the time of surgery. The majority underwent multiple procedures (n=15), averaging 2.4 surgeries. Primary interventions included fat transfer (n=20), implants (n=2), free flaps (n=1), facial reanimation via functional muscle transfer (n=1), biomaterial filler (n=1), and dermal grafting (n=1). Adjuvant procedures involved rhinoplasty (n=2) and

orthognathic surgery (n=1). In the fat transfer group, the mean number of sessions was 2.3 with a volume of 20.3 cc.

Fat grafting complications occurred in four patients, such as extensive fat absorption (n=3), recipient site hyperpigmentation (n=1), and donor site hypertrophic scarring (n=1). In those who underwent flap-based reconstruction, one patient experienced hypertrophic scarring of the donor site and one patient had a surgical site infection which required reoperation. Following malar reconstruction with a customized implant, one patient suffered periorbital cellulitis and recurrent cheek swelling, requiring long-term antibiotics and implant removal. Mild graft contraction was observed in the dermal-graft patient.

No significant difference in complication rates existed between patients on active disease-modifying medication versus those not (OR 2.0, 95% CI [0.382, 10.482], p=0.412). There was no distinction in complication rates between patients with disease quiescent intervals below and above one year (OR 1.8, 93% CI [0.259, 12.502], p=0.552). The average follow-up duration was  $18.7 \pm 19.0$  months.

**Conclusion:** Pediatric JLS patients frequently undergo multiple procedures, with fat transfer the primary surgical intervention, offering favorable aesthetics and minimal risk. Contrary to literary norms, the use of disease-modifying medications and remission duration does not seem to influence surgical outcomes.

## **Evolution of the Two-Staged Palate Repair and 6-year Outcomes of Concomitant Hard Palate and Alveolar Cleft Repair: A Single Institution Experience**

Abstract Presenter: Laurel Ormiston MD

Abstract Co-Author(s): Lucia Collar Yagas MD, Catherine Bautista, Amanda Gerlach, Duane Yamashiro, Erinn Kim MD, Barbu Gociman MD, Dana Johns MD, Joanna Chen

**Introduction:** The timing of procedures for cleft lip and palate patients is constantly evolving and heavily debated. Conventionally, institutions utilizing a two-stage palatoplasty approach perform the soft palate closure at 3 months, hard palate repair at 1 year, and alveolar cleft repair at 6-8 years. Most hard palates are closed without bony reconstitution; however, the lack of support can lead to a collapsed maxillary arch, dental crowding, and posterior cross-bite, particularly in patients with complete clefts. For the past six years, patients at our institution with a complete cleft lip and palate have been treated with a two-staged palatoplasty. Patients undergo cleft lip repair at 3 months, soft palate repair at 10-12 months, followed by concomitant repair of the hard



palate and alveolar cleft at 2-3 years of age. A custom hard palate prosthesis is placed during the lip repair and replaced at the time of soft palate repair. Hard palate and alveolar cleft repairs are done with bone grafting, using demineralized bone matrix and bone morphogenic protein. The evolution of our hard palate prosthesis allowed for better alignment of the palate shelves, enabling simultaneous bone grafting of the alveolus and hard palate at the time of hard palate surgery. We aimed to showcase that our unique approach to cleft care has potential advantages over traditional cleft care.

**Methods:** A retrospective analysis of syndromic and non-syndromic patients with a complete unilateral or bilateral cleft lip and palate (Veau 3 & 4 classification) was conducted from 2015 to 2023 at our institution. All patients who underwent a two-staged palatoplasty with alveolar cleft repair at the time of hard palate repair were included. Postoperative outcomes of interest included palatal fistula occurrence and location, bone graft take, and velopharyngeal insufficiency necessitating surgical intervention.

**Results:** A cohort of 45 patients completed the protocol, with 28 veau 3 patients and 17 veau 4 patients. The mean age at hard palate and alveolar cleft repair was 2.5 years, with a mean follow-up time of 3 years. The mean total number of major procedures was 3.5. 46.7% (3/45) of patients, all veau 4, had a subsequent palatal fistula develop. 17.8% (8/45) of patients required an additional bone grafting procedure. There were no significant differences between veau 3 and veau 4 patients. The remaining patients had good consolidation, confirmed by a 6 month post-operative CT scan. Out of the 21 patients with a minimum age of 5 years, 9.5% (2/21) underwent surgical intervention for velopharyngeal insufficiency recalcitrant to speech therapy.

**Discussion:** Our two-staged palatoplasty protocol with early bone grafting has led to the ability to complete the bulk of cleft surgeries by the age of 3, restoring near-normal anatomy of the palate and the piriform aperture at an early age. Our protocol demonstrates complication rates comparable to national single-stage palatoplasty data. Current mid-growth data supports the safety and efficacy of our protocol, and continued growth analysis will follow as this cohort reaches facial maturity.

## **Impact of Social Vulnerability, Race, and Urbanicity on Early Nutritional Outcomes in Patients with Cleft Palate**

Abstract Presenter: Ashlie Elver MD

Abstract Co-Author(s): Shelley Edwards, Keeley Frederick, Laura Humphries MD, Ian Hoppe MD

**Purpose:** Infants with cleft palate experience early feeding difficulties resulting in increased hospital utilization from prolonged birth encounters and re-admissions for poor nutritional status. Sociodemographic factors influence cleft palate outcomes, but their impact on early nutritional outcomes is not yet described. This study investigates the association of social vulnerability, race, and urbanicity on birth encounter metrics, and failure to thrive (FTT) rates in patients diagnosed with cleft palate.

**Methods and Materials:** Retrospective data from 2013 to 2023 was queried from Cosmos, a national deidentified database from the Epic electronic health record. Primary outcomes compared birth encounter metrics and prevalence of FTT across sociodemographic cohorts based on 1) social vulnerability index (SVI) quartiles (Q), 2) race, and 3) USDA Rural-Urban Commuting Area codes. SVI, derived from US census data, quantifies community susceptibility to adverse health events. A higher SVI quartile indicates greater social vulnerability. Statistical analysis compared birth weight, birth length of stay (LOS), discharge weight, FTT diagnosis and re-admissions, and utilization of the provider communication platform MyChart.

**Results:** There were 92,437 patients diagnosed with cleft palate. Birth weight was lower in socially vulnerable and Black patients (SVI Q75:  $101.50 \pm 1.569\text{oz}$ ; SVI Q25:  $106.40 \pm 1.85\text{oz}$ ; Black:  $95.3 \pm 2.63\text{oz}$ ; White:  $104.90 \pm 1.02\text{oz}$ ; Other:  $104.80 \pm 2.09\text{oz}$ ), as was longer length of stay (SVI Q75:  $21 \pm 2.39$  days; SVI Q25:  $15 \pm 2.18\text{d}$ ; Black:  $22 \pm 4\text{d}$ ). The diagnosis of FTT increased consistently at each SVI level from 5.1% in the lower quartile to 7.8% in the upper quartile (Q25: 5.1%, Q25-50: 6.1%, Q50-70: 6.5%, Q75%: 7.8%)  $p < 0.001$ . As did FTT re-admissions, which increased from 0.19% in the lower quartile to 0.47% in the upper quartile ( $p < 0.001$ ). An opposite trend was observed for MyChart activation rates ( $p < .001$ ). FTT was significantly higher in Black patients (10.6%) compared to other race categories (range 4.6%-7.1%;  $p < 0.001$ ), as was FTT re-admissions ( $p < .001$ ). MyChart engagement was highest among White patients (60.3%) and lowest in Black (54.4%) and Other Race groups (52.1%;  $p < 0.001$ ).

**Conclusions:** Sociodemographic factors affect early outcomes in cleft palate, as evidenced by a large nationwide analysis. Socially vulnerable and Black patients are more susceptible to unfavorable nutritional outcomes including lower birth weights and

higher incidence of FTT. Attention toward targeted interventions is needed to reduce disparities in cleft care related to social identities, geography, and community. Access disparities, such as utilization of the MyChart Messaging Platform, may contribute to this phenomenon.

## **Midface Growth Outcomes Following Staged Rotation Advancements for Bilateral Cleft Lip Repair**

Abstract Presenter: Erin Wolfe MD

Abstract Co-Author(s): Jonatan Hernandez Rosa, S. Anthony Wolfe, MD

**PURPOSE:** Single-stage bilateral cleft lip repair is frequently espoused as the gold standard for bilateral cleft lip repair procedures. Two-stage bilateral cleft lip repair is an alternative method that, while not as universally accepted, may result in acceptable functional and aesthetic long-term outcomes. We propose and provide long-term follow-up for a different approach to bilateral cleft lip repair following the principles used for the unilateral cleft deformity. Although the downside of this surgical technique is that it involves an additional operation, in the long-term it may be an acceptable alternative to one-stage repairs.

**METHODS:** This is a 16-year retrospective review of all patients that underwent two-stage repair for complete bilateral cleft lip deformity, performed by a single surgeon (S.A.W). Patients meeting inclusion criteria were in mixed dentition and were treated with the following protocol: (1) Pre-surgical naso-alveolar molding and approximation of alveolar segments, (2) Staged rotation advancements with gingivosupraperiosteoplasty and closure of alveolar defect extending back to closure of the anterior palate, (3) McComb nasal correction, (4) Rotation advancement lip repair just as is done in a unilateral cleft, (5) Repetition of the procedure on the contralateral side after 3 months, (6) Closure of the remaining hard palate and soft palate with levator muscle retroposition at 18 months. Cephalometric and anthropometric evaluation at mixed dentition was conducted to evaluate midface growth. Mean Farkas anthropometric measurements for patients in our cohort were compared to mean values for non-cleft patients (nasolabial angle, cutaneous/total upper lip height and nasal tip protrusion/nose height). Mean cephalometric values (SNA, SNB, ANB) for our cohort were compared to values for non-cleft patients.

**RESULTS:** Thirty-two patients were identified via retrospective review who met inclusion criteria. There was no significant difference between anthropometric values for

normal versus cleft lip and palate patients for nasolabial angle, cutaneous/total upper lip height, and nasal tip protrusion/nose height ( $p > 0.05$ ). Anthropometric measurements fell within 1-2 standard deviations of the norm. Cephalometric films were evaluated for 15 patients. Mean SNA was  $78.9 \pm 4.3$ , SNB was  $74.1 \pm 3.8$ , and ANB was  $5.0 \pm 3.4$ , with no significant difference between SNA ( $80.0 \pm 3.7$ ), SNB ( $74.0 \pm 3.4$ ) and ANB ( $4.0 \pm 1.4$ ) for non-cleft patients ( $p > 0.05$ ).

**CONCLUSION:** Using the staged method, noses are normal with a normal nasolabial angle and a normal columella. Lips are full and pouting. There is no ventroflexion of the premaxilla. The results that can be obtained with the use of the staged rotation advancement procedure justify continuing its use. The long-term follow-up of this patient population has proven to have results that resemble the dimensions and ratios of the lip and nose of unaffected children.

## **Peripheral Nerve Grafts As A Method To Promote Optic Nerve Regeneration: A Systematic Review**

Abstract Presenter: Sergio Segrera

Abstract Co-Author(s): Caroline Baker, David Tran MD, Sachin Chinta, Alay Shah MD, Eduardo Rodriguez MD

**PURPOSE:** Whole-eye transplantation is being investigated as a potential solution for individuals suffering from permanent blindness resulting from facial and ocular injuries. The pivotal challenge in achieving success with this surgery lies in restoring the optic nerve's connectivity, which is challenging due to the inhibitory nature of the central nervous system. Peripheral nerves, unlike their central counterparts, have a demonstrated capacity for regeneration. By leveraging this regenerative potential, scientists and clinicians hypothesize that grafting segments of peripheral nerve tissue could serve as scaffolds or conduits to guide and promote optic nerve regrowth following injury. Given the limited literature on this subject, our aim was to conduct a systematic review that examines the current techniques, outcomes, and challenges related to utilizing peripheral nerve grafts to facilitate optic nerve regeneration.

**METHODS:** Following PRISMA 2020 guidelines, we conducted a systematic review of PubMed, MEDLINE, Cochrane, and Web of Science from inception through June 26, 2023. We included original research studies that employed peripheral nerve grafts to explore optic nerve regeneration following injury or trauma in warm-blooded animal models. Extracted data covered the type and source of the graft, techniques of inducing

optic nerve injury, graft implantation methodology, the use of neurotrophins, and observed regenerative outcomes.

**RESULTS:** We included 36 studies, all of which were conducted on rodents.

Techniques for inducing optic nerve injuries varied, with transections being the most common method (78%). The sciatic nerve was used for grafting in 75% of the studies. Additionally, 31% of the studies supplemented the peripheral nerve grafts with neurotrophins, including ciliary neurotrophic factor and brain-derived neurotrophic factor. Most studies grafted the peripheral nerve segments to the site of the lesion (67%), while others implanted the graft intravitreally (33%). All studies included at least one outcome measure of optic nerve regeneration, including the count of regenerating retinal ganglion cells, number of regenerated axons distal to the lesion site, or length of regenerating retinal ganglion cell axons. In studies reporting the count of retinal ganglion cells (47%), there was a significant increase in cell regeneration in models utilizing peripheral nerve grafts compared to controls. Seven studies demonstrated a 15-fold increase in regenerating nerve axons 1.8 millimeters from the site of optic nerve lesion after 46 days, on average. In addition, several studies reported an average 2-fold increase in the mean length of axon growth distal to the site of lesion. Notably, there was no evidence of full-length optic nerve regeneration following peripheral nerve graft transplantation.

**CONCLUSION:** This systematic review underscores the potential of peripheral nerve grafts in facilitating retinal ganglion cell regeneration and axonal regrowth, with a significant number of studies reporting positive outcomes. However, there remain consistent challenges, such as graft integration, long-term viability, and translating observed regrowth into tangible functional vision improvements. Additionally, the variability in grafting techniques and methodologies across different studies highlights the need for standardization and optimization. Future research is warranted to assess the effect of peripheral nerve grafts in promoting optic nerve regeneration following whole-eye transplantation.

## **Addressing the Backlog of Patients with Unrepaired Cleft Lip and Palate in the World's Fourth Poorest Country: A Review of 40 Surgical Camps Conducted by an American Plastic Surgeon**

Abstract Presenter: Isaiah Rhodes

Abstract Co-Author(s): Sophia Arbuiso, Chase Alston, Ashley Zhang, Samuel Medina, Matthew Liao, William Rhodes, Shukri Dahir, David Otterburn MD

**Purpose:** There is a backlog of 4,000,000 patients with unrepaired cleft lip and palate (CLP) in low- and middle-income countries (LMICs) (1). Somaliland is the world's fourth poorest nation and has no practicing plastic surgeons. Since 2011, an American plastic surgeon has conducted 40 surgical camps for CLP patients in Hargeisa, Somaliland and trained the nation's first surgeon capable of repairing cleft lips. Patient age is a surrogate marker for evaluating CLP backlog (2). The purpose of this study was to evaluate the impact of these surgical camps and training program on the backlog of CLP patients.

**Methods:** A retrospective chart review was conducted on all patients who received CLP repair at Edna Adan University Hospital in Hargeisa, Somaliland between 2011-2024. In the last two years of the study, surgical duties were shared between the visiting surgeon and the locally trained surgeon. Information regarding patient age, cleft etiology and surgical management were retrieved. Chi-squared analysis and t-tests were conducted to compare the first years of surgical camps (2011-12) to the last (2023-24).

**Results:** Authors identified 787 surgical procedures, 722 of which were primary repairs (229 palates, 18.0 primary repairs per camp). The average age of treatment decreased from 93.3 months in 2011-12 to 51.9-m in 2023-24 ( $p<0.001$ ). The percentage of patients with primary cleft lip repaired by 6-m increased from 6.8 to 8.8% ( $p=0.660$ ). The number of patients who were repaired after the age of 6 years decreased from 59.1 to 20.6% ( $p=0.006$ ). The percentage of patients with primary cleft palate repaired by 18-m decreased from 25.0 to 20.0% ( $p=0.780$ ). The percentage of patients with primary cleft palate repaired after the age of 6-y decreased from 62.5 to 0.0% ( $p=0.003$ ). The presence of a locally trained surgeon increased operative capacity by 32.4%.

**Conclusions:** Despite regular surgical camps and the presence of a local surgeon capable of performing cleft lip repairs, rates of timely CLP treatment in Somaliland remain low. However, the significant decreases in the number of children over the age of 6-y receiving primary CLP repair suggests that surgical camps and training partnerships are efficacious in decreasing the backlog of unrepaired CLP in Somaliland.

These findings validate calls for increasing global plastic surgery partnerships in neglected LMICs (3).

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## **Alveolar Gap Reduction and Shape Changes Using Active vs Passive NAM Techniques**

Abstract Presenter: Umer Qureshi

Abstract Co-Author(s): Taylor Hallman, Christian Arcelona, Gabrielle Rodriguez, Anitesh Bajaj, Arun Gosain MD

**Introduction:** Cleft lip and/or palate (CL/P) has one of the highest incidences of any congenital defect, with around 1 in every 700 people born being afflicted with this condition. Because of the prevalence of CL/P, physicians have established a number of techniques even before surgery to improve the outcomes of CL/P repair. For approximately 6 months after birth, neonates have elevated levels of maternal estrogen which allows physicians to readily manipulate the defect prior to a surgical repair. With this in mind, Dr. Barry Grayson initially introduced active nasolabial molding (ANAM) and revolutionized CL/P treatment by reducing the alveolar and palatal defects through the traction applied by the device. This treatment can lead to improved surgical results because the defect was reduced. However, this method is quite labor intensive, expensive, and requires weekly visits for adjustments.

There have been a number of modifications inspired by the original ANAM technique including passive nasolabial molding (PNAM). These techniques require fewer follow up appointments and do not require external taping for support thus making it cheaper, less labor intensive, and have a lower frequency of visits for adjustments. However, the common issue with PNAM methods is that they are not nearly as efficacious as ANAM

methods.

The goal of this study is to measure the proficiency of a novel PNAM technique in comparison to the commonly implemented Grayson ANAM technique.

**Methods:** A retrospective study was conducted on CL/P patients undergoing ANAM and PNAM. Each patient's CL/P was imaged with a three dimensional camera prior to the study and at the end. Using the captured images, the interalveolar width, maxillary width, and the canine positions of each patient was measured prior to initiation of treatment and after cessation of treatment. The change in interalveolar width, maxillary width, and canine positions were then calculated. Two tailed independent t tests were then used to compare the changes in maxillary width, interalveolar width, and canine positions of the two techniques. The PNAM technique n = 16 and the ANAM n = 11.

**Results:** The mean for the change in interalveolar segment distance for the PNAM and ANAM techniques were 10.19 mm and 8.32 mm, but there was no significant difference. The mean for the change in canine distance for the PNAM and ANAM techniques were 2.89 mm and 1.74 mm, but there was no significant difference. The mean for the change in maxillary width for the PNAM and ANAM techniques were 1.36 mm and 0.79 mm, but there was no significant difference.

**Conclusion:** There is no significant difference in the final results of these two techniques. However, the PNAM technique is less costly, less labor intensive, and requires fewer follow up adjustment visits in comparison to the ANAM technique. Further in depth analysis is needed, however, reducing the costs and barriers to this care will promote improved patient outcomes.

### **Long-term Outcomes of a Modified Straight-line Palate Repair Technique: Low Fistula and Speech Correcting Surgery Rates with Single Layer Closure at the Hard-soft Junction**

Abstract Presenter: Sasha Lasky

Abstract Co-Author(s): Marah Jolibois, Idean Roohani, Tayla Moshal, Priyanka Naidu, Eric Nagengast MD, Naikhoba Munabi MD, Erin Wolfe MD, Zachary Collier MD, William Magee, III MD, DDS

**Purpose:** In order to optimize speech outcomes, the lead surgeon on this study performs a modified straight-line repair (SLR) palatoplasty with a single layer closure of oral mucosa only at the hard-soft junction. The purpose of this study is to assess fistula



and speech correcting surgery outcomes of this modified SLR technique.

**Methods:** A retrospective chart review evaluated patients without a craniofacial syndrome with Veau III or IV CP ± cleft lip who underwent a SLR palatoplasty at our institution from 1993-2023. Patients who underwent the modified SLR by the lead author were compared to those undergoing traditional SLR. The modified SLR technique involves cutting the nasal mucosa with the aberrant insertion of the levator muscle off of the hard palate along the medial pterygoid plate just to the edge of the eustachian tube. This allows for full release of the levator muscle for which maximum length can be achieved. The criticism for this maneuver has always been the single layer closure at the hard-soft palate junction. Primary outcomes included postoperative palatal fistula, fistula location based on the Pittsburgh Fistula Classification System (PFCS), need for fistula repair, and VPI correcting surgery. Multivariate logistic regression was performed adjusting for sex, race, age at palatoplasty, and Veau classification.

**Results:** A total of 1,857 patients underwent palatoplasty, of which 343 met inclusion criteria (160 modified SLR, 183 traditional SLR). Average length of follow-up from palatoplasty was  $6.4 \pm 5.3$  years. Upon multivariate regression, significantly fewer fistulas were observed with the modified SLR versus traditional SLR technique (3.1% vs 15.3%, Odds Ratio [OR]: 0.19;  $p=0.001$ ). According to the PFCS, modified SLR had Type V (80%,  $n=4$ ) and Type IV (20%,  $n=1$ ) fistula locations compared to traditional SLR with Type V (57%,  $n=16$ ), Type VI (18%,  $n=5$ ), Type III (14%,  $n=4$ ), and Type II (11%,  $n=3$ ) fistula locations. The modified SLR technique compared to traditional SLR was associated with lower rates of fistula repair surgery (0.6% vs 13.1%, OR: 0.26;  $p=0.022$ ) and VPI correcting surgery (1.0% vs 16.8%, OR: 0.051;  $p=0.004$ ).

**Conclusion:** The modified SLR technique resulted in fewer fistulas and lower rates of fistula repair surgery and VPI surgery compared to traditional SLR. Release of the nasal mucosa off the hard palate facilitates more posterior positioning of the levator muscle. This may result in improved speech and allow for more medial mobilization of the oral mucosa leading to less tension on repairs at the hard-soft junction accounting for fewer fistulas. A more in depth discussion about the technique to achieve this success is warranted.

## **Institutional Trends and Surgical Techniques for Treating Macroglossia in Beckwith-Wiedemann Syndrome**

Abstract Presenter: Dominic Romeo

Abstract Co-Author(s): Theodor Lenz, Dr. Benjamin Massenburg MD, Meagan Wu, Jinggang Ng, Patrick Akarapimand, Andrew George, Eric Chien-Wei Liao MD, PhD, Jennifer Kalish, Jesse Taylor MD

**Background:** Around 85% of patients with Beckwith-Wiedemann syndrome (BWS) have macroglossia, and symptomatic patients often undergo tongue reduction surgery. While many surgical techniques are used, little is known about the relative benefits of different approaches. This study leverages a large cohort of patients with BWS who have had tongue reduction surgery to evaluate the risks and benefits of various surgical techniques.

**Methods:** Medical records of patients with BWS seen between December 2004 and February 2024 were reviewed for molecular variant, surgical history, pre- and postoperative polysomnography findings, tongue reduction technique, and perioperative complications.

**Results:** Three hundred and thirty-five patients with BWS and macroglossia were retrospectively reviewed, with 102 undergoing a total of 111 tongue reduction procedures. Six surgical techniques were used: anterior wedge (1, 0.9%), anterior wedge with keyhole (6, 5.4%), peripheral (21, 19.0%), peripheral with keyhole (29, 26.1%), W-plasty (10, 9.1%), and W-plasty with keyhole (35, 31.5%). Obstructive apnea-hypoxia index decreased by 13.1 (3.8-21.0) events/minute after surgery and oxygen saturation nadir increased by 5.5 (-0.5-17.0) % after surgery, with similar improvements across techniques. There were no differences in tongue mass or volume resected using different surgical approaches. The W-plasty technique had the longest operative time (median: 40.0 minutes (interquartile range: 27.0-45.0,  $p<0.05$ ) and resulted in the most blood loss (12.5 (0-28.8) mL,  $p<0.001$ ), but incidence of complications, re-operation rates, hospital admission time, and intensive care unit stay were similar across techniques. The peripheral resection had the shortest operative time (24.0 (22.8-31.0),  $p<0.05$ ) and least blood loss (0 mL;  $p<0.05$ ). Prior to 2019, our team primarily used the W-plasty with/without keyhole approach (82.5% of total), but since 2019, most surgeries are performed using the peripheral with/without keyhole approach (74.2%,  $p<0.001$ ).

**Conclusion:** The peripheral resection is faster and results in less blood loss than the

W-plasty surgical technique for treating symptomatic macroglossia in Beckwith-Wiedemann syndrome. This study documents our institutions transition towards increasingly adopting the peripheral resection approach.

## **Bilateral Cleft Lip and Palate Repair: A Foundation Based Approach**

Abstract Presenter: Sai Anusha Sanka

Abstract Co-Author(s): Kevin He, Gary Skolnick MBA, Kamlesh Patel MD

**Background:** Bilateral cleft lip and palate presents a multitude of challenges that significantly impact a child's speech, hearing, language, and psychosocial development. Current management strategies follow a protocol that often does not adjust to patient/family factors or anatomy. This can often necessitate multiple secondary procedures and result in suboptimal outcomes. This retrospective study, conducted at a tertiary care center from 2011 to 2023, aims to investigate the efficacy of a foundation-based approach for patients with bilateral cleft lip and palate. Foundation based approach requires the premaxilla to be in line with the lateral alveolar segments prior to lip and nose repair. Premaxilla is managed using presurgical orthopedics (passive molding and lip taping) and lip/nose repair at 5-6 months of age, or a premaxillary setback at around 10 months of age during palatoplasty, followed by lip and nose repair 3 months later. This study seeks to establish a patient-centered approach and contribute valuable insights into optimizing treatment strategies, potentially reducing the need for additional procedures, and improving overall quality of life.

**Methods:** This retrospective study included 27 patients who underwent bilateral cleft lip repair. Comprehensive demographic and clinical data were collected, including pre- and postoperative assessments of nose, lip, and palate repair, as well as patient-reported outcomes, along with comorbidities and syndromic status where applicable. Descriptive and comparative statistical analyses were performed using SPSS to evaluate the success of the premaxillary setback, and multivariate analyses were conducted to identify predictors of favorable outcomes.

**Results:** The cohort predominantly comprised males (63%), with an average age of 12 weeks (range: 1 - 59 weeks) at the onset of initial presentation. Among these patients, 8 (30%) required a surgical setback to correctly position the premaxilla, whereas 19 (70%) attained the desired alignment solely through passive molding. Post-initial repair, 5 patients underwent a total of 7 revision surgeries, which included 6 palate revisions (1 fistula repair and 5 VPD repair), 1 lip revision (wedge excision along free margin with VPD procedure).

**Conclusion:** Our study presents a foundation-based approach to patients with bilateral cleft lip and palate. Our treatment protocol has evolved over the past 12 years to ensure the premaxilla (foundation) is set before performing lip and nose repair. If required, the palate repair and setback is done before lip repair, which marks a significant departure from traditional methods and addresses the challenge of protrusive premaxilla early in the treatment process. Benefits of the approach include: 1) Appropriate lip and nose aesthetic outcomes, 2) Closure of the junction between primary and secondary palate during palatoplasty, 3) closure of the alveolar ridge and nasolabial fistula during palatoplasty for boneless bone grafting. To avoid secondary VPD related procedures, our current protocol now also includes the use of buccal adipose, with and without buccal myomucosal flaps, at time of primary palatoplasty to manage tissue deficiency during primary palatoplasty.

## **Infant Skull Thickness in Surgery: Is Weight is More Important Than Age?**

Abstract Presenter: Jesse Menville

Abstract Co-Author(s): Carole Spake MD, Nidhi Shinde, Scott Collins, Elijah Persad-Paisley, Navya Baranwal, Albert Woo MD

**Background & Purpose:** Special consideration is often given to patient age when planning craniofacial procedures. In pediatric patients, the craniofacial skeleton is still maturing and undergoing a rapid period of expansion during the first few years of postnatal life.<sup>1</sup> The timing of surgical interventions thus lies in a critical balance: intervening too early or late may lead to suboptimal outcomes or necessitate additional procedures. This is particularly true regarding endoscopic-assisted and open cranial vault reconstructions in craniosynostosis patients.<sup>2,3</sup> However, there is conflicting data and a lack of strong consensus regarding the optimal timing for these procedures. While examining a cohort of matched controls for a craniosynostosis study, we hypothesized that weight and sex may impact skull thickness in addition to age.

**Methods:** Institutional Review Board (IRB) approval was obtained and maintained throughout the study period. A retrospective review of an institution-wide imaging database was performed to identify 40 pediatric patients who received computed tomography (CT) head scans for non-traumatic indications over a 9-year period. Each skull was segmented in 3D Slicer along suture lines into frontal (right and left), parietal (right and left), and occipital segments. Average calvarial thickness per bone segment and overall thickness per skull were then obtained for each subject using vector arrays.

Gamma regression models were created to determine the adjusted effects of age, weight, and sex on skull thickness. Results were considered significant at  $p < 0.05$ .

**Results:** We found that for the bilateral frontal bones, left parietal bone, and occipital bone, weight was a more significant predictor of calvarial thickness than age or sex alone ( $p < 0.001$ ). Age was a marginally more significant predictor of right parietal bone thickness ( $p = 0.010$ ), although weight itself remained a significant predictor ( $p = 0.017$ ). The interaction of age and weight was also a significant predictor of left parietal bone thickness ( $p = 0.009$ ). Further subanalysis showed that among children 1-5 months old, each additional kilogram of body weight resulted in a 1.05-fold increase in left parietal bone thickness ( $p < 0.001$ ); among children 6-11 months old, left parietal thickness increased 1.06-fold ( $p = 0.012$ ); and for children 12-17 months old, left parietal thickness increased 1.09-fold ( $p = 0.036$ ). Overall, weight was a significant predictor of calvarial thickness in all five bone segments and overall per individual skull.

**Conclusions:** Given these results, we propose that weight be included when considering surgical timing rather than age alone. The lack of consensus and wide range in individual variation in skull thickness by age underscores the need for a more individualized approach to surgical planning in pediatric cranial reconstruction.

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# **Photogrammetric Outcomes and Perioperative Characteristics of Endoscopic-Assisted versus Traditional Fronto-Orbital Distraction for the Treatment of Unicoronal Synostosis**

Abstract Presenter: Meagan Wu

Abstract Co-Author(s): Dr. Benjamin Massenburg MD, Dillan Villavisanis MD, Ashley Chang BA, Dominic Romeo, Jinggang Ng, Gregory Heuer, Scott Paul Bartlett MD, Jordan Swanson MD, MSc, Jesse Taylor MD

**Background:** In this study, we compared the perioperative characteristics and photogrammetric outcomes of patients who underwent endoscopic-assisted fronto-orbital distraction osteogenesis (FODO) versus open FODO via a traditional coronal incision.\

**Methods:** We retrospectively reviewed patients treated for unicoronal synostosis (UCS) from 2013 to 2023. Perioperative characteristics were compared between patients who underwent endoscopic-assisted FODO ("endo-FODO") and open FODO. Photogrammetric outcomes at one to three years postoperatively were compared between a sub-cohort of patients who underwent endo-FODO and a contemporaneous sub-cohort of age- and sex-matched controls who underwent open FODO. The formula symmetry ratio= $-(1-(s/n)) \times 100$  was used to compare linear periorbital dimensions of the synostosed and nonsynostosed sides, with zero indicating perfect symmetry and a more negative value indicating greater asymmetry. Canthal tilt symmetry was represented by  $\Delta$  canthal tilt= $|(s-n)|$ . Differences between pre- and postoperative periorbital symmetry ratios, canthal tilt symmetry, orbital dystopia angle (ODA), and frontal bossing angle were calculated, with positive differences representing improvement postoperatively.

**Results:** A total of 34 patients (14 endo-FODO, 20 open FODO) were included. Patients underwent surgery at a similar mean age in the endo-FODO and open FODO groups ( $6.0 \pm 1.7$  vs.  $6.5 \pm 3.4$  months,  $p=0.916$ ). Duration of anesthesia was shorter in the endo-FODO compared to open FODO group ( $211.0 \pm 30.3$  vs.  $243.4 \pm 30.2$  minutes,  $p=0.004$ ), as was estimated blood loss ( $12.1 \pm 6.3$  vs.  $21.0 \pm 8.2$  mL/kg,  $p<0.001$ ) and blood transfusion requirements ( $15.5 \pm 9.3$  vs.  $68.0 \pm 21.9$ ,  $p<0.001$ ). Twenty patients (10 endo-FODO, 10 open FODO) were included in our photogrammetric analysis, with photographs taken at similar postoperative timepoints in the endo-FODO and open FODO groups ( $1.6 \pm 0.9$  and  $1.3 \pm 0.9$ ,  $p=0.597$ ). Patients who underwent endo-FODO demonstrated significant improvements in margin-reflex distance 1 (MRD1) symmetry ratio ( $-65.0 \pm 86.1$  to  $-12.7 \pm 15.1$ ,  $p=0.004$ ), palpebral height symmetry ratio ( $-11.9 \pm 6.4$  to  $-5.8 \pm 5.7$ ,  $p=0.004$ ), canthal tilt symmetry ( $5.1^\circ \pm 3.2^\circ$  to  $1.2^\circ \pm 1.2^\circ$ ,  $p=0.020$ ), and ODA

( $81.7^{\circ} \pm 2.1^{\circ}$  to  $86.1^{\circ} \pm 1.9^{\circ}$ ,  $p=0.009$ ). Patients who underwent open FODO demonstrated significant improvements in MRD1 symmetry ratio ( $-36.0 \pm 28.9$  to  $-6.6 \pm 6.9$ ,  $p=0.004$ ), palpebral height symmetry ratio ( $-19.8^{\circ} \pm 15.4^{\circ}$  vs.  $-5.3^{\circ} \pm 4.1^{\circ}$ ,  $p=0.033$ ), and ODA ( $82.6^{\circ} \pm 1.7^{\circ}$  to  $86.4^{\circ} \pm 1.7^{\circ}$ ,  $p=0.004$ ). All postoperative measurements as well as degrees of improvement were similar between the endo- and open FODO groups ( $p>0.05$ ).

**Conclusions:** Both endo-FODO and open FODO achieved significant improvements in periorbital symmetry and orbital dystopia at 1.5 years postoperatively. Endo-FODO may achieve comparable aesthetic outcomes to open FODO while demonstrating significantly reduced perioperative morbidity and scar burden.

## **A Comparison of Long-term Aesthetic Outcomes Between Fronto-orbital Distraction Osteogenesis and Conventional Fronto-orbital Advancement and Remodeling**

Abstract Presenter: Meagan Wu

Abstract Co-Author(s): Dr. Benjamin Massenburg MD  
Dillan Villavisanis MD, Ashley Chang BA, Dominic Romeo, Jinggang Ng, Gregory Heuer, Scott Paul Bartlett MD, Jordan Swanson MD, MSc, Jesse Taylor MD

**Purpose:** In this study, we compared the long-term photogrammetric and subjective aesthetic outcomes of patients who underwent fronto-orbital distraction osteogenesis (FODO) versus traditional fronto-orbital advancement and remodeling (FOAR).

**Methods:** We retrospectively reviewed patients treated for nonsyndromic unicoronal synostosis (UCS) from 2009 to 2023. Aesthetic outcomes at five years postoperatively were compared between patients who underwent FODO and a contemporaneous cohort of age- and sex-matched controls who underwent FOAR. The formula symmetry ratio =  $-(1 - (s/n)) \times 100$  was used to compare linear periorbital dimensions of the synostosed and nonsynostosed sides, with zero indicating perfect symmetry and a more negative value indicating greater asymmetry. Canthal tilt symmetry was represented by  $\Delta$  canthal tilt =  $|(s-n)|$ . Differences between pre- and postoperative periorbital symmetry ratios, canthal tilt symmetry, orbital dystopia angle (ODA), and frontal bossing angle were calculated, with positive differences representing improvement postoperatively. The presence of several characteristic dysmorphological features were assessed.

**Results:** A total of 28 patients (14 FOAR, 14 FODO) underwent surgery at a mean age of  $7.4 \pm 2.1$  months. At an average of  $6.7 \pm 1.8$  years postoperatively, the FODO cohort achieved superior margin-to-reflex distance 1 symmetry ratios ( $-6.7 \pm 6.4$  vs.  $-20.1 \pm 17.7$ ,  $p=0.010$ ), ODA correction ( $5.7^\circ \pm 3.2^\circ$  vs.  $3.5^\circ \pm 1.8^\circ$ ,  $p=0.027$ ) and improvements in canthal tilt symmetry ( $3.2^\circ \pm 4.2^\circ$  vs.  $-0.6^\circ \pm 2.8^\circ$ ,  $p=0.004$ ) compared to the FOAR cohort. Fewer patients in the FODO cohort exhibited temporal hollowing (14% vs. 79%,  $p<0.001$ ), supraorbital retrusion (14% vs. 79%,  $p=0.018$ ), and forehead irregularities (21% vs. 71%,  $p=0.008$ ) compared to the FOAR cohort.

**Conclusions:** Compared to FOAR, FODO was associated with greater improvements in periorbital symmetry, orbital dystopia, and fronto-temporal retrusion at seven years postoperatively. It will be important to follow these cohorts to cranial maturity to ensure durability of soft tissue changes and to adequately compare results.

## **Surgical Outcomes after Scalp Reconstruction with Free Tissue Transfer**

Abstract Presenter: Anna Lee

Abstract Co-Author(s): Jerry Yang MD, Ariel Johnson MD, Julian Winocour MD, CM, FACS, FRCSC, Matthew Iorio MD, Tae Chong MD, Christodoulos Kaoutzanis MD, Jason Yu DMD, MD, Phuong Nguyen MD, David Khechoyan MD, David Mathes MD

**PURPOSE:** With the advancement of microsurgical techniques, free tissue reconstruction has emerged as an effective treatment for larger and more complex scalp defects. Previous reports on free tissue transfer for scalp reconstruction have either lacked sufficient patient numbers or provided limited follow-up data. We aim to assess flap selection, procedure staging, and long-term complications at our institution in order to provide valuable insights for surgeons in choosing the optimal reconstructive options for patients with complex scalp defects.

**METHODS:** A retrospective review was conducted of a consecutive set of scalp reconstruction cases that required free tissue transfer between 01/01/2015 and 04/01/2023. Comorbidities, surgical details, and post-operative complications up to 90 days after surgery were noted. Surgical details of interest included pre-surgical scalp defect size, flap selection, whether the procedure was staged, subsequent debulking surgeries, and incidence of concomitant cranioplasty. Postoperative complications identified up to 90 days after surgery included infection, hematoma, wound dehiscence, implant exposure, flap failure, vessel compromise, or death. Descriptive analysis was



performed through Microsoft Excel.

**RESULTS:** There were 33 free flaps performed for scalp reconstruction for 28 patients. Reconstruction for oncologic reasons was done in 75% of cases, and 27% of free flap cases had concurrent cranioplasty. Common comorbidities included smoking (n=18; 64%) and history of radiation (n=17; 61%).

The most common flaps used for scalp reconstruction were latissimus dorsi muscle flap (LD; n=14; 42%) and anterolateral thigh flap (ALT; n=11; 33%). For LD flaps, hematoma (n=5; 36%) was the most common 30-day postoperative complication. For ALT flaps, wound dehiscence (n=3; 27%) and hematoma requiring return to OR (n=2; 18%) were the most common 30-day postoperative complications. At the end of the 90-day period, partial flap failure occurred in four (29%) LD flaps and two (19%) ALT flaps. Complete flap failure occurred in four (14%) LD flaps and zero (0%) ALT flaps. The 90-day complete flap failure rate for all types of free flap scalp reconstructions was 9% (n=3).

**CONCLUSION:** Free flap reconstruction can be an effective method for the treatment of complex soft tissue scalp defects, though it is not without its associated morbidities. Understanding the risks and benefits of such procedures is crucial for both surgeons and patients alike.

## **Zygoma Fractures: When Should You Repair the Orbital Floor?**

Abstract Presenter: Jesse Menville

Abstract Co-Author(s): Nidhi Shinde, Matthew Lee, Albert Woo MD

**Background & Purpose:** The zygomaxillary complex (ZMC) is one of the most commonly fractured areas of the midface.<sup>1</sup> Integral to the architectural stability of this area is the zygoma's intimate relationship with the orbital floor. Hence, ZMC fractures always have an orbital floor component to the injury. Previous studies have focused on the surgical outcomes and complications associated with zygomatic fractures, but few have extensively explored clinical and radiographic indications for orbital floor exploration and implant placement following open reduction of the zygoma.<sup>2,3</sup> This study sought to evaluate whether displacement at different sites of injury could be predictive of the need for orbital floor reconstruction.

**Methods:** Institutional Review Board approval was obtained for a retrospective review of all patients with zygoma fractures who underwent operative intervention by the plastic

surgery service over an 8-year period. All patients during the study period underwent exploration of the orbital floor at the time of ZMC reconstruction. When deemed necessary, an implant was placed for reconstruction of the defect. Computed Tomography (CT) imaging was correlated with data from the Electronic Medical Record to assess for the presence of co-occurring facial fractures. CT data was used to assess the following: zygomaxillary impaction at the infraorbital rim; maximum zygoma displacement at the zygomaticomaxillary buttress, zygomaticofrontal suture, and zygomaticotemporal suture; and orbital floor displacement in the anterior-posterior, inferior-superior, and transverse directions. All displacement measurements were recorded to the nearest tenth of a millimeter. Logistic regression models were fit to assess the adjusted effects of age and gender on implant placement. Results were considered significant at  $p < 0.05$ .

**Results:** Counting bilateral fractures as separate entities, we identified 123 cases spread among 100 patients. The cohort was 73% male and 27% female. Average patient age was 40.1 years old. The youngest patient was 16 years old and the oldest was 75 years old. Fifty-five cases (44.7%) received an implant following orbital floor exploration. In addition to a zygomatic fracture, 79 cases (64.2%) had a concurrent nasoorbitoethmoid fracture; 38 (30.9%) had a concurrent frontal bone fracture; and 64 (52.0%) had a concurrent LeFort I, II, or III fracture. With every 1mm increase in zygomatic displacement in the anterior-posterior direction, patients had 1.14 times higher odds of receiving an orbital implant (OR 1.14, CI (1.01-1.32),  $p = 0.046$ ). Rectus rounding and orbital floor displacement in the inferior-superior, anterior-posterior, and transverse directions were all similarly significantly associated with implant placement ( $p < 0.001$ ).

**Conclusion:** A regression model evaluating zygoma fractures shows that rectus rounding, zygomatic impaction, and orbital floor defect volume were among the strongest indications for orbital floor implant placement.

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## **Trends and Practices in Cleft Repair: A Comprehensive Analysis of Surgical and Billing Practices Over Two Decades Through a National Database Query**

Abstract Presenter: Anna Lee

Abstract Co-Author(s): Molly Murphy, Catherine Alder, Giovanni Tin, Jasmine Chaij, Antonio Porras, Jason Yu DMD, MD, Brooke French MD  
Kristen Lowe, Phuong Nguyen MD, David Mathes MD, David Khechoyan MD

**PURPOSE:** The wide spectrum of malformation in orofacial clefts is associated with various surgical approaches, including single-staged repair, staged repair, or concurrent tip rhinoplasty and/or septoplasty.[1] Previous literature reports 31% of patients undergoing primary cleft lip repair with rhinoplasty and 47% undergoing pre-operative naso-alveolar molding (NAM).[2,3] This study comprehensively examines the national prevalence of cleft lip repair techniques compared to current literature and highlights changes in NAM billing practices over two decades.

**METHODS:** This retrospective study utilized TriNetX, a national deidentified aggregate database, to evaluate patients under 12 months who underwent unilateral (CPT-40700) or bilateral cleft lip repair (CPT-40701, CPT-40702) from 1/1/2000-11/3/2023. Patients with subsequent cleft lip revisions (CPT-40720) were categorized by initial repair year. Data on NAM use (CPT-21079, CPT-21080, D-5931, D-5932, D-5936) and concurrent tip rhinoplasty/septoplasty (CPT-30460, CPT-30462) were collected through identified dental and procedural billing codes. Patient demographics were analyzed using TriNetX, and logarithmic interpolation analysis was performed with PRISM software.

**RESULTS:** Among the 5,642 patients who underwent cleft lip repair, 4,405 patients (78%) had a unilateral cleft lip repair and 1,237 (22%) had a bilateral cleft lip repair. Of those patients, 2,699 (48%) had a same-day tip rhinoplasty or septoplasty. Among the bilateral cleft lip repair patients, 1,136 (91%) were billed with a single staged procedure. The database showed 551 (9.7%) patients had a cleft lip revision, and 128 (2.3%) underwent pre-operative NAM devices.

Over the study period, the prevalence of concomitant tip rhinoplasty and/or septoplasty increased from 14% in 2000 to 59% in 2023 ( $R^2=0.86$ ,  $P<0.001$ ). The prevalence of cleft lip revisions peaked in 2006 at 33% and declined to 9.8% in 2023 ( $R^2=0.93$ ,

P<0.001). The prevalence of staged operations increased from 0% in 2000 to 17% (n=12) in 2023 ( $R^2=0.75$ , P<0.001). The prevalence of NAM was zero in the first 12 years (2000-2011) and increased from 0.1% in 2012 to 2.2% by 2023 ( $R^2=0.996$ , P<0.001).

**CONCLUSION:** More patients are undergoing cleft lip repair with concomitant tip rhinoplasty and/or septoplasty, and fewer patients have required cleft lip revisions, possibly due to improved surgical techniques. The majority of bilateral cleft lip repairs remain single-staged, which may be supported by the increased availability of NAM. Billing inconsistencies may explain why only 2.3% of our patients reported NAM use, despite literature reporting 47%. [2]

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### Comparative 3-Dimensional Analysis of Pi vs Posterior Vault Remodeling for Nonsyndromic Single-Suture Sagittal Craniosynostosis Correction

Abstract Presenter: Alexander Velazquez

Abstract Co-Author(s): John Sullivan MD, Michael Lebhar MD, Colton Fernstrum MD, Jeffrey Roux, Bradley Hathaway Jr., Laura Humphries MD, Ian Hoppe MD

**Purpose:** Both the Pi procedure and posterior vault reconstruction (PVR) are surgical procedures that address sagittal craniosynostosis and aim to increase intracranial volume by differing methods. This study seeks to compare the volumetric differences between the two methods.

**Methods:** A 3-dimensional analysis was performed of pre and post-operative head computed tomography (CT) scans from patients who underwent PVR and the Pi procedure for treatment of sagittal craniosynostosis at a single institution from 2018 to

2023. Pre and post operative CTs of 18 patients with nonsyndromic single-suture sagittal craniosynostosis were separated by operative technique performed. Both pre and post operative scans were compared to age-sex matched controls. PVR patients were further stratified by those requiring a subsequent bifrontal orbital advancement reconstruction (BFOAR). Cranial index (CI) and intracranial compartment volumes were analyzed utilizing SyngoVia. Paired and unpaired t-tests examined differences between groups.

**Results:** Ten patients underwent a Pi procedure and 8 patients underwent a PVR. Postoperatively, the Pi procedure demonstrated an increase of mean CI from 70.2 to 77.0 ( $p = 0.01$ ). However, CI continued to be statistically significantly decreased compared to controls post-operatively ( $p = 0.007$ ). Mean CI increase amongst PVR patients between surgeries was not significant and this trend continued in those receiving a subsequent BFOAR. When compared to controls post-operatively the PVR mean CI was significantly decreased ( $p = 0.002$ ). Preoperatively, both Pi and PVR patients had a significantly larger total intracranial volume compared to controls ( $p = 0.043$ ,  $p = 0.042$ , respectively). Postoperatively, the Pi cohort's total intracranial volume remained statistically significantly larger than controls ( $p = 0.002$ ) but those undergoing PVR alone as well as those undergoing a PVR and a subsequent BFOAR total intracranial volume did not differ significantly compared to controls.

**Conclusions:** The preliminary results of this study demonstrate that neither procedure corrected cranial index post-operatively. The PVR procedure did not increase intracranial volume significantly compared to controls, thus effectively normalizing it (due to increased intracranial volume preoperatively). The Pi procedure significantly increased the total cranial volume when compared to controls. The distribution of the volume changes between the two techniques is different and warrants continued investigation.

## **A Coddling of the Sagittal Suture: Inequality in Spring-Assisted Expansion**

Abstract Presenter: Jinggang Ng

Abstract Co-Author(s): Ashley Chang BA, Dillan Villavisanis MD, Sameer Shakir MD, Dr. Benjamin Massenburg MD, Meagan Wu, Dominic Romeo, Jordan Swanson MD, MSc, Scott Paul Bartlett MD, Jesse Taylor MD

**BACKGROUND:** We examined differences in long-term morphometric outcomes of spring-assisted expansion for various forms of isolated nonsyndromic sagittal

craniosynostosis.

**METHODS:** A retrospective review was performed of children who underwent spring-assisted expansion from 2011 to 2020 at the Children's Hospital of Philadelphia. Cephalic indices (CI), Whitaker grades, parietal bone thickness, degree of suture fusion were assessed. Frontal bossing and vertex-nasion-opisthocranion (VNO) angles were compared to a normal control group.

**RESULTS:** Fifty-four subjects underwent surgery at age  $3.6 \pm 1.0$  months with follow-up of  $6.3 \pm 1.8$  years. Mean CI was  $75.2 \pm 4.1$  at  $5.9 \pm 2.0$  years postoperatively. Mean CI were  $75.8 \pm 4.1$  (n=32),  $76.4 \pm 4.0$  (n=22), and  $77.1 \pm 4.8$  (n=11) at 5, 7, and 9+ years postoperatively, respectively. Fifty-one (94.4%) were Whitaker Grade I. On physical examination, 12 (22.2%) demonstrated craniofacial abnormalities. At long-term follow-up, there were no differences in frontal bossing angle ( $102.7 \pm 5.2$  degrees versus  $100.7 \pm 5.6$  degrees,  $p=.052$ ) and VNO angle ( $44.9 \pm 3.3$  degrees versus  $43.9 \pm 2.2$  degrees,  $p=.063$ ) between study and control groups. Younger age at surgery predicted a lower Whitaker grade, more normalized VNO angle, and greater change in CI during active expansion. Increased percentage fused of the posterior sagittal suture predicted a higher Whitaker grade, while decreased anterior fusion was associated with frontal bossing and temporal hollowing. Three (5.6%) required reoperation for persistent scaphocephalic cranial deformity.

**CONCLUSIONS:** Overall, children undergoing spring-mediated expansion for sagittal craniosynostosis demonstrated maintenance of CI, favorable cosmetic outcomes, and a low reoperation rate at mid-term follow-up. Early intervention is associated with improved aesthetic outcomes, and regional fusion patterns may influence long-term craniofacial dysmorphology.

## **Blood Transfusion and Opioid Requirements in Open vs. Minimally Invasive Repair of Single-Suture Craniosynostosis**

Abstract Presenter: Taylor Hallman

Abstract Co-Author(s): Umer Qureshi, Kathryn Reisner, Arun Gosain MD

**Introduction:** Advances in surgical techniques in recent decades have allowed for the development of minimally invasive approaches. The popularity of minimally invasive surgical repair for treatment of craniosynostosis is increasing, yet data regarding morbidity from these procedures compared to traditional open repair techniques is

sparse. This study compares the surgical outcomes, as well as blood transfusion and opioid requirements of open versus minimally invasive single suture craniosynostosis procedures.

**Methods:** We conducted a retrospective chart review of patients at our institution with a diagnosis of craniosynostosis who underwent surgical repair from 2007-2023. Patients with multi-suture synostosis were excluded from the study. Those meeting inclusion criteria were assessed for the following: 1) type of synostosis, 2) surgical repair characteristics (repair technique, operative time), 3) intraoperative/postoperative complications, blood transfusions, and opioid administration, and 4) length of stay. Demographic information was also recorded. Pearson's chi squared test was used to test for differences in complications between repair methods, and independent t-tests used to assess for differences in blood transfusion volumes and opioid administration.

**Results:** A total 317 patients were included in our analysis. Sagittal suture synostosis was the most frequently encountered (66.9%), followed by metopic (17%), coronal (14.5%), and lambdoid (1.6%). Only 32.2% of patients underwent repair with minimally invasive techniques (endoscopic or limited incision), with 52.9% of these occurring from 2017-2023. The average age of patients undergoing minimally invasive repair was 3.6 months, whereas those who underwent open repair averaged 9.7 months ( $p < 0.01$ ). Operative time was significantly shorter for minimally invasive repairs (186 minutes) than for open repair (309 minutes) ( $p < 0.01$ ).

The most common complication observed among all patients was incidental dural laceration ( $n = 25$ ). Patients who underwent minimally invasive repair were significantly less likely to suffer from a cerebrospinal fluid leak postoperatively compared to patients who underwent open repair ( $p < 0.05$ ). No statistically significant differences in the rate of hematoma, postoperative bleeding, infection, wound dehiscence, or increased intracranial pressure were observed.

Total blood transfusion volume per kilogram of body weight was significantly higher for patients treated with open repair (20 mL/kg) than minimally invasive (7 mL/kg) ( $p < 0.05$ ).

Postoperative opioid administration within two days postoperatively averaged 10.8 mg of oral morphine equivalent (OME) for patients who underwent open repair and 4.6 mg OME for patients treated with minimally invasive techniques ( $p < 0.05$ ). When corrected for body weight, patients who underwent open repair were administered nearly 70% more opioids per kilogram postoperatively ( $p < 0.01$ ).

Length of stay was also longer for patients who were treated with open repair (3.5 days) than patients who underwent minimally invasive correction (1.9 days) ( $p < 0.01$ ).

**Conclusion:** This study demonstrates that the use of minimally invasive repair procedures in patients with single-suture craniosynostosis may result in less morbidity and fewer complications than traditional open repair techniques. As the frequency of early screening and diagnosis of craniofacial abnormalities rises, physicians have increasing opportunities to intervene with a less morbid surgical technique.

## **Identification of a Regenerative Mix for Recellularizing Human Auricular Cartilage Scaffolds**

Abstract Presenter: Arya Sherafat

Abstract Co-Author(s): Nawal Khan, Melinda Lem MD, Jason Pham MD, Nikhil Prabhakar, Madelyn Shay, Miles Pfaff MD, MHS, Mary Ziegler MD, PhD, Alan Widgerow MD, Leonardo Alaniz MD

**Background:** Utilizing biological scaffolds for cartilage tissue engineering is a promising tool for improving auricular reconstruction. Decellularized auricular scaffolds provide a means of regenerating cartilage in vitro for in vivo implantation, but the identification of the ideal regenerative mix remains a challenge. The purpose of this study was to identify the best regenerative mix for inducing chondrogenesis by evaluating decellularized human auricular cartilage seeded with auricular chondrocytes in the presence of adipose-derived stem cells with and without platelet-rich plasma.

**Methods:** Human cadaver auricular cartilage was decellularized. Biopsy punches of this tissue were recellularized with either auricular chondrocytes alone, auricular chondrocytes with adipose-derived stem cells, or both cells with platelet-rich plasma. Confirmation of decellularization and recellularization was done by hematoxylin and eosin staining. Extracellular matrix preservation and production were determined by Masson's Trichrome, Alcian blue, and Verhoeff-van Gieson staining. Collagen II assessments were made using immunohistochemistry. All sections were mounted and imaged at a magnification level of 4×. Five images per section were obtained to make collagen II quantifications using ImageJ. Unpaired, two-tailed t-tests were performed to evaluate statistical differences between groups.

**Results:** Decellularization of cadaver auricular cartilage was successful by the absence of cells, reduction in glycosaminoglycans, and the preservation of collagen and elastin. Recellularization was more efficient when chondrocytes were seeded with adipose-derived stem cells, and this was further enhanced with the addition of platelet-rich plasma. The co-culture with platelet-rich plasma yielded better collagen and



glycosaminoglycan induction. Moreover, when platelet-rich plasma was added, collagen II induction was significantly increased ( $p<0.05$ ).

**Conclusion:** We identified a regenerative mix that included auricular chondrocytes, adipose-derived stem cells, and platelet-rich plasma, which stimulated chondrogenesis on decellularized auricular cartilage. This finding provides a model that can be further explored in vivo to assess the formation of cartilage. The scaffold and regenerative mix hold the potential for developing novel auricular reconstruction techniques.

### **Comparative analysis of patient-reported outcomes after cranial vault remodeling and strip craniectomy with the FACE-Q Craniofacial Module**

Abstract Presenter: Patrick Mercho

Abstract Co-Author(s): Margaret Bello, Katelyn Makar MD, Salil Gupta, Khoa Tran, Sunil Tholpady MD, Emma Cordes MD

**Purpose:** The debate continues among craniofacial surgeons regarding the effectiveness of strip craniectomy (SC) compared with cranial vault remodeling (CVR) in achieving functional and aesthetic outcomes in patients with single-suture craniosynostosis. This study aimed to compare long-term patient-reported outcomes (PROs) between SC and CVR/FOA (fronto-orbital advancement) procedures at a single institution using the validated FACE-Q Craniofacial Module.

**Methods:** Patients ages  $\geq 8$  years of age and parents of patients  $< 8$  years of age who underwent SC or CVR/FOA for single-suture craniosynostosis were eligible. Patients with  $< 2$  years of follow up, lambdoid synostosis, and syndromes were excluded. Primary endpoints were PROs as measured by the FACE-Q, with higher scores indicating increased health-related quality of life. Linear regression was used to control for covariates.

**Results:** Sixty-two participants completed the module (response rate 33.3%). SC was performed in 29 patients (46.8%) and CVR/FOA in 33 patients (53.2%). On bivariate analysis, SC patients had higher Eye ( $p=0.03$ ) and Forehead ( $p=0.05$ ) scores. On regression analysis, there was no significant difference in PROs between operation type. Both metopic and sagittal synostosis were associated with higher Eye (metopic: 17.61,  $p=0.049$ ; sagittal: 41.44,  $p<0.001$ ) and Head scores (metopic 48.12,  $p=0.001$ ; sagittal 49.35,  $p<0.001$ ) compared with unicoronal, and sagittal synostosis was associated with higher FACE (38.16,  $p<0.001$ ), Forehead (55.93,  $p<0.001$ ), and Nose

scores (19.28,  $p=0.003$ ).

**Conclusions:** From patients' and parents' perspectives at a single institution, SC and CVR/FOA were equivalent regarding aesthetics and health-related quality of life.

## **When Timing Matters: Effects of Neoadjuvant Chemotherapy on Flap Outcomes in Head and Neck Microsurgical Reconstruction**

Abstract Presenter: Chen-Hsiang Kuan MD

**Background:** The management of advanced head and neck cancers has undergone a partial paradigm shift with the emerging role of neoadjuvant chemotherapy. The aim of this study was to evaluate the surgical outcomes of microsurgical reconstruction in head and neck cancer patients who underwent neoadjuvant chemotherapy.

**Methods:** This retrospective cohort study reviewed patients who underwent head and neck microsurgical reconstruction from January 2014 to August 2022. Patients with prior history of chemotherapy were included and categorized into two groups: preoperative neoadjuvant chemotherapy (A group) and postoperative adjuvant chemotherapy (B group). A 1:1 propensity score-matched analysis was performed to evaluate flap survival, microsurgical revision rates, and complications.

**Results:** The study cohort included 53 patients in the A group and 265 patients in the B group. After propensity score matching, the A group had significantly higher rates of flap loss (Odds ratio, [OR] 3.98; 95%CI, 1.08-15.18;  $p=0.031$ ), wound-related complications (OR 4.30; 95%CI, 1.31-8.02;  $p=0.036$ ), and microsurgical revision rates (OR 4.73; 95%CI, 2.10-10.64;  $p=0.02$ ).

**Conclusion:** Preoperative neoadjuvant chemotherapy for advanced head and neck cancers can have deleterious effects on wound healing and flap outcome during subsequent microsurgical reconstruction. Surgeons should exercise caution in patient selection for this approach.

## **Evaluating Neurocognitive Outcomes in Craniosynostosis: Towards a Standardized Approach**

Abstract Presenter: Payton Grande

Abstract Co-Author(s): Devra Becker MD, Christen Holder, Robin Evans MD, FACS, FRCS

**Purpose:** Craniosynostosis extends beyond aesthetic concerns, significantly influencing neurocognitive development. Children affected by this condition often face difficulties in several areas including academic achievement, motor skills, language development, and social interactions. Presently, there is a lack of universally employed standardized methodology for evaluating neurocognitive outcomes in these children. This research intends to explore the various neurocognitive assessment tools employed in the study of craniosynostosis, with the goal of identifying, comparing, and synthesizing these instruments to enhance understanding and evaluation of neurocognitive impacts.

**Methods:** A comprehensive systematic review was carried out, examining research related to neurocognitive assessments within the context of craniosynostosis. This review encompassed studies involving individuals of any age group and included all variations of the condition-whether syndromic or non-syndromic, and regardless of the affected suture(s), covering both single and multi-suture craniosynostosis cases. Data pertaining to a range of neurocognitive developmental indicators were collected using a standardized template. Data was then evaluated by a trained neuropsychologist, who classified them and analyzed the most effective practices for their use.

**Results:** Our review encompassed 134 studies, published from 1981 to 2023. The age range of patients evaluated spanned from as young as one month to as old as 50 years at the time of their assessment. Across these studies, 117 distinct tests were referenced for the neurocognitive evaluation of patients with craniosynostosis, with 73 of these assessments mentioned only in a single publication. The Bayley Scales of Infant Development (BSID) emerged as the most frequently used test, appearing in 40 (33.9%) of the studies. The BSID was administered to patients ranging from 1.5 to 43 months in age. Following the BSID in prevalence was the Wechsler Intelligence Scale for Children (WISC), which targeted an older demographic, being applied to patients aged 6 to 16 years and referenced in 37 (31.4%) of the papers.

Our analysis revealed six critical domains of neurocognitive development pertinent to the evaluation of craniosynostosis patients: Development/Intelligence, ADHD/Attention, Social-Emotional/Behavioral, Adaptive Functioning, Autism Spectrum Disorders, and Academic Achievement. Out of the 117 tests referenced across the studies we

reviewed, 56 were classified under these six categories. For each domain, we identified the "gold standard" tests, distinguishing between those that are screening scales and comprehensive assessments, which require more time and expertise. Furthermore, we also highlight additional questionnaires that, although not encountered in our literature review, are recognized as gold standard instruments within the neuropsychological community for these specific areas.

**Conclusion:** The critical role of integrating neurocognitive evaluations into craniosynostosis management cannot be emphasized enough. Our responsibility extends beyond achieving aesthetic corrections to encompassing a holistic view of the patient's functional outcomes. Choosing the right neurocognitive assessment tools is crucial, as these instruments play a significant role in screening patients, monitoring progress, and determining the success of treatments. This systematic review lays the groundwork for developing a standardized and efficient strategy for assessing and addressing the neurocognitive impacts of craniosynostosis. By doing so, we aim to improve patient care and optimize treatment results.

## **Environmental Contaminants Associated with Orofacial Clefting: A Systematic Review**

Abstract Presenter: Jessieka Knazze

Abstract Co-Author(s): Jessica Blum MD, Caroline Bay, Sarah Thornton, Nnadozie Uchegbu, Obiageli Oniah, Tyler Dorobek, Catharine Garland MD, Daniel Cho MD, PhD

**BACKGROUND:** Orofacial clefts (OFC) are a spectrum of congenital facial differences including clefts of the lip and palate, which impact 1 in 700 infants. It is widely accepted that OFC is the result of interplay between genetic and environmental factors; however, little is known about the specific environmental contaminants that contribute to their development. The aim of this review is to create a catalog of known contaminants that are associated with OFC to better understand which contaminants lead to OFC.

**METHODS:** Preferred Reporting Item for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to conduct a systematic review. A search was conducted of the following databases from database inception to January 3, 2024: PubMed, Embase.com (Elsevier), Web of Science Core Collection (Clarivate) multi-file search of Science Citation Index-Expanded and Emerging Sources Citation Index, and Agricultural & Environmental Science Collection (Proquest) multi-file search of

Environmental Science Index, TOXLINE, Environmental Science Database, AGRICOLA, and Agriculture Science Database. Select study and demographic characteristics were extracted and analyzed.

**RESULTS:** Literature search yielded 2,450 results, of which 70 were included for analysis. Included studies were published between 1982 and 2023. Case-control studies accounted for 54% of studies followed by retrospective designs at 17%, cross sectional studies at 10% and the remaining 19% a combination of ecological, prospective, and other. Included studies represent 20 different countries including China, Japan, Taiwan, Indonesia, India, France, Italy, Sweden, Denmark, Germany, Norway, Iran, South Africa, Mexico, Mongolia, Australia, Netherlands, the UK, Finland and the USA. When applied, race/ethnicity stratification was predominantly by Non-Hispanic white, Non-Hispanic Black, Hispanic and other or Han and Non-Han ethnicity. The majority of mothers fell between 20 to 34 years of age. Nearly all studies chose 1 month preconception through the first trimester as the study timeframe. Approximately 50% of studies evaluated and noted associations with multiple defects in addition to OFC including neural tube defects and cardiac anomalies. Risk of OFC was described with odds ratios (OR) in 80% of included studies.

Over 115 environmental contaminants associated with OFC were identified. Major water contaminants related to OFC include trihalomethanes and haloacetic acids from water disinfection byproducts, elements and metals, such as lead, and nitrates. Key air pollutants leading to OFC are particulate matter (PM) less than 10  $\mu\text{m}$  and PM<sub>2.5</sub>  $\mu\text{m}$ , nitrogen dioxide, carbon monoxide, and sulfur dioxide. Exposure to glycol ethers and organic solvents in an occupational setting also demonstrates increased risk of OFC. Additionally, heavy metals and elements such as arsenic, lead, mercury, rubidium, strontium, and Molybdenum have also been implicated in OFC development. Some contaminants may inhibit Hedgehog (Hh) signaling, a critical mediator of growth and differentiation during embryogenesis. Furthermore, contaminants such as dioxins are hypothesized to impact growth factor expression and interact with retinoic acid and glucocorticoid pathways leading to OFC.

**CONCLUSION:** Environmental contaminants associated with OFC are diverse, present globally, and utilize several modes of transmission. This systematic review provides a comprehensive list of contaminants that can be utilized for future research efforts, including understanding mechanisms leading to OFC.

# Dehiscence and Fistula Formation Following Anterior Palatal Reconstruction with Vomer Flap

Abstract Presenter

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**Background & Purpose:** Anterior palatal reconstruction using vomer flaps has been described at the time of primary cleft lip repair. In this procedure, the mucoperiosteal tissue of the vomer is elevated to reconstruct the nasal mucosa overlying the cleft of the hard palate. Here we evaluate the efficacy of a technique in which a superiorly based vomer flap is sutured to the lateral nasal mucosa. We assess vomer flap dehiscence rates and compare the likelihood of fistula development in this cohort to patients who underwent palatoplasty without vomer flap reconstruction.

**Methods:** A retrospective chart review was conducted of all palatoplasties performed by the senior author at an academic institution during a seven-year period. Medical records were reviewed for demographic variables, operative characteristics, and postoperative complications up to one year following surgery. Logistic regression analysis was conducted to assess the effects of vomer flap reconstruction on fistula formation, adjusting for age and sex.

**Results:** Fifty-eight (N=58) patients met inclusion criteria. Of these, 38 patients (control group) underwent cleft palate reconstruction without previous vomer flap placement. The remaining 20 patients underwent either unilateral or bilateral cleft lip repair with vomer flap reconstruction prior to palatoplasty (vomer flap group). When bilateral cases were counted independently, 25 vomer flap reconstructions were performed in total. Seventeen of these 25 vomer flap reconstructions (68%) were completely dehisced by the time of cleft palate repair.

In the vomer flap group, three of the 20 patients (15%) developed fistulas in the anterior hard palate following the subsequent palatoplasty procedure. In the control group, only one of the 38 patients (2.6%) developed a fistula in the anterior hard palate. There was

no significant association between cohorts and the development of anterior hard palate fistulas [OR = 10.88, 95% CI (0.99–297.77)  $p = 0.07$ ], although analysis was limited by low statistical power due to small sample size.

**Conclusions:** In our patient population, anterior palatal reconstruction using a superiorly based vomer flap technique was associated with complete dehiscence in 68% of cases. Fistula formation in the anterior hard palate was also proportionately higher following initial vomer flap reconstruction (15% vs 2.6%). These results prompted the senior author to adjust his surgical technique to one in which the vomer flap overlaps with the oral mucosa. While follow-up from these adjusted vomer flap reconstruction cases remains ongoing, early evidence suggests a reduced requirement for surgical revision following implementation of the modified technique.

### **Long-Term Clinical Outcomes of Patients with Bilateral Cleft Lip and Palate Treated with Modified-Furlow Palatoplasty to Facial Maturity**

Abstract Presenter: Jinggang Ng

Abstract Co-Author(s): Dr. Benjamin Massenburg MD, Yuliia Kovach, Manisha Banala, Zachary Valenzuela BS, Jacob Ariel, Sameer Shakir MD, Hyun-Duck Nah MD, DMD, PhD, Jesse Taylor MD, David Low MD, Jordan Swanson MD, MSc, Oksana Jackson MD

**Introduction:** The long-term effects of the modified-Furlow palatoplasty on patients with bilateral cleft lip and palate (BCLP) are unknown. We aim to report the clinical outcomes of skeletally mature patients with BCLP who underwent a modified Furlow palatoplasty in infancy.

**Methods:** We retrospectively reviewed all patients with BCLP who underwent modified Furlow palatoplasty between 2000 and 2006 who were followed to skeletal maturity and had a lateral cephalogram. The total burden of cleft surgeries and cephalometric measurements were compared to external cohorts who underwent straight-line palatoplasty with intravelar-veloplasty.

**Results:** Twenty-four patients with BCLP were included with an average follow-up of  $18.8 \pm 2.0$  years. Six patients (20.7%) underwent presurgical orthopedics, 16 patients (55.1%) underwent a single-stage lip repair (mean  $\pm$  standard deviation,  $4.0 \pm 1.5$  months), all patients underwent modified-Furlow palatoplasty ( $10.7 \pm 0.9$  months), and

all patients underwent alveolar bone grafting ( $7.5 \pm 1.0$  years). Three patients (10.3%) required speech surgery and thirteen patients (54.2%) underwent orthognathic surgery. On lateral cephalograms taken at mean age  $15.3 \pm 2.1$  years, we found greater midfacial growth compared to an external cohort at sella-nasion-A-point angle (SNA) ( $78 \pm 5$  degrees versus  $73 \pm 5$  degrees,  $p=0.009$ ). There was no difference at sella-nasion-B-point angle (SNB) ( $79 \pm 7$  degrees versus  $76 \pm 5$  degrees,  $p = 0.254$ ) or ANB angle (SNA – SNB) was ( $-1 \pm 5$  degrees versus  $-3 \pm 4$  degrees,  $p = 0.101$ ).

**Conclusion:** Patients with BCLP who underwent modified Furlow palatoplasty had improved midfacial growth outcomes at skeletal maturity compared with an external cohort of patients who underwent straight-line palatoplasty in infancy.

### **Quantitative Characterization of Facial Ptosis in Facial Transplantation- A Single Institution Analysis of Nine Face Transplant Patients**

Abstract Presenter: Sam Boroumand

Abstract Co-Author(s): Viola Stoenner MD, Sydney Aquilina, Lioba Huelsboemer MD, Aliyar Zahedi Vafa, Martin Kauke-Navarro MD, Bohdan Pomahac MD

**PURPOSE:** Facial transplantation serves as a "life-giving" reconstructive option for patients impacted by the most severe facial traumas. Despite the procedure's capacity for dramatically improving facial form and function, patients experience significant degrees of facial ptosis post-operatively that can impede facial functionality, necessitating multiple secondary revision surgeries. Especially as a significant majority of the face transplant cohort ages into their second decade of life post-transplantation, the extent of this facial ptosis and its evolution over time has not been described. In this study we seek to not only provide a quantitative assessment of facial ptosis following face transplantation but also provide a characterization of the facial regions most egregiously impacted.

**METHODS:** Several anthropometric facial landmarks both novel and previously reported in the literature were utilized to create angular and ratio-based metrics to evaluate facial ptosis prone regions.<sup>1 2</sup> These measurements were executed utilizing ImageJ, an open-source Java-based processing program. A total of nine face transplant patients- the largest single-center cohort in the world- were included for analysis utilizing 2D headshot photos at two time points: approximately one year post-transplant and



most recent follow-up photo available. Changes in facial ptosis metrics were evaluated with Wilcoxon Signed-Rank Test.

**RESULTS:** Patient post-operative time points between facial ptosis measurements ranged from 3-11 years. The following metrics all demonstrated statistically significant changes between the most recent follow-up time point and approximately one-year post-transplant: left lateral canthus-oral-nasal angle (median difference  $-1.234^{\circ}$ ,  $p=0.0391$ ), right lateral canthus-oral-nasal angle ( $-6.323^{\circ}$ ,  $p=0.0391$ ), bigonial-bizygomatic ratio ( $+0.01814$ ,  $p=0.0391$ ), and ergotrid length-upper lip inferior border ratio ( $+0.05427$ ,  $p=0.0117$ ). Additionally, eyebrow peak angle demonstrated trending decreases (left=  $-4.064^{\circ}$ , right=  $-3.302^{\circ}$ ).

**CONCLUSIONS:** This study provides the first quantification of facial ptosis metrics for facial transplantation patients. The noted decreases in bilateral canthus-oral-nasal angle between the two timepoints highlights the ptosis of the oral commissures in the facial allograft while the increasing bigonial-bizygomatic ratio and ergotrid length-upper lip inferior border ratios demonstrates increased lower cheek/jowl ptosis and ergotrid lengthening. Collectively these results highlight that ptosis in the lower parts of the face surrounding the oral commissure may predominate in this patient population providing surgical insight into the facial regional anatomy that should be closely monitored and targeted for revision operations.

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## **Risk Factors for Concomitant Injury Following Electric Scooter Accidents in the United States: A One-Year Review of a National Database**

Abstract Presenter(s): Taylor Allenby MD, Kayvon Jabbari

Abstract Co-Author(s): Kayvon Jabbari, Marlie Fisher MD, PhD, Taylor Allenby MD, Michael Gehring MD, Daniel Najafali, An-Jey Su, Kia Washington MD, David Mathes MD, Mark Greyson MD, Matthew Iorio MD

**Background:** Recent studies have investigated the growing trend of electric scooter (e-scooter) related injuries [1,2]. The current literature describes primary injuries from single or regional institutions [3,4], with similar reports from national databases [5]. Given that e-scooter trauma patients often suffer multiple injuries, we assessed the prevalence and risk factors for combinatorial injury patterns following e-scooter traumas. We sought to provide evidence for local government and e-scooter companies to improve safety policies.

**Methods:** The data for this study was obtained from the National Electronic Injury Surveillance System (NEISS), which provides national estimates of injuries presented to emergency departments across the United States. In 2019, the NEISS had its first major update to include new variables, including multiple body parts, multiple injury types, alcohol use, and drug use. We queried the NEISS for year 2019 (most recent data available) using product code 5042 ("Scooter/skateboards, powered") and subsequently used key search terms for the exclusion of non-electric scooter injuries. National estimates were created using weights provided by the NEISS. Patient demographics, body part, diagnosis, and disposition were reported. Multivariable logistic regression was performed to identify independent predictors of concomitant injuries. SAS/STAT software was used for data analysis with significance threshold set at an alpha value of 0.05.

**Results:** In 2019, there were an estimated 31,193 (n=840, unweighted) patients with e-scooter injuries in the United States. Of these, 48.2% (n=405) presented with secondary body part involvement. The most common injury, primary body part was the head (16.8%), with the face (17.8%) reported as the most common secondary site of injury. Fracture (27.5%) was the most common primary diagnosis while contusions/abrasions (33.8%) was the most common secondary diagnosis. Among patients with concomitant body part injuries, the most prevalent primary/secondary injury patterns included head/face (7.9%), head/head (4.9%), face/face (3.95%), face/knee (1.98%), and face/mouth (1.98%). Alcohol use (AOR 0.372; 95% CI 0.210-0.661; p=0.0007) and other race (AOR 0.214; 95% CI 0.059-0.772; p=0.0153) were protective for injury to

multiple body parts. Male sex was protective for both primary fracture (AOR 0.651; 95% CI 0.465-0.912;  $p=0.0125$ ) and upper extremity injury (AOR 0.614; 95% CI 0.445-0.847;  $p=0.003$ ) but was not predictive for head and neck injury. Patient age was not predictive for primary fracture, head/neck injury, and upper or lower extremity injuries. Overall, 11.1% of all patients were admitted/hospitalized.

**Conclusions:** We have shown that e-scooter trauma patients most commonly experience injury of the head or face, regardless of sex and age differences. This suggests that all e-scooter riders may benefit from mandated helmet use. Further, these results will serve as a baseline for guiding clinical suspicion for the treatment of e-scooter patients. Our work assumes the need for accurate inpatient coding of e-scooter injuries to assess surgical treatment algorithms and outcomes within this population.

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# Publication Trends and Surgeon Perceptions: A Comprehensive Analysis of Gender Disparities in Craniofacial Surgery

Abstract Presenter: Molly Macisaac

Abstract Co-Author(s): Iman Khan, Rafael Felix Tiongco, Joshua Wright, Fatima Qamar, Carisa Cooney MPH, CCRP, Richard Redett MD, Jordan Halsey MD

**Background and purpose:** The literature exploring diversity, equity, and inclusion (DEI) within craniofacial surgery collectively illuminates the historical challenges faced by women and underrepresented minorities. Across numerous studies, gender disparities persist as a prominent and recurrent theme, with women consistently underrepresented in the number of craniofacial surgeons, faculty positions, leadership roles, and representation at conferences.<sup>1-3</sup> This is despite substantial progress in female representation within plastic surgery and the broader medical landscape. Academic productivity, often measured through publication records, emerges as a critical determinant influencing career advancement. Multiple studies have highlighted that female plastic surgeons tend to have fewer publications compared to their male counterparts<sup>4</sup> with the same theme seen in burn surgery, aesthetic surgery, and hand surgery. Furthermore, analyses of craniofacial fellowship programs reveal disparities in gender and ethnic composition, although younger cohorts show a more equitable distribution of leadership roles among genders signifying some progress in DEI within craniofacial surgery.<sup>5</sup> This study benchmarks the academic productivity of craniofacial surgeons in 2022 and surveys their perspectives regarding diversity, equity, and inclusion (DEI).

**Methods:** Total, first author, and senior author PubMed publications in 2022 were recorded for 193 craniofacial attendings and fellows. Craniofacial surgeons were also surveyed regarding academic experience, leadership roles, and DEI perceptions. **Results:** For analysis of the academic craniofacial cohort in 2022, women comprised 27% (n=53). Males led total publications (81% vs 19%,  $p<0.001$ ), senior-author publications (84% vs 16%,  $p<0.001$ ), average total publications (6.6 vs 4.0,  $p=0.043$ ), and average senior-author publications (3.1 vs 1.5,  $p=0.02$ ). Sub-analysis of craniofacial fellows showed a higher proportion of women (65%) with no statistical difference in total or average publication counts. Survey responses (n=26) included a perceived lack of female representation in academic and leadership roles. Barriers included inadequate support from current leadership, systemic issues, and biases. Recommendations for improvement included mentorship programs, targeted recruitment, and equitable conference speaker selection.

**Conclusion:** The landscape of DEI within craniofacial surgery is characterized by multifaceted challenges and evolving dynamics. This study revealed that while gender disparities still exist, they are accompanied by signs of progress, with younger craniofacial surgeons exhibiting more balanced publication records and leadership positions. Further studies are needed to examine these cohorts more comprehensively and longitudinally. DEI remains an ongoing journey, and tangible steps that can be implemented include mentorship programs tailored to women and underrepresented minorities, increased recruitment efforts, enhanced DEI education, and equitable representation of women in conference speakers. This study highlights both challenges and promising developments, paving the way for a more inclusive craniofacial surgery community.

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## **Confronting Craniosynostosis: Concerns, Challenges, and Coping of Caregivers and Their Children**

Abstract Presenter: Ethan Paliwoda

Abstract Co-Author(s): Alejandro Torres, Elma Dema, Avi Gajjar, Mason Horne, Mathew Trandafirescu, Matthew Adamo, Benjamin Schalet MD, MS, Stephanie Bray MD, MS

**Introduction:** Parents of children with rare conditions may use social media to better understand and care for their children (1). Thus, a comprehensive understanding of the shared online experiences of parents and patients with conditions like craniosynostosis is warranted. Analysis of these shared media posts may provide insights into care outcomes and satisfaction (2). This study intends to investigate patient and caregiver experiences with craniosynostosis via social media.

**Methods:** Instagram and TikTok posts featuring "#craniosynostosis" were systematically analyzed. Data were extracted from 350 Instagram and 350 TikTok posts directly sharing insights into the patient journey with craniosynostosis. Three reviewers subsequently examined, classified, and verified these contributions according to the predominant themes reflecting the lived experiences of those affected by craniosynostosis.

**Results:** The most commonly identified themes included "Raising Awareness" (556, 79%), "Spreading Positivity" (470, 67%), "Trauma/Resilience" (430, 61%), "Hopes/Anniversaries" (367, 52%), "Quality of Life" (352, 50%), "Family Dynamics" (284, 41%), "Anxiety/Fear" (280, 40%), "Impact on Parental Mental Health" (263, 38%), "Early Detection/Diagnosis" (230, 33%), and "Decision-Making" (224, 32%). Other notable themes included "Developmental Milestones" (183, 26%), "Appearance Concerns" (164, 23%), "Transitioning Home After Hospitalization" (116, 17%), and "Scientific Explanations" (93, 13%).

TikTok videos encompassed more themes ( $p=0.047$ ) than Instagram posts. TikTok posts more likely ( $p<0.001$ ) regarded raising awareness, spreading positivity, trauma/resiliency, hopes/anniversaries, quality of life, family dynamics, anxiety/fear, impact on parental mental health, early detection/diagnosis, and decision-making. Instagram posts more likely surrounded developmental milestones ( $p<0.001$ ), multidisciplinary care teams ( $p=0.038$ ), emotional support ( $p<0.001$ ), stigma ( $p=0.038$ ), education/advocacy ( $p<0.001$ ), and hydrocephalus/ICP concern ( $p<0.001$ ).

Generally, both male and patient accounts were limited. However, females more likely ( $p<0.001$ ) posted compared to males, and caregivers more likely ( $p<0.001$ ) posted than patients. Male patients more likely ( $p<0.001$ ) posted than female patients, while female caregivers more likely ( $p<0.001$ ) posted than male caregivers. Patients more likely ( $p<0.001$ ) used TikTok, while caregivers more likely ( $p<0.001$ ) used Instagram. Patients more likely posted regarding spreading positivity ( $p=0.026$ ), quality of life ( $p=0.021$ ), appearance concerns ( $p<0.001$ ), quality staff ( $p=0.043$ ), stigma ( $p=0.008$ ), peer relationships/social integration ( $p<0.001$ ), psychological impact/support services ( $p=0.008$ ), using humor ( $p<0.001$ ), etiology/causes ( $p<0.001$ ), and transitioning to adulthood ( $p<0.001$ ). Caregivers more likely posted regarding impacts on parental mental health ( $p=0.029$ ).

**Conclusion:** Online content analysis revealed that social media may serve as an avenue to seek support, share experiences, and celebrate milestones like "cranioversaries." Coping and concerns about appearance or development were common. Male caregiver perspectives were underrepresented, and TikTok may emerge as a platform to hear experiences directly from patients. Social media generally may serve physicians to gain insights into experiences with craniosynostosis, disseminate accurate information, and connect with patients.

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## **The Association of Neighborhood Disadvantage with Surgical Outcomes and Follow-Up Adherence in Patients with Cleft Palate**

Abstract Presenter: Daniel Chu

Abstract Co-Author(s): Alexandra Center, Jessieka Knazze, Manasa Kalluri, Chloe Lam, Caroline Bay, Ellen Shaffrey MD, Steven Moura MD, Catharine Garland MD, Daniel Cho MD, PhD

**Purpose:** Previous studies have characterized individual sociodemographic factors affecting care adherence and operative rates; however, there is limited data on how neighborhood-level disadvantage may affect surgical outcomes in patients with cleft palate. The area deprivation index (ADI) and the childhood opportunity index (COI) are novel measures of disadvantage, incorporating several US census indicators of poverty, education, housing, and income. Our study aims to elucidate whether neighborhood disadvantage, measured via ADI and COI, is associated with intervention outcomes and follow-up adherence in patients with cleft palates.

**Methods:** Pediatric patients with cleft palate who received repair, revision, and fistula repair procedures between 2013-2023 were included. Patients with a traumatic cleft, previously adopted, and 18 years of age or older were excluded. State ADI and COI scores, represented as quintiles, were determined based on zip codes or addresses. We collected basic demographic and clinical variables including opioid and antibiotic prescriptions at discharge, complications, ED return, PICU, and hospital readmissions within 30 days of discharge. Furthermore, postoperative follow-up adherence variables include no-shows, cancellations (patients and administrative), significant delay in follow-up (more than 2-year delay) and lost to follow-up. Univariable logistic regressions were used to assess the association of ADI and COI with binary variables and Spearman-ranked correlations were utilized to assess continuous variables.

**Results:** A total of 244 patients (138 Male) were included and had Veau classification breakdown of 25 Veau I, 73 II, 67 III, 38 IV, and 41 submucous. Our results reveal significant delays in follow-up in both high disadvantaged ADI (OR1.265, 95%CI [1.052–1.523];  $p=0.013$ ) and COI (OR1.263, 95%CI [1.017–1.567];  $p=0.034$ ) groups. In palate repair procedures, higher disadvantaged ADI quintiles revealed significant associations with greater total number of no-shows ( $rs(162)=0.200$  [95%CI 0.043–0.348];  $p=0.011$ ), patient cancellations at 30 days post-op (OR1.400, 95%CI [1.056–1.858];  $p=0.020$ ), total number of patient cancellations ( $rs(162)=0.157$  [95%CI -0.002–0.308];  $p=0.047$ ), and total number of overall cancellations ( $rs(162)=0.171$  [95%CI 0.012–0.321];  $p=0.030$ ). Meanwhile, higher disadvantaged COI quintiles revealed significant associations with greater rates of no-shows at 60 days post-op (OR1.952, 95%CI [1.130–3.372];  $p=0.016$ ), and total number of no-shows ( $rs(162)=0.159$  95%CI [0.001–0.310];  $p=0.043$ ). In palate revision surgeries, higher disadvantaged ADI quintiles were significantly associated with higher post-op complication rates (OR1.875, 95%CI [1.200–2.931];  $p=0.006$ ) and post-operative fistula rates (OR1.900, 95%CI [1.055–3.424]  $p=0.033$ ), while higher disadvantaged COI quintiles were significantly associated with higher rates of hospital readmission (OR5.297, 95%CI [1.417 – 19.796];  $p=0.013$ ) and greater administrative cancellations at 30 days post-op (OR1.602, 95%CI [1.005–2.554];  $p=0.048$ ). In oronasal fistula repair procedures, higher disadvantaged COI



quintiles showed significant negative associations with opioid prescriptions at discharge (OR0.524, 95%CI [0.276–0.994] p=0.048).

**Conclusions:** Our results showcased that neighborhood deprivation, as indexed by ADI and COI, had many significant associations to measured outcomes and follow-up adherence rates in cleft palate procedures. Understanding how neighborhood disadvantage impacts cleft repair outcomes is crucial to clinical care, policy making, and tackling health disparities for our patients. Future analyses will explore how ADI and COI intersects with demographic characteristics such as race, sex, age, insurance and their impact on management outcomes and follow-up adherence.

### **Provider Characteristics and Pre-Transfer Costs of Potentially Avoidable Transfers for Pediatric Facial Fracture Patients in a Single Institution**

Abstract Presenter: Xiaosu Liu

Abstract Co-Author(s): Lucille Cheng, Nicolas Kass, Angel Dixon, Anne Glenney MD, Jesse Goldstein MD

**PURPOSE:** Pediatric facial fractures place significant physical, psychological, and financial burdens on both the patients and their families. These injuries require prompt and specialized care, often prompting transfers from local facilities to tertiary centers or a children's hospital ED staffed with pediatric providers. Literature reports that approximately 40% of children moved to specialized pediatric hospitals were either immediately released post-transfer or admitted for less than a day, indicating a set of transfers that might have been unnecessary or avoidable [1]. These potentially avoidable transfers (PAT) to alternative facilities may exacerbate the treatment process, leading to prolonged and expensive care [2][3]. There remains a gap in the literature regarding the predictors linked to a higher likelihood of PAT. Our study aims to elucidate the provider and facility characteristics associated with PAT and estimate the subsequent costs borne by the patients.

**METHODS:** We conducted a retrospective chart review for pediatric patients who presented to a University of Pittsburgh Medical Center-affiliated (UPMC) ED with facial fractures and were subsequently transferred to the Children's Hospital of Pittsburgh (CHP) ED between 2006 and 2021. The primary outcome examined was a PAT, defined as a patient with a length of stay less than one day, with no admission, surgery, or emergent procedure performed post-transfer. Provider credentials, pediatric training, and pre-transfer facility type were assessed by multivariate logistic regression and odds

ratio analyses. Pre-transfer costs, including ED imaging and transportation costs, were estimated based on the UPMC Charge Description Master file and Department of Human Services Pennsylvania ambulance fees published in 2023.

**RESULTS:** Of the 175 identified patients who met the inclusion criteria, 73 had accessible electronic medical records available and 37 were PAT. Characteristics significantly associated with PATs include provider credentials ( $p = 0.013$ ) and the initial presenting facility type ( $p = 0.024$ ). An increased odds of initiating a PAT is observed in patients who initially presented to Advanced Practice Providers (APPs), including Nurse Practitioners and Physician Assistants, compared to those who presented to MD/DOs (OR = 3.17, 95% CI [1.17, 8.54]). Additionally, there is a significant difference in the likelihood of PAT when initially presenting to trauma center EDs compared to non-trauma center EDs ( $p = 0.024$ ). The total estimated cost per PAT patient, which included expenses for imaging and transportation, amounted to \$6,332.11, where imaging expenses accounted for \$5,844.66 (92.3% of total cost) and transportation costs amounted to \$487.45 (7.7%).

**CONCLUSIONS:** Facial fractures in pediatric patients necessitate prompt and specialized medical care; however, emergent transfer is often avoidable. Our findings highlight the significance of provider and facility characteristics associated with PATs, offering potential avenues for reducing unnecessary transfers. We found that PATs are associated with initial presentation to APPs, as well as to non-trauma center hospital EDs. These insights provide valuable guidance on possible strategies to reduce PAT, such as additional provider training and targeted site interventions, to minimize patient expenses and avoid unnecessary utilization of specialized hospital resources.

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## Identifying Timing of Cleft Palate Care and Long-Term Outcomes in Syndromic and Non-Syndromic Patients

Abstract Presenter: Katherine Zhu

Abstract Co-Author(s): Moreen Njoroge, Keith Kuo, Matthew Heron, Alina Galaria, Atharva Bhagwat, Thalia Liu, Abby Liu, Fahad Alkahtani, Christopher Lopez MD, Jordan Gornitsky MD, Robin Yang MD, Richard Redett MD

**Purpose:** Cleft palate (CP) is among the most common congenital anomalies in the United States and may be non-syndromic or syndromic. Patients with CP may undergo several surgeries from birth to adulthood. Unfortunately, a myriad of factors may contribute to care delays, which may be predisposing to intra- and post-operative complications or worse long-term outcomes (e.g., revisionary surgeries). Therefore, we aimed to compare the timing of CP care and characterize the long-term outcomes for syndromic and non-syndromic CP patients.

**Methods:** We retrospectively reviewed patients at our institution receiving CP care between January 2003 and September 2023. Patients who received initial CP repair elsewhere or were diagnosed with Pierre Robin sequence were excluded. Data extracted included patient demographics, syndromes, prenatal diagnosis, ages at first visit and initial repair, and long-term outcomes, including surgical complications, velopharyngeal insufficiency, and speech therapy. Bivariate analysis and univariate/multivariable logistic regression were performed. Propensity score matching was performed to match syndromic and non-syndromic patients based on their gender, migrant status, adopted status, race, and category of age.

**Results:** A total of 183 patients were included in the study, out of which 14.2% (n=26) were diagnosed with a syndrome, while 86.0% (n=157) were non-syndromic. Stickler syndrome (n=14/26, 54%) was the most common syndrome. Syndromic patients were more likely to receive a prenatal diagnosis (24.0% vs. 5.3%,  $p < 0.001$ ) and showed a trend towards earlier initial consultations and repairs than non-syndromic patients, although not statistically significant (first consultation: 228 vs. 413 days,  $p = 0.07$ ; first repair: 542 vs. 639 days,  $p = 0.36$ ). Syndromic patients required more speech therapy (76.9% vs. 52.2%,  $p = 0.019$ ), with no significant differences in surgical complications ( $p = 0.601$ ) or velopharyngeal insufficiency ( $p = 0.532$ ). Propensity score analysis revealed syndromic patients had higher odds for speech therapy (OR = 3.05, 95% CI [1.22, 8.71],  $p = 0.024$ ) and growth delays (OR = 6.7, 95% CI [1.18, 38.12],  $p = 0.025$ ). The odds ratio for OSA was notably higher in syndromic patients (OR = 7.99, 95% CI [3.26-20.09],  $p < 0.001$ ). There was a significant difference in the mean distance to healthcare

facilities, with syndromic patients traveling further to receive care (113.6 miles vs. 32.04 miles,  $p = 0.047$ ).

**Conclusion:** Syndromic CP patients are more likely to be diagnosed prenatally and commence treatment earlier compared to their non-syndromic counterparts. However, this expedited care pathway does not necessarily translate to reduced long-term healthcare needs, as evidenced by the higher demand for speech therapy.

### **Comparison of Soft-Tissue Procedures in the Long-Term Management of Patients with Syndromic Craniosynostosis**

Abstract Presenter: Tayla Moshal

Abstract Co-Author(s): Idean Roohani, Marah Jolibois, Sasha Lasky, Erin Wolfe MD, Naikhoba Munabi MD, Jeffrey Hammoudeh MD, Mark Urata MD

**Background:** Patients with syndromic craniosynostosis often require secondary soft tissue procedures to normalize facial appearance. This study evaluated the soft tissue procedures required for patients with different syndromic craniosynostoses.

**Methods:** This retrospective chart review evaluated patients with syndromic craniosynostosis who received care at a tertiary children's hospital between 2004 and 2023. Soft tissue procedures of interest included medial canthopexy, lateral canthopexy, facial fat grafting, scalp scar revision, scalp reconstruction, ptosis repair, and septorhinoplasty. Descriptive statistics, chi-squared tests, and independent t-tests were used to analyze the differences in soft tissue procedures across craniofacial syndromes.

**Results:** A total of 103 patients with syndromic craniosynostosis were included, with a mean follow-up of  $7.7 \pm 5.7$  years. Syndromes included Apert ( $n=39$ , 37.9%), Crouzon ( $n=32$ , 31.1%), Pfeiffer ( $n=16$ , 15.5%), Saethre-Chotzen ( $n=10$ , 9.7%), Muenke ( $n=5$ , 4.9%), and Carpenter ( $n=1$ , 1.0%). Ninety-three patients (90.3%) underwent at least one soft tissue procedure, averaging  $3.6 \pm 3.3$  procedures per patient. A significantly higher percentage of patients with Apert syndrome (48.7%) underwent lateral canthopexies than Crouzon (25.0%,  $p=0.041$ ), Saethre-Chotzen (20.0%,  $p=0.102$ ), and Pfeiffer syndrome (12.5%,  $p=0.012$ ) patients. Brow elevations were more common among patients with Saethre-Chotzen syndrome (63.6%) compared to Pfeiffer (33.3%,  $p=0.036$ ) and Crouzon syndromes (28.1%,  $p=0.009$ ). Scalp reconstructions were more common among patients with Pfeiffer syndrome (50.0%) compared to all other syndromes (Apert: 32.5%,  $p=0.039$ ; Crouzon: 22.6%,  $p=0.007$ ; Saethre-Chotzen: 9.1%,

p=0.098; Muenke: 0.0 %, p=0.015). A higher percentage of patients with Crouzon syndrome (21.9%) underwent septorhinoplasty than those with Apert syndrome (5.1%; p=0.035). There were no significant differences in the proportion of patients who underwent fat grafting or scar revisions between syndromes.

**Conclusion:** Our findings indicate that soft tissue procedures are a common adjunct to bony reconstruction in patients with syndromic craniosynostosis, with significant differences in procedures required for treating craniofacial irregularities in each syndrome. Despite excellent initial bony correction, patients often underwent several soft tissue procedures from infancy to adulthood. The underlying genetic mutations that characterize these syndromes may contribute to abnormalities in soft tissue elasticity, wound healing, and overall integrity. Awareness of these soft tissue differences and the procedures for their correction may better prepare syndromic craniosynostosis patients, families, and care teams for the treatment ahead.

## **Medpor Ear Implant Salvage Technique for Pediatric Patients with Chronic Exposure and Infection: A Retrospective Case Series**

Abstract Presenter: Hung Le

Abstract Co-Author(s): Karen Lu MD, Anirudh Sudarshan, Sarah Frommer MD, PhD, Dr. Jeffrey Cone Jr., MD

**Background:** Medpor ear reconstruction is championed for its ability to create an aesthetic, long-term reconstruction, but challenged for its risk of implant exposure or infection (1-3) . Technique refinements continue to lower these risks, and while several papers demonstrate successful secondary flap coverage after implant exposure, a paucity of literature exists on the management of the implant itself, namely whether the implant should be debrided, removed, or exchanged entirely in instances of exposure and infection. This study borrows established techniques for breast implant salvage (4-5), details an adjuvant technique to secondary flap coverage— that of concomitant implant exchange—, and describes its application in five successful Medpor ear reconstruction salvages.

**Methods:** This study is a retrospective case series identifying five patients who underwent Medpor ear reconstruction for congenital microtia with salvage procedures performed between January 2018 to December 2023. Three of these patients had their initial reconstruction at an outside facility. Patients' ages ranged from 5 to 10 years old. All patients had a diagnosis of congenital microtia, one patient had Goldenhaar

syndrome with bilateral microtia, and another patient had Treacher-Collins syndrome. Patients underwent operative debridement, cultures, implant exchange, and simultaneous flap reconstruction. Oral antibiotics were continued for one to two weeks and were tailored to culture results. Patients were followed for a minimum of 8 months post-operatively.

**Results:** Each patient experienced successful implant salvage without further exposure or infection. Prophylactic antibiotics of Cefazolin or Cephalexin IV were given intraoperatively. Intraoperative cultures were positive in five patients, with the most common bacterial species being Staph aur. and MRSA. Patients had an average recovery time of 14.2 days. The negative outcome in all patients was a decreased ear projection over time.

**Conclusion:** A paucity of literature exists demonstrating Medpor ear implant exchange in the setting of chronic exposure or infection. The infrequency of implant exposure makes the subject more challenging to study. This case series demonstrates a technique that may optimize the success rate for Medpor salvage in microtia reconstruction while eliminating the period without a reconstructed ear.

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## **Defining the Role of Technology in Management of Acute Craniofacial Fractures: Surgical Planning, Operative Deliverables, and Postoperative Results**

Abstract Presenter: Yasmine Soubra

Abstract Co-Author(s): Andi Cummins MD, Andrea Sisti MD, Hung Le, Zi Yae Kang, Sarah Frommer MD, PhD, Raymond Harshbarger MD, FACS, FAAP

**Background:** Complex, multi-fracture craniofacial trauma can be challenging, given limited exposure, fracture morphology, and preservation of vital facial structures. The use of virtual surgical planning (VSP) with operative deliverables (guides/plates) has become an integral tool in the practice of elective craniomaxillofacial surgery, such as orthognathic surgery, improving surgical accuracy and efficiency. However, in the setting of craniofacial trauma, it has proven difficult to incorporate due to inadequate time to design, transportation, burden of cost, and potential inaccuracy of printed models. Our institution sought to address the question of practical utility of technology for acute craniofacial trauma.

**Objective:** To review experience with use of virtual planning and intraoperative deliverables (VSPD) in performing open reduction internal fixation (ORIF) of various fractures within the craniofacial skeleton.

**Methods:** A retrospective review was performed for patients who underwent ORIF of acute craniofacial fractures using a VSPD protocol at our institution between January 1, 2020 and December 31, 2023. Patient demographics, medical history, primary injuries, surgical treatments, complications, and reoperation information were collected.

Upon admission, the patient's CT was sent for planning. During VSP (typically within 48hrs) fracture fragments were reduced with mirror imaging, creating a reduction/perfection image. Validity of reduction was checked by assessing occlusion, symmetry, and overall appearance of the craniofacial skeleton. Virtually planned reduction/perfection models were created with marked fracture lines. For occlusal fractures (LeFort-type and mandible), occlusal splints were also generated from CT data. Intraoperatively, standard plates were contoured and applied to the reduction/perfection model with fracture sites etched on the plate; generating real-time 3D custom plates to guide fracture reduction/fixation. Postoperative CT scans were compared with the generated virtual plan to assess the accuracy of the predictive virtual plan. Specific craniofacial regions were studied for applicability of this technique.

**Results:** Within the specified time frame, we identified 45 patients who met inclusion criteria. The majority of patients had multiple and comminuted facial fractures, most commonly including orbital floor (n=21) and zygomaticomaxillary complex (n=23). VSP planning was typically performed within 48hrs of admission, with model turnaround times 2-3 days. The VSPD protocol was successfully applied in all patients studied. All craniofacial regions where VSPD protocol was utilized had improved operative efficiency/postoperative accuracy. This was especially noted in treatment of frontal sinus, restoration of proper orbital size, combined dental/bone reduction in occlusal fractures, and restoring height of condylar/subcondylar fractures. Delay in treatment of open mandible fractures did not lead to increased rate of postoperative infection. There was a good correlation of the predicted VSP plan and the actual postoperative scan.

**Conclusion:** The use of technology in the form of a VSPD protocol for treatment of complex craniofacial fractures was successfully applied to treat patients in a timely fashion. Reduction/perfection models marked with fracture sites were useful to create real time custom 3D plates with occlusal splints useful to transfer the virtual plan surgically, thus improving accuracy and efficiency in ORIF procedures in all regions of the craniofacial skeleton studied. Postoperative CT scans compared to the virtual plan showed a high degree of accuracy.

## **Creating Sensate Ears in Microtia Patients with the Nagata Technique**

Abstract Presenter: Narain Reddy

Abstract Co-Author(s): Sophia Allison, Hannah Soltani, Rachel Donaldson, Akira Yamada MD, FACS, PhD

**Introduction:** A primary advantage of autologous auricular reconstruction in microtia repair is preservation of sensation. However, given the complexity of the reconstruction and unique anatomy of patients affected by microtia, little has been done to characterize how sensation is affected after receiving microtia reconstruction using the gold standard technique, Nagata Technique. The purpose of this study is to understand how different types of sensation are affected among patients who received autologous reconstruction.

**Methods:** Seven patients underwent first stage autologous reconstruction by the senior author using the Nagata Technique. Each patient was tested with different sensory tests in clinic preoperatively, at the 3-month post op visit, and 6-month post op visit. Each test was conducted at 9 different areas on the affected ear and results were averaged together for each test. The sensory exams conducted assessed tactile perception,



locational accuracy, discrimination between sharp and dull pressures, thermal differentiation (hot vs cold), and sensitivity to fine touch using microfilaments of 5 different sizes.

**Results:** All seven patients completed the preoperative and 3-month post operative tests, and four patients completed an additional set of tests at the 6-month visit. At the 3-month post op visit, tactile perception was fully preserved in three patients across the 9 tested points on the ear, while four patients experienced a decrease in sensation at one or two points. Of these four patients, half regained full sensation in all 9 points by 6 months. Regarding locational accuracy, at the 3-month post op visit, four patients fully preserved sensation across the 9 points on the ear, while three patients had a loss in sensation at one or two points. Of these three patients, one regained full sensation by 6 months. Regarding discrimination between sharp and dull pressures, at the 3-month post op visit, four patients preserved sensation across the 9 distinct points on their ear, while three had reduced discrimination at up to four points with one of these fully recovering sensation at 6 months. Regarding thermal differentiation at 3 months, three patients fully preserved discriminatory ability while four had reduced discrimination at up to four points. Two of these patients regained full discriminatory ability by 6 months. Regarding sensitivity to fine touch, only one patient maintained preoperative levels at all points with the other six demonstrating reduced sensitivity to the same size microfilament tested preoperatively. By 6 months, two of these patients had improved sensitivity to the smaller microfilaments.

**Conclusion:** While some sensory functions are regained quickly, others may take up to 6 months or longer. This preliminary study highlights the degree of sensory preservation in patients after the first stage of microtia reconstruction using the Nagata Technique. This data will arm microtia surgeons and aid families in making more informed decisions about their choice for microtia reconstruction.

## **Epidemiology of Microtia: An Analysis of 22,075 Patients from the Pediatric Health Information System Database**

Abstract Presenter: Sierra Willens

Abstract Co-Author(s): Kevin Blaine, Leonardo Alaniz MD, Miles Pfaff MD, MHS

**Introduction:** Microtia is a congenital anomaly characterized by malformation of the external ear. In the early 2000s, the Complex Chronic Conditions (CCC) classification system was developed to identify children with serious, long-standing health problems

based on various body systems and disease types. Microtia as a diagnosis itself does not meet the definition of a CCC, but having the condition may elevate the incidence of CCC occurrence given its association with other complex organ anomalies. Here, we utilized the Pediatric Health Information System (PHIS) database to investigate the epidemiology of Microtia and its association with CCC and other conditions. Understanding common diagnoses associated with microtia can help guide screening protocols.

**Methods:** A retrospective review of the PHIS database was conducted between 2015 and 2023. Patients were identified with an initial encounter at a PHIS-registered hospital having an associated ICD-10 diagnosis of Microtia. The database included data from patients across 26 states, their demographics, associated organ system flags, and any CCC.

**Results:** A total of 22,075 patients were identified as having an initial ICD-10 diagnosis of Microtia. Of these patients, 12,187 cases were male (55.2%), with a significant proportion of cases identified as non-Hispanic white (n=8,775, 39.8%) or Hispanic (n=7,135, 32.3%). Nearly 40% of the population was found to have at least one CCC (n=8,496), with half of these patients noted to have two or more CCCs. Cardiovascular issues were the most common associated organ flag (16.8%), followed by gastrointestinal and neurologic conditions (15.4% and 12.0% respectively).

**Conclusions:** This study highlights a significant correlation between microtia and complex chronic conditions (CCCs). With 40% of patients diagnosed with microtia also presenting with at least one CCC, the research underscores the need for comprehensive medical assessment and care strategies for this patient population. This study further supports the finding that cardiac conditions appear to affect this population more than other conditions, necessitating a re-evaluation of first-line screening modalities for conditions associated with microtia.

## **Open vs. Closed Primary Cleft Rhinoplasty**

Abstract Presenter: Joseph Ribaudo

Abstract Co-Author(s): Adam Boukind, Gary Skolnick MBA, Alison Snyder-Warwick MD, Kamlesh Patel MD

**Purpose:** Patients with cleft lip and palate (CLAP) often have substantial nasal deformity. These patients require a primary rhinoplasty a few months after birth. This

can be completed using either an open or closed approach as there is no consensus in the literature regarding which approach is more effective. Despite initial rhinoplasty, many patients with CLAP undergo intermediate and/or definitive rhinoplasty in early adolescence, demonstrating a need for improved primary rhinoplasty outcomes. The goal of this project is to compare nostril asymmetry in patients with CLAP that underwent closed or open primary rhinoplasty at our institution.

**Methods:** We conducted prospective enrollment of patients with unilateral complete CLAP at our single institution. Inclusion criteria consisted of patients less than 17 years of age, no intermediate or secondary rhinoplasty, and with unilateral complete CLAP. Each patient that qualified and consented for the study had photos of their nostrils taken. Maximum nostril height and width were measured using ImageJ. All measures were expressed as ratios with respect to the unaffected nostril. A ratio of 1 represents perfect symmetry in that nostril measurement. Chart review was performed to obtain demographic information and past surgical history. Open rhinoplasty approach was characterized as utilizing a rim incision and placement of interdomal sutures.

**Results:** 11 patients satisfied the inclusion criteria, 6 in the open rhinoplasty and 5 in the closed rhinoplasty group. Mean age of the entire cohort was 7.1 years. Group comparison analysis was conducted via two-sided unpaired t-test. Both groups had an average nostril height ratio less than 1 and an average nostril width ratio greater than 1. There was no significant difference in nostril height ratio for open vs. closed technique (0.82 vs. 0.69,  $p=.15$ ). There was no significant difference in nostril width ratio for open vs. closed technique (1.10 vs. 1.13,  $p=.77$ ). We calculated that a cohort of 36 subjects would be needed to provide 80% power to detect differences in nostril height between the two groups.

**Conclusion:** Reduction of cleft nasal deformity can be performed using both open and closed techniques. Patients with open techniques had clinically increased nostril symmetry in height, but not statistically significant. Both techniques had residual cleft nasal deformity, characterized by increased width and decreased height in ipsilateral nostril. We are continuing to prospectively enroll patients in this study to increase our sample size.

## Outcomes of dental implants in fibula free flaps for head and neck reconstruction

Abstract Presenter: Allison Karwoski

Abstract Co-Author(s): Moreen Njoroge, Jordan Gornitsky MD, Eric Resnick, Alina Galaria, Christopher Lopez MD, Robin Yang MD

**Purpose:** Reconstruction with osteocutaneous fibula free flaps (FFF) is a common procedure following resection for head and neck cancer. FFF has drastically improved the functional and aesthetic outcomes of patients, particularly in regard to oral function. The purpose of this study was to evaluate the clinical outcomes and timing of dental implant placement in patients following head and neck reconstruction with FFF.

**Methods:** A retrospective analysis of 60 patients who underwent FFF reconstruction for head and neck cancer and had dental implants placed from 2012-2023 was performed. Patient demographics and characteristics including sex, race, insurance type, history of radiation therapy, and medical comorbidities were assessed. Primary outcome measures evaluated included surgical complications, operative time, number of implants placed, follow-up, time of radiotherapy initiation, and dental implant success. Bivariate analyses using Chi-square tests and linear regression were performed for outcome measures and p-value of  $< 0.05$  was considered significant.

**Results:** There were a total of 234 implants done for 60 patients (24F, 36M). The majority were white ( $n=48$ , 80%) and had a median household income of \$55,000 to \$100,000 ( $n=40$ , 66.7%). The most common primary resection surgery was mandibulectomy ( $n=29$ , 48.3%), and 39 patients received neoadjuvant radiation treatment. The most common surgical complications in our patient cohort were nonunion or delayed union and recipient dehiscence. The median time to implant placement was 547 days and median number of implants was 4 (range = 1-8). A history of preoperative radiotherapy was significantly associated with a longer time to implant placement following FFF reconstruction ( $p=0.046$ ). Patients with osteoradionecrosis were associated with a longer time to dental implant placement ( $p=0.03$ ). Post-operative FFF complication rates were not associated with dental implant survival.

**Conclusion:** Both neoadjuvant radiation therapy and a history of osteoradionecrosis have an impact on timing of dental implant placement. These factors should be considered when assessing the timing of dental implant placement following FFF reconstruction.

## **Maxillary Hypoplasia as a Long-term Outcome of Sphincter Pharyngoplasty in Patients with Cleft Palate**

Abstract Presenter: Nghiem Nguyen

Abstract Co-Author(s): Madeline Chin MD, Kaavian Shariati, Jeremiah Taylor, Kelly Huang, Libby Wilson MD, Justine Lee MD, PhD, FACS

**Purpose:** While many studies discuss the changes in pharyngeal airway dimension and function following maxillary advancement surgery, less is known about the long-term consequences of sphincter pharyngoplasty surgery on maxillary growth. The current body of literature that reports on maxillary and mandibular growth outcomes after pharyngoplasty is either limited by small cohort sizes or short follow-up duration after surgery. This study aims to report on maxillary and mandibular growth effects as a long-term outcome of sphincter pharyngoplasty.

**Methods:** All patients with cleft lip and palate (CLP) or isolated cleft (iCP) who underwent sphincter pharyngoplasty at a single institution from 1992 to 2023 were retrospectively reviewed. An age- and diagnosis-matched control group with CLP/iCP who did not undergo sphincter pharyngoplasty was also identified. Exclusion criteria were patients with less than 15 years of age at the last office visit, follow-up duration less than 1 year after pharyngoplasty, Lefort surgery prior to pharyngoplasty, and any pre-existing conditions that could significantly affect craniofacial growth (e.g. hemifacial microsomia, velocardiofacial syndrome, craniosynostosis, etc.). Postoperative outcomes include clinical diagnoses of maxillary and mandibular hypoplasia, indication for Lefort surgery, as well as sella-nasion-A point (SNA) and sella-nasion-B point (SNB) angles obtained from lateral cephalograms. Chi square tests and independent samples t-tests were performed to compare outcome differences between pharyngoplasty and control groups. Multivariable logistic regression was also performed to evaluate independent predictors of maxillary hypoplasia.

**Results:** Among the pharyngoplasty cohort (n=114), the average age at time of surgery was  $12.0 \pm 4.5$  years (mean $\pm$ SD) and average follow-up duration was  $8.4 \pm 5.1$  years after pharyngoplasty. Average age at the last office visit in the pharyngoplasty cohort was  $20.4 \pm 3.0$  years compared to  $19.5 \pm 3.4$  years ( $p=0.06$ ) in the control cohort (n=86). Diagnosis of maxillary hypoplasia was significantly more frequent in the pharyngoplasty cohort than controls (60.5% vs. 33.7%, respectively,  $p<0.001$ ). Compared to control patients, pharyngoplasty patients had greater indication for Lefort surgery (25.6% vs. 54.4%, respectively,  $p<0.001$ ) and significantly smaller SNA angles ( $78.2 \pm 5.4$  degrees vs.  $75.4 \pm 4.5$  degrees, respectively,  $p=0.03$ ). There were no significant differences in

diagnosis of mandibular hypoplasia (9.6% pharyngoplasty vs. 9.3% control,  $p=0.93$ ) or SNB angles ( $76.9\pm6.0$  degrees pharyngoplasty vs.  $78.2\pm5.0$  degrees control,  $p=0.40$ ). Multivariable analysis results indicated that pharyngoplasty was independently associated with a three-fold increase in later diagnosis of maxillary hypoplasia (OR=3.4, 95%CI 1.7-6.9,  $p<0.001$ ).

**Conclusion:** Although it is well known that maxillary surgery may subsequently compromise pharyngeal air space, pharyngoplasty surgery may conversely be associated with a higher likelihood of long-term maxillary hypoplasia and indication for future LeFort surgeries.

## **Referral Patterns for Craniosynostosis Surgical Consultation: A Retrospective Review**

Abstract Presenter: Valeria Mejia

Abstract Co-Author(s): Tayla Moshal, Marah Jolibois, Idean Roohani, Sasha Lasky, Artur Manasyan, Jeffrey Hammoudeh MD, Mark Urata MD

**Purpose:** Delays in the presentation of craniosynostosis impede timely surgical intervention and can be detrimental to patient outcomes. Disparities in accessing care may influence referral time and hinder access to providers who can provide swift and accurate diagnoses. Furthermore, an initial evaluation by a provider unfamiliar with the diagnosis might prolong referral to a neurosurgeon or craniofacial surgeon. This study aimed to explore referral patterns associated with surgical consultation for craniosynostosis.

**Methods:** A retrospective review of California-based craniosynostosis patients at a tertiary children's hospital between 2014 and 2024 was performed. The demographic variables collected included patient sex, age, race/ethnicity, median household income, and patient zip code. Patient zip codes were used to calculate state-specific Area Deprivation Index (ADI), a measure of socioeconomic disadvantage in deciles from least (1) to most (10) disadvantaged based on income, education, employment, and housing quality. ADI scores of (5) and greater were considered to have higher disadvantages. Referral-related information was abstracted, including the type of provider, zip code of the referring institution, and the referral date. Patient age at presentation and craniosynostosis surgery were also recorded. Descriptive statistics, chi-squared tests, and independent t-tests were used for the statistical analysis.

**Results:** In total, 278 patients with craniosynostosis were evaluated. There were 126 (43.9%) Hispanic/Latinx, 76 (26.5%) White, 10 (3.5%) Asian, three (1.0%) Black/African American, and 56 (19.5%) other unknown patients. More than half (57.5%) of the patients had public insurance, and a median household income of \$81,559 ± \$29,293. The mean ADI was 5.48 ± 2.25. The mean age at referral was 4.38 ± 4.56 months, and the mean age at presentation for surgical consultation was 5.49 ± 4.54 months. The mean time from referral to presentation was 43.10 ± 79.50 days. Across racial groups, significant differences were observed in the age at presentation ( $p < 0.001$ ). The majority of referrals were from pediatricians ( $n=222$ , 74.4%), followed by outside craniofacial/neurosurgeons ( $n=26$ , 8.6%), self-referrals ( $n=12$ , 4.0%), neonatologists ( $n=10$ , 3.4%), and unknown ( $n=2$ , 0.1%). Patients referred from mid-level providers had the oldest age at referral (6.73 ± 6.47 months), followed by patients referred from outside hospital craniofacial/neurosurgeons (6.34 ± 5.18 months), pediatricians (4.14 ± 4.21 months), self-referrals (4.15 ± 5.91 months) and neonatologists (0.82 ± 1.20 months),  $p = 0.0147$ .

**Conclusion:** This study highlights significant differences in the age of referral for patients with craniosynostosis depending on provider type and patient race. Education and awareness of craniosynostosis at the community and provider levels may affect referral timing. Initiatives should be taken to address these disparities, promote equitable access to all craniosynostosis surgical options, and improve patient outcomes.

## **Establishing the Pediatric Head Circumference Growth Curve for Patients with Sagittal Craniosynostosis**

Abstract Presenter: Tobi Somorin

Abstract Co-Author(s): Justin Beiriger MD, Casey Zhang, Jeffrey Chen, Nicolas Kass, Angel Dixon, Joseph Mocharnuk, Megan Pencek MD, Joseph Losee MD, Jesse Goldstein MD

**Introduction:** Serial measurement of head circumference is an integral part of pediatric care and is important for diagnosing conditions that result in head shape abnormalities, such as sagittal craniosynostosis, which is the most common form of craniosynostosis. The importance of monitoring head circumference growth curves in healthy patients is widely known; however, there exists no comparable metric for patients with sagittal synostosis. Our study aims to generate standardized, validated growth curves for

patients diagnosed with isolated sagittal craniosynostosis. Secondly, we aim to stratify growth by different treatment approaches.

**Methods:** A total of 241 patients diagnosed and treated for isolated sagittal craniosynostosis at a single institution between 2004-2022 were analyzed. Smoothed, LOESS non-parametric curves were estimated preoperatively and postoperatively to compare patient age to head circumference. The postoperative growth curves were further stratified into three groups by treatment approach: Group 1 (no surgery), Group 2 (minimally invasive surgery), and Group 3 (open vault surgery). Analysis was conducted using RStudio (Version 1.3).

**Results:** Among the patients who met inclusion criteria, 76.8% were male. The majority of patients were Caucasian (79.7%). 39.8% of patients were managed non-surgically, 35.3% with minimally invasive endoscopic surgery, and 24.9% with open cranial vault reconstruction. Average age at surgery for 5.5 months and 2.8 years for Group 2 and Group 3, respectively. Optimal curve smoothing required restricting the age ranges for growth tracking to attenuate the effect of outlier patients: 0-7 years for Group 1, 0-5.75 years for Group 2, and 0-3.5 years for Group 3. In patients with sagittal craniosynostosis who did not undergo surgery, the 50th percentile measurement at 6.5 months of age was equivalent to between the 3rd and 5th percentile according to the CDC's growth curves for healthy infants. At 12.5 months of age, the 50th percentile circumference was equivalent to between the 50th and 75th percentiles of the national CDC growth curve for healthy infants.

**Conclusion:** Our study represents the first attempt to create a "well-child" growth curve to aid pediatric care providers in the long-term management of infants diagnosed with isolated sagittal craniosynostosis in order to monitor for abnormal development and neurologic sequelae. Our efforts yielded comprehensive curves illustrating growth trends over time and across treatment approaches, indicating reasonable benchmarks for head circumference growth based on the 10th, 50th, and 90th percentiles.



## Feeding and Swallowing Outcomes in Pierre-Robin Sequence: an 11-Year Cohort Study

Abstract Presenter: Nicolas Kass

Abstract Co-Author(s): Angel Dixon, Alexander Comerchi, Anne Glenney MD, Casey Zhang, Pooja Humar MD, Megan Pencek MD, Matthew Ford, Jesse Goldstein MD

**Purpose:** Poor oral feeding outcomes in Pierre Robin Sequence (PRS) patients are a cause of significant morbidity and can lead to caregiver distress. PRS is often divided into syndromic and non-syndromic, but the effect of medical complexity remains unexplored. Minimal literature exists to guide surgeon-patient family conversations on development of oral feeding ability. In this study, we aimed to assess the utility of a three-part classification, determine time until being safe to feed orally, and the effect of surgical management in PRS.

**Methods:** A retrospective cohort study was performed on all patients with PRS between 2010 and 2021. Patients were divided into isolated, syndromic, and complex based on genetic status and existence of 2 or more significant medical comorbidities. Imaging data from modified barium swallow was reviewed and used in predictive models. Differences in time until being safe to feed orally based on was plotted on Kaplan Meier curves were used to identify differences between variables of interest and cox regression to determine predictive ability of relevant covariables.

**Results:** Of the 122 PRS patients included in this study, 37 were isolated, 56 syndromic, and 29 complex. Isolated patients were more likely than syndromic or complex patients to be safe to feed at birth (16 vs 11 vs 3,  $\chi^2=9.28$ ,  $p=.01$ ). Kaplan Meier plot demonstrated significant differences across time points for each diagnosis (medians 1.14 IQR[0-8.5] vs 8.35 IQR[3.61-52.18] vs 12.71 IQR[2.57-84.29],  $p=.0001$ ). A similar pattern was seen after stratifying further based on conservative management or MDO (medians 0.0 IQR[0-0] vs 8.35 IQR[3.61-52.18] vs 12.71 IQR[2.57-84.29],  $p<.0001$ ). Cox regression demonstrated differences between conservative management and MDO for isolated ( $p=.01$ ) and syndromic ( $p=.007$ ), which disappeared upon controlling for pre-operative AHI ( $p=.26$ ) and ( $p=.12$ ). Cox regression demonstrated syndromic patients were 46.3% less likely to be safe to feed at a given time (HR .463, 95% CI [.293, .734],  $p=.001$ ) and complex patients were 32.6% less likely to be safe to feed at a given time (HR .326, 95% CI [.194, .569],  $p=.0005$ ) compared to isolated patients. Additionally, the presence of laryngomalacia was not associated with a statistically significant change in the likelihood of being safe to feed by mouth at any level (HR 1.08, 95% CI [0.71 to 1.65],  $p=0.71$ ).

**Conclusions:** Our study demonstrated highly significant and impactful differences in feeding outcomes between isolated, syndromic, and medically complex PRS. In doing so, we confirmed the utility of expanding stratification of PRS from two to three categories. Finally, we were unable to confirm surgical intervention as a factor that shortens time until a patient is safe to feed orally. These findings will impact strategies for future research into PRS and can be used during difficult conversations between surgeons and patient families.

### **Complication Rates in Surgically Managed Craniosynostosis: A Large, National Cohort Evaluation**

Abstract Presenter: Daniel Kwon

Abstract Co-Author(s): Dillan Villavisanis MD, Olachi Oleru MD, Nargiz Seyidova MD, Peter Shamamian Jr, BS, Carol Wang BA, Alex Sarosi MD, Peter Taub MD

**Purpose:** Craniosynostosis is a primarily surgically managed congenital condition with functional and aesthetic sequela. Based on the complexity of the pathology and patient comorbid conditions, there are several well-described post-surgical complications in surgical management of craniosynostosis, including surgical site infection and neurologic implications (e.g. dural injury and CSF leaks). While outcomes have been reported from single institutional studies, fewer have evaluated complication rates for patients from a national cohort. The purpose of the present study was to report the outcomes, utilization, and procedural costs of patients admitted for craniosynostosis from a large, national database.

**Methods:** A database retrospective cohort study was conducted using the 2018, 2019, and 2020 National Inpatient Sample (NIS). Discharge information was obtained for patients who fulfilled both a primary diagnosis with ICD-10 classification for craniosynostosis (ICD-10: Q75.0) as well as ICD-10 PCS classification for related surgical management (i.e., opening of cranial suture, linear / strip craniectomy, formation of / repair with cranial bone flap, other cranial osteoplasty) in the same admission. To assess inpatient safety, data were collected for demographics, hospital characteristics, inpatient mortality, inpatient medical complications (IMC), and inpatient surgical complications (ISC).

**Results:** Between January 1, 2018, and December 31, 2020, there were a total of 2,135 patients who received surgical management for a primary diagnosis of

craniosynostosis after admission. Within this cohort, 1,470 (68.9%) of patients were male and 1,475 (69.1%) were under 1 year of age. Postoperative inpatient surgical complication rates were relatively low, totaling 120 (5.6%) patients which included 15 (0.7%) hemorrhages, 5 (0.2%) infections, and 100 (4.7%) neurologic complications. There were no inpatient mortalities or thromboembolic events reported in the database. There were 70 (3.3%) patients with postoperative inpatient medical complications including 5 (0.2%) cardiovascular, 60 (2.8%) pulmonary, and 5 (0.2%) renal / urinary complications. Procedures were performed on 2110 (98.8%) patients in urban teaching hospitals and 1825 (85.5%) patients in private not-for-profit hospitals.

**Conclusion:** By leveraging a large, national database, the present study underscores the relative safety and efficacy of surgical interventions for craniosynostosis, with manageable complication rates. In particular, there were no thromboembolic events in this population. These insights into specific complication rates of craniosynostosis surgeries provide valuable benchmarks for surgeons aiming to optimize patient outcomes. However, the predominance of surgeries in urban teaching and private not-for-profit hospitals highlights a potential accessibility and resource distribution issue that warrants further investigation. Future research should investigate the risk profiles, cost, and utilization for each of the included heterogeneous surgical procedures, ensuring the continuous improvement of care for this vulnerable population.

### **The effects of Tisseel (fibrin sealant) application for stabilization of microvascular pedicle in head and neck reconstruction**

Abstract Presenter: Yur-Ren Kuo MD, PhD

**Background:** Fibrin sealants have been increasingly applied to various reconstructive procedures. In this article, we review cases where fibrin sealant was used to stabilize microvascular pedicles and compared them with those performed without fibrin sealant.

**Materials and methods:** Between 2018 and 2021, 711 consecutive patients underwent free tissue transfer for head and neck reconstruction. Following microvascular anastomosis, the microvascular pedicles were placed in the optimal position and fibrin sealant was used in 488 cases to fix and stabilize them. The other group with 223 free flaps without fibrin sealant usage were analyzed. For those with fibrin sealant usage also performed fat grafts in 111 cases for vascular protection. The complications including infection, hematoma, and vascular exploration, were compared.

**Results:** Both groups showed an excellent success rate of around 98%. Among those 488 cases with fibrin sealant usage groups, 65 complications were noted which involved 27 hematomas (5.5%), 27 tissue infections (5.5%), and 12(2.5%) vascular compromises. Analysis of the other 223 free flaps without fibrin sealant usage revealed 21 hematomas (9.4%), 19 infections (8.5%), and 18 (8.1%) vascular compromised. The usage of fibrin sealant showed a statistically significant reduction in both vascular compromise and infection rate (Infection: OR 0.465,  $p < 0.05$ ; Vascular compromised: OR:0.34, both  $p < 0.05$ ), while hematoma showed no statistical significance.

**Conclusion:** The usage of fibrin sealant in head and neck reconstruction showed a significant reduction of complications including vascular compromise and infection. It can be used to prevent vascular kinking but also in stabilizing the position of the microvascular pedicles.

## **Postoperative Radiologic Imaging in Secondary Alveolar Bone Grafting for Cleft Lip and Palate: A Systematic Review and Meta-Analysis**

Abstract Presenter: Connor Groff M.D.

Abstract Co-Author(s): Chioma Obinero MD, Alfredo Cepeda MD, Jose Barrera, Danielle Sobol MD, Phuong Nguyen MD, Matthew Greives MD

**INTRODUCTION:** Radiographs (XRs), computed tomography (CT) scans, and cone-beam CT scans (CBCT) are utilized for postoperative assessment of secondary alveolar bone graft (SABG) in patients with cleft lip and palate (CLP). However, the optimal choice for imaging modality remains unclear. This study compares the image fidelity and safety profile for XR, CT, and CBCT in the assessment of patients with CLP who have undergone SABG.

**METHODS:** This systematic review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Articles from MEDLINE and Elsevier Embase were screened and reviewed. Observational or interventional studies that involved use of XR, CT, or CBCT for postoperative graft assessment after SABG were included. The primary outcome was graft success rate. Secondary outcomes were percent-by-volume of graft maintained and patient safety, defined by radiation exposure. A random effects model was used to calculate the pooled outcomes for each imaging modality. Chi-squared analysis was

used to compare pooled outcomes between different imaging modalities.

**RESULTS:** Of the 149 articles identified initially, 14 met the inclusion criteria, including 7 cohort studies, 6 case series, and 1 case-control study. There were 2225 total participants included in the meta-analysis, of which 199 patients underwent XR, 988 patients underwent CT, and 1038 patients underwent CBCT for assessment of SABG outcomes. CT demonstrated the lowest graft success rate (62.0%) compared to both XR (72.6%,  $p < 0.01$ ) and CBCT (69.8%,  $p < 0.01$ ). Compared to the other 2 imaging modalities, CBCT had the lowest reported mean percent-by-volume of graft maintained (32.1%). Lastly, CT had a higher mean radiation dosage (39.7 milligray; mGy) than what has been reported for both XR (intraoral: 0.65 to 3.6 mGy; panorex: 3.3 to 4.2 mGy) and CBCT (9.9 to 25.2 mGy).

**CONCLUSION:** CT demonstrated lower graft success rates than both XR and CBCT, possibly indicating a higher image fidelity for postoperative assessment of SABG. However, compared to CBCT, CT may have a higher radiation exposure. Randomized trials and longitudinal studies are necessary to perform a direct comparison between CT and CBCT and to correlate the image fidelity of these modalities with important clinical outcomes, such as long-term orthodontic outcomes and total radiation exposure.

### **Cleft Deserts: A Geospatial Analysis of Cleft Lip and Palate Care and Social Determinants of Health in the United States.**

Abstract Presenter: Matthew Heron

Abstract Co-Author(s): Siam Rezwan, Atharva Bhagwat, Katherine Zhu, Jordan Gornitsky MD, Richard Redett MD, Robin Yang MD

**BACKGROUND:** Cleft lip and palate (CLP) management requires longitudinal care from several coordinated providers. Many CLP teams offer multidisciplinary services, but patients with less economic, social, and cultural capital face barriers accessing these resources and may experience poorer longitudinal outcomes.

**PURPOSE:** This study describes the geospatial distribution of cleft care across the United States, assesses disparities in social determinants of health between families with and without access to CLP care, and recommends interventions for improving access.

**MATERIALS AND METHODS:** We identified American Cleft Palate Craniofacial

Association-approved CLP teams in the United States and calculated a one-hour driving radius around each clinic. We defined counties within each radius as having access to care and those outside of each radius as being without access. Using data from the National Vital Statistics Survey, American Community Survey, and Behavioral Risk Factor Surveillance System, we compared counties with and without access across risk factors for developing cleft (i.e., incidence risk factors) and obstacles to care (i.e., access risk factors).

**RESULTS:** We identified 187 CLP teams in 45 states and the District of Columbia. Most were in the South (n = 60, 32.0%), followed by the West (n = 45, 24.1%), Midwest (n = 42, 22.5%), and Northeast (n = 40, 21.4%). The proportion of children with CLP team access was greatest in New York, New Jersey, and Pennsylvania (89.6%) and least in Alabama, Mississippi, Tennessee, and Kentucky (45.4%). Nationally, children without access to CLP teams were 38% more likely to have prenatal tobacco exposure, 7% more likely to have prenatal obesity exposure, and 28% less likely to have health insurance ( $p < 0.01$ ). Although insurance disparities were most pronounced in the Middle Atlantic and Midwest, children in Texas, Oklahoma, Arkansas, and Louisiana were the most likely to be uninsured, regardless of CLP team access. Children without CLP team access in the South were 29% more likely to have a birth weight  $< 2,500$  grams and 46% more likely to be living below the federal poverty line ( $p < 0.01$ ). Southern children were also less likely to have married parents and more likely to live with single mothers or grandparents ( $p < 0.01$ ). Children with access to CLP teams were more likely to have mothers and fathers  $\geq 40$ -years-old (33% and 22%, respectively), and significantly more likely to have married parents ( $p < 0.01$ ). Children with access were also 2.2-times more likely to live in families that migrated to the United States and 7-times more likely to speak English as a second language.

**CONCLUSIONS:** There are pronounced disparities affecting patients with and without access to CLP care. To ease access for patients  $> 1$  hour from a CLP team, immediate interventions must address transportation and care costs since these patients typically have fewer financial resources and suboptimal insurance; Long-term interventions must address systemic contributors, such as tobacco use and obesity. For patients near a CLP team, interventions should anticipate cultural diversity and ensure clinic offerings and materials are appropriate for a multicultural and multilingual patient population.

## **Cartilaginous Craniofacial Augmentation with Custom-Designed Blades**

Abstract Presenter: Kiana Hashemi

Abstract Co-Author(s): Saumya Kapoor, Rees Ridout, Pushpak Patel, Shannon Hubany, Casey Hedman, Julia Fedorova, Matthew Vaccaro, Alexia Stamatiou MD, Fernanda Scala MD, Brian Kellogg MD, Angelo Leto Barone MD

**Introduction:** Skeletal facial structure deficiency can be observed as a result of congenital malar hypoplasia, micrognathia, and microtia or from traumatic injury. While technological advancements have enriched the development of customized implants, concerns persist regarding alloplastic implants, which are prone to infection, irregularities, and extrusions (1). Augmentation with autologous or allogeneic cartilage, produced with custom-designed blades, may be an alternative. We present the design and testing of customizable blades for production of anatomical subunits for facial augmentation.

**Methods:** Blades for the zygoma, chin, and retroauricular ear block (to gain projection during stage 2 microtia repair) were designed using Computer-Aided Design software. Proof-of-concept blades were 3D-printed in resin with a Stratasys-J55-Prime Polyjet 3D printer. Next, stainless-steel versions of chin and ear blades were created via Direct Metal Laser Sintering. Medical students (n=13) were recruited to test each blade. Students initially hand-carved constructs from carrots-an experimental cartilage-like substrate-using a 10-blade. Next, each student used the experimental blades to generate blade-cut constructs with potential additional hand-carving if needed. For each construction method, time to construct production was measured and students were asked for agreement on ease of production, achievement of intended shape, and preference for hand-carving versus blade-cutting, using a Likert scale of 1-5 (1=strongly disagree, 5=strongly agree). Constructs underwent blind rating by a surgeon and surgical resident who scored constructs compared to reference models using 4 criteria: length ( $\pm 2$ mm), width ( $\pm 2$ mm), thickness ( $\pm 2$ mm), and contour/shape. Scores were given on a scale of 1-5 (1=0/4 criteria met, 5=4/4 criteria met).

**Results:** Overall zygoma, chin, and retroauricular ear block production times by blade-cutting (zygoma: 132 sec, chin: 66 sec, ear: 73 sec), were lower than hand-carving (zygoma: 188 sec, chin: 132 sec, ear: 116 sec;  $p < 0.05$ ). Blade-cutting with zygoma and retroauricular ear block blades allowed for greater ease of production. All blades achieved higher anatomical accuracy of the intended construct shape. Blade-cutting was the preferred method over traditional hand-carving ( $p < 0.05$ ). Blind rater scores demonstrated increased construct cosmesis in blade-cut zygoma constructs compared

to hand-carved ( $p < 0.05$ ), but there was no significant difference in blind ratings for blade-cut versus hand-carved chin and retroauricular ear block constructs. **Conclusion:** Implementation of customizable blades to shape cartilage may prove useful in producing cartilaginous implants with lower potential to carry risk compared to alloplastic implants. Utilization of these blades may allow for user-friendly, reproducible, and precise production of cartilaginous units while reducing operative time compared to manual carving.

#### **References:**

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### **Evaluation and Management of Head and Neck Hemangiomas in Infancy**

Abstract Presenter: Isabel Ho

Abstract Co-Author(s): Tyler Stumm MD, Sonal Shah, Howard Wang MD

**Background:** Hemangiomas are one of the most common head and neck masses encountered in the pediatric population and can be broadly classified into infantile and congenital hemangiomas. Accurate diagnosis and classification are essential for selecting the appropriate treatment approach, including observation, medical therapy, or surgery. The aim of this study is to review our clinical experience and early outcomes with evaluation and management of infants less than one year of age with hemangiomas in the head and neck region.

**Methods:** A retrospective review of all infants with hemangiomas in the head and neck region managed by our team over a 3-year period were included. Clinical characteristics, such as location, depth, symptoms, imaging, biopsy, and treatment modality, were tabulated. Hemangiomas were classified into infantile hemangioma (IH), rapidly involuting congenital hemangioma (RICH), and non-involuting congenital hemangioma (NICH). Physician assessment at around one year of age of whether of patients needed further treatment was obtained from review of patient chart and clinical photographs.

**Results:** A total of 164 patients with 262 hemangiomas met inclusion criteria. Of the



vascular lesions identified, 160 patients had IH, 2 had RICH, and 2 had NICH. The most common locations were the scalp (n=55, 21.0%), eyelid/periorbital region (n=28, 10.3%), and the neck (n=25, 9.5%). The average number of hemangiomas per patient was  $1.6 \pm 0.1$ . The average age of initial evaluation was  $6.6 \pm 1.7$  months. 18 (11.1%) patients reported symptoms related to the hemangioma including ulceration, bleeding, and visual obstruction.

Most did not require imaging for diagnosis (n=134, 81.2%), although some underwent ultrasound (n=18, 10.9%), MRI (n=7, 4.2%), or both (n=5, 3.0%), to aid in diagnosis or to exclude visceral involvement if suspected (e.g. liver ultrasound). One patient met diagnostic criteria for PHACE. Only one patient underwent biopsy of their hemangioma. Most patients underwent medical treatment for their hemangiomas (n=139, 84.2%), with only one (0.6%) undergoing surgical excision, and 22 (13.3%) opting for observation alone. Two patients (1.2%) underwent both medical and surgical treatment in the first year of life. Systemic propranolol was the most common initial medical therapy (n=107, 77.5%), followed by topical timolol (n=29, 21.0%) and oral atenolol (n=2, 1.5%). The average length of follow-up was  $11.1 \pm 1.8$  months. Of the patients treated with propranolol, only 14 (13.1%) experienced complications, mostly minor complications such as cold hands and feet (n=9, 8.4%) and sleep disturbances (n=4, 3.7%). No patients were required to stop treatment due to complications. At the most recent follow-up, a majority of the patients were deemed to unlikely need any additional treatment (74.55%).

**Conclusion:** Most head and neck hemangiomas can be diagnosed based on history and physical exam alone. Beta blocker therapy is the mainstay of treatment in infancy for head and neck IH that require treatment, with an excellent safety profile. Surgical management may be indicated for select cases of IH for diagnostic or treatment indications. Congenital hemangiomas present with unique features and require a different treatment approach, with surgical resection usually indicated in cases of NICH.

## **The Pittsburgh Extended Dissection Technique Improves Outcomes in Alveolar Bone Grafting**

Abstract Presenter: Joseph Mocharnuk

Abstract Co-Author(s): Miles Pfaff MD, MHS, Jesse Goldstein MD, Lindsay Schuster, Joseph Losee MD

**Introduction:** Outcomes in alveolar bone grafting (ABG) in cleft lip and palate care are influenced by several factors, such as age at grafting, diagnosis severity, and

dental/orthodontic care. Few studies to date have emphasized the importance of the surgical approach taken for bone grafting, including the degree of alveolar dissection and pocket creation for graft deposition. The current study aims to describe and objectively evaluate an "extensive dissection technique" for bone grafting, and, in doing so, describes a new scale for evaluation of graft quality.

**Methods:** Unilateral cleft lip and palate patients who underwent the "extensive dissection technique" for ABG were retrospectively compared to patients who underwent the traditional technique. Patients who received allograft were excluded from analysis. Outcomes compared included post-operative complications and regraft rates. Bone graft quality following ABG was assessed by two blinded orthodontists using the standardized way to assess grafts (SWAG) scale. When the 6-point SWAG scale was determined to be insufficiently sensitive to detect postoperative changes in graft quality, the authors devised a new Pittsburgh Clinical Correlate Score (PCCS) for assessment of the blinded post-op radiographs. The PCCS is a four-point scale where 1 means a regraft is requested, 2 means that there is orthodontic movement with informed consent of some bony deficiency, 3 means that the results are clinically acceptable, with no reservations in orthodontic movement, and 4 means that the orthodontists have determined that they should allow for dental eruption and re-assessment. Univariate comparisons of several clinical variables (e.g., left or right complete on incomplete cleft lip and palate, syndromic status, and use of acellular dermal matrix, etc.) across patient cohorts were conducted using Welch's t-test, and interrater reliability of each orthodontist's rating of bone graft quality was assessed using Pearson's correlation coefficient). The difference in PCCS between the old and new method cohorts was determined by the Wilcoxon rank sums test.

**Results:** One hundred seventy-three (60% male) who underwent ABG were evaluated in clinic during the study period. Of these patients, 85 underwent the traditional ABG method (75.2%, 61% male), and 88 (24.8%, 57% male) underwent the extensive dissection technique. None of the patients who underwent the new method needed a revision bone graft, whereas 20 (23.5%) of patients undergoing the old method did (p-value <0.0001). Clinical correlate scores of bone graft quality for patients who underwent the new, extensive dissection technique were significantly lower (and therefore, improved) relative to those who underwent the traditional ABG method (p-value = 0.04).

**Conclusion:** This study objectively demonstrates that the extended dissection technique reduces regraft rates for alveolar reconstruction in patients with orofacial clefts. While this technique does result in a larger dissection pocket and a need for a

greater amount of bone graft, our experiences suggests that this disadvantage is outweighed by the reduced complications of this technique.

## **Recognizing Variations in Primary Palatoplasty Billing: A Review of 9,827 Cases**

Abstract Presenter: Ashlie Elver MD

Abstract Co-Author(s): Wesley Zhang, Jamie Lewis, Laura Humphries MD, Ian Hoppe MD

**Purpose:** Accurate coding is critical to proper reimbursement in the US fee-for-service system. Ambiguity and undervaluation of current procedure terminology (CPT) in craniofacial surgery may create variation in billing practices of common procedures like primary palatoplasty (CPT: 42200). This study aims to identify unbundling trends in primary palatoplasty and discuss its appropriateness based on current coding guidelines.

**Methods and Materials:** Retrospective data from the Pediatric National Surgical Quality Improvement Program (PNSQIP) database reviewed patients from 2016 to 2021 with the primary CPT code 42200 (palatoplasty for cleft palate, soft and/or hard palate only). Patients in the 'unbundled' cohort had an additional CPT code 42235 (repair of anterior palate, including vomer flap), while 42200 was billed alone in the 'bundled' cohort. Operative time, surgical specialty, length of stay (LOS), and other perioperative variables were compared.

**Results:** There were 9,827 patients with CPT 42200. Of these, 9,156 patients (93.2%) were bundled, and 671 (6.8%) were unbundled. Operative time was significantly longer in the unbundled cohort (157.08 min vs 133.16 min;  $p < 0.001$ ). LOS was shorter in the unbundled group (1.42 days vs 1.58 days;  $p = 0.026$ ). Plastic surgeons were less likely to unbundle (6.2% vs otolaryngology, 9.12%;  $p < .001$ ).

**Conclusion:** Significant variations in primary palatoplasty billing practices exist. Longer operative times in unbundled cases may indicate a more involved procedure. A critical review of current coding guidelines is needed, including an examination of undervalued and ambiguous CPT codes in cleft surgery.

## **Optimizing Outcomes: A Systematic Review of ERAS® Pathways in Craniofacial Surgery**

Abstract Presenter: Jessica Blum MD

Abstract Co-Author(s): Manasa Kalluri, Mary Carbullido MD, Alexandra Center, Catharine Garland MD, Daniel Cho MD, PhD

**Background & Purpose:** Enhanced Recovery After Surgery (ERAS®) protocols have become more prevalent in clinical practice and in the primary literature given their reliable demonstration of improved surgical outcomes. In the process of seeking to develop our own ERAS pathway for craniosynostosis, the authors sought to assess the quality and breadth of the existing ERAS® literature in craniofacial surgery.

**Methods and Materials:** A systematic review was performed using PubMed and Embase, following Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA). Two independent reviewers screened 89 abstracts and 34 full texts using Covidence systematic review manager. Ultimately, fifteen clinical studies reporting on ERAS® protocols in craniofacial surgery were included. Data on adherence to ERAS® guidelines as well as study design, patient demographics, components of the ERAS® perioperative pathway, and outcomes following pathway implementation were collected. Descriptive statistics were used to summarize findings.

**Results:** Most published ERAS® pathways in craniofacial surgery are designed for cleft lip and/or palate (CLP) repair (46.7%), followed by orthognathic surgery (33.3%), speech surgery (6.7%), fronto-orbital advancement (6.7%), and alveolar bone grafting (6.7%). Eighty percent of studies were conducted in the United States, with representation from China, Japan, and Brazil. The average number of participants per study is 104 (range 19-359), and most studies (73.3%) contained a historical control group as well as the intervention group post-ERAS® implementation. The most common outcome evaluated was postoperative pain control/narcotic minimization (66.6%), followed by oral intake (26.7%), length of stay (26.7%), readmissions/ED visits (20%), the impact of a standardized surgical technique (20%), blood loss/minimizing transfusion requirements (13.3%), and minimizing postoperative nausea and vomiting (13.3%). One hundred percent of studies that compared pre- and post-ERAS® cohorts found improved outcomes in one or more domain in the ERAS® group. The studies themselves were imperfectly designed as zero studies reported endorsement from ERAS® society leadership, only two followed ERAS® society methods, four used the proper ERAS® formatting and diagram, eight were developed by individuals from different health settings and different professions with consideration for patient involvement, nine were multidisciplinary and created with a plan for audit and

evaluation, 11 addressed all phases of operative care, and only one failed to report on multiple patient outcomes.

**Conclusion:** Existing ERAS® literature in craniofacial surgery is primarily in cleft lip and palate and orthognathic surgery with a paucity of published craniosynostosis ERAS® pathways. Existing pathways consistently demonstrate improvement in surgical outcomes but fall short in their ability to adhere to ERAS® guidelines and holistically address perioperative care.

### **Relationship of Social Vulnerability on Surgical Timing for Patients with Craniosynostosis in Mississippi**

Abstract Presenter: Shelley Edwards

Abstract Co-Author(s): Emily Hecox MD, Mary Elise McMinn, Savannah Walker, Jamie Lewis, Laura Humphries MD, Ian Hoppe MD, Katherine Baker

**Purpose:** For patients with craniosynostosis, early diagnosis and intervention are imperative to optimize treatment options and long-term outcomes. The impact of sociodemographic factors and diagnostic timing is unclear. This study aims to investigate this relationship and identify healthcare disparities and barriers to timely intervention in the authors' home state using Social Vulnerability Index (SVI), a tool developed by CDC/ATSDR to assess community-level vulnerability.

**Methods:** Retrospective chart review was conducted for patients diagnosed with craniosynostosis before age 2 years who were treated at the authors' institution between 2012-2023. Patients were stratified into quartiles based on the SVI of their home county and age at the time of diagnosis was recorded. Statistical analysis was conducted utilizing one-way ANOVA with Tukey's multiple comparisons tests.

**Results:** 136 patients were identified for sociodemographic analysis. A one-way ANOVA comparing age at diagnosis revealed a main effect of SVI quartile ( $p < 0.002$ ). The most socially vulnerable quartile (quartile 4) was significantly older at the time of diagnosis compared to all other quartiles ( $p < 0.001$ ). In contrast, no difference was found between quartiles 1, 2, and 3.

**Conclusions:** Relative to their peers, the most socially vulnerable patients are more likely to experience delayed diagnosis of craniosynostosis. These delays may contribute

to delayed treatment, thereby limiting treatment options and impacting surgical outcomes. These findings highlight the need for targeted interventions to improve equity in craniosynostosis care for vulnerable populations.

## **Bilateral TMJ Changes Secondary To Unilateral Condylar Hyperplasia**

Abstract Presenter: Louisa Darko

Abstract Co-Author(s): Thiviya Sivakanthan  
Derek Steinbacher MD, DMD, FACS

**Background:** Patients with unilateral condylar hyperplasia (UCH) may present with TMJ symptoms, rather than concerns or recognition of asymmetry. Localization of TMJ pain may be on the affected (long) side, unaffected side, or both. Flattening, severe erosion and internal derangement on the opposite side can be appreciated radiologically. This can be a red herring, shielding the true diagnosis of UCH from the contralateral side. We hypothesize that excessive growth of the ipsilateral condylar neck and head on the side of UCH results in an upward and backward force on the opposite side TMJ, with resultant symptoms and findings (condylar flattening, anterior disc displacement, eminence changes). The purpose of this paper is to highlight the bilateral TMJ findings in UCH, and address potential treatment strategies.

**Methods:** This is a retrospective study involving radiologic and biographical data from subjects with TMJ UCH, as well as controls. Patient details and high quality Cone beam CT (CBCT) scans (1mm slices or less) were analyzed. CT scans were digitized and morphometric points were placed using Planmeca software (Hoffman Estates, Illinois). Linear and volumetric measures were taken in reference to the eminence, TMJ space, condylar position, and neck lengths. Volumetric analysis of the condylar head and neck was done using Analyze 14.0 software (Overland Park, KS, USA). Results were assessed using univariate analysis (T-Wilcoxon test).

**Results:** 40 patients were included (29 with UCH, 11 controls). The condylar head was flatter and erosive appearing on the contralateral UCH side compared to both ipsilateral side in the same subject, and compared to controls. Analysis between the affected and unaffected sides in patients with UCH showed a significant difference in condylar head and neck length ( $p=0.0019$ ) and volume ( $p=0.0030$ ); anterior glenoid space ( $p=0.035$ ) and vertical height of condylar eminence ( $p=0.00044$ ). The difference in ramus length was not significant ( $p=0.6533$ ). Between the controls and the UCH patients, there was a significant difference in the variance in condylar head and neck length ( $p=1.98e-07$ ) and

volume between the two sides ( $p=1.94e-08$ ) but not ramus length ( $p=1$ ). The vertical height of the condylar eminence was smaller on the affected side than in the controls ( $p=0.0018$ ) and the anterior glenoid space was significantly smaller on the unaffected side compared to the controls ( $p=0.0053$ ).

**Conclusion:** This study highlights TMJ morphological differences in patients with UCH. These differences in condylar and glenoid morphology are consistent and should be used to aid and underpin the diagnosis. Importantly, patients who present with TMJ pain and erosion on one side, should be assessed for opposite side UCH, as the underlying culprit.

### **Comparative Analysis of Nasal Patency in Patients Unilateral Cleft Lip Nasal Deformity versus Non-Cleft Patients with Nasal Airway Obstruction**

Abstract Presenter: Reanna Shah

Abstract Co-Author: Dennis Frank-Ito

**Background:** Anatomical abnormalities in the nasal airway associated with unilateral cleft lip nasal deformity (uCLND) often create multiple sites of nasal airway obstruction (NAO), and little is understood regarding the extent or severity of NAO induced by uCLND compared to those experienced by non-uCLND patients with NAO. Most studies investigating NAO in patients with cleft lip and/or palate have focused on comparisons with a control group exhibiting normal nasal anatomy or among different cleft morphologies.

**Objective:** The aim of this study is to employ computational techniques to quantify the patent nasal airways in individuals with uCLND, comparing them with non-uCLND subjects experiencing NAO and a healthy control group. Additionally, differences in the patent nasal airway were evaluated based on sex and population group.

**Methods:** Anatomically accurate three-dimensional patient-specific nasal airways were reconstructed from computed tomography images in 30 subjects: 10 subjects with uCLND, 10 non-uCLND subjects with NAO, and 10 healthy controls. Unilateral nasal airways surface area (SA) and volume (V) were calculated for each subject with uCLND for both cleft (CS) and noncleft (NCS) sides, and more obstructed (MOS) and less obstructed (LOS) sides for non-uCLND subjects with NAO, as well as for healthy controls.

**Results:** Median nasal airspace SA was smaller on the impacted side for subjects with

uCLND and non-uCLND subjects with NAO when both sexes were combined, as well as when isolated by sex. For subjects with uCLND - mean SA for both sexes was CS=64.68cm<sup>2</sup> (IQR=9.72cm<sup>2</sup>) versus NCS=75.68 cm<sup>2</sup> (IQR=5.90cm<sup>2</sup>). Mean SA for all non-uCLND subjects with NAO was LOS=91.97cm<sup>2</sup> (IQR=18.47cm<sup>2</sup>) versus MOS=97.66 cm<sup>2</sup> (IQR=16.79cm<sup>2</sup>). Males consistently displayed higher median (IQR) SA than females across all categories. When including both male and female subjects, the difference in SA between the CS and NCS for subjects with uCLND is statistically significant (p=0.006). However, the difference in volume for both sexes between the CS and NCS was not statistically significant. Furthermore, nasal volume had higher variability when comparing males and females: IQR of the NCS was 3.19cm<sup>3</sup> vs 1.54cm<sup>3</sup>, 2.42 cm<sup>3</sup> vs 0.29cm<sup>3</sup> for the MOS, and 2.62cm<sup>3</sup> vs 0.56cm<sup>3</sup> for the LOS, respectively. The MOS among non-uCLND subjects with NAO had the highest SAV ratio a median of 21.28cm<sup>-1</sup> (IQR=14.51cm<sup>-1</sup>) for both sexes, 25.13cm<sup>-1</sup> (IQR=19.98cm<sup>-1</sup>) for males, and 20.66cm<sup>-1</sup> (IQR=0.38cm<sup>-1</sup>) for females.

**Conclusion:** SA was consistently smaller on the impacted side compared to the non-impacted side across all three groups: both sexes, males, and females. Males had increased SA (IQR) compared to females across all classifications. Nasal volume results paralleled SA findings; however, males subjects with uCLND on the NCS and with NAO on both sides were found to have smaller nasal volumes their female counterparts. Notably, there was a higher variability of volumes for males than females. Lastly, surface area to volume (SAV) ratios indicated that more affected sides had a larger SAV ratio, suggesting potential nasal obstruction, while normal subjects generally had the smallest SAV ratio.

## **Prognostic Factors Associated with Surgical Intervention in Pediatric Head and Neck Sarcoma**

Abstract Presenter: Tayla Moshal

Abstract Co-Author(s): Idean Roohani, Marah Jolibois, Sasha Lasky, Simon Youn, Mark Urata MD, Jeffrey Hammoudeh MD

**Background:** Most pediatric head and neck cancers are aggressive sarcomatous neoplasms. Treatment often involves neoadjuvant and adjuvant therapies in addition to surgical intervention. However, extensive surgical dissection in this region can present challenges to craniofacial surgeons who aim to achieve negative margins while minimizing associated morbidity and mortality. The purpose of this study is to identify



the prognostic factors associated with surgical intervention in pediatric patients with head and neck sarcomas.

**Methods:** Pediatric patients who underwent surgical resection of head and neck sarcomas at a tertiary children's hospital between 2006 and 2023 were retrospectively reviewed. Patient demographics, pathological diagnosis, treatment modality (i.e., surgery, chemotherapy, and radiation), surgical margins, and survival were abstracted. The primary outcome was the 5-year survival rate following surgical intervention by plastic and maxillofacial surgery services. Kaplan-Meier analysis using the log-rank test was used to compare the predicted survival rates between various risk factors while adjusting for metastatic disease.

**Results:** Of 310 pediatric patients with craniofacial tumors, 229 were classified as non-odontogenic tumors. Of these, 60 tumors were sarcomatous- most commonly rhabdomyosarcoma (50.0%), followed by osteosarcoma (8.3%) and Ewing sarcoma (6.7%). The mean follow-up time was  $6.3 \pm 5.2$  years. The 5-year survival rate of all patients with sarcomatous tumors was 76.7%. Compared to patients who underwent surgical resection with R1/2 margins, those who achieved R0 margins had a significantly higher 5-year survival rate (100.0% vs. 73.6%;  $p=0.024$ ). Patients treated with early surgical intervention rather than neoadjuvant chemoradiation had improved 5-year survival rates (90.9% vs. 60.0%,  $p=0.040$ ).

**Conclusion:** Radical primary surgical intervention resulted in significantly higher 5-year survival rates in pediatric patients with head and neck sarcomas. When possible, achieving R0 margins during surgical resection might improve survival among this population. Future investigations are encouraged to provide patients and families with a more comprehensive understanding of various treatment options to better guide informed decision-making.

### **Novel Application of Computed Tomography in Pediatric Orbital Floor Fractures: Utilizing Orbital Index to Predict Risk of Enophthalmos and Surgical Intervention**

Abstract Presenter: Alexander Comerci

Abstract Co-Author(s): Megan Kerbag, Joseph Mocharnuk, Nicolas Kass, Zhazira Irgebay MD, Janina Kueper MD, Jesse Goldstein MD

**Background:** The rapid development of the craniofacial skeleton from infancy to adulthood represents a unique obstacle in the clinical management of pediatric orbital

fractures. Historically, treatment of orbital fractures in children has been approached similarly to that of adult patients. Distinct structural differences in bony composition and skull proportions however warrant the investigation of consequent adverse outcomes in pediatric orbital fractures and potential solutions to mitigate them. In adults, the orbital index, a measurement first suggested by Davidson et al., acts as a validated tool to stratify risk of delayed enophthalmos. The present study aims to demonstrate the utility of the orbital index, a composite measure of fracture location, size, and inferior rectus distortion, in the prediction of enophthalmos and surgical intervention in pediatric patients.

**Methods:** A retrospective review was performed for all patients under 18 years of age who presented to Children's Hospital of Pittsburgh, a pediatric level I trauma center. Demographic information, trauma mechanism, adverse outcomes, and craniomaxillofacial unenhanced high-resolution computed tomography (CT) scans were collected. Each scan was assessed for the following three parameters: total area of the fracture (cm<sup>2</sup>), primary location (anterolateral, anteromedial, posterolateral, or posteromedial), and shape of the inferior rectus muscle. Logistic regression analysis was utilized to generate a predictive model of management-type and adverse outcomes. Two-sample Student's t-tests were applied for comparison of orbital index across patient groups.

**Results:** A total of 3,334 patients were diagnosed with facial fractures between 2006 and 2021. Of 275 patients that presented with isolated orbital floor fractures (8.2%), 63 patients were excluded based on unextractable or missing data, poor CT image quality, or non-isolated fractures. The final analytic sample consisted of 212 patients with an average age of 11.6 (SD: 4.5) and range of 1.0 to 17.9 years. Average time of follow-up for each patient was 17 days (SD: 4.3). High-velocity injuries were the most common cause of fracture, specifically sports-related injuries (31.1%) and motor vehicle accidents (25.0%). Anteromedial fractures were the most common fracture type (34.0%). Thirteen patients developed enophthalmos (6.1%) and 52 (25.0%) received surgical intervention. Larger orbital index scores contributed to a 73% increase in the odds of developing enophthalmos ( $p=0.005$ ). A larger score was also associated with a 69% increase in the odds of surgery ( $p<0.001$ ).

**Conclusions:** The management of pediatric orbital floor fractures is complex though can be further clarified with the utilization of CT to analyze fracture characteristics and assign a composite orbital index. In scenarios where typical surgical indications (e.g., enophthalmos, inferior rectus entrapment) are not apparent, the orbital index is effective in predicting management-type and the development of feared adverse outcomes.

## **A Survey on Enhanced Recovery After Surgery (ERAS) Elements in Pediatric Orthognathic Surgery**

Abstract Presenter: Medha Vallurupalli

Abstract Co-Author(s): Jennifer Fligor MD, Raj Vyas MD

**Background:** Enhanced Recovery After Surgery (ERAS) protocols implement perioperative interventions to improve patient outcomes by limiting the surgical stress response, optimizing physiological function, and facilitating recovery. They have demonstrated success in adult surgical populations. We predict these benefits extend to the pediatric craniofacial population and can be particularly effective for orthognathic surgery. This study investigates current attitudes and use of ERAS protocols in orthognathic surgery.

**Methods:** An electronic survey was distributed to 102 craniofacial (CF) and oral and maxillofacial (OMF) surgeons in the United States. Responses were collected from April to July 2023. Surveys queried surgeons' knowledge, use, and attitudes regarding specific ERAS elements in pediatric (patients under age 25) orthognathic surgery. Surgeons were specifically asked about their preoperative, intraoperative, and postoperative practices and beliefs. Survey responses were collated and analyzed.

**Results:** 41 (40.2%) of 102 surgeons completed the survey. 7 of 14 surveyed elements are employed by a majority of surgeons for all patients: hypothermia prevention (61.0%), standardized protocol for maintaining normovolemia (61.0%), bolus of intraoperative tranexamic acid (51.2%), multimodal approach to postoperative nausea (61.0%), minimized use of opioids for postoperative pain control (51.2%), postoperative antiemetics in the first 48 to 72 hours (53.7%), and postoperative bite stabilization (58.5%). Additionally, 21 (51.2%) of surgeons reported using short acting anesthetic agents, like Precedex, intraoperatively for all or most patients, but only 11 (26.9%) surgeons reported use for all or most patients postoperatively. With regards to bite stabilization, 29 surgeons (70.7%) reported using just elastics. Liposomal bupivacaine was not commonly used: 37 surgeons (90.2%) reported never using this modality. Infusion dosing of intraoperative tranexamic acid was used for no or some patients by 24 surgeons (58.5%). Surveyed surgeons were least familiar with preoperative nutritional screenings or consultations (17.1%) and postoperative goal directed or zero fluid balance models (29.3%). Surgeons reported the most familiarity with bite

stabilization (65.9%), minimizing use of opioids for postoperative pain control (48.8%), and administering a bolus of intraoperative tranexamic acid (43.9%).

**Conclusions:** Surveyed surgeons endorse and report using ERAS-type perioperative elements in pediatric orthognathic surgery. Most surgeons reported, at minimum, being somewhat knowledgeable about most surveyed ERAS elements. Further evidence and multidisciplinary cooperation is necessary to implement a formalized ERAS protocol for pediatric orthognathic surgery.

## **Systematic Review and Novel Grading Algorithm for Blunt Cephalovascular Trauma with a Case Example**

Abstract Presenter: Zachary Koenig MD

Abstract Co-Author(s): Halil Safak Uygur MD; Sarah Shabih

**Introduction:** Branches of the internal and external carotid arteries that supply the scalp and face are susceptible to injury by blunt trauma while crossing bony structures or direct damage from penetrating injuries (1). Blunt trauma can have effects ranging from vessel dissection to pseudoaneurysm to complete transection with free extravasation (2). Unless avulsion with hemorrhage is present, the vascular injury patterns can present days to months after the trauma (3). Further complicating the matter is that additional injuries are rarely found (4). Unlike for blunt cerebro-vascular injury (5), there is no grading algorithm for blunt cephalo-vascular injury to guide proper diagnosis of these injuries.

**Methods:** A systematic review of the literature as of January 2024 was performed to collect all reports describing blunt injury to branches of the internal and external carotid arteries supplying the cutaneous regions of the face and scalp. The preference was directed toward specific the vascular injury encountered and the treatment regimen. Patient demographics and ancillary injuries were also identified. A novel grading algorithm for these injuries was proposed.

**Results:** 99 abstracts were collected, and 74 articles were included in the systematic review after inclusion criteria were met. 64 (86.5%) were case reports while the others included sample sizes ranging from to 2-13 patients. In this analysis, we included a 77-year-old female with no significant past medical history who presented immediately after colliding with her door with a grade 3 injury which was repaired by surgical ligation.

111 patients were included in total. 91 (81.9%) were male, and average patient age at the time of presentation was  $39.3 \pm 25.9$  years. The most commonly injured vessel was the superficial temporal artery (89, 80.2%). This was identified by computed tomography angiography (CTA) in 65 (58.6%) cases. 16 (14.4%) patients presented with concomitant facial fractures, and 9 (8.0%) patients reported anticoagulation use. The most common type of vessel injury was pseudoaneurysm (101, 91.0%), followed by arteriovenous fistula (3, 2.7%), and transection (7, 6.3%). The characteristics and timing of symptom presentation after the injury varied depending on the injury pattern. The most common treatments included surgical ligation with or without aneurysm resection (79, 71.2%), endovascular embolization (16, 14.4%), or anticoagulation (9, 8.1%). 107 (96.4%) patients saw complete resolution of symptoms after their given treatment.

**Conclusions:** Blunt cephalovascular trauma is an uncommon injury and often missed in the acute setting due to paucity of symptoms unless complete transection is present. The literature surrounding this topic involves low sample sizes. There must be a high index of suspicion to obtain a CTA to identify facial and scalp vasculature injuries. Treatment of arteriovenous fistula, pseudoaneurysm, or vessel avulsion most often involves surgical ligation or endovascular embolization which provides strong outcomes with complete resolution. Plastic surgeons must be equipped to handle such injuries should they present as a facial trauma consult.

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## **Jansen Metaphyseal Chondrodysplasia: Craniofacial Manifestations**

Abstract Presenter: Fiona Obiezu

Abstract Co-Author(s): Konstantinia Almpiani, Kristen Pan MD, Anisha Ninan, Kelly Roszko, Golnar Jahanmir, Christopher Zalewski, H. Jeffrey Kim, Lee Weinstein, Rachel Gafni, Carlos Ferreira, Michael Collins, Janice Lee, Smita Jha

Jansen metaphyseal chondrodysplasia (JMC) is an ultra-rare skeletal dysplasia caused by constitutive activation of the parathyroid hormone type 1 receptor (PTH1R). Patients usually present in childhood with characteristic metaphyseal flaring, short limbed-short stature, and bowed legs, ultimately requiring multiple surgeries for fractures and deformities. There are only 30 patients estimated to have the disease globally. Literature describing the craniofacial characteristics is sparse despite the striking craniofacial phenotype. This study investigates the prevalent craniofacial manifestations and functional implications of a cohort of patients with JMC.

Six patients (4 males, 67%) with genetically confirmed JMC underwent comprehensive craniofacial phenotyping consisting of CT and 18F-NaF PET/CT scans in addition to ophthalmologic, otolaryngologic, audiometric, and dental evaluations. Median age at the time of evaluation was 27.5 [IQR: 29] years. Sagittal suture craniosynostosis was seen in 5 of the 6 patients; one patient underwent cranial reconstruction for severe craniosynostosis in infancy. Patients also had characteristic pronounced supraorbital ridges, widely spaced eyes (hypertelorism), high arched palate, abnormal-shaped teeth, and relative mandibular retrognathia due to maxillary prognathism. Obstructive sleep apnea requiring continuous positive airway pressure (CPAP) was noted in 2 patients and, though the remaining patients had no clinical symptoms, airway analysis showed tracheal narrowing in 5 of the 6 patients on head CT. On CT skull, all patients showed bilateral, relatively symmetrical expansile, mixed lytic and sclerotic bone lesions throughout the skull. Neural crest cell (NCC)-derived bones of the viscerocranium (face), sagittal suture with adjacent parietal bones, and skull base showed greater involvement than mesoderm-derived bones (occipital and parietal), resulting in what can be considered a typical radiographic appearance. Sphenoid bone expansion was associated with optic canal narrowing in all patients when compared to age-matched controls. Additional findings include progressive optic nerve atrophy, conductive or mixed hearing impairment, facial nerve palsy, and malocclusion requiring orthodontic treatment.

To conclude, patients with JMC have a prominent craniofacial phenotype with a distinct facial and radiographic appearance, hearing and vision impairment, sleep apnea and dental anomalies. Sagittal craniosynostosis is common and surgical intervention may be warranted depending on the severity of craniosynostosis. Given the prominence of airway narrowing, airway management should be considered during surgical procedures requiring anesthesia. Additional reconstructive surgical procedures of affected facial structures are yet to be described due to the rarity of this condition. These findings begin to explore the consideration for craniofacial interventions in patients with JMC. Prominent involvement of neural crest cell-derived structures and its association with neurocristopathies that result in well-known congenital craniofacial anomalies implicates a role for NCCs in the development of JMC.

## **Risk Factors for Postoperative Complications Following Mandibular Fracture Repair**

Abstract Presenter: Eric Resnick

Abstract Co-Author(s): Bashar Hassan MD, Seray Er, Pharibe Pope, Judy Pan MD, Michael Grant MD, PhD, FACS, Grigorios Lamaris MD, PhD

**Background:** Complications following mandibular fracture repair (MFR) may carry significant morbidity to patients. The purpose of our study is to determine the risk factors for postoperative complications following MFR.

**Methods:** We conducted a retrospective cohort study of trauma patients who underwent MFR in 2018 and 2019. Excluded were patients <18 years old and those with postoperative follow-up <2 weeks. The primary outcome was the incidence of major and minor postoperative complications following MFR. Demographics, mandibular fracture characteristics, and postoperative complications were reported. The mandibular injury severity score (MISS) of each patient was calculated. Bivariate analysis and multivariate logistic regression were performed.

**Results:** Of n=275 patients included, mean (SD) age was 35 (14) years and median (IQR) follow up was 49 (26-117) days. Most patients (n=208 [76%]) underwent both maxillomandibular/intermaxillary fixation (MMF/IMF) and open reduction and internal fixation (ORIF). The incidence of major postoperative complications was 19% (n=51) including malunion (n=8 [2.9%]), malocclusion (n=21 [7.6%]), and reoperation (n=26

[9.5%]). The incidence of minor postoperative complications was 61% (n=167) including jaw pain (n=108 [39.3%]), mental nerve paresthesia (n=85 [30.9%]), infection (n=31 [11.3%]), TMJ complications (n=29 [10.6%]), restricted maximal intercisal opening (n=15 [5.5%]), hardware loosening or exposure (n=15 [5.5%]) and wound dehiscence (n=14 [5.1%]). Alcohol use at the time of surgery and greater MISS score were associated with greater odds of major complications (adjusted odds ratio [aOR] 95% confidence interval [95% CI] 3.4 [1.2-9.0], 1.09 [1.02-1.16], respectively. Smoking at the time of surgery and moderate-to-severe fracture displacement (>2 mm) were associated with greater odds of minor complications (aOR [95% CI] 2.1 [1.04-4.2], 2.7 [1.2-6.4], respectively).

**Conclusion:** Alcohol use, smoking, greater MISS score, and displaced fractures >2 mm were significant risk factors for postoperative complications following MFR. Our findings can help guide informed decision making and surgical planning in patients with mandibular fractures.

## **Management of Progressive Facial Nerve Weakness Due to Benign Tumors**

Abstract Presenter: Benjamin Rail

Abstract Co-Author(s): Natalie Gault, Shai Rozen MD, FACS

**BACKGROUND:** Gradual onset facial nerve dysfunction due to benign tumors presents diagnostic and surgical challenges due to the often-multiyear progression of intermittent episodes of facial weakening and partial recoveries. This study aims to share our experience with this unique population and review the literature.

**METHODS:** Adult patients with slowly progressive facial weakness or hemifacial spasm due to facial nerve involvement of a single benign tumor across a 13-year period were analyzed for demographics, facial palsy history, tumor characteristics, tumor treatments, reanimation treatments, and outcomes.

**RESULTS:** 14 met the inclusion criteria, with a mean age of symptom onset of 49 years and mean age of first visit of 54 years. 64% of patients were initially misdiagnosed. All patients presented with incomplete facial palsy, and 50% with synkinesis. The most common benign tumor type was facial nerve schwannoma (50%), followed by facial nerve hemangioma (21%), acoustic neuroma (14%), paraganglioma, and cavernous hemangioma (both 7%). 36% underwent complete tumor extirpation, 36% radiation,



14% mastoid decompression, and the remaining 14% are under observation. The facial nerve was sacrificed in 60% of patients who underwent extirpation. 43% of patients underwent dynamic facial reanimation, which, when feasible, was performed prophylactically, prior to potential future extirpation.

**CONCLUSIONS:** Identification and consideration of the prolonged course of facial nerve dysfunction, often with synkinesis, is necessary, as is evaluation of retained mimetic muscle tone given the uncertainty of denervation time. In suitable patients, prophylactic reanimation surgery should be proposed to avoid periods of complete flaccid facial paralysis and corneal exposure.

### **Cryopreserved Autogenous Cranioplasty: A Systematic Review and Meta-Analysis of Factors Associated with Severe Bone Resorption**

Abstract Presenter: Jude Kluemper

Abstract Co-Author(s): Emily Pfahl, Abdulaziz Elemosho MD, Kerry-Ann Mitchell MD, PhD

**Introduction:** Cryopreserved autogenous cranioplasty (AC) is often performed by plastic surgeons and neurosurgeons following a decompressive craniectomy. Previously removed calvarial bone is widely considered the gold standard for cranioplasty given its low rejection rate and low cost (1). However, AC is associated with many complications including bone flap resorption (BFR) which can necessitate surgical revision. Clinically relevant BFR can occur in as many as 34% of all cranioplasty patients (2). Prior meta-analyses have attempted to investigate various factors contributing to BFR. However, these studies are limited by varying definitions of BFR and varying methods of bone flap preservation across the literature (3). The goal of this meta-analysis was to examine factors associated with severe bone flap resorption in cryopreserved autogenous cranioplasty patients.

**Methods:** A literature search was performed across 4 databases (PubMed, Scopus, Web of Science, EMBASE). A total of 1085 papers were screened according to PRISMA guidelines. Studies which examined factors related to bone flap resorption were examined. Studies with the same definition of BFR (resorption requiring reoperation) and the same calvarial bone storage method (cryopreservation) were included for final analysis.

**Results:** Of the 1085 studies were screened, 7 were found to meet inclusion criteria for analysis. These 7 studies include a total of 1650 patients. Patients with resorption were significantly younger (WMD = -8.38,  $p = <0.001$ ). Calvarial bone flap fragmentation also caused significant increases in BFR (OR = 4.88,  $p = <0.001$ ). Interval between craniectomy and cranioplasty did not significantly impact resorption rates (WMD = 1.37,  $p = 0.82$ ) neither did patient sex (OR = 0.88,  $p = 0.36$ ) or bone flap size (WMD = 0.17,  $p = 0.94$ ). Finally, presence of a ventriculoperitoneal (VP) shunt was not associated with an increased risk of resorption (OR = 1.09,  $p=0.80$ ).

**Conclusion:** The risks of performing cranioplasty on younger patients has been well established, as has the risk of performing cranioplasty with fragmented calvarial bone. Interestingly, the presence of a VP shunt and size of the bone flap were not found to significantly affect resorption rates, which contradicts pervious findings (2)(4). We hope the results of this focused meta-analysis lead to a reevaluation of the factors associated with severe BFR in future autogenous cranioplasty patients.

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# **The Association Between Chiari 1 Malformation and Non-syndromic and Complex/Syndromic Craniosynostoses: A Systematic Review**

Abstract Presenter: Jasmine Chaij

Abstract Co-Author(s): Diane Saab, Anna Lee, Allyson Alexander, Corbett Wilkinson, Brooke French MD, Jason Yu DMD, MD, Phuong Nguyen MD, David Khechoyan MD

**Purpose:** Chiari I malformation (CM) is typically the result of either caudal traction or craniocerebral disproportion. Craniosynostosis (CS), the premature fusion of cranial sutures, can result in craniocerebral disproportion and thus has been associated with CM. Although there are studies with small sample sizes evaluating the association between CM and CS, a comprehensive meta-analysis of the cumulative data has not been reported. Moreover, most patients with CS who develop CM are diagnosed incidentally and have asymptomatic presentations [1]. For this reason, knowing the distribution of CM among different phenotypic presentations of CS will help in clinical evaluation. We aim to highlight the prevalence of CM amongst diverse phenotypic presentations of CS.

**Materials and Methods:** A meta-analysis via PRISMA guidelines was conducted with keywords for Chiari malformation OR terms related to Chiari malformation AND craniosynostosis OR multi-sutural craniosynostosis OR single-suture craniosynostosis OR related terms. These terms were applied to databases OVID (Medline), Cumulated Index to Nursing and Allied Health Literature (CINAHL), Scopus, and the register Cochrane Trials on 1/11/24, with the yield of 688 articles with 264 duplicates. Records were further screened by three independent reviewers with perusal of individual abstracts, with the inclusion criteria of specific discussion of craniosynostosis (single suture, multi-suture, or syndromic) and CM as diagnosed by cerebellar tonsillar herniation at or below 5 mm. Logistic regression analyses were performed for suture types and syndromes independently. The coronal suture and Saethre-Chotzen syndrome served as the reference categories for regression analysis, respectively.

**Results:** Based on the inclusion criteria, 23 reports were sought for retrieval. Based on the cumulative data in all reports, 30.2% of single-suture CS was associated with CM. Specifically, 43.9% of lambdoid, 6.7% of coronal, 6.5% of sagittal, 0.8% of metopic, and 20.5% of multi-sutural CS were associated with CM. Additionally, 22.2% of all syndromic cases presented with CM. By specific syndrome, 73.0% of Pfeiffer, 43.0% of Crouzon, 30.6% of Crouzon-Pfeiffer, 17.2% of Apert, 7.7% of Muenke, and 1.2% of Saethre-Chotzen presented with CM.

The results highlight a significant positive association between CM and lambdoid CS ( $\beta = 2.38$ ,  $p < 0.001$ ) and multi-suture CS ( $\beta = 1.28$ ,  $p = 0.001$ ). Conversely, metopic suture involvement demonstrated a negative association with CM ( $\beta = -2.20$ ,  $p = 0.038$ ), while sagittal CS showed no significant association ( $\beta = -0.034$ ,  $p = 0.932$ ). There was a significantly greater association of CM with the syndromes Apert ( $\beta = 2.81$ ,  $p = 0.00579$ ), Crouzon ( $\beta = 4.10$ ,  $p < 0.0001$ ), Crouzon-Pfeiffer ( $\beta = 3.56$ ,  $p = 0.000495$ ), and Pfeiffer ( $\beta = 5.38$ ,  $p < 0.000001$ ).

**Conclusions:** Based on this meta-analysis, the rates of CM are significantly associated with lambdoid CS and with multisutural CS. Additionally, there is a significant association between CM and the syndromes Apert, Crouzon, Pfeiffer, and Crouzon-Pfeiffer. These data emphasize the importance of careful evaluation of at-risk phenotypes of CS for CM.

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## Mandibular Condylar Neck Fractures: A Treatment Algorithm

Abstract Presenter: Sai Anusha Sanka

Abstract Co-Author(s): Dennis Nguyen MD, Damini Tandon MD, Esther Ochoa, Gary Skolnick MBA, Dennis Nguyen, Kamlesh Patel MD

**Purpose:** Condylar neck fractures are currently treated with soft diet, maxillomandibular fixation (MMF), or open reduction and internal fixation (ORIF). Literature suggests that operative fixation results in improvements in malocclusion, interincisal opening, jaw deviation, and jaw pain. Operative fixation can be performed via intraoral endoscopic-assisted, preauricular, or retromandibular approaches. Our study aims to simplify the decision-making process in treating of these complex mandible fractures by developing a management algorithm that takes into account patient and fracture characteristics.

**Methods:** Retrospective review was performed of patients who underwent operative treatment of their condylar neck fractures from 2016-2022 (n=22). At our institution, patients with an isolated fracture with no loss of height were treated with a soft diet.

Patients with malocclusion due to a second mandibular fracture but no loss of height of the condylar neck fracture were managed with closed reduction and mandibular maxillomandibular fixation (MMF) during ORIF of the second fracture. Patients with malocclusion and fracture displacement (loss of height) but no dislocation were treated with operative fixation using either a retromandibular (n= 5) or an intraoral endoscopic-assisted approach (n=9). Patients with displacement and dislocation were first treated with a preauricular approach for the dislocation, then with operative fixation via retromandibular or with an intraoral endoscopic-assisted approach (n=8). We analyzed these cases and their respective outcomes to develop our treatment algorithm. Assessment included operative time, occlusion, interincisal opening, jaw deviation, post-operative pain, and post-op complications.

**Results:** Condylar neck fractures were predominantly observed in males (81%), often combined with other mandible fractures (59%). Patients with condylar dislocation required longer operations (n=8, median time 215 minutes), while those with displacement but no condylar dislocation received a retromandibular operative approach (n=5) and endoscopic-assisted approach (n= 9) with shorter operative times (median 173 minutes and 160 minutes respectively).

Among the 22 patients, 13 underwent adequate follow-up for a minimum of one month. The average duration of follow-up for these patients was 4.3 months, ranging from 1.03 to 24.6 months. Seven patients were lost to follow-up prematurely, (mean 0.44 months, range 0-0.7 months), and two patients had incomplete documentation of outcomes. Among the 13 patients with adequate follow-up, 85% (11 out of 13) successfully achieved restoration of their premorbid occlusion. Additionally, 23% (3 out of 13) with a follow-up average of 1.1 months range: 1.03 to 1.17 months) experienced abnormal interincisal opening post-operation. The same proportion, 23% (3 out of 13), exhibited jaw deviation, while none of the patients reported pain while chewing. Lastly, 15% of these patients (2 out of 13) experienced complications, including ongoing malocclusion and sialoceles, neither of which required a secondary procedure.

**Conclusions:** We present a case series of our algorithm for management of condylar neck fractures. The majority of patients achieved restoration of premorbid occlusion without long-term complications. Using this algorithm has simplified the decision-making process and allowed for effective treatment of challenging mandibular condylar neck fractures.

## Trends in Surgical Technique Selection Following Mandibular Fracture

Abstract Presenter: Matthew Sink

Abstract Co-Author(s): Shelley Edwards, Emily Hecox MD, Ian Hoppe MD, Laura Humphries MD

**Purpose:** Surgical management of mandibular fractures is among the most common procedures performed by craniofacial surgeons, with established algorithms guiding treatment (Ellis et al., Alyahya et al.). Even with consensus on fracture management protocols, the delivery of equitable care can be susceptible to clinician bias, including consideration of socio-economic status of the patient. The Social Vulnerability Index (SVI) is a well-established percentile value assigned to individuals in geographical areas that can be used as a marker for socioeconomic status, such that more vulnerable populations have higher SVI percentiles. This study aims to explore the relationship between SVI and the selection of surgical repair techniques following mandibular fracture.

**Methods:** Data from Cosmos, a deidentified national database from Epic, was queried for patients with mandible fractures requiring operative fixation by using the five commonest Current Procedural Terminology (CPT) codes for operative mandible fractures as well as the ICD-10 codes detailing fracture characteristics (Ferry et al.). These CPT codes include: open treatment, mandibular fracture with interdental fixation (21462); open treatment, complicated mandibular fracture, multiple surgical approaches including internal fixation, interdental fixation, and/or wiring of dentures/splints (21470); open treatment, mandibular fracture without interdental fixation (21461); open treatment, mandibular condylar fracture (21465); and open treatment, mandibular fracture with external fixation (21454). The identified patients were then stratified into demographic cohorts by SVI quartile. Data were analyzed using a Chi-Square test for trends.

**Results:** This query identified 21,533 patients who underwent operative fixation of mandibular fractures from 2013-2023. Of these patients, 52.2% (n=11,231) underwent open treatment with interdental fixation, 34.4% (n=7,407) underwent open treatment requiring multiple approaches, 20.1% (n=4,324) underwent open treatment without interdental fixation, 5.7% (n=1,226) underwent mandibular condylar fracture repair, and 1.4% (n=299) underwent open treatment with external fixation. Interestingly, patients with higher SVI were more likely to have an ICD-10 diagnosis of closed mandibular fracture ( $p<0.0001$ ). However, patients with lower SVI were more likely to have an ICD-10 diagnosis of condylar fracture ( $p<0.0001$ ). Analysis for SVI percentile identified

significant trends for two surgical techniques. Patients with a higher SVI were more likely to undergo open treatment of mandibular fracture without interdental fixation (CPT 21461,  $p=0.0058$ ). Conversely, patients with a lower SVI were more likely to undergo open repair of mandibular condylar fracture (CPT 21465,  $p=0.0066$ ).

**Conclusion:** These results suggest that there is an association between SVI and mandible fracture repair technique. Patient factors, such as severity and type of injury in addition to dental status and occlusion, may differ between SVI groups. For example, poor dentition in a higher SVI group may preclude the choice of interdental fixation. In contrast, patients with better dentition with a lower SVI group may experience symptomatic malocclusion with condylar fractures, thus resulting in more open treatments for this group (Weiss et al.). Further investigation is necessary to understand the patient and provider factors that are responsible for these findings.

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## **Transfusion Tune-Up: Cranial Vault Remodeling with Fewer Blood Transfusions**

Abstract Presenter: Elizabeth Dominguez

Abstract Co-Author(s): Carly O'Donnell MD, Carly O'Donnell, Jonathan Bacos MD, Sameer Shakir MD, Kant Lin MD, Robert Havlik MD, Kristen Klement MD

**Background:** Cranial vault remodeling (CVR) for the treatment of craniosynostosis has been associated with substantial blood loss with a high incidence of allogenic blood transfusion. Transfusions have been associated with risks including metabolic acidosis, bacterial or viral contamination, fluid overload, lung injury and other transfusion-related reactions. The purpose of this study was to identify modifiable factors that may predict post-operative transfusion in order to reduce the rate of allogenic blood transfusion in patients undergoing CVR.

**Methods:** A retrospective review of the electronic medical record was conducted to include patients who underwent cranial vault remodeling between 2012 and 2020 at the Children's Hospital of Wisconsin. Demographic and intraoperative variables were tabulated. Outcomes of interest included postoperative transfusion.

**Results:** This study included 237 patients with craniosynostosis. The most common diagnosis was sagittal synostosis 48%. Intraoperatively, 41 (17.3%) of patients received tranexamic acid (TXA). 115 patients (48.5%) required a transfusion of blood products postoperatively. Intraoperatively, patients received  $49.0 \pm 37.6$  cc/kg of blood products on average. Children that received TXA were less likely to receive a postoperative transfusion ( $p < 0.001$ ). Children that received a drain were more likely to receive a postoperative transfusion than those children who did not receive a drain ( $p = 0.004$ ) and children who received NSAIDs were less likely to have a postoperative transfusion than children that did not receive NSAIDs ( $p < 0.001$ ). There was a significantly higher intraoperative crystalloid volume administered in the group that received postoperative transfusion ( $M = 50.3$  cc/kg,  $SD = 32.2$ ) than those children who did not receive a postoperative transfusion ( $M = 39.7$  cc/kg,  $SD = 21.3$ ), ( $t(235) = -3$ ,  $p = 0.002$ ). Total operative time and total intraoperative blood products transfused (cc/kg) had a weak but significant positive relationship ( $r = 0.22$ ,  $p = 0.001$ ).

**Conclusions:** TXA administration was associated with reduced transfusion requirements. NSAID administration postoperatively did not confer more postoperative transfusions.

While we found that the use of drains, increased intraoperative fluids, and operative time correlated with postoperative transfusions, these factors may reflect a more extensive operation.



## Extradural Dead Space Following Cranioplasty – A Systematic Review

Abstract Presenter: Alexa Stefanko

Abstract Co-Author(s): Gwendolyn Daly, Erik Wolfswinkel MD, Sara Alturky

**Background:** To restore a regular contour following cranioplasty, often an extradural dead space is created between the reconstruction and dura. It is often assumed the brain will ultimately expand and fill this space. However, in delayed or scarred cases, this dead space does not fill and may increase the risk for subsequent seroma or post-operative infection (1,2). The management of extradural dead space has yet to be standardized or summarized in the literature.

**Methods:** A systematic review of the literature was performed via searches of Embase, Cochrane, and PubMed in accordance with PRISMA guidelines. All English-language studies published before February 10, 2024 that described the risks or management of extradural dead space during cranioplasty were included.

**Results:** Of 544 screened articles, 65 underwent full-text review and 26 were included in the final analysis. All but three articles (n=23, 88%) discussed dead space treatment. The remaining two articles examined whether extradural dead space was a risk factor for mesh exposure (no association was found), seroma formation (dead space was a predictor for epidural fluid collection), or bone flap resorption (greater dead space was found to be a risk factor for resorption). Sixteen studies (62%) discussed filling the dead space with an omental or muscle free flap. Muscle free flaps were often used in the setting of revision cranioplasty after infection. Two papers (8%) discussed a variation of this approach using a combination of a muscle free flap and vascularized rib transfers. Two studies (8%) described filling the dead space with hydroxyapatite. Two studies (8%) described suturing the dura to the bone flap or artificial bone directly, rather than filling the dead space with another material. Only one study (4%) did nothing to obliterate the dead space, instead choosing to wall the dead space off from the paranasal sinuses only. Complications related to filling of the dead space included flap failure (n=1, 4%), and infection (n=3, 12%)

**Conclusions:** Management options of extradural dead space during cranioplasty are infrequently discussed. Free flaps are an emerging technique that may reduce the risk of post-operative complications in carefully selected patients. Further research is required to quantify the risks associated with leaving dead space after cranioplasty and determine the safety and long-term patient outcomes associated with using free flaps to obliterate dead space.

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## Evaluating Aesthetic Outcomes in Unoperated Metopic Craniosynostosis vs. Open Surgical Intervention

Abstract Presenter: Jasmine Chaij

Abstract Co-Author(s): Connor Elkhill, Allyson Alexander, David Khechoyan MD, Brooke French MD, Antonio Porras, Phuong Nguyen MD

**Introduction/Purpose:** Children with craniosynostosis (CS) undergo surgical intervention to mitigate the risk of increased intracranial pressure (IIP) secondary to their volumetric constraints and to normalize cranial head shape. Although metopic craniosynostosis (MC) is not usually associated with IIP, patients with severe dysmorphology improve the normalization of their cranial shape and aesthetics with operative intervention. There is currently no universally accepted metric to assess post-surgical outcomes or aesthetic appearance of patients with unoperated MC [1, 2, 3]. We used our recent quantitative method to objectively evaluate the aesthetic outcomes of groups of patients with both unoperated and operated MC using 3D photogrammetry.

**Method:** Patients with CT-confirmed diagnoses of MC from 2013-2023 were retrospectively identified at a single institution. A normative model of local head development built from the CT images of 2,020 subjects was used to create a Head Shape Anomaly (HSA) index as previously described indicating the number of standard deviations away from normative distributions the head shape of a patient is, accounting for age and sex [4]. Using 3D photogrammetry, we evaluated patients who underwent open repair of MC pre-operatively and post-operatively and those with MC who did not undergo surgical correction.

**Results:** Forty-three unique patients who underwent open surgical correction for MC

were evaluated both preoperatively (age at photogram:  $8.21 \pm 4.71$  months,  $1.61 \pm 2.16$  months before surgery) and one year after surgery (time after surgery  $13.34 \pm 11.74$  months). Patients who did not undergo surgical repair for MC were evaluated at one year of age. The HSA index of patients who underwent surgical correction (age at photogram  $24.06 \pm 12.30$  months) and five patients with unoperated MC (age at photogram  $19.96 \pm 16.64$  months) were compared. There was a significant improvement in HSA index in MC patients who underwent corrective surgery at one year after surgery ( $1.619 \pm 0.65$  before surgery vs.  $1.37 \pm 0.39$  after surgery,  $p=0.03$ ). Patients with unoperated MC presented a HSA index of  $1.98 \pm 0.82$ , which was not significantly different from either the pre-operative ( $p=0.26$ ) or the post-operative ( $p=0.09$ ) surgical groups. Of the 5 patients with unoperated MC, 3 patients had mild presentations and 2 patients were offered surgical intervention and elected conservative management.

**Conclusion:** Patients with MC who undergo surgical correction demonstrate an improvement of aesthetic head shape at 1 year from surgical intervention. Interestingly, no differences in HSA index between the pre-and post-surgical group and the unoperated group were identified, which may be limited by the sample size of unoperated patients and the mild clinical presentations of some unoperated patients. It is important to consider that patients with unoperated MC have a wide variety of presentations and do not present a significant trend of increasing HSA index over time.

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## **Concomitant head and neck reconstruction in patients with traumatic brain injury requiring a craniotomy – comparison of clinical characteristics and outcomes**

Abstract Presenter: Sobhi Kazmouz

Abstract Co-Author(s): Sam Jiang, Ankit Mehta

**Background:** Most craniotomy wounds can be closed primarily. In some percentage of cases, as is common in complex head and neck trauma, significant wounds require more advanced reconstruction techniques. Identifying patients undergoing a craniotomy for traumatic brain injury who are more likely to require a reconstruction for wound closure can help plastic and neurological surgeons plan and allocate resources effectively. This study aims to characterize the clinical differences between patients undergoing craniotomy who need reconstruction compared to those who do not, as well as the inpatient differences in outcomes between the two groups.

**Methods:** The National Trauma Data Bank was queried from 2017 to 2021 for adult patients with traumatic brain injuries requiring a craniotomy. Patients were divided into the "with reconstruction" and "without reconstruction" groups depending on if they had an accompanying reconstruction of the head and neck region to their craniotomy. The "with reconstruction" group was propensity score matched with the "without reconstruction" group based on demographics, comorbidities, and injury severity. Student t-tests and Pearson  $\chi^2$  tests were used to assess group differences.

**Results:** A total of 28889 patients meeting the inclusion and exclusion criteria were identified, of whom 3860 had a concomitant reconstruction and 24525 did not. Patients with reconstruction were more likely to be smokers, on Medicaid, and have a higher GCS score. Following propensity matching, there 3860 patients in each group. Patients with reconstruction had a higher length of stay in the hospital (21.6 vs. 16.6 days,  $p<0.01$ ), were more likely to develop pressure ulcers (5.1% vs. 3.0%,  $p<0.01$ ) and deep venous thrombosis (6.0% vs. 4.8%,  $p<0.02$ ), and more likely required discharge to a long-term facility (8.1% vs. 6.5%,  $p<0.01$ ). The mortality rate did not differ, however, between the patient groups.

**Conclusions:** Patients undergoing craniotomy with accompanying head and neck reconstruction demonstrate a clinical profile that suggests a more severe brain injury and additional risk factors that can complicate their wound closure. They also experience a longer length of stay and complications consistent with prolonged hospitalization. Plastic surgeons would benefit from working with neurosurgeons to

identify which patients will require reconstruction and be more aggressive with prophylactic measures against complications of prolonged hospital stay.

## **Staying Safe During Septorhinoplasty: A CT-guided Anatomical Approach to Avoiding Skull Base Injury**

Abstract Presenter: Hannah Soltani

Abstract Co-Author(s): Kareem Termanini MD, Ariel Figueroa MD, Taylor Hallman, Umer Qureshi, Kathryn Reisner, Sophia Allison

**Background:** Septorhinoplasty is one of the most common surgical procedures performed by plastic surgeons. Although sparsely reported, iatrogenic injury to the delicate cribriform plate during septorhinoplasty due to middle turbinate resection or manipulation can result in severe complications such as CSF leak and meningitis. (1) The intimate and complex relationship of the anterior cranial skull with the middle turbinate, perpendicular plate of the ethmoid (PPE), and nasal bones is often under-recognized, and rarely studied among plastic surgeons. Through a CT-guided analysis, this study established a clear anatomic relationship between the middle turbinate, PPE and cribriform plate to provide the plastic surgeon with a roadmap for staying safe during septorhinoplasty.

**Methods:** A retrospective chart review of patients  $\geq 17$  years of age who underwent CT sinus imaging was conducted. Patients receiving sinus CT scans due to traumatic etiologies, syndromic patients with abnormal nasal anatomy, and patients with a history of prior septorhinoplasty or sinus surgery were excluded from the study. 150 CT scans were randomized for evaluation and analyzed for the following measurements: 1) length of the cribriform plate, 2) length of the middle turbinate, 3) distance of middle turbinate anterior attachment from the origin of the cribriform plate, 4) length from basal lamella of the middle turbinate to sphenoid sinus, nasal bone length, and angle of anterior nasal spine to cribriform plate.

**Results:** The mean age of patients with scans was  $46.83 \pm 24.02$  years, with 58% female and 42% male. The length measured from the crista galli to the anterior sphenoid sinus averaged  $29.50 \pm 4.17$  mm. The length of the middle turbinate extended more posterior than the cribriform plate in all patients and averaged  $38.38 \pm 4.45$  mm. All patients had middle turbinate attachments to the cribriform plate, with an anterior attachment of  $5.79 \pm 1.89$  mm, which was  $17 \pm 6\%$  of the total length of the cribriform

plate. The length measured from the basal lamella to anterior sphenoid sinus averaged  $12.48 \pm 2.46$  mm, which was  $43 \pm 10\%$  of the length of the cribriform plate. The length of the nasal bone was  $21.04 \pm 3.80$  mm and the distance from the anterior nasal bone to the cribriform plate was  $30.35 \pm 4.50$  mm. The angle measured between the anterior nasal spine and cribriform plate was  $67.12 \pm 3.54^\circ$ . These measurements demonstrated that a significant portion of the middle turbinate arises from the cribriform plate.

**Conclusions:** This study clearly defined the anatomic dimensions of the structures adjacent to the cribriform plate using CT-guided measurements. While medical illustrations commonly depict middle turbinate attachment to the lateral nasal wall, our study demonstrated the direct connection of the middle turbinate to the cribriform plate. Anatomic knowledge of these structures may guide the plastic surgeon to avoid unfavorable fracture patterns and anterior skull base injury during middle turbinate manipulation during septorhinoplasty.

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#### **Age As a Consideration for Safe Pediatric Septorhinoplasty: A 30-Year Analysis of Literature**

Abstract Presenter: Raina Patel

Abstract Co-Author(s): Phillip Loan, Gabriela Cendejas, Maheen Akhter MD, David Perrault MD, Rahim Nazerali MD, Rohit Khosla MD

**Background:** Pediatric corrective nasal septal surgery is a controversial procedure, as the rapid growth spurt that adolescents experience can alter the anatomy of the midfacial region. However, surgery is often the best course of treatment in the case of facial trauma or severe nasal obstruction. It is suggested that the rate of revision surgery is higher in children than in adults due to the midfacial anatomical changes that adolescents experience; however, we lack sufficient evidence regarding the complication and revision rates of pediatric primary nasal septal surgery. Our study aims to understand the current clinical guidelines and safety profile of performing pediatric septorhinoplasty with an emphasis on understanding the optimal age for this

procedure.

**Methods:** A systematic review of PubMed, MEDLINE, and CINAHL was conducted using PRISMA guidelines. Clinical studies from 1994-2004 involving primary nasal septal surgery in children aged 0-18 years were included. Articles were excluded if study data involved subjects aged 19 years or older. Case series and cohort studies were included, and case reports were excluded. Two independent reviewers screened full-text articles to apply inclusion and exclusion criteria. Three reviewers each conducted data extraction of all studies, which was done independently to control for bias. Data was collected on patient-reported outcomes, postoperative complications, and rates of revision surgery. Descriptive analyses were performed using R Software.

**Results:** There were 31,875 patients from 27 studies that met inclusion criteria. The mean age at primary surgery was  $12.4 \pm 1.2$  years. With respect to specific types of procedure, septoplasty was performed in 63% of all articles, rhinoplasty in 25.9% of articles, and septorhinoplasty in 22.2% of articles. The average rate of complication across all studies was  $9.9\% \pm 4.1\%$ . The average time to complication was  $34.0 \pm 5.1$  days. The average rate of revision was  $4.2\% \pm 10.3\%$ , and revision was most frequently indicated for recurrent nasal passage obstruction (58.9%). The mean time to revision septoplasty was  $775.1 \pm 314.0$  days, and the mean age of participants at revision surgery was  $17.8 \pm 3.4$  years.

**Conclusion:** Pediatric corrective nasal septal surgery demonstrates generally low complication and revision rates. Complications were minimal and largely occurred during the peri-operative period, suggesting that midfacial anatomical changes that are distributed over a longer time period do not affect the timing of complications. Revision surgery, when indicated, occurs approximately two years following the primary procedure and typically at the late adolescence stage; however, additional data is needed to understand the optimal timing of revision surgery, as this was reported in only 18.5% of studies. Overall, our findings indicate that performing septorhinoplasty in the pre-adolescent years is generally safe. Long-term follow-up studies can help determine an optimal age range for which the postoperative complication rate and revision rate are minimal.

## **A 10 Year Retrospective Analysis of Mandibular Fracture Patterns in Blunt and Penetrating Trauma**

Abstract Presenter: Caroline Kreh

Abstract Co-Author(s): Louisa Ragsdale MD, Kevin Chen MD

**Background:** Mandibular fractures are a common consequence of several mechanisms of injury including assault, motor vehicle accidents, and falls. Facial traumas that lead to mandible fractures are typically either blunt or penetrating. Previous studies have examined the pattern of craniofacial fractures created by different mechanisms of injury; however, little research has examined overall fracture patterns across all sites of the mandible and the effects of blunt and penetrating trauma on these patterns.

**Purpose:** To review the fracture patterns including secondary fracture sites for both blunt and penetrating trauma to the mandible over a 10-year period at a single institution.

**Methods:** A retrospective chart review was performed on all patients who were treated at Saint Louis University for mandible fractures from January 2013 to December 2022. Variables collected for analysis included mechanism and date of injury, fracture location(s) within the mandible, comminution, and demographic data (i.e., age, gender, and race). Chi-square analysis was performed for categorical variables and student's t-test was performed for comparison of means of continuous variables.

**Results:** 570 patients with mandible fractures were identified in the 10-year time span. Motor vehicle accidents were the most common cause of these injuries, accounting for fractures in 203 patients (35.6%). The most common location of mandibular fractures was the body, which was fractured in 30.3% of patients. This was followed by the parasymphysis (26.0%), angle (23.9%), ramus (17.4%), subcondylar region (13.3%), condyle (12.4%), symphysis (6.6%), and coronoid process (6.5%). Blunt trauma caused significantly more subcondylar and condylar fractures as well as parasymphyseal fractures compared to penetrating trauma ( $p < 0.05$ ). Patients who had penetrating trauma caused a significantly higher proportion of body fractures ( $p < 0.05$ ). The most common fracture patterns were isolated body fractures, isolated angle fractures, and angle/parasymphysis fractures. When broken down by grouped fracture patterns, a significant difference in distribution was seen between blunt and penetrating trauma. Blunt trauma cases were more likely to present with multiple fractures and with fractures of the posterior mandible, including the condylar and subcondylar regions. Comparatively, penetrating trauma was associated with higher rates of singular



fractures and with fracture sites in the anterior mandible. The difference in parasymphyseal fracture rates seen on individual fracture site analysis was shown to be largely due to blunt trauma causing a significantly larger number of angle/parasymphyseal fracture patterns.

**Conclusion:** Mandibular fracture sites are well studied. Most previous literature focuses on rates of injury at individual sites on the mandible. This study demonstrates that it is useful to think of mandibular fractures in terms of the pattern of their placement across all sites on the mandible rather than as isolated, individual areas of injury. The mechanism of injury to the mandible partially determines the fracture pattern observed. The differences in the transmission of force during blunt and penetrating trauma result in measurably dissimilar fracture patterns generated within the mandible.

## **Refractory Pediatric Idiopathic Intracranial Hypertension: A Case Series Exploring Posterior Vault Distraction Osteogenesis as an Innovative Therapeutic Approach**

Abstract Presenter: Christopher Runyan MD, PhD

Abstract Co-Author(s): Daniel Zaki MD, Amelia Davidson, Daniel Couture, Attila Dos Santos, Mario Blondin MD

**Introduction:** Idiopathic intracranial hypertension (IIH) is defined as elevated intracranial pressure (ICP) without a clear etiology. In refractory cases with imminent visual deterioration, surgical management, including cerebrospinal fluid shunting or optic nerve sheath fenestration, is offered as a last resort. This study examines our use of posterior vault distraction osteogenesis (PVDO) as a novel surgical treatment for pediatric patients with refractory IIH and evaluates the relationship between skull suture fusion and elevated ICP in this population.

**Methods:** A retrospective review was conducted on pediatric patients diagnosed with IIH and age- and sex-matched controls who had undergone head computerized tomography (CT) scans. In addition to general demographics, data collected included clinical findings on presentation, previous noninvasive treatments for IIH, and perioperative details about PVDO. Patients were excluded if they had a history of other inherited or acquired craniofacial conditions or had undergone craniofacial or neurosurgical procedures other than PVDO. Utilizing the head CT scans, a 5-point scale developed by Madeline and Elster was employed to grade major and minor cranial

suture fusion.

**Results:** Fifteen patients with IIH and thirty-one controls were included in this study. Compared to unaffected controls, patients in the IIH group had a higher BMI (32.9 vs. 22.0,  $P = 0.01$ ). Within the IIH group, patients undergoing PVDO ( $N = 3$ ) were significantly younger at the time of diagnosis (6.7 vs. 13.1 years of age,  $P = 0.004$ ). Three patients underwent PVDO with significant improvement in their symptoms. The average latency phase, active phase, consolidation phase, time from distractor placement to removal, and distraction distance were 1.3 days (1-2 days), 29.3 days (23-40 days), 167.5 days (146-189 days), 230 days (189-287 days), and 25 mm (23-29 mm), respectively. Although one surgical patient had a fused sagittal suture, we found no clinically significant association between IIH and premature suture fusion.

**Conclusions:** PVDO appears to be a safe and effective treatment for managing pediatric patients with refractory IIH. Although one patient had premature fusion of the sagittal suture in our study population, there was no association between craniosynostosis and IIH.

### **Post-transplantation Bone Volume Changes in Eight Face Transplant Recipients- A Single Center Study**

Abstract Presenter: Lioba Huelsboemer MD

Abstract Co-Author(s): Sam Boroumand, Aliyar Zahedi Vafa, Neil Parikh, Viola Stoegner MD, Bohdan Pomahac MD, Martin Kauke-Navarro MD

**Purpose:** For patients with severe facial trauma or disfigurement, facial transplantation has the potential for providing significant reconstructive restoration. Depending on the patient's individual circumstances, face transplantation may include bone as part of the donor allograft. However, the long-term integrity and composition of these donor bone grafts remains uncertain. Thus, the purpose of this study is to provide a long-term quantification of bone volume changes within a single institution cohort of face transplant patients.

**Methods:** Individual maxillofacial/head CT scans for eight patients (six male, two female) were identified from 2011-2023 across two time points: about one year post-face transplantation and the most recent scan available for each patient. CT scans from each timepoint were analyzed in Materialise Mimics (v25) software to segment out the

bony anatomy from each scan and calculate the volume of the mandibular and maxillary components. Volumes were compared of each anatomical component utilizing Wilcoxon Signed-Rank Test.

**Results:** Out of eight face transplantation patients, three had a combined maxilla and mandible bony allograft included in their face transplant, one had a maxilla-only bony allograft included, and four had only soft tissue allografts with no bone included. On average, patients were 10.1 years post-transplantation (range 5-13 years) and had an average duration between scan timepoints of 6.5 years (range 1-12 years). Across all patients, there was a significant median decrease in both mandibular ( $-5,131 \text{ mm}^3$ ;  $p=0.0078$ ) and maxillary ( $-2,740 \text{ mm}^3$ ;  $p=0.0078$ ) volumes over time. When specifically comparing the volume changes between the cohorts who received bony allografts versus those that did not, patients with bony allografts had an average change of  $-4,242 \text{ mm}^3$  for their mandible and  $-3,219 \text{ mm}^3$  for their maxilla over time, in comparison to an average volume change of  $-8,519 \text{ mm}^3$  for the mandible and  $-3,492 \text{ mm}^3$  for the maxilla observed in patients with non-bony allografts.

**Conclusion:** This study provides the first quantification of facial bone volume changes in face transplant recipients over an extended multi-year follow-up period. Although the results show significant volume loss in the mandible and maxilla of face transplant patients over time, the average volume loss in the soft tissue only allograft patient cohort was greater than that seen with the bony allograft cohort in both the mandible and maxilla. Although preliminary, this finding suggests that patients with bony facial allografts may not experience any accelerated degeneration. The etiology of the overall volume decrease is likely multifactorial with impacts from the natural degenerative processes that occur with aging, loss of teeth, the influence of life-long immunosuppressive therapy and episodes of rejection, and allograft interactions with the recipient's immune system.

## **Toward a Normative, Optimal Interfrontal Angle Atlas for Objective Diagnosis of Metopic Craniosynostosis**

Abstract Presenter: Esperanza Mantilla Rivas MD

Abstract Co-Author(s): Austin Tapp, David Garcia Mato, MD, Soheli Rana, MD, Monica Manrique-Castrillon MD, Nathanael Oh, Kathleen Johnson, Albert Oh MD, Marius George Linguraru, Gary Rogers MD

**Background:** Because the metopic suture fuses normally in infancy, the determination of pathological metopic fusion rests on the degree of forehead narrowing. Current diagnostic techniques for metopic craniosynostosis rely on subjective criteria, 2-dimensional measurements, or 3-dimensional analysis that fail to capture individual variation of shape. This study presents an objective, data-driven normative model that represents the age- and sex-specific variability of forehead deformation.

**Methods:** A retrospective review of computed tomography (CT) scans of patients aged 0 to 24 months who presented to the emergency department between 2010 and 2023 was completed. Patients with craniosynostosis (CS) or associated syndromes, history of hydrocephalus, or other brain/cranial abnormalities were excluded. Each patient underwent cranial shape analysis. Optimal interfrontal angle (oIFA), transverse forehead width (TFW), skull circumference (SC), intracranial volume (ICV), and malformation range (MR) were calculated. Differences between groups in relation to age, gender, and race were measured by multinomial regression.

**Results:** Cranial shape metrics were calculated for 645 patients, with a minimum of 25 patients in each month group. The patients' median age at the CT scan was 11.0 months; slightly over half of the patients (55%) were male and (58.9%) African American. The median oIFA was  $141.2^\circ$ , TFW was 56.6 mm, SC measured 415.4 mm, and ICV was  $988.0 \text{ cm}^3$ . MR was assessed for specific skull bones, revealing variations within normal limits. Our analysis found that males demonstrated a significantly higher mean ICV compared to females ( $1036.5 \text{ cm}^3$  [846.7, 1176.8] vs.  $944.2 \text{ cm}^3$  [771.6, 1061.1], with  $p < 0.001$ ).

Interestingly, a sub-analysis categorizing the patients by age group found a trend where oIFA distribution and TFW distribution were inversely proportional. Specifically, oIFA showed a slight decrease with increasing age, moving from  $138.9 \pm 19.3^\circ$  to  $137.3 \pm 19.0^\circ$ , while TFW showed a slight increase from  $55.8 \pm 23.9 \text{ mm}$  to  $62.1 \pm 25.9 \text{ mm}$ . Moreover, we found a very strong and statistically significant correlation between age and ICV (Pearson's  $r=.75$ ;  $p < 0.001$ ), indicating that, on average, the ICV tends to increase by about 198 mm for every one-unit increase in log age (in months) in males, and 129 mm in females.

**Conclusion:** The determined metrics provide an objective normative forehead angulation in a cohort of 645 patients, representing the largest and most comprehensive study to date. The evaluated metrics establish a standardized framework for objectively evaluating craniofacial morphology and removing subjectivity in determining pathological forehead narrowing from normal variation. The presented approach advances the precision of diagnosing trigonocephaly, and the observed inverse

relationship between oIFA and age, coupled with age-related increases in TFW and ICV, provides valuable insights for guiding surgical interventions in metopic craniosynostosis.

## **Fixation of Nanoparticulate Mineralized Collagen Glycosaminoglycan Materials with Poly(DL-lactide) Implants Improves In Vivo Skull Regeneration**

Abstract Presenter: Meiwand Bedar MD, Msc

Abstract Co-Author(s): Xiaoyan Ren, Wei Chen, Youngnam Kang, Shahrzad Moghadam, Kelly Huang, Justine Lee MD, PhD, FACS

**Introduction:** Cranioplasties are crucial for ensuring cerebral protection, restoring neurological function, and improving psychosocial well-being. However, current available cranioplasty materials have significant drawbacks; autologous bone grafting is constrained by limited availability and donor site morbidity, while alloplastic materials are associated with high complication rates. Consequently, there is a clinical need for regenerative bone biomaterials that emulate properties of tissue-specific extracellular matrix (ECM) and regulate progenitor cell fate. Nanoparticulate mineralized collagen glycosaminoglycan (MC-GAG) promotes in vitro osteogenic differentiation and in vivo skull regeneration without exogenous growth factors and ex-vivo progenitor cell seeding, offering a promising "materials-only" solution for osseous defect reconstructions. Further refinement of the material is however imperative to enhance safety and regenerative potential for clinical translation. A pertinent challenge faced during early bone healing is ensuring the protection of underlying structures while simultaneously maintaining optimal intracranial pressure to support neurological function. In this work, we investigated how the regenerative capacity of MC-GAG may be influenced by its fixation and overlay with a clinically available resorbable poly(D,L-lactide) (PDLLA) implant intended for cerebral protection.

**Methods:** A 14-mm full thickness, extradural defect was created in each New Zealand white rabbit. Animals were divided into 4 groups: 1) defect without reconstruction, 2) defect with PDLLA implant, 3) MC-GAG scaffold only, and 4) MC-GAG with PDLLA implant. Initial bone healing assessment was conducted on explanted skulls at 3 months using microcomputed tomography (microCT) scanning, histology, and reference point indentation. For a comprehensive understanding of long-term effects, in vivo microCT imaging was subsequently performed at 3, 6, and 9 months, with further examination biomechanical properties of explanted skulls at 9 months.

**Results:** At 3 months, the explanted skulls revealed that MC-GAG significantly enhanced mineralization in comparison to the empty and PDLLA-treated defects, with even greater mineralization observed for the MC-GAG-PDLLA combination scaffold. Histological analysis of the interface between the reconstruction and native bone indicated that MC-GAG promoted the development of an intricate network of trabecular mineralized content whereas the untreated defect primarily featured fibrous, non-mineralized tissue. MC-GAG-PDLLA demonstrated enhanced structural organization more closely representative of nearby native bone. Biomechanical assessment of the treated skulls demonstrated enhanced toughness and resistance to microfracture of both MC-GAG alone and MC-GAG-PDLLA compared to the empty and PDLLA-treated defects, with significantly greater measures of stiffness for MC-GAG-PDLLA. While no difference in regenerated bone mass was detected by in vivo CT between the treatment groups after 3 months, MC-GAG-PDLLA exhibited the highest bone mass at 6 months, and both MC-GAG-containing scaffolds demonstrated enhanced bone regeneration compared to the empty and PDLLA-treated defects at 9 months. By 9 months, PDLLA implants were completely resorbed, and analyses of the mechanical properties of explanted skulls at 9 months revealed that both strength and stiffness were greatest and most similar to native bone for MC-GAG-PDLLA.

**Conclusions:** Together, these results demonstrate that the reconstruction of a cranial defect with a MC-GAG scaffold fixated with PDLLA implants significantly enhanced long-term mineralization and bone regeneration compared to a scaffold consisting of either MC-GAG or PDLLA alone.

## **Developing the Early Postoperative Recovery Score (EPRS) to Enhance Outcome Prediction in Orthognathic Surgery**

Abstract Presenter: Moreen Njoroge

Abstract Co-Author(s): Atharva Bhagwat, Thalia Liu, Abby Liu, Alina Galaria, Katherine Zhu, Jordan Gornitsky MD, Robin Yang MD

**Purpose:** Orthognathic surgery significantly improves quality of life by addressing dentofacial deformities and enhancing dental occlusion, temporomandibular joint function, and facial aesthetics. This study introduces the Early Postoperative Recovery Score (EPRS) to evaluate early post-surgical recovery, addressing the gap in understanding how preoperative characteristics influence postoperative outcomes,

including hypernasal speech, dysphagia, and obstructive sleep apnea (OSA).

**Methods:** We retrospectively reviewed charts of patients who underwent orthognathic surgery from 2015 to 2022, collecting data on demographics, clinical characteristics, and postoperative outcomes to construct the EPRS. This metric aggregates postoperative factors like hypernasal speech, dysphagia, respiratory issues, OSA, surgical site infections, and other complications into a quantifiable recovery measure. Logistic regression analyses were conducted to evaluate the effects of preoperatively measured age and BMI on overall recovery, including the incidence of postoperative obstructive sleep apnea (OSA). The EPRS served as a dependent variable in logistic regression models, categorizing patient recoveries into more stable (score >1) and less stable (score ≤1) groups. Each postoperative complication, such as surgical site infection, speech difficulties (e.g., hyponasality or hypernasality), swallowing difficulties, and persistent OSA, is assigned a point. The score is incremented to reflect the complexity of recovery associated with each complication.

**Results:** Among 88 patients, 53% were male, and 65% were White/Caucasian. Most (84.1%) had a preoperative BMI under 35 kg/m<sup>2</sup>, with 35% reporting cleft palate histories. We observed surgical site infections in 18.4%, primarily in the mandible (12.6%). A higher preoperative BMI (≥ 35 kg/m<sup>2</sup>) significantly correlated with persistent post-operative OSA (OR: 2.091, 95% CI: 1.326-3.578, p = 0.007). Similarly, older age increased the risk of OSA post-surgery (OR: 1.147, 95% CI: 1.042-1.263, p = 0.005). Multivariable analysis demonstrated that patients with a cleft palate were significantly more likely to experience specific postoperative recovery issues, as quantified by the EPRS, with an odds ratio of 1.344 (95% CI: 1.003-1.901, p = 0.048). Surgical details showed that 78.4% had combined maxillary and mandibular osteotomies, 95.5% underwent Le Fort 1 osteotomy, and 85.2% had BSSO. Maxillary advancement occurred in 62.5% of cases (average advancement: 5.179 ± 6.278 mm), and 4.3% had inferior vertical lengthening. In the mandible, 10.2% had advancement, and 17.1% underwent a setback, with the procedure length averaging 541 minutes.

**Conclusion:** The EPRS provides a structured approach to quantifying early recovery after orthognathic surgery, with preoperative BMI, age, and cleft palate history emerging as significant outcome predictors. This metric offers insights into postoperative recovery, potentially guiding future patient management. Further validation of EPRS could refine its clinical application, enhancing outcome prediction and patient care strategies in orthognathic surgery.

## **Surgical Approach to Microtia and Ear Reconstruction Determines Post-Operative Cutaneous Sensation Preservation**

Abstract Presenter: Sierra Willens

Abstract Co-Author(s): Ja'neil Humphrey, Leonardo Alaniz MD, Nikhil Shah MD, Miles Pfaff MD, MHS

**Introduction:** This study compares sensory outcomes in pediatric patients undergoing microtia reconstruction using alloplastic (Medpor, porous polyethylene) fascia-skin graft reconstruction and single and two-stage cutaneous flap-based reconstruction

**Methods:** In this IRB-approved, single-site, retrospective study, pediatric patients diagnosed with microtia (ICD-10 code Q17.2) or ear differences were included. Sensory recovery was assessed using the Semmes-Weinstein Monofilament Test (range: 0.07g to 4g monofilaments) before initial reconstruction and after single and two-stage reconstruction. Mann-Whitney U tests compared sensitivity between autologous cutaneous flap-based approaches versus alloplastic Medpor fascia-skin graft-based techniques. A Friedman test was carried out to compare sensitivity scores for the following regions: tragus, conchal bowl, lobule, and helix/antihelix followed by subsequent Dunn-Bonferroni post hoc tests.

**Results:** Seven Medpor patients (nine ears total) who underwent fascia-skin graft-based soft tissue coverage and 18 autologous cartilage patients who underwent single and two-stage cutaneous flap (Nagata technique; 18 ears total) were included. The total cohort included 20 grade III and 6 grade II microtic ears; one cauliflower ear that underwent Medpor-based reconstruction was included. The mean time from index procedure to sensory exam was 46 months in the Medpor group and 25 months in the cutaneous flap group. Overall, cutaneous flap-based reconstruction resulted in improved sensory outcomes when compared to Medpor reconstruction. There were significant differences in reported sensation between autologous and Medpor groups, including the tragus (0.07g vs. 4g;  $p < 0.001$ ), the conchal bowl (0.2g vs. 4g;  $p < 0.001$ ), and the helix/antihelix (0.2g vs. 4g;  $p < 0.001$ ), respectively. There were no significant differences in the lobule between either technical approach. Between the two groups, the most sensitive area was the lobule, while the least sensitive areas of the Medpor group were the tragus, bowl, and helix distributed equally ( $p = 0.023$ ). Meanwhile, only the helix/antihelix ( $p = 0.009$ ) showed reduced sensation in the autologous cutaneous flap-based approach but still demonstrated improved sensation in Medpor fascia-skin graft patients.



**Conclusions:** Cutaneous flap-based reconstruction results in improved sensation over Medpor fascia-skin graft-based reconstruction. These results add to the list of advantages and disadvantages of each approach and should be considered when treating patients with ear differences.

## **Operative hematoma following alloplastic cranioplasty: Analysis of Risk Factors.**

Abstract Presenter: Nicholas O'sick DO

Abstract Co-Author(s): Alexander Carruth, Sarah Frommer MD, PhD, Raymond Harshbarger MD, FACS, FAAP, Hung Le

**Background:** An acute hematoma after implant reconstruction of hemispheric cranial defects can be significant. Despite high prevalence in 2% of head injuries and 15% of fatal head traumas, there is scant evidence of predictive factors risk of an acute hematoma post-operatively following alloplastic cranioplasty. An epidural hematoma can lead to compression of the brain with midline shift, and rapid neurologic decline, necessitating urgent reoperation (1). Previous reports describe associations with heavy alcohol use and level IV ASA classification (2). Herein, we describe a retrospective cohort study of patients who suffered an operative hematoma following alloplastic cranioplasty, assessing potential predictive factors.

**Methods:** A retrospective review was conducted for adult patients who underwent alloplastic cranioplasty, from January 2010 and October 2023, comparing patients who developed an operative post-operative hematoma vs. patients who did not. Operative hematoma was defined as epidural hematoma with neurologic exam change or epidural hematoma with midline brain shift on postoperative CT. Variables studied were demographic data (age, sex, and race), relevant medical history (diabetes, hypertension, smoking, and chronic alcohol use disorder), perioperative details (steroid usage, anticoagulant usage, and bleeding disorders), and blood pressure (BP) readings (pre-operative, intra-operative, and post-operative systolic and diastolic averages). Hypertension was determined when there were more than two blood pressure measurements greater than 140 mm Hg systolic and/or  $\geq 80$  mm Hg diastolic, respectively. Statistical analysis aimed to identify predictive factors for operative hematoma formation, employing a multivariable logistic regression model. All patients regardless of post-operative complications were followed up for a minimum of 6 months.

**Results:** There were 134 alloplastic cranioplasties included in our study during the

studied time frame. Fourteen of the cases (10.4%) were operative hematomas. Patients with heavy alcohol use were associated with an increased risk of hematoma (p-value = 0.01). Patients with an elevated pre-operative systolic/diastolic BP reading had an increased risk of developing a hematoma as compared to the non-hematoma group, p-value 0.04 and 0.02 respectively. Patients with an elevated intra-operative systolic average BP also had an increased risk of hematoma formation after alloplastic cranioplasty (p-value 0.002). All other investigated variables-such as anticoagulants, bleeding disorders, and increased age-did not yield statistical significance in affecting the development of a hematoma.

**Discussion:** Hematoma after alloplastic cranioplasty necessitating reoperation can be a life-threatening complication. Despite its prevalence, there have been limited analyses of predictive risk factors leading to hematoma formation. In the 14/134 patients who developed an operative hematoma following alloplastic cranioplasty, we found an association of heavy alcohol use, increased preoperative systolic/diastolic BP, and increased intraoperative systolic BP. One limitation of our research is the limited sample size. Further study would include the implementation of a prospective protocol to control hemorrhage.

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### **Velopharyngeal Insufficiency in Patients with Microtia: A Proposed Screening Algorithm**

Abstract Presenter: Kiana Hashemi

Abstract Co-Author(s): Casey Hedman, Yeraldi Geronimo, Shannon Hubany, Saumya Kapoor, Rees Ridout, Julia Fedorova, Matthew Vaccaro, Fernanda Scala MD, Brian Kellogg MD, Angelo Leto Barone MD

**Introduction:** Individuals with microtia present with conductive hearing loss. They may also present with soft palate dysfunction, particularly velopharyngeal insufficiency (VPI),

further affecting speech resonance and intelligibility (1). Current VPI evaluation methods include perceptual speech evaluation, intraoral examination, nasometry, nasopharyngoscopy, videofluoroscopy, and mirror fogging tests (2). Since a standardized speech evaluation for this population is not routinely available, these patients are not routinely screened. We propose a standardized resonance evaluation tool for patients with microtia to identify correctable speech errors early and provide appropriate therapy.

**Methods:** A retrospective medical record review was conducted at a single, tertiary medical center from September 2022 to January 2024. Results of speech and resonance evaluation following our proposed algorithm were collected from charts of patients four to eighteen years of age with isolated or syndromic, unilateral and/or bilateral microtia. Data consisted of perceptual speech evaluation completed in both English- and Spanish-speaking patients by a bilingual speech-language pathologist (SLP) specialized in resonance disorders using the Cleft Audit Protocol for Speech-Augmented-Americleft Modification (CAPS-A-AM). Qualitative and quantitative VPI measures were gathered from nasometry, nasopharyngoscopy, and/or videofluoroscopy. Parent and patient questionnaire responses to the Velopharyngeal Insufficiency Effect on Life Outcomes (VELO) and Intelligibility in Context Scale (ICS) were collected to assess perception of speech and emotional impact on patients and caregivers.

**Results:** Of sixty-six patients with microtia at our center, fourteen patients fitting inclusion criteria completed perceptual speech evaluation for VPI, with median age 10. All patients (n=14) displayed conductive hearing loss of affected ear(s). 36% of patients selected Spanish as their primary language (n=5). Microtia was present unilaterally in 86% of patients (n=12) and bilaterally in 14% (n=2). Signs of syndromic microtia were present in 29% (n=4). Hypernasality indicative of VPI was detected in 21% of patients (n=3) for which targeted speech therapy and follow-up assessment were recommended. Patient ICS scores were not significantly different between patients with or without VPI.

**Conclusion:** Microtia patients can present with VPI, among other speech disorders. We propose a comprehensive screening algorithm for resonance disorders in patients with microtia through assessment of resonance, intelligibility, and oropharynx structure and function with appraisal of the emotional impact of VPI. Furthermore, assessment by a SLP certified in bilingual evaluation expands VPI detection to a larger population without inter-examiner variability. While the current sample size is limited, VPI evaluation has allowed for detection of hypernasality in patients with microtia, facilitating appropriate follow-up care. Implementation of a standardized evaluation may improve early identification and treatment of VPI in patients with microtia.

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## **Safety and Efficacy of Autologous Calvarial Graft Reconstruction for Large Cranial Defects in Pediatric Patients: Objective Analysis of Postoperative Bone Resorption**

Abstract Presenter: Gary Rogers MD

Abstract Co-Author(s): Kathleen Johnson, Perry Bradford MD, Cherrie Chenyu Liu MD, Monica Manrique-Castrillon MD, Nathanael Oh, Austin Tapp, Md Sohail Rana, Albert Oh MD, Esperanza Mantilla Rivas MD

**Background:** Large cranial defects in pediatric patients present unique challenges for craniofacial surgeons. Fresh autologous calvarial graft is the preferred reconstruction technique due to the growing pediatric cranium and the decreased infection risk. This study aims to evaluate the outcomes of autologous calvarial graft for reconstruction of large defects in pediatric patients.

**Methods:** A retrospective study on patients who underwent a cranioplasty with fresh autologous calvarial grafts at our institution between 2012-2022 was performed. Bone healing was assessed clinically on all the patients, and when available, a pre- and post-reconstruction three-dimensional computed tomography was used to quantify the defect size. Secondary outcomes included complications, readmissions, and reoperations.

**Results:** Twenty-seven patients with a median age of 9.8 years were included. The majority of defects were frontoparietal, with a median defect size of 175.4 (range 16.0-373.2) cm<sup>2</sup>. At a median of 11.8 months after surgery, only one patient (3.7%) exhibited an obvious, palpable cranial defect. There were no infections, cerebrospinal fluid leaks, readmissions, or reoperations reported. At a mean of 24 months after surgery,

postoperative CT was available in thirteen (48.1%) patients. The median bone healing rate was 84.1%. Seven (53.8%) of the 13 patients showed a degree of incomplete bone healing. This sub-group of patients had an initial median defect size of 298 [IQR from 199-205] cm<sup>2</sup> and, at an average of 24 months, showed a decreased but persistent median defect of 60 [IQR from 19.4-75.9] cm<sup>2</sup>. Incomplete bone healing correlated with larger initial defects and a higher number of previous craniofacial procedures (median of 2.0 [range between 2.0, 5.0], p-value=0.005).

**Conclusion:** Fresh autologous bone graft cranioplasty consistently remains a safe and effective procedure with a median bone healing rate of 84.1%. Patients with a higher number of previous cranial procedures and a larger initial defect size may be at higher risk of incomplete bone healing. Future prospective studies with larger sample sizes should be performed to further evaluate these risk factors.

## **IS TISSUE REPLACEMENT DURING PRIMARY PALATOPLASTY A KEY TO MORE CONSISTENT SPEECH RESULTS? A RETROSPECTIVE REVIEW OF 438 PATIENTS RECEIVING TISSUE REPLACEMENT SURGERY.**

Abstract Presenter: Samuel Mann

Abstract Co-Author(s): Jose Garcia MD, MPH, Robert Mann MD, Beyhan Annan

There are almost unlimited anatomical variations of cleft defects. For the surgeon, this means an equivalent number of variables in planning treatment. Most surgeons tend to get comfortable with a single repair pattern and use it in most situations. However, as clefts become wider and more complex, most single patterns require more modifiers to reduce the tension to the central closure and this brings more secondary healing into play. The result of this traditional, single-pattern approach is that there are more speech failures with wider and more complex clefts. In the 2017 Plastic and Reconstructive Surgery Journal article, "The Double Opposing Z-Plasty Plus or Minus Buccal Flap Approach (DOZP+/-BFA), to Repair of the Cleft Palate: a review of 505 Consecutive Cases," Within the larger study the results for two groups of patients (pts) were compared; 1) Pts born with Veau 1 and narrow Veau 2 clefts, and 2) Pts with wider Veau 2, and Veau 3 and 4 clefts. There was no significant difference in nasal resonance scores. The present study expands the number of groups to ask the question: Across all cleft widths and classifications, is there a relationship that can be seen between the surgical replacement of missing tissue and eventual speech result?

**Methods:** This is a retrospective study that reviews outcomes for pts treated by one surgeon between 1985-2019. Multiple surgical patterns based of the DOZP+/-BFA were used, designed to replace missing tissue within the cleft defect as the defects progress from simple to complex. Every pt was treated with a Furlow type Z- Plasty. The only variable was the number of buccal flaps used for tissue replacement ( zero, one, or two). Pts were grouped by Veau classification & anatomically by width of the cleft as measured at the junction of hard and soft palate, establishing three width categories. 7 groups illustrate the increasing severity of the defect and the cleft widths. 1). V1. 2) Narrow and medium V2. 3). Wide V2. 4). Narrow V3. 5). Medium V3. 6). Wide V3. 7). V4. Two populations were evaluated. Population X was inclusive of all patients. And Population Z including only patients without syndromes or Pierre Robin sequence. Speech testing was done by multiple speech pathologists. Using a 1-4 nasal resonance scale. 1. non -nasal , 2. mild hyper nasal, 3. moderate hyper nasal, 4. severe hyper nasal. The Kruskal-Wallis test was used to compare resonance scores across populations and groups.

**Results:** Speech results were statistically similar across all groups and population categories. Population X, p-values 0.81 & 0.36, and population Z, p-value 0.85 & 0.27. Population X Group 1) 57 pts, Pts receiving Tissue replacement (TR) 8/ 57. Total Buccal flaps per group (BF) 10/57, median nasal resonance score (NRS) 1.26. 2) 57 pts, TR 20/57, BF 42/57, NRS 1.42. 3) 50pts, TR 42/50, BF 79/50, NRS 1.44. 4). 24 pts, TR 11/24, BF 16/24, NRS 1.33. 5) 93pts. TR 75/93, BF 128/93 NRS 1.28. 6). 73pts, TR 70/73, BF 132/73, NRS 1.26. 7). 85pts TR 83/85 BF 156/85, NRS 1.21. Population Z Group 1) 50 pts, TF 9/50, BF 10/50, NRS 1.28. 2) 21 pts, TR 10/21, BF 16/21, NRS 1.09. 3) 28 pts, TR 25/28, BF 48/28, NRS 1.39. 4) 20 pts, TR 9/20, BF 13/20, NRS 1.15. 5) 77 pts, TR 63/77, BF 109/77, NRS 1.16. 6) 64 pts, TR 63/64, BF 127/64, NRS 1.20. 7) 74 pts, TR 2/74, BF 135/74, NRS 1.13. The number of BF's increased from narrow to wide within V classes and increased when moving through from classes V1 through V4. Which demonstrates the number of BF per pt, as well as the NRS for each group and population.

**Conclusion:** The study shows the DOZP+/-BFA can achieve consistent excellent speech resonance results regardless of a pts V classification or cleft width. The higher resonance scores that were seen in population X group (2) & (3) is likely a reflection of the impact of an increased number pts with syndromes seen in these V2 cleft groups. For population Z the resonance scores demonstrated a remarkable consistency across all groups. The lower number of BF's used in V3 group 4, seems to be a product of the arch collapse that often accompanies this group. With experience the senior author better recognized how much the arch collapse was hiding the magnitude of the deficiency. Over the 34 years covered by this study, more and more BF's were added to

the narrow V3 group to reduce future issues arch collapse can cause at maturity. Every pt born with a cleft is missing a specific amount of tissue relative to their unique cleft defect. It would appear that through the process of tissue replacement the DOZP+/-BFA establishes an equity of tissue across all V classes and cleft widths. When all cleft defects have essentially equal tissue to work with, surgeons more opportunity to achieve success for all patients. Future studies are necessary to better quantify the exact degrees of tissue deficiencies and to identify more tissue replacement options.

## **An Introduction to The Orbital Buttresses**

Abstract Presenter: Bashar Hassan MD

Abstract Co-Author(s): Adam Sylvester, Danny Wescott, Deborah Cunningham, Paul Manson MD, Michael Grant MD, PhD, FACS

**Purpose:** Facial buttresses are supportive bony structures of the facial skeleton that form a thick, strong, and protective framework for the face. Surgical fixation may be required to restore morphology and function when damage to these buttresses occurs. We sought to determine if, similar to buttresses of the facial skeleton, buttresses of the internal orbit exist.

**Methods:** We analyzed 10 human cadaver skulls imaged by microcomputed tomography (microCT). Image processing and thickness/heat mapping were performed using Avizo and ImageJ softwares. After identifying the orbital buttresses, we reviewed CT scans of patients who had orbital fractures across three years to determine the frequency of fracture of the orbital buttresses.

**Results:** We identified 5 distinct orbital buttresses that consistently demonstrated increased thickness relative to adjacent orbital bones across skulls: supero-medial fronto-ethmoidal strut containing the deep orbital buttress, inferomedial strut containing the posterior ledge, inferior orbital fissure, sphenoid-frontal supero-lateral strut, and the sphenoid lip (Figure 1). These buttresses can be divided into 4 anterior-to-posterior horizontal buttresses (supero-medial fronto-ethmoidal strut, inferomedial strut, inferior orbital fissure, and sphenoid-frontal supero-lateral strut) and 3 posterior/deep buttresses (deep orbital buttress, posterior ledge, part of the sphenoid lip). To investigate the resilience and frequency of involvement of these buttresses after trauma, a total of 1186 orbits of 593 individuals with orbital fractures were analyzed. Orbital buttresses were spared in 770 (65%) orbits. The inferomedial strut with the

posterior ledge was the most commonly fractured buttress in 14.4% of orbits (n=171), followed by the sphenoid strut and lip (66 [5.6%]), inferior orbital fissure (61 [5.1%]), and the supero-medial fronto-ethmoidal strut with the deep orbital buttress (42 [3.5%]). Fall and assault were the most common mechanisms of injury behind the involvement of orbital buttresses.

**Conclusion:** To our knowledge, this is the first description of the buttresses of the internal orbit. Orbital reconstruction for fracture repair or oncologic purposes requires the support of orbital buttresses. Understanding the anatomy of orbital buttresses is crucial for successful surgical planning, proper implant positioning, and restoration of function and appearance.

### **Calcium Release-Activated Calcium Channel Protein-1 is Required for Osteoblast Maturation and Function on Nanoparticulate Mineralized Collagen Glycosaminoglycan Materials**

Abstract Presenter: Meiwand Bedar MD, Msc

Abstract Co-Author(s): Wei Chen, Xiaoyan Ren, Kelly Huang, Shahrzad Moghadam, Youngnam Kang, Justine Lee MD, PhD, FACS

**Introduction:** Cranial defects necessitate reconstruction to ensure cerebral protection, neurological, and psychological well-being. The prevalent morbidity and infection rates associated with existing cranioplasty materials have sparked significant interest in the development of biomaterials that mimic tissue-specific extracellular matrix (ECM) properties, guiding osteoprogenitor cell differentiation. Nanoparticulate mineralized collagen glycosaminoglycan (MC-GAG) materials have been evaluated in our laboratory to induce osteogenic differentiation of primary osteoprogenitors in vitro and regeneration of rabbit skull defects in vivo without exogenous growth factors or cell seeding, an effect not observed in non-mineralized collagen glycosaminoglycan (Col-GAG) materials. Given that the critical difference between MC-GAG and Col-GAG is the mineral content, the temporal and spatial elution of inorganic ions may be critical to the osteogenic properties of MC-GAG. This is supported by prior research demonstrating the important role of calcium ions in bone homeostasis. To refine MC-GAG properties, understanding the downstream osteogenic signaling pathways activated by these biochemical cues and identifying potential targets for material optimization are imperative. Of particular interest is Orai1, a critical subunit of store-operated calcium release-activated calcium channel (CRAC), implicated in skeletal development. In this work, we evaluated the



contribution of Orai1 to MC-GAG-mediated osteogenesis.

**Methods:** To examine the role of extracellular calcium signaling through store-operated calcium entry (SOCE) on osteogenic differentiation of primary bone marrow-derived human mesenchymal stem cells (hMSCs), we treated 2D cell cultures with a small molecule inhibitor of store-operated calcium entry (SOCE), MRS1845, for 14 days. hMSCs were subsequently seeded on MC-GAG or Col-GAG materials for 7 days with or without MRS1845. Next, small interfering RNAs (siRNAs) targeting Orai1 and a scrambled control were used to specifically knockdown Orai1 expression in hMSCs cultured on Col-GAG and MC-GAG. Osteogenic gene and protein expression were measured using quantitative RT-PCR and western blot analysis, respectively. Mineralization was evaluated by Alizarin Red staining.

**Results:** To understand whether store-operated calcium entry was essential to osteogenic differentiation of hMSCs and MC-GAG activity, cells in 2D and 3D cultures were treated with a small molecule inhibitor of SOCE, MRS1845. In 2D cultures, calcium depositions visualized with Alizarin Red staining were reduced with MRS1845 treatment compared to controls. In 3D cultures, MRS1845 decreased the gene expression of early and late osteogenic markers alkaline phosphatase (ALP) and osteocalcin, respectively, as well as protein expression of the osteogenic marker runt-related transcription factor-2 (Runx2) specifically in MC-GAG compared to control. As small molecule inhibitors lack channel specificity, siRNA was used to specifically knockdown Orai1 expression. Isolated Orai1 knockdown reduced Runx2 protein expression and gene expression of late osteogenic marker bone sialoprotein-2 (BSP2) specifically on MC-GAG compared to scrambled control siRNA. Mineralization significantly diminished on MC-GAG with Orai1 knockdown, whereas no effects were evident on Col-GAG as demonstrated by Alizarin Red staining.

**Conclusions:** Orai1-mediated calcium ion signaling was required for MC-GAG-induced osteogenic differentiation. Further refinement of calcium levels on MC-GAG may facilitate its clinical application in the reconstruction of craniofacial defects.

# **Delineating the Sexual Dimorphism in Mid-Facial Bony Anatomy Using Advanced 3D Imaging Techniques**

Abstract Presenter: Abdallah Abu Shehab MD

Abstract Co-Author(s): Jess Rames MD, Meng, Alexandre Meira Pazelli MD, Sara Hussein MD, Basel Sharaf MD

**Introduction:** Facial shape is significantly influenced by the contours of the underlying facial bony skeleton. Gender dimorphisms in facial skeletal anatomy are of particular interest to facial plastic surgeons for planning craniofacial and aesthetic surgery. While the orbits and upper face have been previously investigated, dimorphic differences in the mid-face skeleton are not well understood.

**Objectives:** This study aims to elucidate the morphological differences in the midface region, focusing on the maxilla and zygomatic bones in male and female subjects through the analysis of high-resolution facial computed tomography (CT).

**Methods:** A retrospective review of facial CT scans in our institution's patient database was conducted. Data were extracted for 100 white patients aged between 20 and 79 years. Inclusion criteria were limited to scans with a resolution of 1 mm or finer. Scans indicating a history of facial trauma, tumors, orthognathic surgery, or orthodontic interventions were excluded.

Segmentation and 3D volumetric reconstruction were performed using Materialise Mimics (version 25.0, Materialise NV, Belgium). Reformatted 3D CTs were transferred to 3-Matics software and manual measurements of the mid-facial skeleton, specifically the maxillary and zygomatic bones were performed. We took several measurements: the bizygomatic width (the horizontal distance between the most lateral part of the zygomatic bones), the distance between the frontozygomatic sutures, the orbitale distance (the horizontal distance between the lowest point of both orbit), the distance between the infraorbital foramina, the vertical distance from the nasal spine to the nasion, the depth from the nasal spine to the

posterior

border of the maxilla, the pyriform angle, and the maxillary angle (Figure 1). Relevant demographic information was summarized as mean and analyzed using unpaired Student t-tests, with a 95% confidence interval.

Out of a total 100 patients, 46 were females and 52 were males. Patients were subdivided based

on age into three groups: young (20-39 years), middle-aged (40-59 years) and elderly (60-79

years) with a mean age of 51 years in females and 50 years in males. Statistical analysis

showed significant differences all the measured aspects of the mid-facial region between

males and females, except for the maxillary angle, where the difference was not significant ( $P$

$> 0.05$ ). The average measurements where women differed from men included the bizygomatic width by -6.8 mm, the frontozygomatic sutures distance by -5.5 mm, the orbital

distance by -3.3 mm, and the vertical distance from the nasal spine to the nasion by -4.2 mm,

all with a  $P$  value of less than 0.01. The distance of the infraorbital foramen differed by -2.2

mm ( $P = 0.05$ ), the facial depth by -1.7 mm ( $P = 0.015$ ), and the pyriform angle by 3.01 mm

( $P = 0.045$ ). Notably, when evaluating differences within subdivided age groups, the pyriform

angle was the only measurement to show a statistically significant difference ( $P = 0.012$ ).

**Conclusions:** Our analysis of mid-facial skeletal anatomy utilizing 3D imaging techniques has revealed significant sexual dimorphism. Measured parameters including zygion distance, frontozygomatic sutures distance, orbital distance, and vertical distance showed significant differences ( $P = 0.01$ ).

## **Evaluating Clinical Indicators Necessitating Intervention Post-Ophthalmology Consultation for Orbital Fractures**

Abstract Presenter: Bashar Hassan MD

Abstract Co-Author(s): Urjita Das, Wuqaas Munir, Shannath Merbs, Michael Grant MD, PhD, FACS, Ramya Swamy

**Purpose:** Orbital floor fractures account for most inpatient admissions and the highest emergency department costs among ophthalmologic traumas. Despite this, routine ophthalmology consultations for orbital fractures may not be an efficient use of resources, leading to unnecessary urgent transfers, increased wait times, and higher care costs. We sought to determine the risk factors associated with intervention following ophthalmologic consultation for patients with orbital fractures.

**Methods:** This is a cross-sectional study of patients who were diagnosed with orbital fractures and had an ophthalmology consultation at the R Adams Cowley Shock Trauma Center emergency department or within 24 hours of admission between January 2015 and December 2020. Our primary outcomes were the frequency and predictors of interventions following ophthalmology consultation. Demographic information, ophthalmologic exam findings, and types of interventions were evaluated. Descriptive statistics, bivariate analysis, and multivariate logistic regression were conducted.

**Results:** Of 815 patients included in our analysis, 20% (n=162) of patients required intervention following ophthalmology consultation. Patients who sustained gunshot wound injuries, medial wall fractures, or presented with a relative afferent pupillary defect, ocular muscle entrapment, gaze restriction, periorbital laceration, and subconjunctival hemorrhage, were significantly more likely to require intervention, compared with those who did not. On multivariate logistic regression, only reduced visual acuity (aOR [95% CI] 3.4 [1.95-5.98]) and periorbital laceration (aOR [95% CI] 4.6 [2.78-7.71]) were significant predictors of intervention following ophthalmology consultation. Topical antibiotics [51 (30.2%)], periorbital laceration repair [35 (20.7%)], and exploration/repair of globe rupture [28 (17.7%)] were the most common interventions.

**Conclusion:** The fact that most patients with orbital fractures do not undergo intervention after an ophthalmology consultation raises questions about the initial need for such consultations. Our study offers crucial guidance for efficient patient triaging and identifying those in need of ophthalmology consultations, potentially leading to

decreased morbidity from ocular trauma and improved resource utilization.

## **An Approach to Neonatal Skull Base Teratoma Treatment: The Necessity of a Multidisciplinary Team**

Abstract Presenter: Sophia Allison

Abstract Co-Author(s): Hannah Soltani, Rishabh Sethia, Jeff Rastatter, Akira Yamada MD, FACS, PhD

**Introduction:** Teratomas are embryonal neoplasms composed of at least 2 of 3 germ layers. In neonates, the sacrococcygeal location is the most common location (60%) and head and neck involvement is rarer (5%) with an incidence of 2.5-5:100,000 live births. (1) We present the case of a female neonate who had a rare, mature, skull-base teratoma identified on ultrasound during gestation. The management of this neoplasm involved fetal surgery, neurosurgery, ENT, and plastic surgery teams.

**Methods:** Imaging of the teratoma revealed an anterior skull base teratoma with extension into and protruding from the nasopharynx resulting in gross enlargement of the right nostril and sinonasal cavity. Resection of the teratoma and reconstruction of the nostril involved 4 separate surgical procedures: an ex-utero intrapartum treatment (EXIT) procedure, teratoma resection, 2 stage nostril reconstruction. From the identification of the teratoma, plastic surgery was involved with preoperative planning due to the defect which required inevitable reconstruction. The EXIT procedure was performed to establish an airway before placental support was removed. Subsequently, neurosurgery and ENT performed an endonasal resection of the teratoma without intracranial involvement or cerebral spinal fluid leakage as previously described. (2) Although originally not part of the surgical plan, plastic surgery was available for consultation during the resection for optimization of post-resection anatomy. Plastic surgery was consulted when part of the nasal sill and cutaneous lip had to be resected due to teratoma adhesion. Plastic surgery performed an advancement flap to repair the defect caused by the adhesion as well as reduce the substantially sized ala. Histopathology of the mass specimen confirmed that it was a mature, cystic teratoma. After the resection, a 2-stage reconstruction was performed by the plastic and reconstructive surgeon. The first stage involved medial movement of the right ala and alar rim to reduce the size of the nostril and advance lateral tissue to compensate for the nasal cleft that existed after resection. The second stage involved harvesting cartilage from the concha to reinforce the alar rim, further reducing nostril size by V-Y

advancement, achieving a more balanced nasal symmetry.

**Results:** The child is now 3 years old and there is no evidence of recurrence of the tumor nor neurological defects. She has an optimal, symmetric cosmetic outcome of the nasolabial area that was involved.

**Conclusion:** This rare case highlights the need for early diagnosis of these airway-obstructing masses to prepare for a safe delivery. Furthermore, a plastic surgery consult during the resection is indispensable to improved cosmetic outcomes and highlights the crucial communication that must exist within multidisciplinary team on complex cases.

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### **Impact of Surgical Timing on Postoperative Complications Following Open Reduction Internal Fixation of Mandibular Fractures**

Abstract Presenter: Bashar Hassan MD

Abstract Co-Author(s): Eric Resnick, Seray Er, Pharibe Pope, Judy Pan MD, Grigorios Lamarinis MD, PhD, Michael Grant MD, PhD, FACS

**Purpose:** The mandible is the second most fractured facial bone. While closed reduction via mandibulomaxillary fixation (MMF) is therapeutically beneficial, open reduction internal fixation (ORIF) has become the standard of care for the treatment of mandibular fractures. Timing of ORIF has evolved through time and has been a subject of debate for decades. Existing research investigating the association between timing of ORIF and postoperative complications is characterized by small sample sizes and yields conflicting recommendations regarding early vs delayed surgical intervention (Reference 1). Our study aimed to investigate the association between timing of ORIF and the incidence of postoperative complications.

**Methods:** We conducted a retrospective cohort study of trauma patients who underwent mandibular fracture repair in 2018 and 2019. Excluded were patients <18 years old, those who underwent MMF only, and those with postoperative follow-up <2 weeks. The primary outcome was the incidence of postoperative complications following ORIF. The duration between injury and ORIF was categorized into: 1-3, 4-7, 8-14, and >14 days. The association between surgical timing categories and the incidence of postoperative complications was assessed using bivariate analyses and multivariate logistic regression.

**Results:** Of n=226 patients included, median (IQR) age was 32 (25-42) years, and median (IQR) follow up was 49 (25-118) days. The majority of patients (n=207 [92%]) underwent both ORIF and MMF. Most patients had early ORIF within 3 days of injury (n=168 [74%]). Figure 1 shows the distribution of ORIF procedures by days from injury to surgery. Major postoperative complications included unplanned reoperation (n=25 [11.1%]), malocclusion (n=20 [8.8%]), and malunion (n=7 [3.1%]). Minor postoperative complications included jaw pain (n=91 [40.3%]), mental nerve paresthesia (n=79 [35%]), infection (n=30 [13.3%]), temporomandibular joint complications (n=17 [7.5%]), and wound dehiscence (n=14 [6.2%]). After controlling for potential confounders of the association between timing of ORIF and postoperative complications e.g., mechanism of injury, past medical history, and mandibular fracture site, delayed ORIF beyond 2 weeks of injury was associated with significantly greater odds of malunion (aOR [95% CI] 17.9 [1.9->100], P=0.012) and unplanned reoperation (aOR [95% CI] 5.8 [1.3-26], P=0.023). Delayed ORIF 8-14 days after injury was associated with significantly greater odds of malocclusion (aOR [95% CI] 14.5 [1.8->100], P=0.012).

**Conclusion:** The timing of ORIF following mandibular fracture is a critical factor in postoperative outcomes. Delayed ORIF beyond 1 week of injury was significantly associated with greater odds of postoperative complications. Our findings underscore the importance of timely ORIF in the management of mandibular fractures to minimize the risk of postoperative complications.

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## **Double Trouble: Combining Alveolar Bone Grafting with Revision Palatoplasty**

Abstract Presenter: Robert Tung MD

Abstract Co-Author(s): Jessica Nye, David Mitchell MD, Michael Talanker MD, Jackson Green, Jose Barrera, Chioma Obinero MD, Danielle Sobol MD, Matthew Greives MD

**Purpose:** The cleft lip and palate patient (CLCP) requires multiple interventions to address structural and functional deficits. Alveolar bone grafting (ABG) during mixed dentition is performed to stabilize the maxillary arch and to facilitate closure of oronasal fistulas. Some patients will also undergo revision palatoplasty during this time period to treat velopharyngeal insufficiency (VPI). In the following study, we evaluate the safety and efficacy of performing revision palatoplasty at the time of ABG.

**Methods:** A retrospective single institution review was conducted of pediatric patients with CLCP who underwent ABG at a large urban academic children's hospital from 2017 to 2023. Patient records were reviewed for age at surgery, cleft repair type (unilateral or bilateral), grafting method, performance of concurrent procedures, surgery duration, and length of hospital stay. The primary outcome, bone graft success, was confirmed by imaging at least 6 months postoperatively. Patients who underwent revision rhinoplasty, cheiloplasty, and myringotomy tube placement at the time of secondary ABG were excluded. Statistical analyses were performed using R studio (Posit, PBC) to examine differences between patients who underwent concurrent revision palatoplasty with ABG (ABG+VPI) and ABG alone (ABG Only).

**Results:** Of the 156 ABGs performed, 102 (65.4%) met our inclusion criteria. Thirteen patients (12.7%) underwent ABG+VPI and eighty-nine patients (87.3%) underwent ABG Only. The median age at the time of surgery was 9 years (IQR:8-10) and 61.8% of patients had a unilateral cleft palate. There were no significant differences in age, cleft laterality, or grafting method between the groups. The median operative time for the ABG Only patients was 75 minutes (IQR:63-97), compared to 134 minutes (IQR:108-162) for the ABG+VPI group ( $p < 0.001$ ). Patients in the ABG+VPI group had planned admissions, with a median length of stay of 20 hours (IQR:19-24). Whereas those in the ABG Only group were discharged a median of 2 hours (IQR:1-2) after arrival in PACU ( $p < 0.001$ ). There were no complications for either group. Post-operative imaging confirmed bone graft success in 57.1% of ABG Only and 61.5% of ABG+VPI patients ( $p > 0.9$ ).

**Conclusion:** While we do not want to delay VPI surgeries, some CLCP patients do not have an indication for surgery until later in life. Our study demonstrates that revision



palatoplasty can be performed safely at the same time as ABG without affecting graft survival. This is an important consideration for this complex patient population to potentially minimize the overall number of surgeries.

## **Single-stage VSP-guided resection and custom PEEK implant reconstruction of complex oncologic and dysplastic defects of the calvarium**

Abstract Presenter: Brendan Cronin MD

Abstract Co-Author(s): Jake Alford MD, Jake Alford MD, Zachary Brooks, Nathan Sigel, Richard Everson, Reza Jarrahy MD

**Purpose:** Historical management of complex lesions with calvarial extension involves staged resection and reconstruction, which requires multiple operations and is complicated by scalp flap contracture and scarring of surgical planes with subsequent distortion of anatomic landmarks. Advances in virtual surgical planning (VSP) and intraoperative guided navigation have enabled new possibilities for complex, multi-disciplinary, single-stage resection-reconstruction. Multiple prior studies have demonstrated the safety and utility of custom PEEK (polyetheretherketone) implants for calvarial defect reconstruction, however, a paucity of articles with limited sample size have been reported regarding VSP-guided one-stage extirpation and reconstruction. We describe our technique and report outcomes for the largest cohort to date of single-stage, VSP-guided oncologic resection and custom fabricated PEEK implant reconstruction.

**Methods:** A retrospective review was performed from September 2019 to February 2024. Patients were included if they underwent preoperative VSP and design of intraoperative cutting guides and custom PEEK implants for simultaneous neoplastic/dysplastic lesion excision and PEEK reconstruction. Data including demographics, defect location and characteristics, length of surgery, length of hospital stay, estimated blood loss (EBL), length of follow up and postoperative complications were recorded. A brief description of planning and operative technique is provided.

Our technique involves a joint preoperative VSP session with the neurosurgical and plastic surgery teams for design of the cutting guides and PEEK implant. Cutting guides are designed based on available imaging with a margin as determined by the extirpative surgeon. Contour, boundaries, and location of planned fixation of the PEEK implant are then designed by the plastic surgeon. Intraoperatively, the overlay of the cutting guide

and tumor are confirmed by linked intraoperative guided navigation. Precise extirpation enables high fidelity fit of preoperatively custom fabricated PEEK implants.

**Results:** During the study period, 10 patients (6 female, average age 55 years) underwent single-stage VSP-guided extirpation and immediate PEEK implant reconstruction. Defect etiologies included meningioma (n=3), fibrous dysplasia (n=2), metastatic tumor (n=2), glioma (n=1), hemangioma, and invasive recurrent dermoid cyst (n=1). The majority of defect locations predominantly involved the frontal bone and various additional regions of the fronto-orbital-temporal-skull base (6/10) or occupied the occipital/parietal regions (4/10). Average defect diameter was 10cm. Mean case duration was 363 +/- 173 minutes with a mean EBL of 281 +/-130 cubic centimeters. Median (IQR) hospital length of stay was 3 days (4.25). Median (IQR) follow up was 36.5 (71.75) days. One patient developed a postoperative cerebrospinal fluid leak requiring diversion complicated by ventriculitis and intracranial abscess requiring washout and PEEK implant removal. Otherwise, no complications were noted. One patient noted mild contour irregularities of the temporal region, otherwise, patients were satisfied with the aesthetic outcomes of reconstruction

**Conclusions:** VSP-guided single-stage resection and PEEK implant reconstruction as performed by a multidisciplinary plastic surgery and neurosurgical team is feasible with low complication rates and good cosmetic outcomes. Future interventions comparing overall cost, hospital length of stay, number of operations and complications between staged vs simultaneous resection/reconstruction are needed to better characterize the potential benefits of this emerging technique.

### **Is Access to Ear Molding Therapy for Congenital Auricular Deformities Associated with a Higher Socioeconomic Status? A Single Institution's Experience.**

Abstract Presenter: Giap Vu MD

Abstract Co-Author(s): Aidan O'shea, Sara Neimanis MD, Clinton Morrison MD, Carolyn Cafo

**Purpose:** Ear molding is a non-invasive, effective treatment modality for congenital auricular deformities. However, limited literature to date addressed disparities in access to ear molding. We hypothesized that patients who underwent ear molding therapy tended to come from more socioeconomically advantaged backgrounds.

**Methods:** We retrospectively reviewed all patients with a primary diagnosis of congenital auricular deformity who underwent ear molding between April 2015 and October 2023 at a single institution. Descriptive statistics were performed to characterize the cohort's demographic, socioeconomic, and clinical characteristics. The national percentile and state decile for the Area Deprivation Index (ADI) score corresponding to each patient's block group based on home address were extracted from the Neighborhood Atlas website (Center for Health Disparities Research, University of Wisconsin School of Medicine and Public Health, Madison, WI). The empirical cumulative distribution functions for the cohort's ADI national percentiles and state deciles were plotted and compared with the null cumulative percentile and decile distribution functions, respectively; two-sample one-sided Kolmogorov-Smirnov tests were used to evaluate the statistical significance of differences in the distributions. Alpha levels were set a priori at 0.05.

**Results:** 140 patients underwent ear molding therapy during the study period. Mean age at treatment initiation was 15.4 days (standard deviation = 8.6 days). Male infants accounted for 56% of the cohort (N = 78). Most of the patients were White/Caucasian (N = 108; 77%) and non-Hispanic/Latino (N = 116; 83%). English was the primary household language in 135 patients (96.4%). Private insurance paid for the treatment in the majority of patients (N = 95; 68%), followed by Medicaid/Child Health Plus (N = 40; 29%), self-pay (N = 3; 2%), and other types of government insurances (N = 2; 1%). The empirical cumulative distribution function (eCDF) for the cohort's ADI national percentiles was significantly greater than the null cumulative percentile distribution function ( $D^+ = 0.21$ ;  $p = 0.012$ ), indicating that our cohort of patients undergoing ear molding therapy tended to be more socioeconomically disadvantaged on a national scale. Similarly, the eCDF for the cohort's ADI state deciles also showed dominance over the respective null distribution, suggesting higher deprivation in the ear molding cohort on a state level, although this relationship was not statistically significant ( $D^+ = 0.50$ ;  $p = 0.084$ ).

**Conclusions:** Contrary to our initial belief that patients who have access to ear molding therapy tend to be more socioeconomically advantaged, evidence from our cohort demonstrated that those who received this treatment might come from less privileged or at least similar socioeconomic backgrounds compared to the general population. This finding may suggest successful pipelines from the early diagnosis of auricle deformities by pediatricians to timely referral to pediatric plastic surgeons and favorable insurance coverage patterns for this condition, although further investigations are warranted to elucidate other factors that influence this relationship.

## **Patterns and Outcomes of Maxillary Distraction in Patients with Cleft Lip and Palate**

Abstract Presenter: Dr. Benjamin Massenburg MD

Abstract Co-Author(s): Dominic Romeo, Steven Du, Meagan Wu, Jinggang Ng, Hyun-Duck Nah MD, DMD, PhD, Joseph Napoli MD, DDS, Jesse Taylor MD, Scott Paul Bartlett MD, Jordan Swanson MD, MSc

**Introduction:** Several studies suggest high rates of relapse with larger orthognathic maxillary advancements in patients with cleft lip and palate (CLP), yet this is common practice in many craniofacial centers. We have employed LeFort 1 osteotomy and maxillary distraction osteogenesis (MaxDO) in a range of patients with substantial negative overjet, either as a bridge to orthognathic surgery or with the aim to avoid it. We studied patterns and outcomes of maxillary distraction, with a primary endpoint of malocclusion requiring secondary orthognathic surgery.

**Methods:** We retrospectively reviewed all patients with a diagnosis of CLP who underwent MaxDO from 2007 to 2022. Using patient factors, age at skeletal maturity, cephalometric analysis, and surgical history, we determined predictors for long-term occlusal normalization and risk factors for relapse and additional orthognathic surgery. Chi-square tests were used for binomial variables and a multivariate logistic regression was performed.

**Results:** Twenty-six patients with CLP who underwent MaxDO for midface hypoplasia and Angle Class III malocclusion between ages 9.0-19.2 years were included. There were 11 female and 15 male patients. Seventeen patients (65.4%) had bilateral clefts and six patients (23.1%) were syndromic. These patients had an average of  $12.5 \pm 2.5$  mm negative overjet preoperatively, had an average ANB angle of  $-7.6 \pm 2.7$  degrees, and they were distracted an average of  $13.9 \pm 3.1$  mm. Nine patients (34.6%) underwent additional orthognathic surgery for definitive skeletal correction. Patients with genetic syndromes (66.7% versus 30.0%), age younger than 14 (46.2% versus 30.8%), and bilateral clefts (47.1% versus 22.2%) had higher rates of secondary orthognathic surgery.

In females, MaxDO achieved stable occlusion without additional surgical intervention in 83.3% of those who underwent surgery after the age of 13.5 years, compared to 0% under 13.5 years (Figure 1,  $p=0.006$ ). In males, MaxDO achieved stable occlusion without additional surgical intervention in 50.0% after the age of 17 years, compared to 0% below 17 years (Figure 1,  $p=0.018$ ). On multivariate logistic analysis, older age at time of MaxDO was associated with long-term normalization of occlusion ( $p=0.045$ ).

**Conclusion:** Le Fort I distraction osteogenesis effectively achieves maxillary advancements of greater than 12mm in patients with cleft lip and palate. In young children, maxillary advancement with distraction osteogenesis may normalize severe malocclusion through secondary school ages as a bridge to definitive orthognathic surgery. For some patients, surgical overcorrection into a skeletal Class II relation can avoid future orthognathic surgery while they are orthodontically treated into a final occlusion. In most females over 13.5 years of age and half of males over 17 years of age, strategically planned maxillary distraction osteogenesis achieves stable normalization of occlusion without need for further orthognathic surgery.

## **Enhanced Recovery in Cranial Vault Remodeling: Optimizing Pain Management**

Abstract Presenter: Jonathan Bacos MD

Abstract Co-Author(s): Carly O'Donnell MD, Elizabeth Dominguez, Carly O'Donnell, Sameer Shakir MD, Kant Lin MD, Robert Havlik MD, Kristen Klement MD

**Background:** Perioperative pain control in cranial vault remodeling (CVR) poses significant challenges. Pain medication administration may conceal signs of neurologic compromise related to intracranial surgery. Additionally, increased narcotic use in CVR has been associated with increased length of hospital stay, hypoxic respiratory events and increased episodes of emesis prolonging recovery.[1] The purpose of this study was to identify modifiable factors associated with increased narcotic use in an effort to optimize pain management and postoperative recovery.

**Methods:** A retrospective review was performed on 237 patients with craniosynostosis who presented to a tertiary pediatric hospital between 2012 and 2020 for open CVR. Outcomes of interest included total morphine equivalents for hospitalization.

**Results:** Patients who received postoperative NSAIDs required significantly lower total morphine equivalents (ME) for hospitalization (ME =  $0.43 \pm 0.48$  cc/kg) compared to children who did not receive NSAIDs (ME =  $1.12 \pm 1.17$  cc/kg,  $p < 0.005$ ). The relationship between total volume transfused intraoperatively (mL/kg) and total ME for the hospitalization (cc/kg) had a moderately significant positive relationship ( $r = 0.25$ ,  $p < 0.001$ ). There was a weak positive relationship between operative time and total hospitalization ME (cc/kg) ( $r = 0.18$ ,  $p = 0.006$ ). Subjects who underwent placement of a drain received significantly higher total hospitalization ME when compared to those who

did not (ME=1.39±1.25 cc/kg) versus (ME= 0.46±0.49 cc/kg, p<0.001).

**Conclusions:** Postoperative NSAID use is associated with decreased narcotic requirements during the immediate postoperative period whereas increased fluid requirements intraoperatively, longer operative durations, and drain placement are associated with higher narcotic use. Modifying these intraoperative factors when clinically appropriate may reduce postoperative narcotic requirements and expedite postoperative recovery.

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## **The Impact of Tranexamic Acid Usage on Craniosynostosis Surgery Outcomes: A Single-Center Review**

Abstract Presenter  
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Alexander Velazquez  
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**Purpose:** Tranexamic acid (TXA) has become an increasingly common adjunct to assist with the mitigation of blood loss in both elective and traumatic surgery. Through its mechanism of action of inhibiting the activation of plasmin and therefore inhibiting the breakdown of clotting, it is thought to assist in limiting intraoperative blood loss. This study examines a single institution's use of TXA in cranial vault remodeling surgery and how it correlates with improved recovery following cranial vault remodeling surgery.

**Methods:** A retrospective chart analysis of 168 patients who underwent craniosynostosis surgery between 2012 and 2023 at the authors' institution was performed. 149 patients received a loading and maintenance dose of TXA during surgery. Outcomes recorded included TXA loading and running dose, estimated blood loss, blood replaced, length of hospital stay and morphine equivalents needed.

**Results:** While the dose was not consistent in all patients, all patients receiving TXA within the study received a loading and maintenance dose. For the TXA cohort, there was a trend towards a decrease ( $R = 0.3$ ) in overall blood loss, blood replacement and percent loss of circulating blood volume; however this was not statistically significant. Even though the average weight of patients in the TXA cohort was lower, indicating a lower blood volume, the patients who received TXA on average lost 6% less of their total blood volume. Also, the average blood loss in these cases decreased from 280 cc to 199 cc, but this as well as the percent loss was not statistically significant. Additionally, there was a trend ( $p = 0.087$ ) in patients that received TXA and decreased ICU stay and a significantly ( $p = 0.043$ ) decreased amount of morphine equivalents required postoperatively.

**Conclusion:** In evaluation of this subset of patients, while there was not a statistically significant decrease, there was a trend toward less surgical blood loss and the amount of resuscitative blood products needed in the patients that received TXA in cranial vault remodeling surgery. This may have contributed to the enhanced recovery of these patients which was noted by the trend towards a decreased ICU stay and a significant decreased need for morphine products in the postoperative period.

## **Diagnosis and Screening of Velocardiofacial Syndrome by Evaluating Facial Photographs Using a Deep Learning-Based Algorithm**

Abstract Presenter

Yujin Myung M.D., Ph.D.

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**Background :** Early detection of rare genetic diseases, including velocardiofacial syndrome (VCFS), is essential for patient well-being. However, their rarity and limited clinical experience of physicians make diagnosis challenging. Deep learning algorithms have emerged as promising tools for efficient and accurate diagnosis [1]. This study investigates the use of a deep learning algorithm to develop a face recognition model for diagnosing VCFS.

**Methods:** The study employed publicly available labeled face datasets to train the multitask cascaded convolutional neural networks (MTCNN) model [2]. Subsequently, we examined the binary classification performance for diagnosing VCFS using the most efficient face recognition model. A total of 98 VCFS patients (920 facial photographs) and 91 non-VCFS controls (463 facial photographs) were randomly divided into training and test sets. Additionally, we analyzed whether the classification results matched the known facial phenotype of VCFS [3].

**Results:** The face recognition model demonstrated high accuracy, ranging from 94.03% to 99.78%, depending on the training dataset. The accuracy of the binary classification diagnostic model varied from 80.82% to 88.02% when evaluating with photographs taken at various angles, but reached 95.00% evaluating with frontal photographs only. Gradient-weighted class activation mapping heatmap revealed the high importance level of perinasal and periorbital areas, exhibiting consistency with the conventional facial phenotypes of VCFS.

**Conclusion:** This study shows the feasibility and effectiveness of MTCNN-based model for detecting VCFS solely from facial photographs. The high accuracy underscores the potential of deep learning in aiding early diagnosis of rare genetic diseases, facilitating timely interventions for patient care.

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## Revision Surgery and Developmental Comorbidities Predict Developmental Delays in Craniosynostosis Patients

Abstract Presenter

Theresa Webster MD

Abstract Co-Author

Thomas Imahiyerobo MD

**Background:** Although craniosynostosis has been linked to developmental delays, current studies often fail to account for additional patient characteristics that may independently impact rates of cognitive and speech delays in these cohorts. This study sought then to assess predictors of developmental delays in children undergoing surgical management of craniosynostosis.

**Methods:** Retrospective chart review was performed on patients with craniosynostosis who underwent surgical correction at a single institution between 2016-2023. Logistic regression identified predictors of developmental and speech delays. Variables included age, gender, insurance status, syndromic presentation, sutural involvement, surgical approach, revision surgery, and neurodevelopmental comorbidities. Delay comorbidities were defined as coexistent patient conditions impacting long-term speech and cognition apart from their synostosis.

**Results:** A total of 300 patients underwent either endoscopic (53%) or open (47%) surgical correction. Median age at surgery was 4.2 months [IQR 2.6-10.3 months]. Revision surgery was performed in 2.7% of patients. Syndromic presentations were observed in 6.0%. Of the total cohort, 9.0% were diagnosed with developmental delay and 13.7% had speech delays. The most prevalent neurodevelopmental comorbidities included autism (4.0%), hearing loss (3.7%), hydrocephalus (3.3%), and epilepsy (1.7%). Delay comorbidities [OR = 1.33; 95% CI 1.20-1.47;  $p < 0.01$ ] and need for revision surgery [OR = 1.45; 95% CI 1.19-1.76;  $p < 0.01$ ] increased odds of a concurrent developmental delay diagnosis. Odds of speech delay were also increased by delay comorbidities [OR = 1.45; 95% CI 1.28-1.64;  $p < 0.01$ ] and revision surgery [OR = 1.38; 95% CI 1.09-1.76;  $p < 0.01$ ]. Factors associated with longitudinal rehabilitation resource utilization at latest follow-up were delay comorbidities [OR = 1.50; 95% CI 1.28-1.76;  $p < 0.01$ ], age at surgery > 6 months [OR = 1.24; 95% CI 1.06-1.44;  $p < 0.01$ ], and use of early intervention/school programs [OR = 1.57; 95% CI 1.20-2.06;  $p < 0.01$ ].

**Conclusions:** In the general population, there is a 17% rate of developmental delay in children and a 2-19% rate of speech delay. As demonstrated in this study, the rates of

developmental delays in patients undergoing surgical correction of craniosynostosis mirror those of the general population. Consistent predictors of developmental delays in craniosynostosis patients include need for revision surgery and co-existent developmental comorbidities. Notably, surgical approach, sutural involvement, and age at surgery > 6 months were not independent predictors of developmental or speech delays. Future studies linking synostosis to developmental delays and assessing neuropsychological outcomes after surgery should control for these factors.

## **Stem Cells as a Method to Promote Optic Nerve Regeneration: A Systematic Review**

**PURPOSE:** Whole-eye transplantation has emerged as a potential intervention for cases of irreversible blindness due to facial and ocular trauma. Central to the success of this procedure is reconnection of the optic nerve, which has historically been considered incapable of regeneration due to the central nervous system's inherent inhibitory environment. Stem cells have the ability to differentiate and promote tissue repair and have been proposed as a potential method to enhance optic nerve regeneration and function. Due to the paucity of literature on this topic, we sought to perform a systematic review analyzing the current methodologies, outcomes, and challenges surrounding the use of stem cells as an approach to promote optic nerve regeneration.

**METHODS:** Following PRISMA 2020 guidelines, we conducted a systematic review of PubMed, MEDLINE, Cochrane, and Web of Science from inception through June 26, 2023. We included original research studies utilizing stem cells to investigate optic nerve regeneration in the setting of injury or trauma in warm-blooded animal models. Data extraction included animal model and stem cells used, techniques for optic nerve injury and application of stem cells, and outcome measurements.

**RESULTS:** We included 29 studies, of which 93% utilized rodent models and 72% induced injury through optic nerve crush. Regarding stem cells, 72% utilized mesenchymal cells while 24% chose neural cells. Most studies injected stem cells intravitreally following optic nerve crush (59%), while others injected them at the site of the lesion (17%) or in the sub-tenon space (10%). All studies included at least one outcome measure of optic nerve regeneration, including the number of regenerated axons distal to the lesion site, relative expression of growth-associated protein 43, or density of retinal ganglion cells. Of these, 11 studies demonstrated a 9-fold increase in regenerating nerve axons 825 micrometers from the site of optic nerve lesion after 54 days, on average. Additionally, 7 studies reported an average 4-fold increase in relative expression of growth-associated protein 43 over 18 days. Several studies (38%) also reported functional outcome measurements, including those from electroretinograms or flash visual evoked potentials. Two studies reported improved flash visual evoked

potential outcomes based on the decrease in the latency of the P1 wave. Additionally, 6 studies demonstrated improved electroretinogram results following stem cell transplantation indicated by an augmented a-wave amplitude or an increased amplitude of the scotopic threshold response. Notably, there was no evidence of full-length optic nerve regeneration nor complete restoration of retinal function following stem cell transplantation.

**CONCLUSION:** Stem cells appear to be a viable option to enhance optic nerve regeneration following injury due to trauma. Many studies demonstrated positive preliminary results, including enhanced optic nerve regrowth and even functional improvement in certain models. Identifying the most efficacious stem cell type, perfecting delivery mechanisms, and ensuring long-term cell survival are challenges that should be explored. Furthermore, understanding the integration of regenerated nerve fibers within the intricate visual pathway is crucial. Given the findings of our review, additional research is warranted to assess long-term optic nerve regeneration after whole-eye transplantation with stem cells.

Abstract Presenter  
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**PURPOSE:** Whole-eye transplantation has emerged as a potential intervention for cases of irreversible blindness due to facial and ocular trauma. Central to the success of this procedure is reconnection of the optic nerve, which has historically been considered incapable of regeneration due to the central nervous system's inherent inhibitory environment. Stem cells have the ability to differentiate and promote tissue repair and have been proposed as a potential method to enhance optic nerve regeneration and function. Due to the paucity of literature on this topic, we sought to perform a systematic review analyzing the current methodologies, outcomes, and challenges surrounding the use of stem cells as an approach to promote optic nerve regeneration.

**METHODS:** Following PRISMA 2020 guidelines, we conducted a systematic review of PubMed, MEDLINE, Cochrane, and Web of Science from inception through June 26, 2023. We included original research studies utilizing stem cells to investigate optic

nerve regeneration in the setting of injury or trauma in warm-blooded animal models. Data extraction included animal model and stem cells used, techniques for optic nerve injury and application of stem cells, and outcome measurements.

**RESULTS:** We included 29 studies, of which 93% utilized rodent models and 72% induced injury through optic nerve crush. Regarding stem cells, 72% utilized mesenchymal cells while 24% chose neural cells. Most studies injected stem cells intravitreally following optic nerve crush (59%), while others injected them at the site of the lesion (17%) or in the sub-tenon space (10%). All studies included at least one outcome measure of optic nerve regeneration, including the number of regenerated axons distal to the lesion site, relative expression of growth-associated protein 43, or density of retinal ganglion cells. Of these, 11 studies demonstrated a 9-fold increase in regenerating nerve axons 825 micrometers from the site of optic nerve lesion after 54 days, on average. Additionally, 7 studies reported an average 4-fold increase in relative expression of growth-associated protein 43 over 18 days. Several studies (38%) also reported functional outcome measurements, including those from electroretinograms or flash visual evoked potentials. Two studies reported improved flash visual evoked potential outcomes based on the decrease in the latency of the P1 wave. Additionally, 6 studies demonstrated improved electroretinogram results following stem cell transplantation indicated by an augmented a-wave amplitude or an increased amplitude of the scotopic threshold response. Notably, there was no evidence of full-length optic nerve regeneration nor complete restoration of retinal function following stem cell transplantation.

**CONCLUSION:** Stem cells appear to be a viable option to enhance optic nerve regeneration following injury due to trauma. Many studies demonstrated positive preliminary results, including enhanced optic nerve regrowth and even functional improvement in certain models. Identifying the most efficacious stem cell type, perfecting delivery mechanisms, and ensuring long-term cell survival are challenges that should be explored. Furthermore, understanding the integration of regenerated nerve fibers within the intricate visual pathway is crucial. Given the findings of our review, additional research is warranted to assess long-term optic nerve regeneration after whole-eye transplantation with stem cells.

# **Long Term Outcomes of a Pediatric Blood Management Protocol in Cranial Vault Reconstruction**

Abstract Presenter  
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Anna Carlson MD

**Introduction:** Blood transfusion is common in cranial vault surgery, and protocolized efforts to minimize transfusion have been reported in recent years. This study assesses the long-term, prospective outcomes of a pediatric blood management protocol for the cranial vault reconstruction (CVR) population.

**Methods:** A protocol for preoperative hematologic optimization of patients undergoing CVR was developed. In brief, patients were screened with standard hematologic laboratory assessment. Based on patient hemoglobin (Hgb), preoperative interventions were recommended: if Hgb >13 g/dL, no further intervention was required, those between 10 and 13 g/dL were given oral vitamin C, oral iron, and erythropoietin alfa/darbepoetin alfa, and those <10 g/dL received additional intravenous iron supplementation. Patients found with abnormal coagulation studies underwent formal hematology consultation. Preoperatively, patients received tranexamic acid (TXA) and/or aminocaproic acid. Intraoperatively, cell-saver technology and blood sparing operative techniques were employed. Postoperatively, iron or erythropoietin alfa supplementation was prescribed. Prospective data was collected for all CVR patients from January 2016 - October 2023. A retrospective control cohort of patients undergoing CVR without the described protocol from January 2015 - December 2015 was also reviewed. For statistical analysis,  $p < 0.05$  was deemed significant.

**Results:** A total of 194 successive patients (20 control, 174 treatment) underwent CVR from January 2015 - October 2023. Age, sex, and weight were not significantly different between control and treatment groups (Age: 11.1 vs 13.0 months; Sex (Male): 65.5% vs 67.8%; Weight (kg): 8.6 vs 9.4). Mean postoperative Hgb was significantly higher in the control group (10.9 vs 9.4 g/dL,  $p < 0.01$ ). No difference was observed in Hgb at time of discharge between control and treatment groups (9.6 vs 9.4 g/dL,  $p > 0.05$ ). Mean estimated blood loss (217.4 vs 125.2 ml,  $p < 0.01$ ) and volume of intraoperative packed red blood cells (223.8 vs 47.8 ml,  $p < 0.001$ ) were significantly higher in the control group.

compared to the treatment group. The rate of packed red blood cell transfusion (80.0% vs 31.6%,  $p<0.001$ ) and mean total transfusion volume during hospitalization (226.9 vs 56.5 ml,  $p<0.001$ ) were higher for the control group compared to treatment. Mean length of stay did not differ between groups (3.6 vs 3.4 days).

**Conclusion:** Multi-disciplinary and multi-approach efforts to optimize blood management in the CVR population are critical. This prospective study represents a robust and reproducible protocol for pediatric blood management with significant reductions in transfusion requirements.

## **The 'Rocky' Factor: Orbital Floor Fracture Repair for Repeat Offenders**

Abstract Presenter  
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**Background:** The Lamina Papyracea ('Paper-Thin') orbital bone often fractures in orbital blow-out injuries while the globe remains intact. Repair of the orbital floor or medial wall has been successfully accomplished with multiple constructs (cranial bone, titanium, resorbable plate) as long as the pyramidal anatomy of the orbit is recreated. However, 'repeat offenders' who suffer serial orbital trauma after repair may be at risk for globe injury. We reviewed treated orbital floor fractures to see if globe injury was more likely with certain repairs.

**Methods:** We culled through 18 years of trauma data and studied isolated orbital floor fractures (no other facial fractures) ( $n=589$ ); the recurrent isolated orbital floor fractures were studied in detail. Type of initial procedure and subsequent globe injury were documented.

**Results:** There were 9% or 53 recurrent isolated orbital injuries following initial orbital floor fracture. The mechanism of injury in these repeat orbital injuries was mostly from an assault (96%). Of the recurrent isolated orbital injuries, 11% (6/53) had a significant globe injury (globe rupture). The breakdown including globe injury to repeat orbital injury was: 5 out of 6=Titanium plate, 1 out of 14=split cranial bone graft, 0 out of

31=resorbable plate, 0 out of 2=gelfilm. Only 1 of 6 with globe injury regained (marginal) sight in that respective eye.

**Conclusions:** Although patients not at risk of recurrent orbital trauma may be treated successfully with different orbital floor materials, those known to be repeat trauma offenders (like boxers, or known gang members) are at risk for globe rupture unless a less rigid material like a resorbable plate is used to repair the orbital floor or medial wall.

## **Enhanced Recovery after Surgery in Craniofacial Trauma: A Prospective Single Center Study**

Abstract Presenter

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**Background:** A previous retrospective analysis demonstrated elevated levels of narcotic use amongst craniofacial trauma patients admitted to our institution. No studies to date have investigated enhanced recovery pathways in craniofacial trauma. An Enhanced Recovery After Surgery (ERAS) protocol was subsequently developed and implemented for this patient population. This study's aim was to investigate the ERAS protocol's efficacy in reducing opioid use post-operatively.

**Methods:** This single-institution, prospective cohort included 41 patients recruited from February 2020 to June 2023. The control group included 31 patients retrospectively reviewed from October 2015 to September 2018. Opioid use was quantified in morphine milliequivalents (MME). Total MME use at 24 hours post-operatively and during inpatient stay was gathered. A Wilcoxon rank sum test was conducted to compare medians between both groups. Multivariable linear regression analysis was also conducted to control for age, gender, length of stay (LOS), and facial fracture type.

**Results:** There was a significant decrease in MME requirement in the ERAS group at 24 hours post-operatively (30 vs 71.5,  $P < 0.001$ ) and during entire LOS (92 vs 844,  $P < 0.001$ ). LOS was similar between both groups (Median= 48-96hrs,  $P > 0.05$ ). These results were consistent when controlling for age, gender, LOS and fracture type between both groups.

**Conclusion:** Implementation of an ERAS protocol for patients undergoing surgery for isolated craniofacial trauma was found to be associated with decreased opioid use in the first 24 hours after surgery and throughout admission. These results highlight the potential efficacy of an ERAS protocol for pain control in this patient population.

## **DOES INTRAOPERATIVE ANTICOAGULATION AFTER ANASTOMOSIS REVISION IMPROVE OUTCOMES IN HEAD AND NECK FREE FLAP RECONSTRUCTION?**

Abstract Presenter  
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**Purpose:** Microsurgeons often start a heparin-drip intraoperatively when concerned about thrombosis in the setting of an anastomotic revision (AR) based on anecdotal evidence. There is a paucity of studies analysing antithrombotic effect in flaps requiring AR(1). We aimed to determine outcomes following intraoperative anticoagulation in head and neck free flaps requiring AR to guide future use.

**Methods:** This was a single-centre retrospective review of all patients who underwent head neck and free flap reconstruction from January 2012 to October 2022. Data including intraoperative findings comprising severity score for the vascular issue, flap loss, return to operating room for bleeding/vascular compromise was extracted from department REDCap database.

**Results:** Among 1173 patients, 71 patients with 72 flaps (6%) had AR; (48 at index surgery; 24 at take-back). Flap-loss was 2% overall and 23% (17/72) in the AR group. Intraoperative heparin-drip was administered in 32 patients, 18 at index & 14 at take-



back surgery.

Among 71 patients with AR, flap-loss in patients who received heparin-drip were comparable to those who did not(22% vs 25%). In the 41patients with an identifiable thrombus, flap-loss rate was significantly lower(26%vs 65%; OR=5.14;CI:1.27-20.67) in heparin group. Within the thrombus group, heparin use had a significantly lesser flap-loss in patients requiring revision of only single vessel (9% vs 85%; p=0.003), and those with AR for isolated arterial issue (18% vs 100%, p=0.038); the flap outcomes were not affected in cases requiring revision of both vessels. There was no association found between heparin and flap loss in the no-thrombus group(p=0.79). There was no significant difference in flap loss rates in subgroups with AR at index(heparin vs no heparin :5% vs 17%,p=0.38) or take-back surgery( heparin vs no heparin: 35% vs 58%,p=0.125) .

There was no significant difference in the bleeding rates between heparin and no-heparin groups in the overall cohort(25%vs15%;p=0.29),thrombus(22%vs21%;p=0.95) and no-thrombus(40%(2/5)vs 12%(3/26);p=0.138) subgroups. There was no significant association found between heparin and bleeding in subgroups of patients based on number of vessels revised or severity scoring. Intraoperative tPA use was not found to impact flap outcomes, however, there was a significant increase in bleeding rates in the overall cohort (43%vs 13%,p=0.022) and in thrombus subgroup(46% vs 10%;p=0.023) both in univariate and multivariate analysis.

**Conclusion:** In patients with AR and thrombus, heparin-drip use demonstrated significant reduction in flap loss with similar bleeding rates. In patients with AR without a thrombus, the difference in flap outcomes or bleeding rates did not achieve statistical significance. In patients with thrombus, heparin was particularly beneficial in patients who required revision of single vessel (vein or artery) and those with primarily arterial issues without an increase in bleeding. Use of tPA was associated with higher rates of bleeding without an increase in flap salvage in the setting of a thrombus. Although restrictive use is recommended, there is a potential benefit from precise use of heparin in the AR patients with an identified thrombus and lesser surgical complexity of vascular compromise.

## References

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## **Nasal Appearance in Unilateral Cleft Lip and Palate: Early Cleft Lip Repair versus Traditional Repair With Nasoalveolar Molding**

Abstract Presenter

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**Purpose:** Nasoalveolar molding (NAM) has historically improved nasal cartilage shape before cleft lip repair. Similar to NAM's mechanism, early cleft lip repair (ECLR) leverages neonatal plasticity from residual maternal estrogen to reshape the nose and approximate the cleft segments before surgical repair. This study compared nasal anthropometrics to assess the nasal symmetry of patients who underwent ECLR versus traditional lip repair (TLR) with NAM (TLR+NAM).

**Methods:** Non-syndromic patients with complete unilateral cleft lip and palate (UCL±P) who underwent primary lip repair between 2005 and 2023 at a tertiary pediatric hospital were reviewed retrospectively. Cohorts included patients who underwent repair before three months of age (ECLR, n=231) and those who underwent TLR+NAM (n=86). Preoperative and postoperative (within one year) anthropometrics were measured from frontal and basal images, including nasal width, nostril width, and nostril breadth. The cleft severity was quantified based on the cleft width ratio (CWR). Pre- and post-operative cleft and non-cleft ratios were compared. Smaller ratios were considered more symmetric, with zero indicating an ideal symmetry.

**Results:** Sixty-one patients were included (36 with ECLR and 25 with TLR+NAM). ECLR and TLR+NAM had comparable CWR ( $0.51 \pm 0.09$  vs.  $0.50 \pm 0.09$ ,  $p=0.620$ ). All patients' mean follow-up time was  $3.6 \pm 3.5$  years (TLR + NAM:  $7.3 \pm 5.2$ , ECLR:  $2.7 \pm 2.0$ ). Pre- to postoperative nasal symmetry significantly improved with ECLR (Nasal width:  $1.69 \pm 0.76$  vs.  $0.11 \pm 0.11$ ;  $p<0.001$ ; Nostril width:  $2.20 \pm 1.72$  vs.  $0.19 \pm 0.20$ ,  $p<0.001$ ; Nostril breadth:  $1.40 \pm 0.52$  vs.  $0.09 \pm 0.10$ ;  $p<0.001$ ) and TLR+NAM (Nasal width:  $1.94 \pm 1.25$  vs.  $0.14 \pm 0.12$   $p<0.001$ ; Nostril width:  $2.00 \pm 1.06$  vs.  $0.19 \pm 0.16$ ,  $p<0.001$ ; Nostril breadth:  $1.35 \pm 0.61$  vs.  $0.09 \pm 0.09$ ,  $p<0.001$ ). ECLR and TLR+NAM achieved

comparable postoperative improvement in all anthropometric nasal symmetry measurements (nasal width: 8.6% vs. 9.7%,  $p=0.678$ ; nostril width: 14.3% vs. 10.4%,  $p=0.293$ ; nostril breadth: 8.5% vs. 13.9%,  $p=0.292$ ).

**Conclusion:** ECLR and TLR + NAM effectively corrected cleft nasal deformity and achieved comparable nasal symmetry after UCL±P repair. Since both approaches achieve a similar nasal appearance, families can make more informed treatment decisions based on timing preferences, financial circumstances, and patient needs.

### **An Algorithm Utilizing Premaxillary Osteotomy in the Management of Patients with Bilateral Cleft Lip**

Abstract Presenter

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**Background/Purpose:** Premaxillary osteotomy may be needed during primary lip repair to normalize labial topography. There is a paucity of guidelines and long term data regarding premaxillary setback at primary lip repair. This study analyzes indications and outcomes for premaxillary osteotomy (PO) and presents an algorithm for its use in the management of patients with bilateral cleft lip (BCL).

**Methods:** A retrospective review was conducted evaluating patients undergoing lip repair at our institution from 2003-2023. Cohorts included patients with BCL ± cleft palate who underwent lip repair with simultaneous PO(BCL+PO) or without PO(BCL-PO). Indications, timing of surgery, complications, and the need for orthognathic surgery to correct midface hypoplasia were assessed.

**Results:** 1,090 patients who underwent cleft lip repair were identified, of which 266 patients with BCL/P met inclusion criteria. Of these, 51 patients required premaxillary setback. Based on these results, a management algorithm was developed. One hundred forty nine patients with complete BCL/P were recommended NAM. For patients with a protruding premaxilla who failed treatment (n=12) or not deemed candidates of NAM (n=31), premaxillary setback was recommended ( $6.056 \pm 4.682$  months). Patients with a protruding premaxilla who presented to our institution late were also recommended premaxillary setback (n=8,  $12.977 \pm 8.196$  months). Across all patients, complications included wound dehiscence (n=3) and abscess formation (n=2). Notably, there were no instances of avascular necrosis of the premaxilla. Compared to BCL-PS, BCL+PS had comparable rates of wound dehiscence (2.7% vs. 7.7%;  $p=0.932$ ), lip revisions (10.0% vs. 11.3%;  $p=0.976$ ), and orthognathic surgery rates ( 50.0% vs. 56.3%;  $p>0.999$ ).

**Conclusion:** Premaxillary osteotomy is a safe procedure with comparable outcomes to traditional bilateral cleft lip. Thus, we advocate for premaxillary setback at primary lip repair for protuberant premaxillas preventing tension-free closure. This algorithm provides safe experiential based guidance for the management of the premaxillary segment.

### **A Comparison of Long-term Reoperation Rates in Syndromic versus Non-Syndromic Coronal Synostosis**

Abstract Presenter  
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**Background:** Primary treatment of craniosynostosis typically involves cranial vault remodeling (CVR) with or without fronto-orbital advancement (FOA). Though a single corrective surgery is often necessary, patients with syndromic craniosynostosis might require additional revisional procedures. Relapse-manifesting as fronto-orbital or

midface retrusion-is a common sequela necessitating additional surgical intervention. This study investigates the impact of craniofacial syndrome status on long-term reoperation rates following primary CVR±FOA for coronal synostosis.

**Methods:** A retrospective chart review evaluated patients with syndromic-craniosynostosis who underwent primary CVR±FOA at our institution from 2004-2023. Patients with unicoronal or bicoronal synostosis with at least three years of follow-up were included. Revisional surgeries included repeat FOA, LeFort III, or monobloc advancement/distractions after index operation. Multivariate regression with interaction analysis was performed, adjusting for age at surgery, suture-type craniofacial-syndromic diagnosis, posterior vault distraction osteogenesis (PVDO), and post-operative helmetting.

**Results:** Upon review, 266 patients with coronal synostosis who underwent CVR±FOA were identified with a mean follow-up time of  $4.8 \pm 4.3$  years. Sixty-six (24.8%) patients had a craniofacial syndromic diagnosis (23 Apert, 17 Crouzon, 10 Pfeiffer, 9 Saethre-Chotzen, 6 Muenke, and 1 Carpenter). The syndromic cohort had a significantly higher revision rate than the non-syndromic cohort (33.3% vs. 2.0%;  $p < 0.001$ ). The average time until revision surgery was  $7.2 \pm 2.9$  years postoperatively. Upon multivariate regression, patients with a syndromic diagnosis had a 17-fold increased risk of reoperation following their index operation (Odds Ratio [OR]: 16.8;  $p < 0.001$ ). Further regression analysis revealed that PVDO reduced the risk of revision surgery for the syndromic cohort by 98% (OR: 0.02;  $p$ -interaction=0.025).

**Conclusion:** The diagnosis of an associated craniofacial syndrome was a significant predictor of relapse after initial surgical intervention for coronal synostosis. However, implementing PVDO as the initial surgical approach for these patients could mitigate the need for revisional surgery, thereby decreasing the need for subsequent surgical interventions.

## **Clinical, Histologic, and Transcriptomic Evaluation of Sequential Fat Grafting for Morphea**

Abstract Presenter(s)

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Juzi Liu

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Morphea, also called localized scleroderma (LoS), is a rare disease of unknown etiology without satisfactory treatment for skin sclerosis and soft tissue atrophy. To provide clinical, histologic, and transcriptome evidence of the anti-sclerotic and regenerative effects of sequential fat grafting with fresh fat and cryopreserved stromal vascular fraction-gel (SVF-gel) for LoS. We conducted this single-center, non-randomized controlled trial between January 2022 and March 2023. This study was conducted in the Department of Plastic and Reconstructive Surgery of Nanfang Hospital, Southern Medical University. Adult participants with young or old-onset LoS, and presented with varying degrees of skin sclerosis and soft tissue defect. Group A received sequential grafting of fresh fat and cryopreserved SVF-gel (at 1 and 2 months post-operation). Group B received single autologous fat grafting. All patients were included in a 12-month follow-up. The primary outcome included changes in the modified Localized Scleroderma Skin Severity Index (mLoSSI) and Localized Scleroderma Skin Damage Index (LoSDI) scores evaluated by two independent blinded dermatologists. The histologic and transcriptome changes of LoS skin lesions were also evaluated. Of 44 patients (median [IQR] age, 26 [23-33] years) enrolled, 24 were assigned to Group A and 20 to Group B. No serious adverse events were noted. The mean mLoSSI scores at 12 months showed a 1.6 (SD [standard deviation], 1.50) decrease in Group A and 0.9 (SD, 1.46) in Group B ( $p=.134$ ), whereas the mean LoSDI scores at 12 months showed a 4.3 (SD, 1.34) decrease in Group A and 2.1 (SD, 1.07) in Group B ( $p<.001$ ), indicating that Group A had a more significant effect in reversing LoS skin damage but not disease activity compared with Group B. Histologic analysis showed improved skin regeneration and reduced skin sclerosis in Group A, whereas skin biopsies of Group B patients did not show significant change. Transcriptome analysis of skin biopsies from Group A patients suggested "TNF $\alpha$  signaling via NF- $\kappa$ B" might be at central play in the immunosuppressive and anti-fibrotic effect of sequential fat grafting. 15 hub genes were captured, among which many associated with scleroderma pathogenesis were down-regulated and validated by immunohistochemistry, such as EDN1, PAI-1, and CTGF. Sequential fat grafting with fresh fat and cryopreserved SVF-gel was safe and its therapeutic effect is superior to that of single autologous fat transplantation with improved mLoSSI and LoSDI scores. Histological and transcriptomic changes further support the effective changes after treatment.

# **A Comparison of Osteotomy Designs for the Correction of Isolated Lambdoid Craniosynostosis: Clinical Experience and a Novel Technique**

Abstract Presenter

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**PURPOSE:** Although several open techniques have been described for surgical correction of lambdoid synostosis, no consensus exists on the optimal technique. This study describes a new osteotomy design for surgical correction of isolated lambdoid synostosis followed by postoperative helmet therapy (PHT) and reviews postoperative outcomes.

**METHODS:** A single-institution retrospective cohort study evaluated patients who underwent open posterior vault remodeling (PVR) for correction of isolated lambdoid synostosis between 2014–2023. Patients with significant deformational plagiocephaly and multisuture craniosynostosis were excluded. Variables included patient history, perioperative data, estimated blood loss (EBL), length of hospital stay (LOS), and postoperative outcomes. Anthropometric measurements, including cranial index (CI) and cranial vault asymmetry index (CVAI) at initiation and termination of PHT, were collected using a proprietary machine learning application (Cranial Technologies). Fisher's exact, Wilcoxon rank-sum and Wilcoxon signed-rank tests were performed.

**Osteotomy Design:**

A single oval-shaped bone flap was elevated, encompassing both the contralateral compensatory occipital-mastoid bossing and the ipsilateral occipital synostotic flattening above the torcula. The calvarial bone flap was then recontoured. Radial osteotomies were performed on the side contralateral to the synostotic suture. A rongeur was used to out-fracture and flare these osteotomies, reducing the convexity of the bone. On the ipsilateral side, several radial wedge osteotomies were performed to increase the

curvature of the contour of bony underprojection. The bone flap was then rotated 180 degrees and tucked underneath the edge of the native bone. Barrel staves were used to out- or in-fracture the native bone as needed. After discharge, patients were seen approximately 2 weeks postoperatively. PHT was performed for 3–12 months.

**RESULTS:** Forty-eight patients underwent open surgical correction of lambdoid synostosis, with 19 patients meeting inclusion criteria (new technique [n=6], old technique [n=13]). PVR occurred at a mean age of  $9.9 \pm 3.0$  months. The median time from surgery to initiating helmet therapy after fittings and swelling reduction was  $1.9 \pm 1.6$  months (range 0.4–4.6). The mean duration of PHT was  $4.1 \pm 2.8$  months (range 1.3–11.5). Patients undergoing the new technique had a median operative time of 3.1 hours, EBL of 160 mL, and LOS of 3 days. The perioperative profile of the new technique was comparable to that of the old technique ( $p > 0.05$ ). The new technique had improved CI after surgery (preoperative: 89.8 vs. pre-PHT: 89.0,  $p = 0.031$ ) and following PHT (preoperative: 89.8 vs. post-PHT: 87.9,  $p = 0.188$ ). The new technique demonstrated improvement in CVAI after surgery (preoperative: 7.8 vs. pre-PHT: 3.4,  $p = 0.031$ ) and after PHT (preoperative: 7.8 vs. post-PHT: 2.8,  $p = 0.031$ ). Relative to preoperative baselines, the new and old techniques demonstrated 4.6% vs. 3.3% improvements in CI ( $p = 0.623$ ) and 66% vs. 59% improvements in CVAI ( $p = 0.624$ ), respectively.

**CONCLUSIONS:** This novel surgical technique, in conjunction with PHT, can result in improved symmetry after open PVR for unilateral lambdoid synostosis. This technique serves as an alternative for surgical correction of lambdoid synostosis.

## **Risk for Subsequent Osteoradionecrosis in A Transferred Fibula Flap in Head and Neck Cancer Patients Undergoing Segmental Mandibulectomy**

Abstract Presenter  
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Chien-Yu Chen

**Introduction:** While radiotherapy plays an important role in Head and Neck Cancer treatment, its side effects can be devastating. Osteoradionecrosis (ORN) remains a challenging disease from the definition, incidence, and pathogenesis to treatment



modalities.

**Objective:** To investigate the predictors of ORN of the transferred fibula bone in head and neck cancer patients who undergoing segmental mandibulectomy followed by free fibula flap (FFF) reconstruction.

**Methods:** A retrospective analysis of 329 patients at Chang Gung Memorial Hospital between January 2014 and December 2019 who underwent free fibula flap reconstruction was conducted. A variety of clinicopathological postoperative parameters were identified and assessed. The data was statistically analyzed with univariate and multivariate logistic regression and the probability of ORN rate was plotted as Kaplan-Meier survival curve.

**Results:** A total of 66 (20%) patients with symptomatic ORN was identified. Tumor status, overall tumor staging, postoperative chemotherapy, re-exploration and postoperative wound infection have been identified as risk factors for the ORN occurrence. In multivariate logistic analyses, re-exploration (OR, 3.02 [95% CI, 1.06-8.94],  $p = 0.04$ ) and postoperative wound infection (OR, 6.36 [95% CI, 3.23-13.49],  $p < 0.001$ ) indicated higher risks for ORN. Few ORN cases were found 3 years after the index surgery.

**Conclusions and Relevance:** Our study highlighted re-exploration and postoperative wound infection are independent risk factors for ORN. We also found the rate of ORN is underestimated in the current literature. If dental osteointegration is to be performed at a later stage, it should be considered at least 3 years after postoperative radiotherapy bearing in mind the increased risk of ORN.

## **Vermilion Tubercle Reconstruction with a Vermilion Flap Transferred Vertically in Cleft Lip Secondary Repair**

Abstract Presenter  
Jia Zhou MD

**Objective:** The authors presented a new method of vermilion tubercle reconstruction in cleft lip secondary repair.

**Methods:** Thirty-nine patients with secondary repair of cleft lip underwent the operation of vermilion tubercle reconstruction with a vermilion flap transferred vertically. The

reconstruction procedure mainly included three processes, restoring the vermilion tubercle tissue in the cleft area, heightening the vermilion with the vermilion flap, and augmenting the volume of the tubercle with the subcutaneous, scar and muscle tissue underlying that vermilion flap. Pre- and post-surgical measurements were obtained from three-dimensional photographs using the VECTRA-XT system, and then the data from both groups were analyzed with paired-samples t test. A patient satisfaction survey was performed postoperatively to evaluate the effect of the reconstruction.

**Results:** The reconstructions of vermilion tubercle were successful in all patients and no complications occurred. Most of vermilion tubercles appeared pronounced bulges post-operation. Follow-up had been completed in twenty-eight patients and the average follow-up period was  $9.71 \pm 5.02$  months. The effective vermilion height increase was from  $5.32\text{mm} \pm 0.91\text{mm}$ 、 $3.98\text{mm} \pm 0.89\text{mm}$ 、 $4.30\text{mm} \pm 0.86\text{mm}$  pre-operation to  $6.35\text{mm} \pm 0.87\text{mm}$ 、 $7.75\text{mm} \pm 1.03\text{mm}$ 、 $7.48\text{mm} \pm 0.97\text{mm}$  post-operation in the midline of lip, the peak of cleft side and the midline of short arm respectively. The postoperative height of vermilion in the cleft side was heightened significantly. the projection of the tubercle was increased significantly from  $0.38\text{mm} \pm 0.46\text{mm}$  to  $0.83\text{mm} \pm 0.51\text{mm}$ . Three-dimensional analysis showed a significant increase in the volume of vermilion tubercle. 96.4% (27) patients achieved satisfied results of vermilion tubercle reconstruction with operation.

**Conclusion:** Vertical transfer of the vermilion flap has been found to be an effective method of vermilion tubercle reconstruction in secondary repair of cleft lip.

## **Exploring the Impact of Radiofrequency and High-Intensity Facial Muscle Stimulation on Enhancing the Submental Area: An MRI-Based Analysis**

Abstract Presenter

Barry DiBernardo MD

**Background:** Concerns over the aesthetic appearance of the lower face, particularly the chin and neck, are common due to excess submental fat (SMF), weakened muscles, and loose skin, which may alter the facial contour, leading to a heavier look under the chin and along the jawline. These issues are exacerbated by tissue degeneration, resulting in reduced definition in the submental area and apparent aging signs, negatively impacting self-esteem. This study assesses the effectiveness and safety of combining Synchronized radiofrequency+ (Sync RF+) and High-Intensity Facial muscle stimulation (HIFES™ technology) for non-surgical submental

enhancement.

**Methods:** In this multicenter, single-arm, open-label, interventional study, thirty-seven (n=37, 36 females and 1 male, aged  $42.2 \pm 12.4$  years, BMI  $28.2 \pm 7.2$  kg/m<sup>2</sup>, skin type II-V) subjects received four (4) treatment sessions targeting the submentum, spaced 5-10 days apart, using a non-invasive, self-adhesive device that delivers both HIFES & Sync RF+ energy. The effectiveness in reducing subcutaneous fat and overall submental volume was assessed via Magnetic Resonance Imaging (MRI) and 3D photography. Patient satisfaction, comfort, and safety were also evaluated, with follow-ups at one and three months post-treatment.

**Results:** Initial findings indicate a significant reduction in subcutaneous fat volume (-25%) and total submental volume (-31%) one month after treatment, with further reductions (-35% for both) observed at three months. 3D photographic analysis showed a -5.78 ml reduction in submental volume at one month. High satisfaction rates were reported by 93.6% of participants, with 87% finding the treatment comfortable.

**Conclusion:** The integration of Sync RF+ and HIFES™ technologies for submental enhancement appears safe and effective, offering insights into its mechanism, including the role of Digastric muscle stimulation, in improving aesthetic outcomes and patient satisfaction.

## **Early Cleft Lip Repair: An Update and Review of the First 200 Patients**

Abstract Presenter  
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**Background:** Similar to nasolabial molding (NAM), early cleft lip repair (ECLR) takes advantage of the high degree of plasticity within neonatal tissues to shape the nasal cartilage and maxilla. This study assesses the efficacy and outcomes of ECLR in our institution's first 200 patients.

**Methods:** This retrospective cohort study included 200 non-syndromic patients with unilateral cleft lip±palate (UCL/P) undergoing lip repair before three months of age from 2015-2023. Demographic, preoperative, perioperative, and postoperative data were collected. Anthropometric measurements were obtained from frontal and basal images, which included medial lip height, lateral lip height, commissure length, and nasal width. Cleft severity was quantified by cleft width ratio (CWR). Ratios between the cleft and non-cleft sides were calculated pre- and post-operatively. Ideal symmetry was defined as a cleft to non-cleft ratio of 1. The difference from ideal symmetry was calculated postoperatively between the cleft and non-cleft sides, with values closer to zero indicating a favorable outcome. The number of presurgical appointments and revision rates were compared between the ECLR cohort and patients who underwent traditional lip repair with NAM (n=86, TLR+NAM).

**Results:** Corrected gestational age of the cohort was  $1.1 \pm 0.5$  months at surgery with a mean follow-up of  $2.9 \pm 2.5$  years. ECLR operative and anesthetic times were  $118 \pm 33$  and  $187 \pm 35$  minutes, respectively. No intraoperative complications occurred. Six patients (3.0%) had postoperative complications, most commonly nasal stent dislodgement (n=4). Compared to TLR+NAM, ECLR patients had significantly fewer presurgical appointments ( $1.3 \pm 0.2$  vs  $13.6 \pm 3.5$ ,  $p < 0.001$ ) and fewer lip revisions (9.0% vs 37.2%;  $p < 0.001$ ). Comparing preoperative to postoperative symmetric ratios, ECLR demonstrated significant improvements in medial lip height ( $p < 0.001$ ), lateral lip height ( $p < 0.001$ ), commissure length ( $p < 0.001$ ), and nasal width ( $p < 0.001$ ). Compared to TLR+NAM, the ECLR cohort had similar CWR ( $0.512$  vs.  $0.498$ ;  $p = 0.571$ ), while demonstrating equivalent postoperative improvements in symmetry in medial lip height ( $p = 0.082$ ), lateral lip height ( $p = 0.292$ ), commissure length ( $p = 0.823$ ), and nasal width ( $p = 0.449$ ).

**Conclusion:** This study demonstrates that ECLR continues to be a safe and effective alternative to TLR+NAM for UCL/P with potentially improved aesthetics and reduced burden of care on patients and families.

# **Surgical Site Infection in Microvascular Head and Neck Free Flap Reconstruction: Analysis of Risk Factors**

Abstract Presenter  
Frank Hsieh FRACS

Abstract Co-Author(s)  
Pascalino Romeo MD  
Marco Stocca

**Introduction:** Free tissue transfer for reconstruction of complex head and neck defects is the standard of care throughout the world. These procedures are not without morbidity and infection is a leading cause of post operative complication. Recent data suggests that current Australian antibiotic prophylaxis guidelines may not fully consider the complexity of these procedures and are inappropriate for effectively mitigating infection. The Australian guidelines recommend cephazolin monotherapy or a cephazolin-metronidazole combination as the first-line prophylaxis options, with clindamycin recommended in penicillin-allergic patients, for a period of no longer than 24 hours.

**Methods:** A retrospective cohort study was done over a 5 year period at Westmead hospital (Sydney, Australia) reviewing data from consecutive 100 free flaps for head and neck reconstruction. Univariate and multivariate analyses have been employed to elucidate statistically significant associations, examining potential risk factors for post operative infection including duration and type of antibiotic.

## **Results**

A surgical site infection developed in 32.0% of cases, with an average onset of 11.3 days post-operation. Preoperative anemia (OR: 3.259) and a prophylactic antibiotic duration of  $\leq 24$  hours (OR: 3.010) were found to be independently significant risk factors for infection. Furthermore, surgical site infection was found to significantly increase unplanned returns to theatre ( $P = <0.001$ ), complete flap failure ( $P = 0.005$ ), and length of stay ( $P = 0.026$ ). The results also suggest that a 48-hour prophylaxis duration may be optimal, with no significant difference in infection rate at this cut-off point.

**Conclusion:** This single tertiary center study has found that pre-operative anemia in the head and neck patient is an independent risk factor for post operative infection and indicates that current Australian guidelines for antibiotic prophylaxis may not be adequate in reducing the risk of infection in our population.

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**Radiographic Indications for Orbital Floor Reconstruction: A Systematic Review of Two Decades of Literature**

Abstract Presenter

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**Background:** Orbital floor fractures are a leading cause of eye trauma hospitalizations in the US. Clinical criteria (e.g. persistent diplopia, enophthalmos) are clear indications for surgery. Nevertheless, these signs are frequently masked by initial post-traumatic swelling. A variety of radiographic parameters continue to be recommended to guide treatment strategies (e.g. fracture size, orbital volume, rounding of IRM (inferior rectus muscle), and IRM displacement. The evidence behind these criteria is unclear. This systematic review aims to identify the most reliable radiographic indications for orbital floor reconstruction.

**Methods:** A PubMed search (years: 2000 to 2021) was conducted to identify original, peer-reviewed, human studies analyzing radiographic indications for orbital floor reconstruction in patients aged 16 years and older. Specifically, we included only studies where the surgical decision was based exclusively on clinical grounds and radiographic correlation only established retrospectively. Two reviewers independently screened the studies for inclusion based on a protocol developed according to PRISMA guidelines. Eligible studies were analyzed to extract radiographic indications for surgical reconstruction and their correlation with patient outcomes.

**Results:** Out of 572 articles, eight met the inclusion criteria. Predictors for surgical repair encompassed a variety of clinical and CT-scan parameters. Persistent diplopia and symptomatic IRM entrapment were widely agreed upon clinical indications. Among radiographic criteria, fracture size was an unreliable predictor for reconstruction. Orbital volume measurements displayed wide variability in methodology. Their predictive value was controversial among studies. The degree of IRM displacement was significantly correlated with the need for surgery in two studies.

**Conclusion:** Clinical criteria continue to be the most reliable indications for orbital floor reconstruction. Displacement of more than  $\frac{1}{2}$  of the IRM below the level of the orbital floor seems to be the most predictive radiographic parameter for surgery. Nevertheless, more quality research with prospective design and larger cohorts is needed to confirm its predictive value. Until there is a gold standard for calculating orbital volume change, a specific volume alteration cannot be reliably employed to guide treatment strategy. Fracture size (% surface area of orbital floor) alone is not a reliable indication for surgery.

## **Osteoradionecrosis of the Mandible and its Reconstruction: A Systematic Review focusing on the patient**

Abstract Presenter  
Frank Hsieh FRACS

Abstract Co-Author  
Harrison Garrett MD

**Introduction:** Osteoradionecrosis (ORN) is an insidious and extremely difficult pathology to manage. The pathology can develop anytime following radiotherapy. Complication rates for treating ORN of the mandible with free tissue transfer are over 30% in the literature with high rates of disease recurrence. This study aims to assess the performance of different reconstructive options following resection of ORN of the mandible and free osseocutaneous tissue reconstruction. A further focus of this systematic review was to produce evidence from the literature surrounding complications and their rates from the treatment. Outcomes and complications across reconstructive options were assessed.

**Methods:** A systematic review of published literature was conducted with no restriction on year of publication. The search was limited to the English language. The study

followed PRISMA guidelines for systematic review. Inclusion and exclusion criteria were generated by the two authors and all articles were assessed by two authors for inclusion in the study.

**Results:** A total of 23 relevant articles fit the inclusion and exclusion criteria as seen in figure 1 of the PRISMA flow diagram. There were 23 retrospective reviews producing 776 patients who underwent a total of 815 free flap reconstructions. An overall free flap failure rate of 5.15% and a complication rate of 42.7% for all treatments. 22 out of these 23 studies sub-categorized the reconstructive methods with the free fibula flap being the best performing option. It has a statistically significant lower failure rate when analysed through a Random-Effects Model with a log odds ratio of -0.99 (C.I. -1.80 - -0.17)  $p=0.017$  (Figure 2-3).

Flap associated complications were the highest frequency and occurred at a rate of 16.8% - this included exposure of hardware, partial flap loss, fistula formation, and non-union. Infection was the second most frequent complication recorded at 10.1%. Across the 776 patients there were 35 instances of recurrence for an average follow up time of 20 months across 15 papers that included follow up time in their studies.

**Discussion:** This review shows statistically significant evidence that the fibula flap had the lowest flap failure rates in managing mandibular ORN. It also produces evidence for overall high complication rates as well as specific potential complications. The data is useful for surgeons in discussions and throughout the consent process with patients, which is essential to manage patients' expectations and allow them to make a more informed decision in their journey.

## **The Current State of Non-Invasive Measurement of Intracranial Pressure in Patients with Craniosynostosis: A Systematic Review**

Abstract Presenter  
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Abstract Co-Author(s)  
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**Introduction:** Elevated intracranial pressure (ICP) has been implicated as a causative factor for neurocognitive impairment in patients with craniosynostosis.<sup>1</sup> Despite being invasive, direct measurements remain the gold standard to measure ICP in patients with craniosynostosis. However, due to risks of direct measurement, there has been persistent effort to develop non-invasive modalities to measure ICP. Previous studies have examined the efficacy of non-invasive methods of ICP monitoring, but these were not limited to the craniosynostosis population.<sup>2,3</sup> Here, we performed a systematic review of the current state of non-invasive ICP measurement techniques specific to the craniosynostosis population.

**Methods:** A systematic review was conducted using PubMed, Cochrane and Web of Science databases to identify studies describing the use of non-invasive ICP measurements in patients with craniosynostosis. Studies were included if they assessed a non-invasive method of ICP monitoring against a direct/invasive ICP monitoring technique in patients with craniosynostosis. Non-English and non-human studies were excluded.

**Results:** A total of 735 studies were screened, of which 52 were included in the study. Nine methods of non-invasive ICP measurement were identified, with varying sensitivities and specificities in detecting elevated ICP. In general, clinical signs and symptoms, radiologic evaluations, visual evoked potentials, and transcranial doppler demonstrated inadequate ability to detect elevated ICP. Optical coherence tomography had the most robust evidence supporting its use to detect elevated ICP in patients with craniosynostosis (90% sensitivity, 81.3% specificity).<sup>4</sup> Using ultrasound to measure optic nerve sheath diameter also showed promise in small series, but has not been rigorously evaluated.<sup>5</sup>

**Conclusion:** Developing a technique to measure ICP non-invasively would overcome a major hurdle in efforts to advance our understanding on the effects of suture fusion on the developing brain. The ideal measurement modality would be highly sensitive and specific for elevations in ICP, be easy to perform in children at any age, and would be reproducible. From the current literature, OCT has demonstrated promise in larger sampled studies in being able to accurately predict elevations in ICP non-invasively. Another promising modality involves the use of ocular ultrasonography to measure the optic nerve sheath diameter. Fundoscopic examination although specific, has not been shown to be sensitive enough to be used as a screening tool in children. However, until further validation and investigation is performed, invasive measures remain the gold-standard for ICP measurements in patients with craniosynostosis.

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## **Impact of Geographic Location and Area Deprivation in Longitudinal Cleft Palate Care: A Propensity-Matched Study**

Abstract Presenter  
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**Purpose:** Understanding the significant impact of socio-economic and geographic factors on healthcare access is crucial in the comprehensive care of cleft palate (CP) patients.<sup>1,2</sup> While existing research acknowledges the influence of socio-economic factors on healthcare outcomes, the specific contributions of ADI and geographic location, especially in relation to adoption status and access to healthcare facilities, remain underexplored. This study aims to clarify how these variables interact to affect healthcare availability and quality for CP patients.

**Methods:** We conducted a propensity score-matched analysis on a cohort of 183 cleft palate patients to evaluate the impacts of Area Deprivation Index (ADI), adoption status, and geographic distance to a care center with healthcare access. Healthcare utilization, specifically the requirement for speech therapy, was compared among patient groups with variable ADI scores, adoption statuses, and distances to healthcare facilities. Bivariate analyses and univariate and multivariable logistic regressions assessed healthcare utilization differences. The study applied propensity score matching to align syndromic and non-syndromic patient groups, adjusting for confounders such as gender, migrant status, race, and age to elucidate the effects of socioeconomic and geographic factors on access to care.

**Results:** Significant differences in ADI and speech therapy outcomes emerged in the propensity-matched cohorts. Patients from higher ADI quartiles demonstrated a lower probability of timely speech therapy (OR = 2.45, 95% CI [1.05, 5.70],  $p = 0.038$ ). Adopted patients exhibited a higher need for speech therapy (78.1% vs. 51.0%, OR = 3.43, 95% CI [1.47-9.04],  $p = 0.005$ ). Additionally, adopted patients faced delays in receiving care (OR for delayed first consultation = 13.27,  $p < 0.001$ ; OR for delayed first surgery = 41.65,  $p < 0.001$ ). Specifically, patients from areas with higher ADI scores exhibited a greater need for speech therapy, with speech therapy needs being notably higher in patients from the most deprived quartiles (OR = 3.05, 95% CI [1.22, 8.71],  $p = 0.0235$  for syndromic patients). There was a significant relationship between higher ADI and increased average travel distance to the care center ( $p = 0.047$ ). Patients living farther from the care center were less likely to access necessary treatments on time (mean distance = 120.5 miles for lower utilization vs. 30.2 miles for higher utilization,  $p = 0.045$ ). Additionally, a substantial portion of the cohort was uninsured (47.5%).

**Conclusion:** Area deprivation, adoption status, and healthcare facility proximity significantly influence healthcare access for cleft palate patients. The data suggest that these factors should be integral considerations in healthcare planning and policy development to improve access and outcomes for this patient group. Further research is warranted to explore targeted strategies that address these determinants to enhance healthcare equity for cleft palate patients.

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## Inlay versus Onlay Designs for Pediatric Alloplastic Cranial Reconstruction

Abstract Presenter

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**Background/Purpose:** Alloplastic cranioplasty is a safe and durable alternative to autologous reconstruction in pediatric patients that allows for reconstruction of large calvarial defects without concerns for bony resorption or when autologous bone is unavailable (Fu et al. 2016). Custom computer-aided design and manufacture (CAD/CAM) implants have gained popularity in alloplastic cranioplasty due to their ease of use, decreased operative times, and highly predictable results (Maniskas et al. 2021, Nguyen et al 2018). While a traditional inlay design is thought to improve contour and minimize overlying soft tissue requirements, the inset requires substantial epidural dissection that confers additional surgical risks. In recent years, we have transitioned to utilization of a custom polyetheretherketone (PEEK) CAD/CAM implant with an onlay design in pediatric cranioplasty, allowing minimization of epidural dissection. To our knowledge, no study to date has compared outcomes between inlay and onlay

## CAD/CAM implant design in pediatric cranioplasty.

**Methods:** This retrospective cohort study included all patients < 18 years of age who underwent alloplastic cranioplasty with a custom PEEK implant over a two-year period with a consistent craniofacial and neurosurgical team at a single tertiary pediatric hospital. Patients were divided into inlay or onlay group based on implant design. Patient demographics and clinical data were collected via chart review. Outcomes of interest included operative time, estimated blood loss, presence of a dural tear (Y/N), location of dural tear, need for implant revision (Y/N), hospital length of stay (LOS), and 30-day complications. Continuous variables were compared via Mann-Whitney U tests, and categorical variables were examined with Fisher's exact tests.

**Results:** Over the study period, 20 patients underwent alloplastic cranial reconstruction utilizing either inlay or onlay implants. Four patients were >18 years of age at the time of reconstruction and were excluded. Among the 16 study subjects, 8 underwent reconstruction with inlay implants and 8 underwent reconstruction with onlay implants. There were no significant group differences in age, gender, defect etiology, or defect size ( $p > 0.06$ ). Three subjects in the inlay group had durotomies along the bone margin; no durotomies occurred in the onlay group ( $p = 0.06$ ). Operative time was significantly decreased in the onlay group ( $90 \pm 23$  minutes versus  $163 \pm 45$  minutes,  $p < 0.01$ ) with less overall estimated blood loss ( $72 \pm 23$  mL versus  $250 \pm 312$  mL,  $p = 0.04$ ) when compared to the inlay group. Three subjects in the inlay group required implant modification at the time of the operation to ensure passive fit, while none required revision in the onlay group ( $p = 0.06$ ). There were no significant differences in 30-day complications or hospital LOS ( $p > 0.13$ ).

**Conclusions:** Onlay cranioplasty for reconstruction of fronto-temporo-parietal craniectomy defects in children is associated with shorter operative time and less blood loss compared to inlay cranial implant design, without an associated increase in 30-day complications, including wound healing. Future research may seek to characterize the long-term safety and efficacy of the onlay technique in pediatric alloplastic cranioplasty.

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## **Who Performs Cleft Lip and Palate Repairs at ACPA Centers: A Look into the Lead Surgeons**

Abstract Presenter

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**Introduction:** Cleft lip and palate is the most frequent congenital craniofacial deformity.<sup>1</sup> A recent multicenter study estimated the incidence of cleft lip with or without cleft palate to be 1 in 2,000 live-births in the United States.<sup>2</sup> While cleft lip and palate repair traditionally falls into the domain of plastic surgery, several related specialties perform these surgeries in this country. In this study, the authors attempt to determine which specialty performs cleft lip and palate repairs in North America by American Cleft Palate Craniofacial Association (ACPA) certified teams.

**Methods:** The ACPA website was used to identify cleft team leaders. The website for each team was then examined to determine the surgical specialty of the team leader. The assumption was made that the specialty of the cleft team leader indicates the specialty performing the highest volume of cleft lip/palate repairs at that institution. For teams that had a leader listed that is not a surgeon or for teams that had multiple team leaders listed on the ACPA website, further examination of the team's website was performed to determine which specialty is likely performing the majority of cleft cases based on the wording of cleft surgery explanations or scheduling instructions for cleft patients. If this information was not available, the team was omitted from the study. To validate these findings, the PEDS-NSQIP database from 2016 – 2021 was queried for all palatoplasties performed and primary surgical specialty was recorded.

**Results:** Of the 199 ACPA-approved cleft teams, 5 teams were omitted from the study due to the inability to determine the team leader or the specialty performing cleft cases. Of the remaining 194 ACPA-approved teams, plastic surgeons are the predominant cleft specialists at 157 (80.9%) institutions, oral surgeons at 16 (8.2%) institutions, and otolaryngologists at 15 (7.7%) institutions. At another 6 institutions, cleft palate repairs appear to be performed more evenly between plastics and oral surgery (3), plastics and otolaryngology (2) or oral surgery and otolaryngology (1). Upon querying the PEDS-NSQIP database 9,827 cleft palate repairs were recorded, with plastic surgery performing 81.1% and otolaryngology performing 18.1% of procedures. Oral surgery was not listed in the database.

**Conclusion:** In North America, it appears that plastic surgeons perform the highest proportion of cleft lip and palate repairs in comparison to other surgical specialties. The data collected from the ACPA website correlates with the PEDS-NSQIP database.

## **Factors Affecting Bony Consolidation in Craniosynostosis Patients Undergoing Cranial Distraction Osteogenesis**

Abstract Presenter  
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**Introduction:** Cranial distraction osteogenesis in treatment of craniosynostosis has many demonstrated benefits, however, questions remain on how to optimize outcomes. Protocols for latency, distraction, and consolidation periods vary in the literature and are guided by clinical observations rather than prospective studies. Our goal is to identify the effect of patient factors and postoperative protocols on consolidation formed in children undergoing distraction osteogenesis for craniosynostosis.

**Methods:** We performed a retrospective review of patients with craniosynostosis who underwent distraction osteogenesis at Rady Children's Hospital between September 2015 and May 2023. Patients with pre-operative and post-operative CT scans from

which measurements could be obtained were included. Mimics software was used to create 3-D reconstructions of pre- and post-operative CTs. Geomagic software was used to measure the surface areas of the distraction gap and residual bony defects, the difference between the measurements representing the amount of consolidation formed on postoperative CT. The surface area of consolidation was measured as a proportion of the total surface area of the gap. Linear regression models were used to analyze which patient variables independently predicted consolidate formation. These included gender, race, ethnicity, age at surgery, suture involved, early reintervention, and length of latency, distraction, and consolidation. Age as a dichotomized variable was substituted for age at first surgery in a secondary model to examine potential differences between patients younger and older than 1 year.

**Results:** Seventy-two patients were identified and 48 met inclusion criteria. 31 patients were female and 17 were male. Most patients identified as white (n=29) and Hispanic (n=26). Median age at surgery was 286 days, with 33 patients undergoing surgery prior to 1 year old. Suture involvement included 19 unicoronal, 9 unilateral lambdoid, and 20 multisuture, 9 of which were bicoronal. Seventeen patients had syndromic diagnoses. Latency period was most often 72 hours and distraction period was  $35.7 \pm 10.3$  days. Consolidation period measured between start of consolidation and postoperative CT was  $72.8 \pm 40.7$  days. Six patients required early distractor removal for infection. When controlling for other factors, only the length of the consolidation period significantly predicted higher proportion of bony consolidate within the distraction gap ( $B = .39$ ,  $p = .01$ ), such that for every additional day of consolidation, there was .39 increase in the value of the proportion of consolidate. The second age model mirrored these findings, and being younger or older than 1 year did not significantly predict proportion of consolidate formed.

**Conclusions:** Our findings demonstrate that longer distraction periods have quantifiable benefit. Further investigation into differences in consolidation period length and the impact of early removal of distractors is indicated. The finding of dichotomized age as a non-significant predictor of consolidate formation is interesting due to the loss of dural osteogenic potential as patients near 1 year old. This may indicate the effect of membranous ossification at the osteotomy in consolidate formation. Our nonsignificant findings are reassuring in that current practice patterns are not detrimental to patient outcomes, however we acknowledge the need for further analysis in larger, prospective cohorts.



## **Periorbital Steroid Infiltration in Cranial Vault Remodeling**

Abstract Presenter

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**Background & Purpose:** This study examines the use of periorbital infiltration of epinephrine and steroids along the anticipated surgical incision as well as within the periorbital soft tissue and its association with postoperative infection risk. Additionally, this study looks at the benefits that are associated with the use of intraoperative steroids such as decreased need for pain medication and stay in the ICU.

**Method/Description:** All patients undergoing cranial vault remodeling surgery over a 10 year period at the senior authors institution were analyzed. Variables collected included the use of periorbitally infiltrated steroids, documented concern for infection, readmission for intravenous antibiotics, a need for reoperation, surgical blood loss, length of intensive care stay, and amount of narcotic pain medication administered.

**Results:** During this time period 168 patients met inclusion criteria and 68 patients received periorbital steroids infiltrated along the proposed incision line as well as around the superior and lateral orbital rim. When comparing the patients that received the steroid infiltration to those that did not, there was no increased infectious risk in the postoperative period. In contrast, there was a significant decrease in the amount of morphine required both in the immediate postoperative period and during the course of their hospitalization. There was also a trend toward decreased length of stay in the ICU but this was not significant.

**Conclusions:** At the authors' institution, patients that received periorbital steroid infiltrations were not shown to be at an increased risk of developing a postoperative

infection. Additionally, we noted that the use of steroids decreased the need for postoperative morphine and decreased their stay in the ICU. This may be attributed to the decrease in postoperative swelling secondary to the steroids. Because of the postoperative benefits and the limited risk of increasing postoperative infection risk, the authors' institution continues to use periorbital steroid infiltration for cranial vault remodeling surgery involving the periorbital region.

**Main Objectives of Presentation:** This presentation describes the authors' recommendation of using periorbital steroid infiltration in craniofacial surgery as it has well defined benefits while not increasing the risk of postoperative infection.

### **Don't Delay: Sociodemographic factors impacting timing of cleft lip repair**

Abstract Presenter

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**Background:** Optimal treatment of cleft lip with or without cleft palate requires early evaluation by a cleft team, detailed surgical planning, and close follow-up to allow a timely operative repair. Furthermore, in complete clefts, the use of nasoalveolar molding (NAM) or lip adhesion surgery (LAS) may be employed, which introduces further logistical challenges. Due to the complexity of care, sociodemographic barriers may cause delays in the treatment of cleft lip patients. This study aims to identify the sociodemographic factors that may limit access to a timely cleft lip care.

**Methods:** This was an IRB-approved retrospective analysis of patients who were treated for cleft lip at a tertiary academic center between 2015 and 2023. Unilateral and bilateral cleft lips with or without cleft palates were included. Study endpoint was

definitive cleft lip repair. The study outcomes analyzed for a timely cleft lip care included the time of initial evaluation, use of NAM vs LAS, age at cleft lip repair, and number of missed appointments. These were compared across different sociodemographic factors including race/ethnicity, family income, insurance status, distance from the hospital, and primary language spoken to identify barriers to cleft lip care.

**Results:** A total of 244 patients (88 white, 75 Hispanic, 21 black, and 60 other) were included in the study. Eighty-four patients had an isolated cleft lip, while the remaining 160 had a cleft lip and palate. Of the clefts, 41 were bilateral and 27 were part of a syndromic presentation. Median age at first cleft evaluation was 2.9 weeks (IQR 1.7-5.7). A family income of <\$75,000/year was associated with a delay in initial evaluation (3.1 [1.9-7.5] vs 2.3 [1.1-4.0] weeks,  $p=0.003$ ). In the 83 patients who underwent an intervention prior to surgery, NAM was used in 79.5% ( $n=66$ ) and LAS in 20.5% ( $n=17$ ). Medicaid insurance was associated with a lower rate of NAM utilization than private insurance (72.7% vs 92.8%,  $p=0.03$ ). The median time to cleft lip repair was 4.5 months (IQR 3.8 to 5.7 months). Delays in surgery were associated with a family income of <\$75,000/year (4.5 [3.8 - 6.0] vs 4.3 [3.7 - 5.0] months,  $p=0.04$ ) and Medicaid insurance (4.7 [4.0 - 6.1] vs 4.0 [3.5 - 4.7] months,  $p<0.001$ ). During cleft lip treatment, 48.1% of patients had at least one missed appointment. A >50-mile commute to the hospital was associated with a higher rate of missed appointments (66.7% vs 45.8%,  $p=0.04$ ). Race/ethnicity and a primary language other than English were not associated with an inferior outcome in the healthcare access indicators analyzed.

**Conclusion:** Patients with cleft lip with and without cleft palate continue to be impacted by various healthcare disparities. In the current study, low family income, longer commute to the hospital, and Medicaid insurance were identified as impediments to optimal cleft lip care. State-level and institutional programs targeting these factors may help decrease the barriers to cleft care access.

### **Effect of liposuction cannulas fenestration area on the architecture and histology of fat grafts.**

Abstract Presenter

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Utilization of fat grafting to address irregularities, facial defects, and body contouring has become increasingly prevalent in reconstructive surgery. The advantages of adipose tissue are diverse: it can be harvested with minimal morbidity at the donor site, it is autologous, and its malleability allows for seamless integration with native architecture. However, a notable drawback lies in its relatively low retention rates, typically ranging from 40-50% after one year. Various factors, harvesting, processing, and infiltration techniques, significantly influence the viability of fat grafts. The substantial absorption of the graft often necessitates subsequent surgical interventions, leading to heightened costs and inherent procedural risks for the patient.

The purpose of this study was to standardize the type of cannula that produces less distortion and trauma on the architecture of the adipocyte. This will enable us to achieve optimal long-term results in this procedure, as well as improvement in volume retention in fat transfer.

This was a descriptive, observational, comparative, and cross-sectional study. The main variable evaluated was the architecture of the fat graft according to the use of different liposuction cannulas.

The abdomen was divided into 4 quadrants, and infiltration was performed using modified Klein solution, which consisted of 1000cc of 0.9% saline solution plus 1 vial of 1mg adrenaline. Fat aspiration was obtained using 2 cannulas of 3mm and 2 cannulas of 5mm with fenestrations of A: 1 mm<sup>2</sup> diameter and B: 2.5mm<sup>2</sup> diameter. Evaluation included the area of the adipocyte in mm<sup>2</sup>, the oily fraction (cell lysis), presence of cellular debris, morphological alteration of the adipocyte, and alteration in its septa.

A total of 40 samples were included in the study. Cannula D showed adipocytes with a larger area, with a median of 6.62mm<sup>2</sup>. However, no statistically significant differences were observed between the groups ( $p=0.49$ ).

Additionally, it was observed that cannula D presented a higher proportion of adipose phase with a median of 12.5mL.

On the other hand, the highest oily phase was obtained with cannula C with a median of 2.44mL, indicating greater adipocyte lysis. In the analysis of alterations in adipocytes and septal alterations, it was found that cannula A has a higher tendency towards severe changes in the architecture of the adipocyte and its septa.

In our analysis, we found an association between the type of cannula and the presence of cellular debris ( $p=0.03$ ). The values that contributed the most to the difference between groups were those of the cannula in group B.

Based on the obtained results, we can conclude that the diameter of the distal fenestrations in the liposuction cannula impacts the architecture of the fat graft, leading to greater disruption of septa and increased cellular debris fragmentation when the area is 1mm<sup>2</sup>. Regarding the oily fraction, indicative of adipose cell lysis, it was found to be higher with the 3mm diameter cannula regardless of the fenestration area.

Findings align with those reported in the literature, larger caliber cannulas with wider fenestrations result in less damage to the adipocyte architecture, reduced lysis or oily fraction.

## **ANATOMIC AND PHYSIOLOGICAL CHANGES FOLLOWING PRIMARY PALATOPLASTY USING THE “BUCCAL FLAP APPROACH”; AN MRI STUDY.**

Abstract Presenter  
Robert Mann MD

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Historically, the cleft defect has been thought of as a gap in the tissue. Traditional primary repairs closed the gap with a combination of primary closure +/- secondary intention, rearranging muscle and mucosa, and the stretching of adjacent tissues to the maximum of elasticity. The Anatomic Cleft Restoration Philosophy (ACRP) is used to guide the "Buccal Flap Approach" where regional flaps address tissue deficiencies. The purpose of the study was to determine the similarities and differences, at maturity, between two groups; patients born with Veau 3&4 clefts and non-cleft controls. All repairs used "The Buccal Flap Approach" during primary palatoplasty. The question was how close to normal could the buccal flap group come to the non-cleft group?

**Method:** This was a prospective study of 119 patients from a single surgeon's practice, all of whom had Veau 3&4 clefts and were followed to maturity. The a priori power

analysis required 14 subjects per group for statistically significant comparisons. The buccal flap (BF) group of 15 randomly selected patients (aged 18-31) received a Double Opposing Z - Plasty + Buccal Flaps (DOZP + BF) repair at primary palatoplasty and had no history of secondary speech or orthognathic surgery. The age and race matched control group (CG) had 15 adults with no history of cleft palate. All participants underwent MRI to visualize their anatomy. Ten standard anatomic measures were chosen for outcome analysis. Normative data studies were included in the analysis to corroborate the measured values.

**Definition of selected measures:** Velar Length; from back of hard palate to uvula tip. Pharyngeal Depth (PD); from back of hard palate to posterior pharyngeal wall. Effective Velar Length (EVL); from back of hard palate to levator veli palatini (levator) muscle bulge. Effective Velopharyngeal Ratio also called Effective VP Ratio (EVPR); is a calculation, EVL divided by PD. Maximal Velar Stretch (MVS); calculation in (mm), EVL in phonation minus EVL at rest.

**Description of results:** The velar length, velar thickness, pharyngeal depth, and levator muscle length were statistically the same for both groups and both groups matched normative values. This degree of similarity between patients with clefts and non-cleft groups is notably different than previously reported in the literature. The NSBa and SNB measures for the BF group matched the CG and normative data. Literature has reported smaller SNB angles between cleft palate group and control groups, indicating the mandible is relatively posterior in relation to cranial base. In the present study, the SNB angles for the BF group were statistically similar to both the CG and normative data.

EVPR was significantly larger in the BF group, however, the EVPR for the BF and CG fell within the normative range for adults without clefts. The SNA in the BF group was statistically different than the CG. However, the BF measures fell within multiple normative data studies looking at "normal faces" and just out of standard deviation for two normative studies looking at "ideal faces." However, the CG fell outside of all the normative data studies. The MRI revealed the muscle and tissue mass of the buccal flap was at the junction between the hard palate and velum. And, in all of the subjects, the buccal flap was located anterior to the levator sling. The resulting EVL in the BF group was statistically longer than the CG and also fell outside of the values reported in a large-scale normative data study of non-patients. The MVS in the BF group did not match CG or normative studies.

**Conclusions:** In this study 8 of 10 measures of the BF group matched controls or normative data. Results suggest that patients treated with buccal flap tissue

replacement have a longer EVL due to the levator sling being placed more posteriorly in the mucosal envelope. This intentional outcome, allowed the levator muscle to be placed more favorably to achieve VP closure. The DOZP + BF repair adds flexible buccal flap tissue to the anterior soft palate which can now expand in response to growth. The buccal flap may also function as a "spacer," decreasing the migration of the levator muscle toward the posterior hard palate. The longer EVL may reflect a more advantageous muscle position, compensating for the decrease in velar stretch often seen in patients with cleft palate and observed in this study. The effective use of buccal flaps achieved a longer EVL, compensating for both the reduction in tissue mobility due to scar tissue, and the inherent deficiencies of malformed velar muscles.

The study demonstrates that when appropriate tissue replacement is possible, normal anatomy and function can be achieved. When appropriate tissue replacement is not possible, tissue augmentation can play an important role establishing successful compensations for irreplaceable tissues.

## **Living with Facio-auriculo-vertebral Spectrum: A 20 Year Single Institution Experience**

Abstract Presenter  
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**Introduction:** Facio-auriculo-vertebral spectrum (FAV), also known as hemifacial microsomia or Goldenhar syndrome, refers to a congenital disorder of craniofacial malformations resulting from dysmorphogenesis of structures related to the first and second branchial arches. Clinical presentations of FAV range from mild to severe with significant variation in phenotypes. The etiology of FAV includes both genetic and environmental factors, and can either be sporadic or hereditary. The management of patients with FAV requires a multidisciplinary approach. This study presents our

experience treating FAV patients over more than 20 years, reporting on patient demographic variables, phenotypes and the associated burden of care.

**Methods:** A retrospective review of patients with FAV born between 1985 and 2021 who presented to Rady Children's hospital multidisciplinary Craniofacial group for care between November 2002 and May 2023 was conducted. Patient characteristics including demographic data, age at presentation, birth history, and medical comorbidities were collected. Clinical documentation of physical exams, radiographic imaging and photographs were used to classify the major manifestations of FAV using the OMENS scoring system. Additional information gathered included duration of follow up and number of surgical interventions. Statistical analysis included the use of Spearman rank correlations to examine relationships between OMENS component grades and burden of care.

**Results:** 230 patients underwent initial chart review and 165 remained after application of exclusion criteria, including lack of documented diagnosis of FAV and insufficient clinical documentation. Our population was equally divided between male (n=82) and female (n=83), and most patients identified as white (n=75) and Hispanic (n=99). Median age at presentation was 203 days, with most patients presenting before 1 year old (n=102, 61%). Mean duration of follow up was 7.8 + 6.2 years. The most frequent manifestation of FAV in our patient population was microtia (n=125), followed by mandibular hypoplasia (n=93), soft tissue deficiency (n=58), facial nerve involvement (n=23), macrostomia (n=15), and orbital asymmetry (n=11). On average, patients underwent 2.0 + 2.8 craniofacial surgeries. Average length of follow up was 7.8 + 6.2 years and average age at last follow up was 10.3 + 6.7 years old. Almost half of patients (n=81) had medical comorbidities involving at least one other organ system. 72% of patients (n=118) were diagnosed with hearing loss, 54 patients with speech delay, and 16 with other developmental delays. Four patients had cleft lip/palate and 6 had cleft palate alone. A statistically significant correlation between severity of mandibular hypoplasia and increased surgical burden was noted ( $p=0.17$ ,  $p=0.03$ ), with additional trends identified in severity of orbital asymmetry ( $p=0.15$ ,  $p=0.06$ ) and cleft lip ( $p=0.14$ ,  $p=0.07$ ). Severity of mandibular hypoplasia ( $p=0.20$ ,  $p=0.02$ ), microtia ( $p=0.18$ ,  $p=0.02$ ), and soft tissue deficiency ( $p=0.17$ ,  $p=0.03$ ) were all significantly associated with increased length of follow up.

**Conclusions:** We present one of the largest cohorts of patients with facio-auriculo-vertebral spectrum in recent literature. Our findings of increased surgical burden based on presence and severity of certain OMENS components and incidence of comorbidities and developmental delays can help guide conversations with patients and family about



what to expect with a diagnosis of facio-auriculo-vertebral syndrome.

## **Perioperative Airway Outcomes in Patients with Pierre Robin Sequence Undergoing Primary Cleft Palate Repair**

Abstract Presenter

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**Purpose:** Pierre Robin Sequence (PRS) is characterized by a clinical triad of micrognathia, glossoptosis and upper airway obstruction, which increases risk for acute respiratory or airway deterioration. Surgical options to address this include tongue-lip adhesion (TLA), mandibular distraction osteogenesis (MDO) and tracheostomy. The majority of PRS patients will also require primary cleft palate repair due to the associated disruption of palatal shelf fusion during development. The purpose of our study is to investigate perioperative airway outcomes at the time of cleft palate repair in patients with PRS.

**Methods:** IRB approval was obtained to perform a retrospective review of prospectively collected data through the Nationwide Children's Hospital electronic medical record. All patients undergoing primary cleft palate repair between March 1st, 2018 and December 31st, 2022 with a diagnosis of PRS were identified. The same time period was then sampled to include a similar number of non-PRS controls. Intraoperative data collected included difficult airway assessment, laryngoscopic view (1-4) and number of endotracheal tube (ETT) insertion attempts. Post-operative outcome data included 30 day readmission rate for airway/respiratory related complications, 30 day reintubation rate, and prolonged intubation beyond the end of surgery. Statistical analysis included students t-test and chi-square.

**Results:** A total of 41 patients with a diagnosis of PRS ((+)PRS) undergoing primary cleft palate repair were identified over the study period; a similar number of controls without a PRS diagnosis ((-)PRS) (N=42) undergoing cleft palate repair were sampled. In the (+)PRS group, rates of prior management were conservative treatment (37%), TLA (24%), MDO (34%) and tracheostomy (4.9%). The (+)PRS group had higher rates

of difficult airways during intubation (17.9% vs 0%,  $p = 0.004$ ), were more likely to have a laryngoscopic view grade 2 or higher (41% vs 9.5%,  $p = 0.001$ ) and on average had a greater mean average number of attempts at ETT placement ( $1.44 \pm 0.11$  vs.  $1.14 \pm 0.08$ ;  $p = 0.030$ ). When stratified by technique of prior PRS surgical intervention MDO was less likely to have a laryngoscopic view grade 2 or higher (7.7% vs. 57%,  $p = 0.0065$ ; 7.7% vs. 50%,  $p = 0.022$ ) and had fewer average number of attempts at ETT placement ( $1.14 \pm 0.097$  vs.  $1.6 \pm 0.19$   $p = 0.02$ ;  $1.14 \pm 0.097$  vs.  $1.88 \pm 0.23$ ;  $p = 0.0013$ ) compared to conservative management and TLA respectively. Post-operative outcomes including readmission within 30 days after surgery for airway/respiratory related complications, need for reintubation within 30 days after surgery, and prolonged intubation beyond the end of surgery did not differ between (+)PRS and (-)PRS.

**Conclusion:** At the time of primary cleft palate repair, patients with a diagnosis of PRS are more likely to have a difficult airway, a worse laryngoscopic view and more attempts at ETT insertion during intubation. However, PRS patients with prior MDO have better laryngoscopic views and less attempts at ETT placement compared to those treated conservatively or with TLA.

## **What's In a Name? A Scoping Review of Published Cleft Palate Repair Techniques.**

Abstract Presenter  
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**Background:** Cleft palate repair can be complex, often combining multiple individual surgical methods to both achieve anatomic closure of the cleft, while lengthening the palate and re-orienting the levator to improve speech outcomes. This elevates the learning curve required for palatal repair as familiarity with multiple techniques is required. Palatal repair techniques are often named after the surgeons who described them, but there have been multiple modifications over time. As the appetite for global education in cleft surgery increases, numerous modifications in techniques can complicate learning. This study aims to evaluate the number of original palatoplasty

techniques and variations thereof and determine the number of studies in the literature that describe their technique in detail.

**Methods:** A systematic review according to PRISMA guidelines was conducted. 1,899 articles were identified. Inclusion criteria included: primary articles objective was to describe a novel method of cleft palate repair either of the hard palate, soft palate, or both and provided details of intra-operative steps taken. Exclusion criteria were: absence of operative details, studies comparing techniques or surgical outcomes and revision rather than primary surgery technique reported. In total, 109 articles met criteria. Demographics gathered were year of publication, first author name and country of origin. Data were gathered on eight steps performed during a palate repair: Design of palatal incisions, islandization of greater palatine flaps, levator muscle management, anterior palate closure, soft palate closure, additional flaps/agents for either multi-layer closure or increasing length, and closure of lateral incisions.

**Results:** Out of 109 articles 29 (26.6%) were cited by surgeon name. Furlow's technique was the most modified with 29 (26.6%) modifications, follow by von Langenbeck's with 18 (16.5%) modifications and Bardach's with 17 (15.6%) modifications. Palatal incision design was reported as straight in 66 (60.6%) articles, Z-plasty in 25 (22.9%) articles, combination of both in 6 (5.5%) and 12 (11%) reported other designs. Mucoperiosteal flaps were described for anterior palate closure in 98 (89.9%) articles and elevation of such flaps was reported 86 (78.9%) articles. Further data were gathered on specific maneuvers for flap elevation and medialization including release of greater palatine artery in 38 (44.2%) articles, release of tensor tendon in 28 (32.6%) articles, dissection into the space of Ernst 11 (12.8%) and hamular fracture reported in 20 (23.3%) articles. Closure of the uvula 37 (33.9%) and final position of flaps for soft palatal closure 27 (24.8%) were both related to soft palatal closure and the least commonly reported intra-operative steps of the articles included. Of each of the named techniques, 26 original articles were retrieved of which 26 (100%) reported 2 or more of these principles of repair. Nineteen (17.4%) articles described all aspects of their technique in detail (all intraoperative steps).

**Conclusion:** Combination and modification of palate repair techniques for different anatomical locations in the palate has resulted in widespread variation. Despite 109 techniques being reported, all techniques described at least one critical step, demonstrating that all techniques, regardless of name, rely on specific principles of palatoplasty. However, technique descriptions are incompletely defined in the literature, with only 19 (17.4%) describing the critical steps from from incision to closure. While design of flaps on the palate are noted, the details of extent of dissection, flap elevation, type of suture technique and method of multi-layer closure were palate surgery. This

could be particularly challenging for plastic surgery trainees, particularly those without a mentor, who are looking to reproduce these techniques. Greater emphasis should be placed on providing specific details of all intra-operative steps taken to facilitate knowledge-sharing in the cleft surgical community.

## **Evaluating the Economic Viability of Cleft Care: An Analysis of Consumer Price Index and Inflation-adjusted Reimbursements for Cleft Lip and Palate Repair in the United States**

Abstract Presenter

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**Purpose:** To evaluate how Medicaid reimbursements for cleft lip and palate repair compare with annual U.S. economic growth when adjusted for inflation.

**Methods:** Current Procedural Terminology (CPT) codes for cleft lip and palate repair were retrospectively reviewed between 2018-2023. Using Medicaid physician fee schedules for the top 5 U.S. states with the highest birth rates, and the study's home state, reimbursements were evaluated and adjusted for inflation to 2023 U.S. dollars. Annual total percentage changes in reimbursement, percent change in inflation-adjusted reimbursement, and reimbursement Compound Annual Growth Rate (CAGR) were evaluated and compared to annual changes in the U.S. Consumer Price Index (CPI).

**Results:** The U.S. CPI increased by 20.9% from 2018-2023. In comparison, the overall total percentage change in reimbursement rates for all cleft lip and palate procedures increased by 7.23%. Annual percent changes in cleft lip and palate reimbursements were significantly lower than annual changes in CPI for all procedures (CPT 40700 P-value = 0.006, CPT 40701 P-value = 0.046, CPT 40702 P-value = 0.038, CPT 42200 P-value = 0.038, CPT 42210 P-value = 0.014). After adjusting for inflation, the overall percent change in reimbursements for all procedures decreased by -12.81%. The greatest mean decreases in inflation-adjusted reimbursement were observed for CPT code 40700, plastic repair of cleft lip/nasal deformity; primary, partial, or complete,

unilateral (−14.94%), and CPT code 42210, palatoplasty for cleft palate, with closure of alveolar ridge (−14.60%). For all procedures, the average CAGR was −2.66%.

**Conclusion:** In contrast to the overall economy, reimbursements for cleft lip and palate procedures in the U.S. are significantly declining each year when adjusted for inflation. To maintain the financial sustainability of cleft lip and palate care for providers and hospital systems, reimbursement trends relative to inflation and the overall economy need to be considered by federal lawmakers to ensure the ongoing financial sustainability of cleft lip and palate care.

## **Aplasia Cutis: From Diagnosis to Management- Two Decades of Clinical Insights**

Abstract Presenter  
Ofir Ron MD

**Introduction:** Aplasia Cutis Congenita (ACC) presents as a rare, yet challenging congenital anomaly characterized by the absence of skin in localized areas.(1) This condition poses significant clinical risks, including dehydration, meningitis, sinus thrombosis, and hemorrhage, with mortality rates reported between 20% and 55%.(2,3)The complexity of ACC necessitates a comprehensive and individualized management strategy tailored according to each case.

**Methods:** Our retrospective analysis spans two decades (2000-2023), encompassing cases of ACC treated within the Plastic and Reconstructive Surgery Department at Soroka Medical Center. This study not only revisits the spectrum of clinical presentations and outcomes but also evaluates the effectiveness of a treatment algorithm developed by our team. (4)This classification system considers the size of the defect, the involvement of skin layers, vascular exposure, and other anomalies and provides a road map for immediate and subsequent treatment. It is designed to identify those who require surgical intervention versus those who can be managed conservatively.

**Results:** The cohort includes 76 patients diagnosed with ACC, predominantly affecting the scalp (96.1%). Defect sizes varied, with a median of 2.5 cm<sup>2</sup> (IQR 15.0 cm<sup>2</sup>). A majority (47.4%) presented with isolated skin defects (Type I), while 25% exhibited underlying bone involvement (Type II), and 11.8% had large vein exposure (Type III). Notably, 19.7% of cases were accompanied by limb anomalies, with prevalence escalating in correlation with defect severity. Adams-Oliver Syndrome was identified in

9.2% of patients. Surgical intervention was pursued in 22.3% of cases, with a mortality rate of 3.95%, mainly by bleeding events. Our findings highlight the efficacy of Integra as a single-stage surgical option, facilitating re-epithelialization even in extensive defects, thereby obviating the need for traditional skin grafts.

**Conclusion:** Over the last two decades, our classification-based treatment algorithm has demonstrated significant efficacy in guiding therapeutic decisions for ACC, leading to successful patient outcomes.

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## **The Effect of Timing on Mandibular Fracture Repair: Analysis of the National Trauma Data Bank**

Abstract Presenter

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**Purpose:** There is variation in recommendations for the timing of operative intervention following mandibular fractures. The National Trauma Data Bank (NTDB) is a validated, nationwide, multi-center trauma patient registry provided by the American College of

Surgeons (ACS). This study aims to evaluate the effects of operative timing of mandibular fractures on outcomes and complications using the NTDB.

**Methods:** A retrospective review of patients with mandibular fractures who underwent operative intervention from the ACS NTDB from 2019-2022 was completed. Patients were separated by timing of operative intervention into less than one day, from one day to two days, and greater than two days following mandible fracture. Demographics, fracture patterns, complications, and operative outcome data were collected. Univariate and multivariate analysis was performed to determine factors associated with complications after surgical repair of mandible fracture.

**Results:** A total of 85,671 patients with 117,074 mandible fractures were identified. Of those, 36,380 (42.5%) patients underwent operative intervention. Most surgical patients were male (79.0%) and Caucasian (57.3%). The most common fracture pattern undergoing operative intervention was symphysis (21.2%), followed by angle (19.5%). Surgical and medical complication rates were significantly higher in patients who were operated on greater than two days following fracture (5.4%; 14.7%) compared to those who operated on less than one day following fracture ( $p<0.001$ ;  $p<0.001$ ). Additionally, rates of surgical site infection and unplanned return to the operating room were significantly higher (1.2%; 4.6%) compared to the rate in those who were operated on less than one day following fractures ( $p<0.001$ ;  $p<0.001$ ). When looking at patients  $> 18$  years of age, the univariate analysis demonstrated that time to operation, preexisting conditions, GCS on arrival, and receiving antibiotics were associated with the presence of surgical complications. Multivariate analysis demonstrated that these all remained significant: total GCS ( $p<0.001$ ), antibiotic therapy ( $p<0.001$ ), total preexisting conditions ( $p<0.001$ ), smoking ( $p<0.001$ ), HTN ( $p=0.032$ ), time to operation ( $p<0.001$ ), and presence of ramus fracture ( $p<0.001$ ).

**Conclusions:** Among the 36,380 patients with operative mandibular fractures, those who underwent operative intervention in less than one day had the lowest rates of surgical and medical complications. The highest rates of complications were seen in those undergoing operative intervention greater than two days following a fracture. These findings suggest that an earlier timing of operative intervention may improve outcomes in patients requiring surgery.

## **Exploring the impact of perioperative ketorolac on postoperative oral nutrition in patients undergoing primary palatoplasty**

Abstract Presenter

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**INTRODUCTION:** In prior observational studies of children undergoing primary cleft palate (CP) repair, perioperative ketorolac combined with Enhanced Recovery After Surgery (ERAS) multimodal pain management has been shown to improve postoperative oral nutrition while reducing hospital length of stay (LOS) and narcotic use. However, these benefits have not been corroborated in a randomized interventional study. The purpose of this study is to assess, using a randomized trial, the impact of perioperative ketorolac combined with our institutional ERAS protocol on inpatient postoperative oral intake in patients receiving primary palatoplasty.

**METHODS:** This is an interim analysis of an ongoing placebo-controlled, double-blinded randomized clinical trial with parallel treatment groups. Patients over 6 months old with CP with or without cleft lip were included in this study. Patients with syndromic CP, cardiac malformations, history of gastrointestinal complications, renal disorders, coagulopathy, and feeding tube dependency were excluded. After enrollment, patients were randomly assigned to the ketorolac (ERAS + ketorolac) or placebo group (ERAS + placebo). Randomization was stratified by cleft severity (incomplete or complete). Patients received ketorolac or placebo for 24 hours postoperatively in addition to our institutional ERAS protocol. The primary outcome was 24-hour postoperative oral intake. Secondary outcomes included LOS and total inpatient narcotic use in morphine milligram equivalents (MMEs). Univariate and multivariate analysis was performed.

**RESULTS:** Twenty-seven patients were randomized with a median age of 12 months (IQR 12-13.8). Thirteen (48%) of the patients were female. Most were non-Hispanic white (14, 52%), with 9 (33%) and 2 (7.4%) identifying as Hispanic/Latino and non-Hispanic black, respectively. Twenty-three (85%) had complete CP, while 4 (15%) had incomplete CP. There were no statistically significant differences in demographic



characteristics between the 2 treatment groups. When comparing the ketorolac and placebo groups using univariate analysis, there was no significant difference in 24-hour postoperative oral intake (360 vs 372 milliliters,  $p=0.4$ ), LOS (26 vs 29 hours,  $p=0.5$ ), or inpatient narcotic use (2.82 vs 2.96 MMEs,  $p=0.9$ ). On multivariate analysis, ketorolac use was not a significant predictor of 24-hour postoperative oral intake ( $p=0.5$ ), LOS ( $p=0.4$ ), or total inpatient MMEs ( $p=0.8$ ). Overall, there were no postoperative complications, though there was one readmission for fever in the placebo group.

**CONCLUSION:** The addition of ketorolac to our institution's ERAS pain management protocol did not significantly impact postoperative oral intake, narcotic use, or hospital LOS after primary palatoplasty. However, by definition, this interim analysis is underpowered to detect any difference in the primary or secondary outcomes. It remains to be determined if any benefits of postoperative ketorolac on 24-hour postoperative oral intake will be identified with continued enrollment in this ongoing randomized trial.

## **Radiotherapy in BTM reconstructed skin cancer excisions in the head and neck**

Abstract Presenter  
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Patients that undergo skin cancer excision in the head and neck region can present significant reconstructive challenges. These patients often have multiple comorbidities, complicating the use of general anesthetic procedures and complex reconstruction. High risk skin cancer excision in this area must also provide a reconstruction able to withstand the negative effects of radiotherapy, owing to the need for adjuvant treatment required in certain tumour pathologies.

Biodegradable Temporising Matrix (BTM) is a polyurethane foam matrix that creates a scaffold for dermal regeneration. Although outcomes are well described for use in burns<sup>1</sup> and other complex wounds<sup>2</sup>, there is limited data on its use in head and neck cancer reconstruction.

In addition to the scarcity of evidence regarding the use of BTM for skin cancer reconstruction in this region, there is also very limited evidence as to the effects of radiotherapy on BTM reconstructed wounds, with only a scattering of case reports in the literature.

In our unit, 53 patients underwent BTM reconstruction for head and neck skin cancer defects. In this study, we present a series of 9 patients from this group who had either received adjuvant radiotherapy following their reconstruction or had BTM reconstruction to resurface an excised radio-recurrent lesion.

**Method:** Retrospective analysis of all patients who underwent adjuvant radiotherapy to a BTM reconstructed skin cancer excision in the head and neck area or who were resurfaced with BTM for a radio-recurrent skin cancer at St Helens and Knowsley NHS Trust between May 2021 and April 2023.

**Results:** 9 patients were identified with a mean age of 74, 2 of whom had BTM for radio-recurrent lesions. Tumour pathology was SCC in 7 patients (78%) and BCC in 2 patients (22%). Regions of the head and neck involved were scalp (34%), forehead (22%), orbit (22%) and cheek (22%). The wound base was bone in 7 patients (78%), muscle flap in 1 patient and post-parotidectomy in 1 patient. Second stage split skin graft (SSG) was performed in all primary tumour patients at a mean of 54 days post-BTM. Radiotherapy was completed within a mean of 4.4 months following second stage SSG in the primary tumour population. Breakdown following BTM application was not seen in any patient in either the primary tumour group or the radio-recurrent group with a mean follow-up of 17.5 months (range 5-35 months). 1 patient was excluded from follow-up due to early recurrence and has since died from disease.

**Conclusion:** Reconstruction with BTM appears to be robust even following insult with radiotherapy for this unique group of patients with skin cancer in the head and neck region.

1. Greenwood JE, Bradley J. Schmitt, Marcus J.D. Wagstaff. Experience with a synthetic bilayer Biodegradable Temporising Matrix in significant burn injury. Burns Open, Volume 2, Issue 1, 2018, Pages 17-34
2. Li H, Lim P, Stanley E, et al.. Experience with novosorb biodegradable temporising matrix in reconstruction of complex wounds. ANZ J Surg. 2021;91:1744–1750.

# Quantifying the Impact of Virtual Surgical Planning (VSP) on Time and Clinical Outcomes in Facial Trauma Reconstruction Cases: The EPPOCRATIS Approach

Abstract Presenter

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**Background:** Virtual Surgical Planning (VSP) and three-dimensional Printing (3DP) technologies have changed the landscape of complex craniofacial deformities from congenital, oncologic, and traumatic etiology. Across literature, this technology employed for its superiority in accuracy over the standard practice. Previously, our group has introduced an in-house, patient-centered management of facial fractures with the use of VSP back to normalized anatomy; EPPOCRATIS [1].

**Methods:** Out of more than 163 screened facial trauma patients, A retrospective review of 40 patients who underwent maxillofacial reconstructions after trauma from September 2014 to September 2023 was performed. We matched surgical cases that employed VSP (n=20) with those that did not (n=20). The cases were aligned based on the fracture patterns and complexity (including Naso-orbito-ethmoid [NOE] ± Frontal Sinus Involvement, Isolated Nasal Fractures, Orbital Fractures, Zygomaticomaxillary Complex [ZMC] fractures, Mandibular Fractures, and Pan-facial fractures) to ensure consistency and comparability of operative metrics. Data including age, BMI, comorbidities, fracture complexity, operative time, length of stay, follow-up period, and reported complications were collected. Differences between the groups were analyzed using t-tests and chi-square tests in RStudio (v.4.3). Lastly, we assessed the fracture reduction accuracy by segmenting the pre- and post-operative CT scans in Mimics 3D software (v25.0, Belgium). Seven cases from the VSP group were analyzed by comparing the pre- and the post-operative scans to the planned VSP. The findings were represented in a heatmap analysis to assess the accuracy of execution of the VSP.

**Results:** A total of 40 patients with a mean age of 41.5 years (SD=17.49) were included. Majority were male (80%). The motor-vehicle accidents were directly correlated with moderate to severe fracture pattern and the need of VSP. While the

intra-operative time is less in the VSP group, this difference was not statistically significant (mean = 5.36 hours [SD: 2.67] with VSP, mean = 5.89 hours [SD = 2.67] without VSP, p-value = 0.802). Furthermore, the hospital stay duration was similar (average = 2.97 days for both groups; p-value = 0.665). The average follow-up period for each group was 221.6 days. Preoperatively, the heatmap analysis revealed regions with intense inward (red-hue) and outward (blue-hue) discrepancies, while post-operatively, the bones demonstrated closer alignment and neutralization of the colors towards the normal patient's anatomy. Some complex fractures showed a deviation of 1.2 mm to 3.8 mm from the plan. This deviation remained clinically acceptable, with no reported complications on this studied cohort.

**Conclusion:** Although operative time and lengths of hospital stay didn't show significant difference among the VSP and the control groups. This cohort demonstrated that VSP could effectively achieve precise fracture reduction in complicated facial fractures. The post-operative accuracy underscores the reliability of this technology. Further investigation with larger sample size is still required to comprehensively analyze the benefits of VSP on surgical outcomes and gather patient-reported outcome measures.

[1] Sharaf, B., et al., EPPOCRATIS: Expedited Preoperative Point-of-Care Reduction of Fractures to Normalized Anatomy and Three-Dimensional Printing to Improve Surgical Outcomes. Plastic and Reconstructive Surgery, 2022. 149(3): p. 695-699.

## **Toward Quantification of Facial Neuromuscular Anatomy: Surface Electromyography, Forces, and Movements Associated with Facial Expression**

Abstract Presenter  
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**Purpose:** Plastic surgeons assess facial expression and manipulate the facial neuromuscular system while employing neuromodulators, when performing facial rejuvenation surgeries, and in reconstructing patients after facial paralysis. Despite

significant advances in imaging technologies, clinical changes in facial expression are still qualitatively assessed following surgical and non-surgical intervention. This is at least partly due to a paucity of data regarding normative metrics for the activity of facial muscles [1,2]. We aimed to quantitatively assess dynamic facial neuromuscular anatomy by cataloguing displacements, forces, and surface electromyography (sEMG) patterns associated with standard facial expressions in healthy participants. This pilot study focuses on parameters associated with zygomaticus major activity and lays the groundwork for developing a comprehensive database of facial movement.

**Methods and Materials:** Healthy volunteers were recruited via survey and cross-sectionally studied in a single in-person visit. Volunteers with self-reported disorders of facial movement were excluded. Baseline demographics were collected. Participants were seated with surface electrodes placed overlying their zygomaticus major muscles and wired to an sEMG sensor and processor. A custom platform containing a tension/compression load cell was used to measure forces produced by each participant. Camera phones were used to video-record participants from multiple angles as they performed "regular" and "maximal" volitional smiling, puckering, cheek blowing, and mouth opening exercises. sEMG signals, forces, and three-dimensional surface movements were assessed with each expression. These parameters were catalogued, correlated, and statistically analyzed.

**Results:** 32 participants were cross-sectionally studied (12 M, 20 F). Mean age of volunteers was 30.9 years (SD 10.1), and mean BMI was 24.3 (SD 3.9). As expected, sEMG signal was greatest overlying the zygomaticus major when participants initiated maximum volitional smiling. The sEMG signature for each volitional movement was distinct and could be statistically differentiated from every other expression ( $p < 0.05$ ). Force vector measurements correlated with sEMG signals and were also statistically different for each facial expression ( $p < 0.05$ ), with the greatest forces also produced during maximum volitional smiling (mean 0.93 N, SD 0.46N ). Mean maximum displacement of the oral commissure was 1.0 cm (SD 0.3 cm) with maximum volitional smiling.

**Conclusions:** A database which catalogues and correlates facial sEMG patterns, forces, and movements associated with various facial expressions has several applications. Algorithms can be derived from this data to quantitatively assess the effects of neuromodulators and complications from facial rejuvenation surgeries, monitor results of rehabilitation protocols after facial paralysis, and even to produce novel technologies in the space of facial roboto-prosthetics. Our protocol can be replicated for every facial muscle to create a comprehensive three-dimensional database of facial expression. Our study represents the first sizable contribution to this

database.

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- [2] Schumann NP, Bongers K, Scholle HC, Guntinas-Lichius O. Atlas of voluntary facial muscle activation: Visualization of surface electromyographic activities of facial muscles during mimic exercises. PLoS One. 2021;16(7):e0254932. Published 2021 Jul 19.

## **Primary Furlow Palatoplasty with Buccal Flap Decreases Likelihood of Velopharyngeal Insufficiency in Patients with Cleft Palate**

Abstract Presenter

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**Introduction:** There has been an increase in the use of buccal flaps during primary palatoplasty, however their efficacy in improving surgical outcomes is unknown. We aim to determine if use of buccal flap during primary Furlow palatoplasty in children with cleft lip/palate (CLP) decreases the likelihood of developing velopharyngeal insufficiency (VPI).

**Methods:** Retrospective cohort study of children with CLP who underwent primary palatoplasty between 1999 and 2022 at a single institution were reviewed. Patients < 2 years old at time of surgery, who underwent primary Furlow alone (FA) or Furlow with buccal flap (FB), and had speech-language pathologists (SLP) evaluation to determine presence of VPI were included. Bayesian multivariate logistic regression with a neutral prior was used to determine the posterior probability of VPI development after FB.

**Results:** Sixty patients were included in the study (64% FA vs 36% FB). Median age of patient at surgery was 12.6 months. Median age of SLP assessment was 4.6 years (range 3.8 – 6.1 years). There was no significant difference in baseline characteristics between those who did and did not develop VPI, except for Veau class (VPI higher with

class 4,  $p = 0.045$ ). Fistula rate was higher in patients who developed VPI (3 vs 1,  $p = 0.01$ ). Ten percent of FB developed VPI versus 26% of FA ( $p = 0.125$ ). After adjusting for Veau class, buccal flaps were found to have an OR of 0.42 (95% CI 0.12–1.36) in VPI development, with a 93% likelihood of decreasing the odds of VPI.

**Conclusion:** Performing buccal flap during primary Furlow palatoplasty for CLP patients has a 93% likelihood of decreasing the odds of VPI. Expansion of this database as new SLP evaluations become available is needed to further elucidate the beneficial therapeutic effects of buccal flap for preventing VPI in this heterogeneous patient population.

## **Machine Learning for Automatic Detection of Velopharyngeal Dysfunction: A Preliminary Report**

Abstract Presenter  
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Even after palatoplasty, the incidence of velopharyngeal dysfunction (VPD) can reach 30%; however, these estimates arise from high-income countries (HICs) where speech-language pathologists (SLP) are part of standardized cleft teams. The VPD burden in low- and middle-income countries (LMICs) is unknown. This study aims to develop a machine learning model that can detect the presence of VPD using audio samples alone.

Case and control audio samples were obtained institutional and publicly available sources. A machine learning model was built using Python software.

The initial 110 audio samples used to test and train the model were re-tested after format conversion and file deidentification. Each sample was tested 5 times yielding a precision of 100%. Sensitivity was 92.73% (95% CI 82.41%-97.98%) and specificity was

98.18% (95% CI 90.28%-99.95%). One-hundred and thirteen prospective samples, which had not yet interacted with the model, were then tested. Precision was again 100% with a sensitivity of 88.89% (95% CI 78.44%-95.41%) and a specificity of 66% (95% CI 51.23%-78.79%).

VPD affects nearly 100% of patients with unrepaired overt soft palatal clefts and up to 30% of patients who have undergone palatoplasty. VPD can render patients unintelligible, thereby accruing significant psychosocial morbidity. The true burden of VPD in LMICs is unknown, and likely exceeds estimates from HICs. The ability to access a phone-based screening machine learning model could expand access to diagnostic, and potentially therapeutic modalities for an innumerable amount of patients world-wide who suffer from VPD.

## **Follow the Yellow Brick Road: Novel Use of VSP for Endoscopic Suturectomy for Treatment of Coronal Synostosis**

Abstract Presenter

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**Background:** While current literature describes the utility of virtual surgical planning (VSP) in the treatment of open cranial vault reconstruction for craniosynostosis, there is a paucity of studies on its use in endoscopic repair. Well-known advantages to endoscopic repair over open cranial vault reconstruction include a shorter operative and anesthesia time, less blood loss, and shorter hospital stay. However, the endoscopic approach for unicoronal synostosis presents additional challenges including difficulty in identification of anatomic end points particularly distally at the skull base, a smooth cortical appearance of the skull as opposed to a frank ridge due to suture fusion, and the non-linear course of the craniectomy. Given that these factors can predispose to incomplete or inaccurate craniectomy when performing an endoscopic case, we devised a novel system to optimize neo-suture placement using VSP in this case series of patients with coronal craniosynostosis.

**Methods:** 8 patients were retrospectively reviewed following endoscopic guided suturectomy for coronal craniosynostosis. For each of these patients a novel VSP



system was used to create soft tissue and bone-registered guides which were then combined into a surface marking guide. This surface marking guide then facilitated pre-operative tattooing of the fused suture line along the periosteum using methylene blue. After obtaining access to the skull, the surgeon can follow the tattooing of the periosteum of the fused suture or "yellow brick road," and verify ideal craniectomy width and length. An additional intraoperative verification guide can then be used to validate complete craniectomy.

**Results:** Of the 8 patients, 5 were female and 3 were male. 2 of the patients were syndromic cases. 4 of the patients had bilateral coronal craniosynostosis, while 4 had unilateral craniosynostosis. Average age at the time of operation was 2.4 +/- 1 months. Average operative time for the unilateral cases was 63 +/- 17 minutes and for the bilateral cases was 78 +/- 26 minutes. Average postoperative day at discharge was 1.5 +/- 1 days. Post-operative CTs were not obtained as there were no post-operative concerns and they are not part of the standardized postoperative pathway for these patients. During the cases, complete and accurate craniectomy was verified through utilization of the surface marking guide and by following the methylene blue tattoo markings of the periosteum along the fused sutured line.

**Conclusion:** Successful suturectomy requires detailed knowledge of sutural anatomy and soft tissue interface with the skull base. With the use of VSP there is decreased reliance on intraoperative assessment in predicting both aesthetic and functional outcomes. In this case series of patients with coronal synostosis, we propose the use of a novel VSP system whose advantages include increased fidelity of neo-suture placement, idealized placement and decreased size of the access incision, restriction of neo-suture width to preserve non-fused bone, and minimized risk of collateral anatomic damage such as the sphenoid wing and lateral orbit.

## **Cranial Changes Following the Melbourne Technique for Sagittal Craniosynostosis**

Abstract Presenter  
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**Purpose:** The Melbourne technique for total cranial vault remodeling aims to address all aspects of the scaphocephaly head shape in patients with sagittal craniosynostosis. These features include excessive cephalic length, anterior vertex position, frontal bossing, vertex narrowing, and occipital bulleting. This study aimed to determine the progressive cranial changes that occur over time following the Melbourne technique for total cranial vault remodeling in sagittal craniosynostosis.

**Methods:** A retrospective review of 3D images of 25 patients with sagittal craniosynostosis treated with the Melbourne technique for cranial vault remodeling was performed. Images were collected pre-operatively, three weeks, three months, one year, and two years post-operatively. Head circumference, cephalic index, frontal bossing index, occipital bulleting index vertex narrowing index, and vertex-nasion-opisthocranium angle (a measure of vertex positioning) were evaluated. 3D composite cranial heat maps were created.

**Results:** Head circumference significantly increased post-operatively ( $p < 0.001$ ), followed by progressive growth across time points. The cephalic index also significantly increased post-operatively ( $p = 0.04$ ) with a subsequent relapse at three months followed by progressively increased growth. The frontal bossing index significantly decreased post-operatively ( $p = 0.02$ ) with a progressive decrease over time. The frontal bossing improved from the 97th percentile to the 75th percentile at two years of age. The occipital bullet index had a relative decrease post-operatively with relapse at three months, followed by a progressive decrease across remaining time points. The occipital bulleting improved from the 84th percentile to the 70th percentile at two years of age. The vertex narrowing index significantly decreased post-operatively ( $p < 0.001$ ), followed by a plateau and slight relapse over time. The vertex narrowing improved from the 98th percentile to the 86th percentile for vertex narrowing at two years of age. The vertex-nasion-opisthocranium angle showed a relative decrease over time with a significant decrease by one year of age ( $p = 0.002$ ).

**Conclusions:** The Melbourne technique for correction of scaphocephaly demonstrated improvement in the cephalic index, frontal bossing, vertex narrowing, occipital bulleting, and vertex positioning at two years of age. Cephalic index and occipital bulleting showed slight relapse at three months, followed by progressive improvement over time.

## **LeFort I Advancement with RED Halo Distraction in Growing Children With Cleft: Long Term Outcomes And Need For Additional Advancement Surgery**

Abstract Presenter

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**Introduction:** LeFort I advancement with rigid internal fixation at the time of facial maturity is the traditional method used to treat maxillary hypoplasia in children with cleft lip and palate. Early LeFort I advancement prior to the time of facial maturity is controversial due to the risk of "outgrowing" the initial advancement and the need for a second advancement surgery when the child is done growing. However, there is very little in the literature that looks at long-term outcomes of early LeFort I advancement in children with cleft lip and palate. Early LeFort I advancement with Rigid External Distractor (RED) Halo, has been used at our institution for the past two decades in children with cleft lip and palate with significant maxillary hypoplasia between the ages of 9 and 14 with good success. We aim to show this is a safe and effective treatment to address significant maxillary hypoplasia in the cleft population prior to the time of facial maturity.

**Method:** A retrospective analysis of all syndromic and non-syndromic cleft lip and palate patients who underwent a Lefort procedure was conducted from 2011 to 2023 at our institution. All patients who are currently at least 15 years old, and who underwent Lefort advancement with RED Halo before the age of 15 were included. The primary outcome of interest was the number of revision Lefort procedures performed.

**Results:** A total of 145 patients had a Lefort advancement with RED Halo placed while they were still growing; before facial maturity was reached at the age of 15. This cohort had an average follow-up of 9 years. The mean age at the initial surgery was 11, with a

range of 6.3-14.9. 9.7% of these patients (14/ 145) subsequently had a repeat Lefort surgery. These 14 patients had their initial surgery at a mean age of 10 (range of 7.6-13.9), and their second revision surgery at a mean age of 15.6 (range of 9.1-19.7).

**Conclusion:** Lefort I advancement with RED Halo prior to the time of facial maturity, with overcorrection to account for additional mandibular growth, is a safe and effective way to correct significant maxillary hypoplasia in children with cleft lip and palate. To maintain the lowest risk for revision, surgical intervention should be performed after 11 years of age.

## **Evaluating the Diagnostic Efficacy of CT Angiography Versus Maxillofacial CT for the Detection of Facial Fractures**

Abstract Presenter  
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**Background:** Facial fractures are responsible for approximately 407,000 emergency department visits per year in the United States. The evaluation of bony facial trauma is frequently supplemented with imaging, and maxillofacial computed tomography (CT) is considered to be the gold standard. However, facial trauma patients often incur concomitant injuries that necessitate additional evaluations by a multi-disciplinary team. For example, traumatologists often utilize CT angiography (CTA) to screen for cerebrovascular injury. The decision to order CTA is typically based on the Denver Criteria. While the Denver Criteria was described over twenty years ago, a study in 2022 demonstrated that 16% of patients with blunt cerebrovascular trauma had none of

the risk factors described in the Denver Criteria and advocated for CTA screening in any patient undergoing CT of the cervical spine. The purpose of this study was to investigate if CTA is sufficient to evaluate bony facial trauma without maxillofacial CT to reduce patient exposure to radiation, improve resource management, and decrease unnecessary costs.

**Materials & Methods:** This was a retrospective study at a single academic institution with level one adult and pediatric trauma centers. Patients who received both CTA and maxillofacial CT between October 2018 and October 2023 were included. The radiology reports for each scan were evaluated. Patients were excluded if the attending radiologist did not complete a dedicated evaluation for osseous facial trauma on either CTA or maxillofacial CT. Facial fractures from each scan were abstracted. The accuracy of CTA was compared against maxillofacial CT, and we calculated the sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) of CTA. McNemar's test was used to evaluate if there was a diagnostic difference between CTA and maxillofacial CT. Wilson 95% confidence intervals (CI) were calculated and an alpha of 0.05 was used to determine statistical significance.

**Results:** 113 patients were reviewed, and 30 patients were included, corresponding to 1,350 bones which were evaluated for fractures. The mean patient age was 48.8 (standard deviation = 18.9) years old. The accuracy of CTA was 96.9% (CI 95.8-97.7%) (n = 1,308/1,350). The sensitivity was 53.1% (CI 41.1-64.8%) and specificity was 99.0% (CI 98.4-99.5%). Simultaneously the NPV was 97.7% (CI 96.7-98.4%) and the PPV was 73.9% (CI 59.7-84.4%). Comparing the diagnostic differences between CTA and maxillofacial CT with McNemar's test demonstrated a p-value of 0.008. The most common fractures that CTA missed were nasal bone fractures (n = 4, 13.3%). No missed fracture required operative repair.

**Conclusion:** Our results confirm that maxillofacial CT is superior to CTA in correctly identifying facial fractures, as demonstrated by McNemar's test. However, our study suggests that CTA may mitigate the need for dedicated maxillofacial CT in patients who have already undergone CTA. While the sensitivity of CTA compared to maxillofacial CT was 53.1% (CI 41.1-64.8%), the fractures that were most commonly missed were nasal bone fractures and none of the missed fractures required operative intervention. Therefore, it appears as though CTA is sufficient to detect clinically significant facial fractures.

# **Expanding Soft Tissue and Mucosal Coverage with Osteocutaneous Free Fibula Flaps with The Lateral Soleus Artery Perforator Flap: Retrospective Clinical Study and Systematic Review**

Abstract Presenter

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**Background:** The free fibula osteomyocutaneous flap has historically been the workhorse flap for mandibular defects. The tenuous reliability of the skin paddle supplied by the septocutaneous perforators in addition to a limited arc of rotation are well-documented.

Previous studies note the possibility of a second skin paddle based on soleus musculocutaneous perforators (lateral sural artery perforator, LSAP flaps) in cases of skin paddle compromise or those without peroneal perforators. In our experience, these LSAP vessels provide a reliable option for multiple skin paddles in cases of extensive soft tissue resection. We present our cohort of patients receiving chimeric flaps for extensive head and neck defect reconstruction based on both traditional peroneal septocutaneous and lateral sural artery perforators. Systematic review of the anatomy was performed.

**Methods:** Retrospective review was performed on patients receiving chimeric fibula osteocutaneous and LSAP fasciocutaneous flaps. Musculocutaneous perforator prevalence and location were documented. The main pedicle for perforators was documented. Systematic review was performed in accordance with PRISMA guidelines.

**Results:** Nineteen cases were assessed. Each case employed 2 skin paddles with an average of 2.2 perforators for each LSAP flap. In 15 cases, the lateral sural vessel emerged from the peroneal artery (78.9%). Four cases had aberrant anatomy with the lateral sural vessel emerging from the common tibioperoneal trunk requiring a second microanastomosis. Two fibula flaps were lost but there were no major nor minor complications with the LSAP skin paddles.

**Conclusion:** In extensive soft tissue resection, the septocutaneous peroneal paddle is used to reconstruct the alveolar ridge and the improved arc of rotation with the LSAP paddle is used for larger defects extending beyond this ridge. Most often, this second skin paddle/soft tissue can be recruited from the lateral soleus artery branching from the

peroneal vessel supplying the fibula flap. When these perforators have an aberrant origin, a second microanastomosis will need to be performed.

## **For Pierre Robin Sequence, Prenatal Diagnosis and Counseling Offer Superior Family Psychosocial Indicators Compared to 'Birthday Surprise'**

Abstract Presenter

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**Background:** Prenatal 3D and 4D ultrasound provide impressive anatomic detail which aid in craniofacial diagnosis. When micrognathia is detected in utero (suggestive of Pierre Robin

Sequence) opportunities of prenatal counseling may provide important information for families. However, the psychosocial implications have not been well studied.

**Methods:** Perinatal newborns diagnosed with Pierre Robin Sequence were grouped into 1) those diagnosed prenatally via ultrasound screening and had extensive multidisciplinary counseling; and 2) those not diagnosed prenatally ('birthday- surprise') (n=34). The two groups were also subdivided into isolated Pierre Robin Sequence (PRS), PRS-Plus (additional anomalies), or PRS syndromic. PROMIS (Patient-Reported Outcomes Measurement Information System) surveys given at 6 weeks after birth were used to compare psychosocial scores from families of these 2 groups.

**Results:** PRS families diagnosed prenatally were counseled in critical airway protocols, PRS treatment algorithm work-ups, feeding, and surgical options; and compared to families with no prenatal diagnosis and no prenatal counseling. The prenatal diagnosed families who received counseling had less anxiety (32%±3 to 72%±5), less depression (34%±4 to 71%±5), and less feelings of social isolation (20%±2 to 69%±4). When the groups were subdivided and compared, this difference in prenatally diagnosed and diagnosed at birth was more profound with PRS-Plus and PRS syndromic families: less anxiety (27%±3 to 89%±5), less depression (36%±4 to 90%±5), and less feelings of social isolation

(24%±2 to 87%±4).

**Conclusions:** Prenatal imaging diagnosis coupled with prenatal counseling offer improved psychosocial indicators for families of newborns with Pierre Robin Sequence.

### **Spring-Mediated Cranioplasty in Sagittal Synostosis: Does it contribute to premature closure of the coronal suture?**

Abstract Presenter

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**Background:** Spring-mediated cranioplasty (SMC) is widely used in treatment of sagittal synostosis, and there are numerous publications evaluating the various factors impacting clinical outcomes, but none describing the possible association of secondary synostosis. The aim of this study is to evaluate the early post operative course of patients who underwent SMC and determine incidence of secondary synostosis, specifically unicoronal synostosis (UCS).

**Methods:** Patients undergoing SMC for non-syndromic sagittal synostosis between January 2021 and December 2023 were included. CT scans obtained preplacement of springs and pre-removal of springs were reviewed. Clinical photographs and measurements were reviewed.

**Results:** A total of ten patients were included. Mean age at time of spring placement was  $4 \pm 1.3$  months. The mean number of springs used was 2. The mean maximum single spring force was 8.7 Newtons and the mean total spring force was  $18 \pm 5.4$  Newtons. Mean cephalic index increased from  $68.5 \pm 3.4$  preoperatively to  $77.8 \pm 3.8$  postoperatively. Springs were removed at a mean interval of 4 months. Three of the ten patients (30%) were documented to have left unicoronal synostosis on pre-removal CT scan. Two of the three patients with UCS underwent suturectomy at time of spring removal.



**Conclusions:** In our cohort of non-syndromic sagittal synostosis treated with SMC, 30% of patients was found to have UCS in the early postoperative period on CT imaging. This has not been previously described in the literature and deserves further evaluation to determine role of SMC as it relates to timing and location of spring placement and spring force.

## **Analyzing the Relationship Between Health-Related Quality of Life Measures in Pediatric Craniofacial Conditions: Difference in Metrics Across Diagnoses**

Abstract Presenter

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**Introduction:** Children affected by Craniofacial Conditions (CFCs) or facial traumatic injuries are faced with a plethora of complex challenges that extend beyond the burden of care associated with their diagnosis. This is particularly applicable to patients' psychological and emotional wellbeing, specifically in relation to their social functioning amongst peers and family members. This study aims to analyze the differences between diagnoses on patient CFC-QOL subscale scores and additional psychosocial assessments.

**Methods:** Children (ages 8-21 years) with CFCs recruited by the craniofacial care team at a major urban children's hospital completed the Craniofacial Conditions Quality of Life Scale (CFC-QoL), including subscales assessing child physical functioning and psychological QoL. Subscales that were included as part of the analysis include: Bullying, Peer Problems, Psychological Impact, Appearance Satisfaction, Desire for Appearance Change, Family Support, and Physical Functioning (scale of 1-5, with

higher score indicating worse QoL). Children also completed the Surgical Satisfaction Scale, a study team-developed tool with the following subscales: Satisfaction with Surgical Outcome, Surgical Recovery, Perception of Surgical Experience, Effects of Surgery on Others. Additional surveys included the Patient Health Questionnaire-4, PROMIS surveys on Peer Relationships, Stigma, and Meaning and Purpose, and the PedsQL Quality of Life Inventory. One-way ANOVAs and post-hoc Tukey tests assessed score differences for all assessments, including subscales, between the different diagnosis groups.

**Results:** A total of 105 patients completed the survey assessment. Patient language was primarily English (92.9%) with mean age of 13.8 (ranging from 8.1 to 21.1). The distribution of diagnoses across our patient population was as follow: 50 (47.6%) patients with Cleft lip or palate, 9 (8.6%) patients with craniosynostosis, 16 (15.2%) patients with FAV, 19 (18.1%) patients with facial trauma, and 11 (10.5%) patients with a dermatologic condition. On the CFC-QoL, patients had the worst mean scores on the Desire for Appearance Change subscale ( $M = 2.6$ ,  $SD = 1.2$ ) and the best mean scores on the Family Support subscale ( $M = 1.6$ ,  $SD = 0.8$ ). ANOVA analyses showed no significant differences between diagnosis groups on all assessments.

**Discussion:** Our results demonstrate that QoL, general functioning, and psychological symptoms were comparable across diagnoses. Findings suggest that different diagnostic groups share similar psychosocial experiences and burden of CFCs. These findings are encouraging for a psychosocial intervention that focuses on improving QoL in patients with CFCs.

## **Mandible Fracture Outcome Disparities in the Incarcerated Patient Population**

Abstract Presenter  
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Abstract Co-Author(s)  
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Paschalia Mountziaris MD, PhD

**Introduction:** Inmates represent a vulnerable healthcare population within the United States, with inconsistent access to surgical specialty care [1,2]. Facial fractures are common among the incarcerated population, comprising approximately 14% of all traumatic injuries [3,4]. However, few studies have evaluated facial fracture outcomes in this population. The aim of this study is to identify disparities in mandible fracture outcomes in the incarcerated population.

**Methods:** A retrospective review of all traumatic mandible fractures at a single academic medical center from 2018 to 2023 was conducted. Mandible fractures were treated by either the plastic surgery, otolaryngology, or oral and maxillofacial surgery services. Outcome measures such as rates of persistent malocclusion, motor deficits, surgical site infection, reoperation, and readmission were compared between inmate and civilian subgroups.

**Results:** 205 patients (mean age 33.07, 81.46% male) who were treated for traumatic mandible fracture were included. 11.71% (n=24) were inmates, while 88.29% (n=181) were civilians. The mean time to operative intervention was 10.21 days in the incarcerated group and 4.35 days in the civilian group ( $p < 0.05$ ). Persistent subjective malocclusion after surgery was noted in 20.83% (n=5) of incarcerated patients and 7.18% (n=13) of civilian patients ( $p < 0.05$ ). There were no significant differences in rates of surgical site infection, reoperation, persistent motor deficits, or readmissions within 30 days.

**Conclusion:** Incarcerated patients with traumatic mandible fractures have increased time to operative intervention and increased rates of subjective malocclusion post-operatively. Increased time to operative intervention may reflect barriers in access to specialty surgical care, which could adversely affect patient outcomes.

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## **Lymphovenous Bypass for Head Neck Lymphedema: A Preliminary Clinical Study**

Abstract Presenter

Ying-Sheng Lin MD

**Introduction:** Head and neck lymphedema (HNL), including external and internal types, could be a possible consequence for patients who have received neck dissection and radiotherapy for head and neck cancer. Initially, the common presentations are heaviness or tightness, followed by swelling in appearance, or difficulty speaking and swallowing in internal edema cases. Lymphovenous anastomosis (LVA) is an established approach to treat extremity lymphedema. We hereby present our preliminary experience in using LVA to treat HNL.

**Patients and Methods:** Between March 2021 to January 2024, six patients with HNL were treated with LVA, which was performed via a preauricular or submandibular incision of the obstructed side. Lymphedema Symptom Intensity and Distress surveys – Head and Neck (LSIDS-H&N) were used for evaluation. In addition, for the external type, MD Anderson Cancer Center Head and Neck Lymphedema (MDACC HNL) rating scale was used for evaluation. For the internal type, Swallowing Quality of Life (SWAL-QOL) was used for evaluation.

**Results:** With an average follow-up period of  $15.4 \pm 15.9$  months, LSIDS-H&N improved from  $1.11 \pm 0.54$  to  $0.44 \pm 0.66$  ( $p = 0.02$ ). For patients with external type, within an average follow-up period of  $15 \pm 16.1$  months, the MDACC HNL rating scale improved from level 2 to 0 or 1a ( $p = 0.008$ ). For patients with internal type, within an average follow-up period of  $21 \pm 17.3$  months, SWAL-QOL improved from  $130.5 \pm 9.2$  to  $151 \pm 19.8$  ( $p = 0.5$ ).

**Conclusion:** Based on our preliminary results, LVA could be a potential solution to both external and internal HNL.

## **Long-Term Outcomes and Early Lessons Learned of Polyethylene (Medpor) versus Autologous Ear Reconstruction at the Children's Hospital of Philadelphia**

Abstract Presenter

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**Background:** Pediatric microtia is the most severe type of auricular malformation and presents as a spectrum of forms, all which pose a unique challenge for surgeons who are faced with choosing the optimal technique. Surgical techniques have evolved in the last 8 years to encompass both autologous and porous high-density polyethylene constructs. In this study, we examine our institution's early experience and evolution of technique with Medpor. We report our long-term outcomes of patients undergoing ear reconstruction with Medpor implant versus autologous rib cartilage.

**Methods:** A retrospective review was performed of all children who underwent ear reconstruction for congenital microtia from 2008 to 2023 at the Children's Hospital of Philadelphia. Auricles that were reconstructed with a Medpor implant were compared to those with autologous costal cartilage. Postoperative complications were graded using a modified Clavien-Dindo scale. Postoperative lateral and frontal photographs were assessed for ear definition, projection, size, and overall appearance in immediate (6 months to 1 year) and late (1 to 5 years) postoperative periods.

**Results:** One hundred patients were included, of whom 72 (72%) were male. Among the cohort, 105 ears were reconstructed, with 48 (45.7%) using a Medpor implant and 57 (54.3%) utilizing autologous costal cartilage. Mean age at surgery was  $7.3 \pm 2.3$  years in the Medpor cohort and  $9.2 \pm 1.9$  years in the autologous cohort ( $p < .001$ ). Mean postoperative follow-up was  $2.5 \pm 1.9$  and  $4.0 \pm 3.4$  years, respectively. Twenty-four (50%) and 24 (42.1%) patients experienced any complication in the Medpor and autologous cohorts, respectively ( $p = .419$ ). Medpor-reconstructed ears were more likely

to experience a higher-grade complication ( $3.6 \pm 0.8$  versus  $3.0 \pm 1.2$ ,  $p=.041$ ). Long-term aesthetic outcome data are currently being tabulated.

**Conclusion:** Incorporating any novel innovation into practice is often accompanied by a learning curve followed by an evolution of technique. Our institution wished to report our early experience, lessons learned, and long-term follow up of our Medpor compared with autologous ear reconstructions after the first 7 years of adoption. Medpor facilitates an earlier reconstruction with minimal donor site morbidity in comparison to the autologous costal cartilage technique. While both techniques are associated with a high rate of complications, Medpor-reconstructed ears were more likely to be associated with higher-grade complications requiring surgical intervention. In our experience, the Medpor framework provides a more consistent aesthetic result with improved ear projection and definition, while autologous results vary depending on individual surgeon and level of experience. Additional data will provide insight on aesthetic outcomes of both modalities. The risk-benefit ratio of each surgical modality should be considered.

## **Gender Affirmation**

### **Assessing the Readability, Content Quality, and Technical Quality of Online Patient Education Materials Related to Gender Affirming Surgery**

Abstract Presenter  
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**Purpose:** Patients increasingly access online resources for information about various treatment modalities, including Gender Affirming Surgery (GAS) patient populations. The present study intends to provide a readability, content quality, and technical quality assessment of online patient educational materials (OPEM) related to GAS.

**Materials and Methods:** An online search using 12 key search phrases "gender affirming surgery", "feminizing top surgery", "masculinizing top surgery", "bottom surgery", "phalloplasty", "vaginoplasty", "gender reassignment surgery", "gender confirmation surgery", "facial feminization", "facial masculinization", "sex reassignment surgery", and "tracheal shave" was performed. Previous user data was disabled to prevent bias from prior search history. The first 20 unique search results for each search term were screened and further assessed if identified as an OPEM. The readability of the online material was assessed with validated readability formulas. The content quality was assessed with DISCERN (comprised of 16 questions, each rated on a scale of 1-5) and JAMA benchmark criteria (scale of 0-4 with assessed components: authorship, attribution, disclosure, and currency). Technical quality of the collected websites was assessed using WebsiteGrader. Other characteristics including mention of World Professional Association for Transgender Health (WPATH) guidelines and discussion of insurance coverage were recorded. Statistical analyses included ANOVA, Chi-Squared tests, and T-tests across website type.

**Results:** Overall, 231 OPEM were identified (Academic/Hospital: 124, Private Practice: 47, Online Health Reference: 43, Other: 17). Across website types, there was no significant difference in readability consensus grade level. The average consensus grade level across analyzed websites was 12.7 which was found to be significantly higher than the NIH-recommended sixth grade level ( $p < 0.001$ ). With regards to content quality, the average DISCERN score was 40.5 for academic/hospital website types, 44.3 for online health reference websites, and 34.7 for private practice websites. Both online health reference websites and academic/hospital websites had significantly higher DISCERN scores than private practice websites ( $p < 0.05$ ). The JAMA Benchmark Criteria was analyzed across website types and average scores were 0.69 for academic/hospital, 2.01 for online health reference websites, and 0.15 for private practice websites. Private practice websites had significantly lower JAMA scores than academic/hospital websites ( $p = 0.009$ ) and online health reference websites ( $p < 0.001$ ).

The average technical quality score was 66.0 for academic/hospital websites, 68.1 for online health reference websites, and 72.5 for private practice websites. Pairwise comparisons found that private practices had a significantly higher technical quality score than academic/hospital websites ( $p < 0.001$ ) and online health reference websites ( $p = 0.023$ ). Academic/hospital websites mentioned WPATH guidelines at a significantly higher rate than online health reference (46% vs 19%,  $p = 0.017$ ) and private practice websites (46% vs 21%,  $p = 0.027$ ).

**Conclusions:** A significant discrepancy in readability was identified between analyzed

websites and the NIH recommendation of a 6th grade level. Significant variability was found in content and technical quality based on website type with private practice websites having lower content quality but higher technical quality. It is crucial for OPEM to be accessible and of appropriate quality for patients seeking information about GAS as overly complicated or low quality information can serve as a hindrance to patients making informed healthcare decisions.

## **The Impact of Facial Feminization Surgery on Appearance Satisfaction and Gender Dysphoria: A GENDER-Q and GPSQ Study**

Abstract Presenter

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**Purpose:** This study investigates facial satisfaction, gender dysphoria and their associated correlation in transgender patients before and after receiving feminizing gender-affirming surgery (FFS).

**Methods:** Our institution participates in an international initiative to field-test the GENDER-Q survey, a novel instrument designed to measure the outcomes of gender-affirming care. In conjunction with the GENDER-Q, we utilized the Gender Preoccupation and Stability Questionnaire (GPSQ) to evaluate gender dysphoria. We collected data from patients both preoperatively and at a minimum of 6 months post-operatively. We compared the overall GPSQ score and GENDER-Q item responses using both unpaired and paired t-tests. Furthermore, Spearman's correlation coefficients to assess the relationship between individual GENDER-Q items and GPSQ scores were calculated.

**Results:** Survey data from 35 transgender patients are included, with 8 patients providing data both pre- and postoperatively, resulting in 29 preoperative and 14 postoperative surveys. The mean follow-up time was 6.5 months (SD=1.5). All patients



received FFS procedures in their upper, middle and lower face. The average age of patients was 33.0 years (SD= 8.2).

Unpaired analysis of the Gender Q for overall satisfaction showed significantly higher values post-operatively than pre-operatively for all parts of the face. The highest pre and post-operative difference in mean Likert scores (out of a maximum of 6) was observed for upper face by 2.6 points ( $p<0.001$ ) and the lowest for cheeks by 1.12 ( $p=0.02$ ).

This trend held for paired analysis with significant differences between pre and post-operative satisfaction scores; with largest and smallest pre and post-operative mean of differences belonging to upper face (2.8,  $p<0.001$ ) and cheeks (0.11,  $p=0.85$ ), respectively.

GPSQ scores (out of a maximum of 56) were significantly lower, indicating improved gender dysphoria, with both paired and unpaired comparisons showing a decrease of 7.12 points ( $p<0.05$ ). The negative correlation between gender dysphoria interference with mental health and postoperative satisfaction was strongest for the upper face ( $r=-0.63$ ,  $p=0.02$ ) and eyebrows ( $r=-0.66$ ,  $p=0.01$ ).

While age did not significantly correlate with pre- and post-operative facial satisfaction scores individually, it was positively correlated with an increase in eyebrow ( $r=0.77$ ,  $p=0.03$ ) and nose ( $r=0.84$ ,  $p=0.01$ ) scores after FFS.

**Conclusion:** The findings of this study underscore a significant enhancement in facial satisfaction and a concomitant reduction in gender dysphoria among transgender patients, post-facial feminization surgery. Notably, satisfaction with the upper face and eyebrows was closely linked to improvements in gender dysphoria, aligning with existing literature that emphasizes the importance of these features in perceptions of femininity. These results endorse the implementation of a comprehensive outcomes evaluation framework for facial feminization procedures and underscore the aesthetic and psychological benefits conferred by these surgeries to the transgender community.

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## **Predictors of Postoperative Dilation Difficulty in Gender-Affirming Vaginoplasty Patients**

Abstract Presenter

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**Introduction:** A necessary component of postoperative care in gender-affirming vaginoplasty is consistent dilation of the neovaginal canal. The process of dilation is time-consuming and requires significant patient instruction and understanding. Patients can experience pain and difficulty with dilation, decreasing compliance and causing distress. This, in turn, can cause inconsistent dilation, leading to partial or complete closure of the neovaginal canal, and necessitate revisional surgery. This study sought to evaluate many patient and intraoperative factors that may contribute to dilation difficulty in patients, from social determinants of health indicators to operative characteristics.

**Methods:** After approval from the Institutional Review Board at the Icahn School of Medicine, a retrospective review of patients undergoing gender-affirming vaginoplasty between January 2016 and December 2021 at The Mount Sinai Center for Transgender Medicine and Surgery was carried out. Demographics, comorbidities, preoperative genital characteristics, intraoperative details, postoperative complications, and follow up information was collected. National and state Area Deprivation Index (ADI) scores, reclassified by quintiles, were collected for each patient. ADI represents a multifaceted evaluation of a region's socioeconomic conditions, which have been linked to health outcomes. The primary outcome was the presence of consistent dilation difficulty reported during follow-up clinic visits for any reason, including discomfort, pain, or understanding of instructions. Pearson's Chi Square and Fisher's Exact Tests were used for categorical values, and Student's T-tests were carried out for continuous variables. Multiple logistic regression was carried out to identify significant predictors of dilation difficulty. Statistical significance was set at  $p < 0.05$ .

**Results:** Four hundred twenty-seven (427) patients were included in the study, 325 (72.7%) patients had no dilation difficulty, and 98 (22.9%) had dilation difficulty. Mean

follow-up time was 12.3 months. On univariate analysis, Medicare insurance status ( $p<0.001$ ), unemployment ( $p=0.007$ ), any psychiatric diagnosis besides gender dysphoria ( $p=0.049$ ), longer preoperative penile length ( $p=0.041$ ), prior pelvic surgery ( $p=0.035$ ), peritoneal vaginoplasty ( $p<0.001$ ), longer operative time (0.023), and any unplanned readmission ( $p=0.004$ ) were associated with postoperative dilation difficulty. Follow-up time was significantly longer in the dilation difficulty cohort ( $p<0.001$ ), and significantly more patients with dilation difficulty required revision surgery ( $p<0.001$ ). Multiple logistic regression revealed higher odds of dilation difficulty in patients with Medicare (OR 6.35, CI 1.55-26.07,  $P=0.010$ ), in the fourth quintile of state-level ADI (OR 4.56, CI 1.30-15.98,  $p=0.018$ ), with a history of keloids (OR 4.59, CI 1.42-14.85,  $p=0.01$ ), with any non-gender dysphoria psychiatric diagnosis (OR 2.0, CI 1.11-3.58,  $p=0.021$ ), and who received a peritoneal vaginoplasty (OR 5.01, CI 1.68-14.95,  $p=0.004$ ). Lower odds of dilation difficulty were associated with patients in the second quintile of national-level ADI (0.356, 0.138-0.918,  $p=0.033$ ), and in employed patients (OR 0.443, CI 0.221-0.930,  $p=0.031$ ).

**Conclusions:** This is one of the first studies to examine the impact of sociodemographic, preoperative, and intraoperative factors on postoperative dilation difficulty in a large cohort of gender-affirming vaginoplasty patients. The risk of dilation difficulty may be associated with multiple aspects of the care spectrum, including social factors, psychiatric comorbidity, and operative technique. Understanding these risks are crucial for early intervention and ensuring patient postoperative dilation success.

### **Three-Dimensional Assessment of Orbital Contours and Their Significance in Forehead Feminization**

Abstract Presenter  
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**Purpose:** Superolateral orbit reshaping, aimed at reducing the prominence and softening of the superolateral orbital rim, is integral to forehead feminization surgery. However, there is limited literature providing objective anatomical evidence on the sexual dimorphism of orbital features. This study aimed to investigate orbital characteristics between cis-males and females and their implications for forehead feminization.

**Methods:** An IRB-approved retrospective review of maxillofacial CT scans was conducted on ethnicity- and age-matched groups of cis-male and female patients (2003-2022). Patients were excluded if they had prior sinus surgery, facial skeletal fracture, or craniofacial abnormalities. Three-dimensional reconstruction of the skulls was performed and processed using Mimics and 3-matic software. Data collected included patient sex, age, ethnicity, orbit dimensions, superolateral orbit angle, superolateral orbit rim prominence, and the extent of supraorbital bar protrusion. Inter-orbital and bi-orbital distances were defined as the lengths between right and left dacryons, and between the right and left ectoconchions, respectively. Mann-Whitney test and Pearson correlation were performed to analyze the association between variables.

**Results:** A total of 186 patients (106 males and 80 females) with a mean age of  $51.2 \pm 20.3$  years were included. Compared to the female group, male patients exhibited significantly taller orbits (male:  $35.8 \pm 2.7$  mm, female:  $34.3 \pm 2.2$  mm,  $p=0.0001$ ), wider orbits (male:  $41 \pm 2.4$  mm, female:  $38.8 \pm 2.2$  mm,  $p<0.0001$ ), longer bi-orbital distances (male:  $100.8 \pm 4.5$  mm, female:  $95.2 \pm 7.9$  mm,  $p<0.0001$ ), a more prominent superolateral orbit rim (male:  $14 \pm 1.9$  mm, female:  $11.1 \pm 1.5$  mm,  $p<0.0001$ ), a narrower superolateral orbit angle (male:  $133.7^\circ \pm 6.7$ , female:  $145.7^\circ \pm 5.1$ ,  $p<0.0001$ ), and greater supraorbital bar protrusion (male:  $3.6 \pm 1.5$  mm, female:  $1.7 \pm 0.8$  mm,  $p<0.0001$ ). However, the ratios of orbital height/width (male:  $0.9 \pm 0.08$ , female:  $0.9 \pm 0.06$ ,  $p=0.28$ ) and inter-orbital distance (male:  $18.7 \pm 3.4$  mm, female:  $19.4 \pm 2.7$  mm,  $p=0.13$ ) were not significantly different between the 2 groups. The prominence of the superolateral orbit rim correlated positively with supraorbital bar protrusion ( $r=0.45$ ,  $p<0.0001$ ), orbital height ( $r=0.22$ ,  $p=0.003$ ), orbital width ( $r=0.37$ ,  $p<0.0001$ ), and bi-orbital distance ( $r=0.42$ ,  $p<0.0001$ ), and correlated negatively with superolateral orbit angle ( $r=-0.56$ ,  $p<0.0001$ ).

**Conclusions:** For effective forehead feminization, prioritize proportional adjustments in superolateral orbit rim prominence, superolateral orbit angle, and supraorbital bar protrusion relative to orbit dimensions, rather than absolute values, to ensure balanced aesthetics, acknowledging size variations between cis-male and female skulls.

## **Along the spectrum from reduction to mastectomy: Comparing the opinions of the transmasculine and gender-diverse community on an algorithmic approach to gender-affirming top surgery**

Abstract Presenter  
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**Background:** Gender diverse patients, including those identifying as non-binary, genderqueer, and genderfluid, may have different preferences for top surgery, often undergoing multiple procedures compared to transgender men (1). There is little discussion in the literature on the options available to these patients that differ from well-described techniques for surgery in binary transgender men. The purpose of our study was to assess the differential experiences, preferences, and needs of transgender men and non-binary individuals, soliciting feedback on a pictorial algorithm to facilitate discussions in surgical decision-making (2).

**Methods:** An IRB-approved survey was distributed through various Reddit gender-based platforms. A total of 799 responses were collected, of which 647 met inclusion criteria for gender diversity. Respondents were grouped by transgender males, non-binary, and others on the transmasculine spectrum. The survey consisted of demographic information, experiences with top surgery care, and an algorithmic questionnaire for top surgery. Group differences were assessed using t-tests and chi-squared tests ( $p < 0.05$  for significance).

**Results:** Non-binary and other transmasculine respondents were significantly more likely to desire "non-standard" chest wall reconstruction ( $p = 0.002$ ), including desiring a breast mound (13.94 and 8.40%) compared to transgender men (2.95%,  $p = 0.006$ ) and the standard approach was selected 15-22% more by transmasculine respondents.

Non-binary and other transmasculine respondents were less likely to desire nipple and areolar complex (NAC) reconstruction, but 10-20% amongst all three groups were "unsure." Non-binary and other transmasculine respondents were more likely to have seen a surgeon ( $p=0.002$ ), feel like they were educating their surgeons on various options ( $p=0.0001$ ) with greater comfort ( $p=0.003$ ). However, their understanding after meeting a surgeon for top surgery was significantly lower compared to transgender men (4.55 and 4.51 vs 4.71,  $p=0.04$ ). Compared to transgender men, non-binary and other gender respondents were older and had higher levels of education ( $p<0.0001$ ).

**Conclusions:** Non-binary and other transmasculine individuals had different preferences and experiences compared to binary transgender men in this survey. In addition to more often desiring a breast mound or foregoing NAC reconstruction, non-binary respondents reported that more often they were educating surgeons on options for aesthetic outcomes. Surgeons performing "standard" top surgery have the requisite technical skills to achieve a spectrum of aesthetic results for non-binary patients. The pictorial algorithm examined in the present study may assist patients and surgeons establish a shared vision for their top surgery outcomes. While most transmasculine individuals across the spectrum prefer a standard top surgery approach, the desire for "non-standard" options was evident across all genders in this survey, indicating that a more open discussion will benefit binary transgender men as well.

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## VTE rate in transgender surgery: Is it safe to continue estrogen?

Abstract Presenter

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**Introduction:** Gender dysphoria is defined as incongruence between expressed and assigned gender. Transfeminine individuals often undergo Gender-Affirming Surgery (GAS) and adopt Estrogen Therapy (ET) for effective gender alignment. Despite the transformative benefits of GAS, a potential increase in risk Venous Thromboembolism (VTE) may be associated with continuation of ET in the peri-operative period. This study aims to assess the rate of venous thromboembolism in GAS patients on ET.

**Methods:** A retrospective review of transgender patients on ET who underwent GAS was conducted between January 1, 2018, and October 1, 2023. Exclusion criteria were defined as patients with thrombophilia or surgeries lasting less than 30 minutes. Demographics were presented using median and interquartile range or mean  $\pm$  standard deviation. Sample normality was assessed using the Shapiro-Wilk test. Independent student T-test and Chi-Squared test were employed when appropriate. A p-value of less than 0.05 was set as statistically significant. All analyses were conducted in R (R Open-Source Software, version 4.1.3). Patients were followed up to eight weeks post-operatively.

**Results:** A total of 195 GAS in 123 transfeminine patients were included (mean age:  $37.06 \pm 14.25$  years). Primary vaginoplasty comprised 47% of procedures followed by Orchiectomy (56.4%) and Facial Gender Affirmative Surgery (28%). The most common ET was 17- $\beta$ -estradiol (47%), whereas the predominant method of administration was oral (46.7%). Eighty-seven procedures (44.5%) were done on patients who stopped ET, and among these patients, 66 (75.86%) stopped ET two weeks prior to surgery. Mean operative times differed between those that continued ET ( $3.92 \pm 2.04$  hours) and stopped ET ( $5.02 \pm 2.71$  hours,  $p = 0.002$ ). Thirty-six patients (18.46%) received postoperative VTE chemoprophylaxis, amongst which 13 (12.04%) were in the ET-continued group and 23 (26.43%) in the ET-stopped group. The average Caprini score of our sample was 3.4 (ET-stopped group 3.6 and ET-continued group 3.0). There was a total of 2 VTE events, one in each group, with an overall 1.03% incidence rate. The VTE incidence in patients continuing and discontinuing ET was 1.04% and 1.15%, respectively ( $p = 0.9447$ ). All VTE events occurred in patients on oral ET, resulting in a 3.3% incidence in patients on oral ET. No statistically significant difference in VTE rate was found in subjects using other forms of administration when compared to oral ET ( $p = 0.19$ ).

**Conclusion:** Based on our cohort of 123 transgender patients, maintaining ET peri-operatively does not elevate the risk of postoperative VTE in patients with low baseline Caprini scores. Oral ET was associated with a relatively higher VTE risk. Further

research with a randomized prospective design is imperative to validate these findings and provide comprehensive guidelines for peri-operative management of ET.

## **Impact of COVID-19 on Gender-Affirming Surgery Caseload**

Abstract Presenter

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**Introduction:** Gender-affirming surgery (GAS) is a vital component of care for many transgender and gender diverse (TGD) patients. At the onset of the COVID-19 pandemic, the American College of Surgeons recommended the delay of all elective and non-essential surgeries. Although GAS encompasses a swath of procedures that help mitigate gender dysphoria and the host of mental sequelae it is associated with, GAS was considered 'elective' and subjected to the delay. Prior research has described a significant rise in GAS volume in the past decade, but there is limited insight into how the COVID-19 pandemic has impacted caseload and clinical outcomes from 2020 onwards (1, 2).

**Aim:** To describe the impact of COVID-19 on GAS case volume and complication rates.

**Methods:** The American College of Surgeons' NSQIP database was queried to identify GAS cases completed between 2019-2021. ICD-10 codes were used to identify TGD patients by diagnosis of gender dysphoria (F64.x) due to limitations in gender-identity inclusion in the NSQIP database. Trends in GAS volume and procedure type were described, and chi-square tests assessing for differences in patient demographics and clinical outcomes were completed using IBM SPSS Statistical Software v24, with  $p < 0.05$  indicating significance.

**Results:** Of the 2,708,874 surgical patients identified in the 2019-2021 NSQIP database, 4,298 (0.16%) were TGD. The proportion of masculinizing and feminizing GAS cases did not differ significantly between years: 44% masculinizing top surgery; 21% masculinizing bottom surgery; 15% feminizing top surgery; 12% feminizing bottom surgery; and 8% head/neck surgery ( $p=0.42$ ). Quarter 2 of 2020 had a notable 53% decrease in GAS volume in comparison to quarter 2 of 2019. Compared to the annual



GAS caseload in 2019, there was a 3% decrease in 2020 and a 34% increase in 2021. The rates of 30-day complications ( $\bar{x}$ =3.6%,  $p$ =0.35); reoperations (2.0%,  $p$ =0.49); and readmissions (1.0%,  $p$ =0.10) did not significantly differ between years.

**Conclusion:** While annual GAS volume has steadily increased since 2010, 2020 marks the first ever decrease in caseload due to the significant decline in cases during the first few months of the pandemic. GAS caseload has since resumed its rising trend, with no significant difference in distributions of patient demographics, GAS procedure types, and clinical outcomes between pre- versus post-pandemic years. These findings highlight potential issues in accessibility of GAS during the pandemic, which comes in addition to the already existing GAS barriers of lengthy waitlists, navigating insurance coverage, obtaining required mental health letters, and completing preoperative hair removal- all of which have a direct impact on the mental health and well-being of TGD patients.

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## Impact of Intraoperative Intravenous Tranexamic Acid Use on Postoperative Bleeding Events in Gender-Affirming Vaginoplasty

Abstract Presenter

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**Introduction:** One of the more common and disruptive complications of gender-affirming vaginoplasty is postoperative bleeding, typically presenting as a hematoma or hemorrhage. These complications often require readmission and reoperation. Interventions targeted at reducing the risk of postoperative bleeding include the use of hemostatic agents, such as intravenous tranexamic acid (IV-TXA), which has been found in multiple surgical disciplines to have some effect on postoperative bleeding events. The present study aims to evaluate the impact of intraoperative IV-TXA administration on postoperative bleeding events in a large sample of gender-affirming vaginoplasty patients.

**Methods:** Following approval from the Institutional Review Board at the Icahn School of Medicine, patients receiving gender-affirming vaginoplasty at the Mount Sinai Center for Transgender Medicine and Surgery between January 2018 and December 2021 were evaluated retrospectively. Demographics, comorbidities, intraoperative details, and postoperative outcomes were collected. Intraoperative details included hemostatic agents, estimated blood loss, anticoagulation, operative time, transfusion, and intraoperative complications. Preoperative and postoperative hemoglobin levels were also collected. Postoperative complications included minor hematomas, defined as hematomas requiring conservative treatment; major hematomas, defined as hematomas requiring intervention such as return to the operating room and readmission; postoperative hemorrhage; and readmission and reoperation related to bleeding. Non-plastic surgery patients, patients who did not receive heparin anticoagulation, and patients with bleeding disorders were excluded. Pearson's Chi Square and Fischer's Exact tests were used for categorical variables, and analysis of variance was used for continuous variables. Statistical significance was set at  $p < 0.05$

**Results:** Three-hundred-forty-two (342) patients were included in the study, 189 of whom did not receive IV-TXA and 153 of whom received IV-TXA. Mean follow up time was 9.5 months. Surgeon preference alone dictated IV-TXA use. All patients received some form of local hemostatic agent, including topical thrombin and Gelfoam. Significantly fewer patients in the IV-TXA group had a minor hematoma (13.2% vs. 0.6%,  $p < 0.001$ ). Estimated blood loss was significantly less in the IV-TXA group ( $121 \pm 51$  mL vs.  $172 \pm 77$  mL,  $p < 0.001$ ). Postoperative hemoglobin was higher in the IV-TXA group ( $10.5 \pm 2.3$  g/dL vs.  $9.75 \pm 1.6$  g/dL,  $p = 0.05$ ). Major hematomas (3% vs. 2.6%,  $p = 0.511$ ), postoperative hemorrhage (7% vs. 4%,  $p = 0.235$ ), bleeding requiring

reoperation (3.7% vs. 3.2%,  $p=0.828$ ), and bleeding requiring readmission (3.7% vs. 1.9%,  $p=0.268$ ) were not significantly different between the two groups. Venous thromboembolic events were not different between the two groups (0% vs. 1.3%,  $p=0.115$ ). Subgroup analysis of readmissions and reoperations for major hematomas or postoperative hemorrhage in each group did not achieve statistical significance, although readmissions for major hematomas were 50% less in the IV-TXA cohort.

**Conclusions:** The use of IV-TXA significantly reduces minor hematomas in patients receiving gender-affirming vaginoplasty, a complication that causes patient distress and pain in the postoperative period. IV-TXA is also useful in decreasing blood loss, and does not significantly impact the rate of venous thromboembolic events, a feared complication of IV-TXA use. Despite no statistically significant difference in major bleeding events, the trend towards fewer readmissions for major hematomas in the IV-TXA cohort may suggest this intervention is worthwhile in preventing serious postoperative bleeding complications.

## **Defining a Danger Zone for Iatrogenic Long Thoracic Nerve Injury in Gender-Affirming Mastectomy**

Abstract Presenter  
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### **Introduction:**

The Long Thoracic Nerve (LTN) lies immediately deep to the serratus anterior fascia on the lateral chest wall,<sup>1</sup> rendering it vulnerable to iatrogenic injury in surgery.<sup>2</sup> LTN injury leading to scapular winging is a well-described complication in the breast oncology and thoracic surgery literature.<sup>3,4</sup> Expansion of insurance coverage for gender-affirming surgical care has led to rapid increases in the number of gender-affirming mastectomies being performed by plastic surgeons.<sup>5</sup> This operation typically involves significant lateral chest contouring placing the LTN at a high risk of injury along the chest wall. In

this study, the course of the LTN relative to the lateral border of the pectoralis major muscle was mapped to delineate and define a danger zone for iatrogenic LTN injury in gender-affirming mastectomy.

### **Methods:**

Patients undergoing gender-affirming mastectomy by a single surgeon at a single institution were prospectively enrolled. The course of the LTN along the lateral chest wall was mapped using intraoperative nerve stimulation. The distance between the nerve and the lateral border of the pectoralis major muscle was measured and adjacent rib level was determined to define the zone in which the LTN is vulnerable to iatrogenic injury.

### **Results:**

Twelve individuals met study criteria and were prospectively enrolled. Study participants were, on average, 23 years old, had an average BMI of 27.8, and 92% had Fischer Grade 3 or 4 ptosis. The LTN was mapped bilaterally and was most reliably located directly lateral to the intersection of the 4th rib and the lateral border of the pectoralis major muscle. The LTN was found an average of 4.3 cm lateral to the pectoralis major at the 3rd rib level, 5.4 cm lateral to the pectoralis border at the 4th rib level, and 6.9 cm lateral to the pectoralis border at the 5th rib level.

### **Conclusions:**

This study defines a danger zone for injury to the LTN in gender-affirming mastectomy. Although proximal LTN injury can cause debilitating shoulder dysfunction, more distal LTN injury can cause chronic postoperative shoulder pain and dysfunction without frank scapular winging, making diagnosis and treatment difficult. Therefore, iatrogenic LTN injury is best avoided. With recent increases in the number of plastic surgeons performing gender-affirming mastectomies, awareness of this LTN danger zone is critical to avoid morbidity.

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## **Understanding zero Gender Dysphoria Index post-vaginoplasty: demographic, historical, and soft tissue factors**

Abstract Presenter

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**Purpose:** Both primary and revisional vaginoplasty are correlated with significantly improved patient-reported gender dysphoria. Moreover, the authors have observed clinically that some patients report zero ("fully resolved") gender dysphoria post-surgically. The present study aims to quantify the extent to which patients report zero Gender Dysphoria Index after primary vaginoplasty and to identify patient demographic, historical, and soft tissue characteristics that may influence this outcome.

**Methods:** Gender dysphoria was measured using Gender Dysphoria Index (GDI), a patient-reported measure of gender dysphoria on a 0-10 Likert scale (where zero is no gender dysphoria), at a single center from October 2016 to September 2021. The GDI is

in the process of validation. Data central tendency and dispersion were measured using mean  $\pm$  standard deviation (SD). Univariate and multivariable logistic regression modeled zero GDI as the dependent outcome. Results are reported as odds ratios (OR) with 95% Confidence Intervals (CI) and significance was defined as  $p < 0.05$ . Variables of interest included age, race, body mass index (BMI), medical and psychiatric comorbidities (hypertension, diabetes mellitus, cardiac disease, peripheral vascular disease, renal disease, HIV status, and psychiatric history), alcohol and tobacco use history, pre-operative penile length, and presence of keloid or hypertrophic scarring.

**Results:** 212 patients who underwent primary vaginoplasty and reported postoperative GDI were included in the study. The average preoperative GDI was 5.80 ( $\pm 2.87$ ), with a significant reduction to 2.86 ( $\pm 2.40$ ) in the postoperative period ( $p < 0.001$ ). 44 patients (20.8%) reported a postoperative GDI equal to zero. In this zero postoperative GDI subgroup, the average preoperative GDI was 5.29 ( $\pm 3.51$ ); similarly to the overall patient cohort, GDI reduction was significant ( $p < 0.001$ ).

Univariate binary logistic regression revealed that White patients were significantly less likely to report a GDI of zero postoperatively (unadjusted OR=0.28, 95% CI=0.14 to 0.56,  $p < 0.001$ ). Patients identifying as Black or Hispanic had approximately four times higher odds of reporting zero GDI postoperatively (unadjusted OR=4.32, 95% CI=1.73 to 10.8,  $p = 0.002$ ; unadjusted OR=4.54, 95% CI=1.69 to 12.2,  $p = 0.003$ ). These odds further increased when adjusting for other covariates and when compared to White patients (adjusted OR=5.52, 95% CI=2.11 to 14.4,  $p < 0.001$ ; adjusted OR=5.83, 95% CI=2.07 to 16.4,  $p < 0.001$ ). Multivariable logistic regression revealed hypertension as the only comorbidity to significantly impact the likelihood of reporting zero GDI postoperatively (adjusted OR=4.35, 95% CI=1.32 to 14.3,  $p = 0.015$ ).

**Conclusions:** Zero postoperative GDI, which can be considered "fully resolved" gender dysphoria, was reported by one out of five patients who underwent primary vaginoplasty. GDI improvement following vaginoplasty was statistically significant regardless of patient demographic, historical, or soft tissue factors.

Though sample size was limited, Black identity, Hispanic identity, and history of hypertension were independently associated with increased likelihood of reporting zero GDI postoperatively. In contrast, White patients had decreased odds of reporting zero postoperative GDI. Future work should identify specific factors, including provider communication, patient education, and preoperative expectations, that affect these patients' experiences with gender dysphoria in the postoperative period.

## **Transmasculine patient preferences of nipple-areola complex position and scar pattern in chest masculinizing mastectomy with free nipple grafts**

Abstract Presenter

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**BACKGROUND:** Chest masculinizing double-incision mastectomy with free nipple grafts is a gender-affirming operation to create a masculine-appearing chest for transgender and non-binary patients. Two important considerations for the procedure include placement of the nipple-areola complex (NAC) and incision pattern. Despite the rapidly growing number of patients undergoing this procedure, there are currently no studies in the literature indicating the preferred NAC position or incision pattern among transmasculine individuals.

**METHODS:** A web-based survey instrument was designed to elicit the surgical preferences of transmasculine patients treated at a large-scale medical system. Digitally-altered line drawings of a male torso were generated to represent various nipple positions and incision patterns. Variations of vertical NAC position included 80%, 85%, and 90% of the distance from the suprasternal notch to the xiphisternal joint. Variations of horizontal NAC position included 50%, 67%, and 75% of the distance from the midline to the anterior axillary line. Additionally, four separate images were generated to represent different inframammary fold (IMF) scar patterns: straight, slant, curved, and hockey stick. Patients were asked to rate each image on a 7-point Likert scale from very undesirable to very desirable. Subjects were asked to self-report demographic information and gender identity. Data analyses were performed using the Kruskal-Wallis test, followed by the Dunn test with Bonferroni correction for individual comparisons.

**RESULTS:** Responses were elicited from 923 patients via electronic message with a total of 106 patients agreeing to participate. The mean age was 27 years (range=18-52, SD=7.9), with 51% identifying as "transgender man", 35% identifying as "man", 7.5% identifying as "non-binary," and 6.5% identifying as "other". Almost all (99%) subjects were assigned female at birth, with 1% reporting assigned intersex. Significant differences ( $p < 0.001$ ) were found between median scores for both NAC images and incision scar images. For NAC position, all images that placed the NAC at 80% or 85% in the vertical dimension AND 67% or 75% in the horizontal dimension were rated

significantly higher than all other options ( $p < 0.01$ ) but were not statistically significant from each other. Conversely, all images that placed the NAC at 50% in the horizontal dimension were rated significantly lower than the other options ( $p < 0.001$ ) but were not statistically significant from each other. For incisional scar, the hockey stick pattern (median=6) was rated significantly higher ( $p < 0.001$ ) than the straight scar (median=5), which was rated significantly higher ( $p < 0.001$ ) than both the slant (median=3) and curved scars (median=2). There was no significant difference between slant and straight scars ( $p = 0.17$ ).

**CONCLUSIONS:** Transmasculine patients prefer NAC placement between 80%-85% of the distance from the sternal notch to xiphisternal joint and 67%-75% of the distance from the midline to anterior axillary line. Patients are particularly averse to nipples placed too medially on the chest. Additionally, patients prefer the hockey stick mastectomy scar pattern most, followed by straight horizontal scars, slanted scars, and curved scars. These results provide valuable context for surgeons offering masculinizing mastectomy to transgender patients.

## **Patient Satisfaction and Sexual Outcomes After Gender-Affirming Vaginoplasty**

Abstract Presenter  
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**Background:** Feminizing genital surgery, vulvoplasty or vaginoplasty, is commonly performed as one way of relieving gender dysphoria in those assigned male at birth. As the landscape of gender affirming care expands to allow greater access to genital surgery, sexual health remains a pivotal aspect of quality of life for many patients. This study aims to report the long-term functional and overall satisfaction outcomes of primary feminizing genital surgeries performed on transgender and gender diverse



individuals.

**Methods:** All patients who underwent primary vulvoplasty or vaginoplasty from 2017 to 2022 at a single integrated healthcare system were administered two questionnaires at least 6 months postoperatively (range 9 months to 6 years). The first questionnaire focused on satisfaction, perception of gender and life, and ability to orgasm. The second questionnaire was a validated Decision Regret Scale regarding their choice to have genital gender affirming surgery. Multivariable logistic regressions were conducted to determine significant associations between relevant variables and sexual outcomes as well as survey responses.

**Results:** Survey response rate was 71.5%, with a total of 118 patients included in the final analysis. An overwhelming majority of 111 patients (94.1%) reported clitoral sensation and 90 patients (90.9%) reported vaginal sensation. Of those interested in sexual activity, 93 patients (84.5%) achieved clitoral orgasm and 45 patients (53.6%) achieved vaginal orgasm. A total of 111 patients (94.1%) strongly agreed that the surgery was the right decision. Clitoral sensation and clitoral orgasm showed no significant clinical predictors. Patients with younger age (OR 0.90, 95%CI: 0.84-0.97,  $p=0.005$ ) and higher BMI (OR 1.28, 95%CI: 1.00-1.63,  $p=0.05$ ) were more likely to report vaginal sensation. Patients with urinary problems, including new-onset urinary incontinence, persistent stream difficulty, urinary tract infections, urethrovaginal fistula, or meatal stenosis, were less likely to report vaginal orgasm (OR 0.28, 95%CI 0.08-0.97,  $p=0.04$ ). Vaginal orgasm was also found to be associated with higher life satisfaction (OR 2.41, 95%CI 1.16-4.98,  $p=0.02$ ) and greater ease of life since surgery (OR 6.09, 95%CI 1.30-28.52,  $p=0.02$ ).

**Conclusion:** Gender affirming surgery in an integrated system allows comprehensive long-term follow-up of patients with interdisciplinary team-based care. Despite the limitations of these surveys, this study demonstrated a majority of TGD patients had high levels of satisfaction, adequate sexual function, and low decision regret after feminizing genital surgery.

### **Three-Dimensional Evaluation of the Frontal Sinus and Implications for Forehead Feminization**

Abstract Presenter  
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**Purpose:** The Ousterhout-based approach to forehead feminization surgery categorizes the forehead into 4 distinct groups based on the degree of prominence and the size of the frontal sinus. However, this classification overlooks frontal sinus heterogeneity and asymmetry. This study aimed to investigate frontal sinus contribution to supraorbital prominence and the implications for forehead feminization.

**Methods:** An IRB-approved retrospective review of maxillofacial CT scans was conducted on ethnicity- and age-matched groups of cis-male and female patients (2003-2022). Patients were excluded if they had prior sinus surgery, mucous thickening within the sinus space, facial skeletal fracture, or craniofacial abnormalities. Three-dimensional reconstruction of the skulls and frontal sinuses was performed using Mimics and 3-matic software. Data collected included patient sex, age, ethnicity, frontal sinus dimensions and asymmetry index (smaller volume/larger volume\*100), bi-temporal width, surface area of the frontal sinus and supraorbital prominence, extent of supraorbital protrusion and nasofrontal angle, and frontal sinus anterior wall thickness. Moderate to extreme asymmetry of the frontal sinus was defined as an asymmetry index below 60. To compare frontal sinus measurements between males and females, data normalization was performed using bi-temporal distance to account for the inherent skull size variation between the two sexes. Mann-Whitney test and Pearson correlation were performed to analyze associations between variables.

**Results:** 183 patients (106 males and 77 females) with a mean age of  $50.9 \pm 20.3$  years were included. Bilateral frontal sinus absence occurred in 5 patients (2.7%), unilateral absence in 15 patients (8.2%), and 74 patients (40.4%) exhibited moderate/severe asymmetry. There were no significant differences in the asymmetry index between the two sexes ( $p=0.2$ ). The male cohort showed mean frontal sinus dimensions of  $54.7 \pm 16.5$  mm (width),  $30.4 \pm 8.7$  mm (height), and  $12.2 \pm 4.5$  mm (depth), while the female cohort exhibited measurements of  $44 \pm 16.7$  mm (width),  $24.3 \pm 8.3$  mm (height), and  $7 \pm 2.9$  mm (depth). Following data normalization, male patients demonstrated

significantly wider ( $p=0.001$ ), taller ( $p=0.0003$ ), and deeper ( $p<0.0001$ ) frontal sinuses compared to female patients. Supraorbital prominence area was  $1255.2\pm390.2\text{ mm}^2$  and  $1214.5\pm277.8\text{ mm}^2$  in male and female cohorts, respectively, with no significant differences after normalization ( $p=0.55$ ), while the frontal sinus area was significantly larger in male patients (male:  $1275.4\pm587.5\text{ mm}^2$ , female:  $834.8\pm495.5\text{ mm}^2$ ,  $p<0.001$ ). Supraorbital prominence area aligned with frontal sinus in only 39.4% of patients ( $\leq 20\%$  difference). Overall, male patients demonstrated significantly thicker anterior wall (male:  $3.1\pm1.4\text{ mm}$ , female:  $3.6\pm1\text{ mm}$ ,  $p=0.002$ ), steeper nasofrontal angle (male:  $121.3\pm10.5^\circ$ , female:  $134.4\pm9.4^\circ$ ,  $p<0.0001$ ), and greater supraorbital protrusion (male:  $3.6\pm1.5\text{ mm}$ , female:  $1.7\pm0.8\text{ mm}$ ,  $p<0.0001$ ) compared to female patients. The extent of supraorbital protrusion correlated positively with supraorbital prominence area ( $r=0.45$ ,  $p<0.0001$ ), frontal sinus surface area ( $r=0.39$ ,  $p<0.0001$ ), bi-temporal distance ( $r=0.51$ ,  $p<0.0001$ ), and frontal sinus volume ( $r=0.24$ ,  $p=0.02$ ), and correlated negatively with nasofrontal angle ( $r=-0.53$ ,  $p<0.0001$ ) and anterior wall thickness ( $r=-0.26$ ,  $p=0.0005$ ).

**Conclusions:** Modifications to Ousterhout's classification are warranted to account for frontal sinus asymmetry. Anterior wall osteotomy should be tailored to the protrusion area. A combination of limited anterior wall setback and bone remodeling should be used for asymmetric cases.

## **Learning Curve for Performing Targeted Nipple Areola Complex Reinnervation (TNR) for Gender Mastectomy- Moving from Nerve Graft Reconstruction to Direct Nerve Coaptation**

Abstract Presenter  
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**Background:** Targeted Nipple Areola Complex Reinnervation (TNR) is a nerve preservation and reconstruction technique shown to restore baseline sensation at the chest and nipple areola complex (NAC) after gender affirming mastectomy (GAM) with free nipple grafting (FNG). We describe the senior authors learning curve for nerve dissection allowing for primary use of direct coaptation instead of nerve graft over time. Further, this study explores the postoperative time to sensation and sensory outcomes between direct repair and use of nerve allografts.

**Methods:** 60 patients who underwent GAM/ FNG at two institutions were prospectively enrolled from November 2021 through September 2023. Three groups with 20 patients each were compared: GAM/FNG + TNR with nerve allograft reconstruction (group 1), GAM/FNG + TNR with direct coaptation (group 2), and a control group GAM/FNG - TNR (group 3). Demographics, mastectomy weight, operative time, intraoperative nerve anatomy and nerve reconstruction technique were collected. Semmes Weinstein filament testing was used preoperatively, and at one, three-, six-and twelve months postoperatively. Monofilament index values included 2.83, 3.61, 4.34, 4.56 and 6.65, with lower values indicate lower threshold for detection, and therefore higher sensitivity. Chi-square analysis was used to detect sensation return differences between groups.

**Results:** Average preoperatively sensation was 3.56 at the chest and 3.87 at the NAC. A learning curve was associated with nerve branch dissection and coaptation with only the first 20 patients requiring a nerve graft. Demographics were comparable between all groups ( $p > 0.05$ ). Per mastectomy, an average of 2 ICN branches were used for direct coaptation. Median allograft length was 3.5 cm (1.5-4.0). Preoperative sensation was comparable between groups ( $p = 0.77$ ). NAC and chest skin sensation were significantly worse as compared to baseline in all groups at the one-month post-operative visit ( $p < 0.01$ ). At 3 months postoperatively, NAC and Chest skin sensation values in group 1 and group 2 were significantly improved as compared to group 3 ( $p < 0.05$ ). At 6 months, 72.7% of patients within group 2 demonstrated NAC sensation equal or improved from baseline. In comparison only 28.1% group 1 had NAC sensation equal to or improved from baseline ( $p < 0.05$ ). Similarly, at 6 months postoperatively 72.7% of patients in group 2 had equal or returned chest sensation, compared to 38.9% of patients in group 1. By 12 months, all sensation level were comparable between groups 1 and group 2 ( $p > 0.05$ ): 70% of group 1 and 83% of group 2 had equal or improved chest sensation, and 79.2% of group 1 and 100% of group 2 had equal or improved NAC sensation. Group 3 continued to have less sensation than the other groups, with 18% having equal or improved NAC sensation and 58% having equal or improved chest sensation.

**Conclusion:** After a short learning curve to improve nerve dissection, TNR with direct coaptation is efficacious and cost effective in restoring chest wall sensation for patients undergoing GAM, with promising results for return of sensation. Both allograft reconstruction and direct repair are feasible options with similar sensory outcomes at 12 months postoperatively.

## **Anthropometric Analysis of Frontal and Orbital Dimorphism: Quantifying Population Averages and Variability in Cis-Gender Men and Women**

Abstract Presenter  
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**Purpose:** Surgical contouring of the frontal bone and orbital rims are foundational components of facial feminization surgery, which can have a transformative impact on gender identity and quality of life in patients. There is minimal evidence with which an individual patient's anatomy can be objectively placed in the context of natural morphologic variations within a population. As a result, identifying surgical candidates and defining the optimal morphologic endpoints of intervention remain subjective decisions. Borrowing from the field of biological anthropology, this study uses three-dimensional geometric morphometrics to: (1) compare skeletal morphology of the frontal and orbital regions between cis-gender men and women, and (2) measure population averages and variability within genders.

**Methods:** We retrospectively reviewed adults who underwent computerized tomography (CT) imaging of the cranium prior to orthognathic surgery. Patients with a history of craniofacial trauma, genetic syndromes, metabolic growth disorders, or

exogenous hormone exposure were excluded. A standardized set of 501 digital landmarks was used to capture surface morphometrics of the forehead, supraorbital ridges, and orbital rims. All landmarked crania were aligned using Generalized Procrustes Analysis to assess for differences in shape without the influence of scale, and principal component analysis evaluated the contribution of gender to the overall variance in coordinates. Using Robust Rank Aggregation, a ranked list of important landmarks most predictive of gender was generated after integrating the relative and absolute differences in male and female mean values, linear discriminant analysis weights and magnitudes, and random forest feature importance scores.

**Results:** A total of 154 patients were analyzed, including 70 (45%) males and 84 (55%) females who underwent imaging at a mean age of  $23.6 \pm 7.7$  and  $26.0 \pm 11.1$  years, respectively. A ranked list of 119 important features with significant aggregate rank scores ( $p < 0.05$ ) demonstrated that the highest degree of inter-gender variability concentrated around the following landmarks: (1) the glabella and adjacent points between the brows, (2) the orbitale and adjacent points along the lateral and infraorbital rim, and (3) the supraorbital notch and adjacent points along the medial supraorbital rim. Landmarks along the lateral infraorbital demonstrated the greatest absolute differences between male and female average values, with females displaying a 2.23 mm greater projection in the anteroposterior dimension. The degree of morphologic variability within genders was similar in the male and female populations.

**Conclusions:** This study applies anthropometric methods of shape analysis to create a normative anatomical map with which skeletal dimorphisms can be quantitatively studied at the population level. An analysis of frontal and orbital dimorphism found the greatest degree of inter-gender variability surrounding the glabella, lateral infraorbital rim, and medial supraorbital rim, which may help inform preoperative evaluation and planning for feminizing procedures of the upper facial third.

## **Comparing Surgical Complication Rates in Combined Hysterectomy and Masculinizing Gender-Affirming Bottom Surgery Versus Staged Approach**

Abstract Presenter  
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**Background:** Hysterectomy is one of the most commonly performed genital gender affirmation surgeries in transmasculine and nonbinary patients and can be performed in a staged manner or at the time of masculinizing genital surgery (1, 2). Prior studies have suggested that adopting a combined approach carries an increased likelihood of complications (3, 4). However, relatively small patient cohorts with varying results were included. This study aimed to (1) define the cohorts of patients undergoing gender-affirming masculinizing genital surgery with and without concurrent hysterectomy and (2) to determine the additive risks of concurrent procedures.

**Methods:** Patients with a diagnosis of gender dysphoria who underwent masculinizing gender-affirming bottom surgery (GABS) from 2012 to 2022 were identified using the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database. The following principal Current Procedural Terminology (CPT) codes: 55980 (metoidioplasty), 55175, 55180 (scrotoplasty, simple or complex) or 56805 (clitoroplasty) were included. Patients were stratified by having a concurrent hysterectomy. Univariate analysis was done to compare the wound, mild systemic, severe systemic, and all-cause complication rates between a single GABS and joint procedure with hysterectomy of any approach.

**Results:** A total of 179 patients were included. Patients who had concurrent hysterectomy were, on average, seven years younger than patients who had single GABS ( $p < 0.01$ ). The two groups were similar in comorbid conditions, such as obesity classification, diabetes, and smoking status. The median total operative time nearly doubled in patients who had a combined hysterectomy ( $p < 0.01$ ). There were no differences in wound, mild, severe systemic, or all-cause complications between the two groups.

**Conclusion:** Our study's results suggest that hysterectomy at the time of masculinizing GABS can be safe when performed in appropriately selected patients. While these combined procedures take longer, as expected, their complication rates are similar. These findings can inform preoperative counseling, while also offering reassurance to surgeons. A combined approach can improve efficiency, access to care, and improve patient satisfaction.

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## **Regret After Gender-Affirming Surgery: A Comparison**

Abstract Presenter

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**Introduction** Regret after gender affirming surgery (GAS) is a complex and controversial issue that has been extensively researched. Comparing regret after GAS to regret after plastic surgery operations and other major life decisions, both surgical and non-surgical, is a novel approach that can provide insight into the magnitude of this issue. Importantly, this paper does not seek to equate gender affirming surgery to other elective surgeries or life decisions, but instead aims to provide a framework to understand regret after gender affirming surgery.

**Methods:** A systematic review of three databases was conducted to investigate the rate of regret after common plastic surgery operations. We queried Medline, SCOPUS, and Web of Science databases for relevant keywords ("regret" AND one of the following: breast reconstruction, breast reduction, breast augmentation, mastopexy, facelift, neck



lift, abdominoplasty, blepharoplasty, brow lift, rhinoplasty, liposuction, thighplasty, and buttock lift) in accordance with PRISMA guidelines. Information regarding percentage of patients experiencing regret, Decision Regret Scale scores, and any quantitative information was extracted. Separately, three separate literature reviews on regret after GAS, regret after elective surgical operations, and regret after other major life decisions were performed.

**Results:** 295 records were identified on initial query. After abstract screening and inclusion and exclusion were applied, a total of 55 articles examining regret after plastic surgery were included. The Decision Regret Scale was commonly used to report regret, and scores ranged from 3.8-41.9. The percentage of patients reporting regret after plastic surgery operations ranged from 0-72%. Rate of regret after GAS is widely reported to be approximately 1%. Other major life decisions, such as tubal sterilization surgery, elective hernia repair, having children, and getting a tattoo have regret rates of 28%, 11%, 7%, and 16.2%, respectively.

**Conclusion:** Overall, when comparing regret after GAS to regret after other plastic surgeries and other major life decisions, the percentage of patients experiencing regret is minor. The next essential step in the study of regret after gender-affirming surgery is to implement interventions to minimize post-operative regret.

## **Assessing Racial Inequalities in Gender-Affirming Genital Surgery: A Review of National Inpatient Data**

Abstract Presenter

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**Introduction:** Racial and ethnic minority groups have historically had more difficulty in accessing healthcare. They have also had worse experiences interacting with the healthcare system. Access issues often stem from structural inequalities, financial difficulties, discrimination, and geography. Beyond race and ethnicity, gender identity often complicates healthcare access and equality for many patients, particularly for patients who identify as transgender and may be seeking gender-affirming surgery. The intersection of these two areas of healthcare inequality may result in deficient healthcare for patients of minority racial and ethnic groups seeking gender-affirming care and surgery. Using a large national inpatient dataset, the present study sought to explore differences in gender-affirming genital surgery characteristics and safety measures by race.

**Methods:** The 2019 Healthcare Utilization Project (HCUP) National Inpatient Survey (NIS) was queried using previously published gender dysphoria ICD-10-CM codes for selected gender-affirming genital surgeries, including vaginoplasty and phalloplasty. Demographics, including race, age, insurance payer, discharge status, and median income for patients were collected. Hospital-level and inpatient safety characteristics were also collected, including bed size, teaching status, for-profit status, region, length of stay, pre-existing comorbidities, and inpatient medical complications. Results were stratified by race and evaluated for significant differences using univariate analysis. Statistical significance was set at  $p < 0.05$ .

**Results:** A total of 1260 patients were included in the present study. The cohort identifying as White represented 67.5%, while 9.1% were Hispanic or Latino, 5.6% were Black or African American, and 3.1% were Asian or Pacific Islander. After stratification of variables by race, significantly fewer Black patients had a routine discharge (64.3%,  $p < 0.001$ ), and significantly more Hispanic/Latino patients left against medical advice (4.3%,  $p = 0.047$ ). Mean length of stay was significantly longer among Black patients (5.21 days,  $p = 0.033$ ). Mean total charges were highest among Black patients (\$199,651, CI \$90,216-\$309,085,  $p < 0.001$ ). Finally, Black patients experienced significantly more inpatient medical complications (14.3%,  $p < 0.001$ ).

**Conclusions:** While the healthcare population is becoming more diverse, healthcare disparities still exist among non-White individuals receiving gender-affirming genital surgery. These non-White individuals experience significantly more challenges when attempting to receive care, which is further complicated by the United States' policy landscape. Future studies will analyze more historical and recent data to assess trends at this intersection.

# **Complications After Gender Affirming Chest Masculinization Surgery Do Not Impact Patient Satisfaction**

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**Background:** It is increasingly recognized that success in surgical care should be defined by both the achievement of technical goals and the patient experience. As past studies have shown conflicting results on the association between the quality of surgical care and patient satisfaction (1), it remains crucial to utilize validated patient reported outcome measures (PROMs) to better define surgical success. In particular, gender-affirming care is a key clinical area that can benefit from PROMs. No validated measure exists exclusively for patients undergoing gender-affirming procedures such as chest masculinization surgery (2). Therefore, the purpose of our study was to understand the association between PROMs and complications on chest wall masculinization surgery.

**Methods:** A single-center retrospective chart review was performed on patients who received periareolar or double-incision gender affirming top surgery (GATS) between January 2015 to August 2019. Patients completed eleven categories of the BODY-Q and three categories of the SCAR-Q measures postoperatively. These PROMs were used to assess the association of complications and patient-reported outcomes in GATS. The complications cohort consisted of individuals with hematoma, seroma, dehiscence, infection, and NAC hypopigmentation requiring revisions. All patients with reported complications were compared to patients without, with univariate analysis through chi-squared and t-tests, and a multivariate analysis of variables significantly related to complications on univariate analysis. A p-value < 0.05 was considered statistically significant.

**Results:** A total of 151 patients who underwent GATS were included, and 19 (13%) were noted to have a complication. Patients in the complications group had a

significantly higher age (31.58, SD 13.26 vs. 27.24, SD 7.97,  $p=0.02$ ) with no other differences in demographics and preoperative variables. There were no significant differences between the two groups in the BODY-Q and SCAR-Q responses. There was no significant difference in the adjusted odds of low satisfaction between patients who developed a complication and those who did not (OR = 1.02, 95% CI [0.98, 1.08]).

**Conclusions:** In our cohort of patients undergoing gender affirming chest masculinization surgery, we found that there was no correlation between the development of a complication and long-term patient reported outcomes measured by two validated PROMs. PROMs should be a primary focus on the success of a plastic surgery procedure, and its continued validation and standardization through hospital systems is critical. Given that complications did not impact long-term satisfaction, this study offers an added reassurance that providers may use to inform their patients.

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## Perioperative Hormone and Medication Management in Transfeminine Patients Following Orchiectomy: A Single Institutional Analysis

Abstract Presenter  
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**Purpose:** For transfeminine and gender-diverse patients, orchiectomy serves as a critical intervention for alleviating gender dysphoria by aligning the physical appearance

with gender identity (1). Following orchiectomy, adjustments in medications and monitoring of hormones are necessary due to the removal of endogenous testosterone. However, guidelines for perioperative medication management in this context are limited. Therefore, this study aims to conduct a descriptive analysis of pre- and post-surgical hormone levels to better understand trends in medication dosing and hormonal monitoring perioperatively.

**Methods:** A retrospective chart review was conducted at a single tertiary hospital, focusing on transfeminine patients aged 18 years or older who underwent gender-affirming orchiectomy between January 2018 and December 2024. Data collection included demographic information, surgical details, pre-surgical hormone therapy, associated lab values, post-surgical hormone therapy, and associated lab values. Patients were included if they had at least one pre- and post-surgical value recorded for both medications and labs. Follow-up was conducted up to one year postoperatively.

**Results:** Fifty-two adult patients were included in the analysis with an average age of 35 years old. 22 (42.3%) underwent standalone orchiectomy while 30 (57.7%) underwent orchiectomy with concurrent vaginoplasty. Prior to surgery, 43 (82.7%) patients were taking Spironolactone with a mean daily dose of 184.9 mg. All patients were prescribed Estradiol with varying routes, including 20 (38.5%) receiving it sublingually at a mean daily dose of 5.6 mg, 10 (19.2%) orally at a mean daily dose of 4.6 mg, 13 (25%) via injectable at a mean daily dose of 0.85 mg, and 9 (17.3%) transdermally (TD) at a mean daily dose of 0.05 mg. The mean pre-surgical hormone levels were 87 ng/dL for testosterone and 187.73 pg/mL for estradiol. At our institution, the target concentrations for transfeminine hormonal therapy are < 50 ng/dL for testosterone and between 100-200 pg/mL for estradiol. Postoperatively, testosterone consistently decreased to < 50 ng/dL, aligning with target concentrations, while estrogen levels remained mostly within the target range, except for a mean value of 222.44 pg/mL at 24-52 weeks postoperatively. Spironolactone use was discontinued by 83.8% of patients within 52 weeks. Notably, sublingual and injectable forms of Estradiol decreased in dosing, while oral and transdermal forms increased during the 24-52 weeks postoperative interval.

**Conclusion:** This study offers insights into perioperative hormonal changes and medication management after gender-affirming orchiectomy. Observation of these trends may serve as a resource for clinicians, enabling them to anticipate changes more effectively. By enhancing understanding of physiological changes and necessary medication adjustments, providers can provide better support in the perioperative period for patients undergoing gender-affirming orchiectomy.

Funding: This study was partially funded by the University of Utah Department of Family Medicine Health Studies Fund.

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## **How Many Clicks Does it Take? Examining the Ease of Finding Gender-Affirming Surgery Information on U.S. Hospital Websites**

Abstract Presenter

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**Purpose:** Transgender and gender-diverse (TGD) individuals face many barriers that impede their access to gender-affirming surgery (GAS).<sup>1</sup> Prior research has highlighted difficulty in searching for GAS providers and locating information about GAS, with considerable webpage inconsistencies and omission of online information.<sup>2,3</sup> As TGD people increasingly rely on the internet when searching for GAS content,<sup>4</sup> we investigated the accessibility of online GAS information relative to three of the most common, non-GAS procedures.

**Methods:** The sample included the 100 largest U.S. hospitals by inpatient beds. The three most common surgeries in adults, hip arthroplasty, knee arthroplasty, and cesarean sections were used as comparative search terms. GAS-terms were: gender affirmation surgery, gender-affirming surgery, gender confirmation surgery, gender-confirming surgery, gender reassignment surgery, top surgery, chest masculinization, facial feminization, metoidioplasty, phalloplasty, and vaginoplasty. Non-GAS terms were: Cesarean section, C-section, knee replacement, knee arthroplasty, hip replacement, and hip arthroplasty.

Beginning at the hospital's homepage, each linked webpage was clicked by a Python puppeteer. Each link on subsequent webpages was then followed until 2500 links had been accessed. At each hyperlinked page, TGD terms and comparative non-GAS terms were identified. Information on states' bans on insurance exclusions for TGD-related care was gathered from the Movement Advancement Project.<sup>5</sup> We used T-tests, chi-squared tests, and Fisher's exact tests to assess associations between variables.

**Results:** Out of the top 100 hospitals, 82 had websites that could be scraped for key terms. All 82 hospitals' websites had non-GAS terms while only 34 (41.5%) had GAS terms. When averaging the minimum number of followed links needed from each hospital to reach a given term, there was a significant increase in average minimum number of links for GAS terms compared to non-GAS terms (2.56 links vs. 1.74 links;  $p = 0.005$ ).

Out of the 20 states that had hospitals with GAS terms on their website, 11 states had laws which proscribed against private insurance transgender discrimination. Hospitals in states with these protective laws were more likely to provide information about GAS, with 57.6% ( $n = 19/33$ ) in these states displaying GAS content compared to 30.6% ( $n = 15/49$ ) in states without such laws ( $p = 0.015$ ). However, there was no statistically significant difference in the average minimum number of followed links needed to find GAS terms between states that had and did not have protective laws (2.4 clicks vs. 2.8 clicks;  $p = 0.43$ ).

**Conclusions:** The study reveals disparities in the availability of GAS and the ease of access to GAS information online. The association between transgender-protective laws and offering GAS online GAS content suggests that these laws may foster an environment where hospitals are encouraged to offer GAS or are more willing to disclose that their surgeons perform GAS. Future efforts are needed to increase GAS capacity building around the country, and hospitals should become more transparent about their GAS offerings.

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## **Inequities in Access to Care: Relation of Neighborhood Socioeconomic Deprivation to Gender-Affirming Surgical Care Distribution in the United States**

Abstract Presenter: Madeleine Givant

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**Purpose:** Financial burden and geographic barriers are significant impediments to obtaining gender-affirming care. The geographical distribution of gender-affirming surgical care has been previously studied but has yet to be assessed through a socioeconomic status lens. This study investigates the association between neighborhood deprivation and availability of gender-affirming surgical care in order to better understand healthcare disparities for transgender and gender non-conforming communities.

**Methods:** Gender-affirming surgeons were identified using the World Professional Association for Transgender Health (WPATH) and TransHealthCare provider directories. Providers in the TransHealthCare directory were further categorized by surgical procedure(s) performed. Physician practice addresses were cross-referenced with their associated University of Wisconsin Area Deprivation Index (ADI), with higher ADI scores corresponding to areas with greater deprivation. Both state ADI (sADI) and national ADI (nADI) scores were collected. Comparisons between provider ADI quintile groups, region, and procedural category offered were made using one-way nonparametric ANOVA with post-hoc testing.



**Results:** We identified 817 gender-affirming surgical care providers. Regional distribution of gender-affirming surgical providers showed 307 (37.6%) practiced in the West, 192 (23.5%) in the Northeast, 193 (23.6%) in the South, and 125 (15.3%) in the Midwest. ADI could not be calculated for 87 providers; these providers were excluded from ADI cross-referenced analysis. Analysis of sADI and nADI scores for providers in different regions found that providers in the West on average served significantly more affluent areas while providers in the Midwest served significantly less affluent areas. Of the 817 providers evaluated, 509 (62.3%) offered Top Surgery, 172 (21.1%) offered Bottom Surgery, 281 (34.3%) offered Facial Surgery, 97 (11.9%) offered Body Surgery, 94 (11.5%) offered Reproductive Surgery, and 14 (1.7%) offered Voice Surgery. Analysis of procedure types offered by providers also revealed significant differences in sADI and nADI quintile groups, with Facial Surgery and Body Surgery being offered in areas of higher socioeconomic status. Analysis of the number of procedural categories offered and nADI quintile showed that providers offering only one gender-affirming procedural category practiced in areas of greater socioeconomic deprivation than those offering two ( $p = 0.03$ ) or four ( $p = 0.04$ ) procedural categories.

**Conclusion:** Individuals seeking gender-affirming surgery in different U.S. regions face serious inequities in access to care. Significantly more providers were found to practice in the West and served more affluent communities. There were the fewest number of gender-affirming providers available in the Midwest. In addition, neighborhoods of higher socioeconomic status were found to have providers that offered a wider range of procedures which may lead to greater continuity of care and additional treatment options for patients living in more affluent areas. These findings highlight the barriers to care that transgender patients face in many parts of the country. Increased training opportunities in gender-affirming procedures to improve availability of providers in underserved areas may help to alleviate current healthcare disparities.

## **Is Social Media an Appropriate Tool for Patients Preparing for Phalloplasty? A Thematic Social Media Analysis**

Abstract Presenter

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**Background:** Social media has become an increasingly popular tool for patients preparing to undergo phalloplasty. Although posts on social media are readily available, the content is not verified or peer-reviewed. This study aimed to assess the quality and reliability of TikTok, YouTube, and Instagram posts related to phalloplasty.

**Methods:** The term "phalloplasty" was searched on TikTok, YouTube, and Instagram on a single day in December 2023. The top 50 posts on each platform were analyzed. The quality of information was assessed with 2 validated tools, the Patient Education Materials Assessment Tool (PEMAT) and the 5-point modified DISCERN instrument, with mean scores obtained by two reviewers. Relevant user metrics, such as number of likes, comments, engagement rate, type of account, and content type, were also collected for each post.

**Results:** Across social media platforms, the majority of top phalloplasty posts were created by patients who had phalloplasty (TikTok: 90%, YouTube: 78%, Instagram: 94%;  $p=0.0435$ ) and focused on the patient experience (TikTok: 78%, YouTube: 64%, Instagram: 86%;  $p=0.0334$ ). Healthcare professionals made up a small proportion of posts (TikTok: 8%, YouTube: 18%, Instagram: 4%;  $p=0.0556$ ). Of that number, plastic surgeons made up 6% of posts. Phalloplasty posts on TikTok received the highest number of likes ( $p=0.00012$ ), views ( $p=0.0002$ ), comments ( $p=0.0014$ ), and engagement rate ( $p=0.0094$ ). YouTube posts had the highest DISCERN (TikTok: 1.9, Youtube: 3.2, Instagram: 2.1;  $p<0.00001$ ), PEMAT understandable (TikTok: 84.4, Youtube: 91.2, Instagram: 77.3;  $p<0.00001$ ), and PEMAT actionable (TikTok: 15.3, Youtube: 86.3, Instagram: 38.5;  $p<0.00001$ ) scores. Posts created by healthcare professionals had the highest DISCERN scores compared to patients (Healthcare: 3.5, Patients: 2.2;  $p=0.00002$ ), but had similar PEMAT understandable (Healthcare: 85.5, Patients: 84.2;  $p=0.719$ ) and actionable (Healthcare: 62.2, Patients: 45;  $p=0.154$ ) scores. Posts with higher engagement were associated with lower DISCERN scores ( $r=-0.292$ ,  $p=0.00029$ ).

**Discussion:** This is the first study to evaluate reliability and quality of content related to phalloplasty across the three most popular social media platforms. Our results indicate the need to enhance the quality of medical information about phalloplasty on social media platforms with the goal of properly educating patients. It behooves plastic surgeons providing gender-affirming surgery, to create high-quality posts on TikTok and other social media platforms to help better educate transgender patients undergoing this

procedure. Greater efforts to disseminate existing high-quality posts on social media should be made among the medical community providing gender-affirming care.

## **Prevalence of Regret in Gender-Affirming Surgery: A Systematic Review**

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**Introduction:** Gender-affirmation surgeries are a rapidly growing set of procedures in the field of plastic surgery. This study is novel in that a thorough analysis has not been performed quantifying, identifying, and recognizing the reasons and factors associated with regret in a largely US population.

**Methods:** A PRISMA analysis incorporating Embase, PubMed, and Web of Science was conducted on April 2023. After compiling the articles, study characteristics were extracted. From the data set, weighted proportions were generated and analyzed.

**Results:** A total of 24 articles were included in this study, with a population size of 3662 patients. A total of 3673 procedures were conducted in the US, 514 in European nations, 97 in Asian nations which included only Thailand, and 19 in South American nations which included only Brazil. A total of 1102 (30.1%) patients underwent transfeminine procedures, and 2560 (69.9%) patients underwent transmasculine procedures. 437 patients underwent a mammoplasty, 583 underwent a vaginoplasty, 333 patients underwent an orchiectomy, 30 patients underwent a vulvoplasty, and 73 patients underwent other procedures for transfeminine patients. For the transmasculine patients, 2361 underwent some form of masculinizing chest surgery, 65 underwent a phalloplasty, 8 underwent an oophorectomy, 486 underwent a hysterectomy, and 69 underwent other procedures. The pooled prevalence of regret was 1.94%. The prevalence of transfeminine regret was 4.0% whilst the prevalence of transmasculine regret was 0.8%. The overall rate of de-transitioning was 0.6%.

**Conclusion:** Both transfeminine and transmasculine patients had significantly lower rates of regret in the US when compared with the rest of the world. The average age of

transfeminine patients was older in the US when compared to the rest of the world, while the average age of transmasculine patients was younger. Additionally, both transfeminine and transmasculine patients had significantly lower rates of regret in the US when compared with the rest of the world. Our study agrees with the present literature that transmasculine patients exhibit significantly lower rates of regret than transfeminine patients. Since transmasculine procedures have been conducted more frequently than transfeminine ones, they have had more opportunities to improve and reduce complications resulting in safer procedures with a low rate of revision. Regret was differentiated into social, gender related, and medical regret with the latter being the most prevalent. Loss of nipple sensation, complaints of genital hair, inability to achieve orgasm, and post-operative pain were the most commonly reported associated concerns for medical regret. Most patients reporting social regret had difficulties due to unsupportive home and social environments. Due to its paradoxical nature, gender related regret may be the most difficult to predict or eliminate. However, physicians can help patients lower regret by exploring of the gender spectrum prior to surgery. To our knowledge this is the most recent review performed on the topic of regret amongst gender affirming surgery patients with an emphasis on a US cohort. This analysis can help shed light on better ways to enhance patient selection and surgical experience.

## **Estrogen Hormone Therapy Stabilizes Lateral Hairline in Transfeminine Patients: Implications for Facial Feminization Surgery**

Abstract Presenter

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**Background:** Although many studies report on the suppressing effects of estrogen therapy on facial and body hair in transgender and nonbinary (TGNB) individuals, few studies have elucidated its effects on hairline stability on the scalp. In this work, we assessed the influence of estrogen therapy on forehead length.

**Methods:** All TGNB patients assigned male at birth (AMAB) seeking facial feminization surgery aged 30 years or older were included in the study. Central and forehead length were collected at initial consultation visits. Variables that potentially influence hair

growth were collected by chart review, including age, duration of hormone replacement therapy (HRT), presence of spironolactone, and presence of other hair treatments, including finasteride, dutasteride, or minoxidil. Multivariable generalized linear models were constructed with relevant predictor variables, while also incorporating global mental health scores as a proxy for psychological effects on hair loss.

**Results:** 171 patients were included in this study, with a median age of 36.0 [interquartile range (IQR): 32.0-46.0] years and a median HRT duration of 2.0 [1.0-6.0] years. Multivariable generalized linear models revealed no significant predictors for central forehead length. On the other hand, lateral forehead length was positively predicted by age ( $B=0.06$ , 95% confidence interval (CI) [0.03-0.08],  $p<0.001$ ) and hair treatment ( $B=0.62$ , 95%CI [0.11-1.13],  $p=0.02$ ), but negatively predicted by HRT duration ( $B=-0.07$ , 95%CI [-0.10- -0.03],  $p<0.001$ ).

**Conclusions:** Although older age is a predictor of lateral hairline recession in TGNB AMAB individuals, lateral forehead length was also predicted to decrease by 0.07 cm with each year of feminizing hormone therapy.

## **Surgical and Post-Operative Mastectomy Complications in Cisgender, Nonbinary, and Transgender Adults**

Abstract Presenter  
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**Introduction:** Nonbinary people are increasingly accessing gender-affirming mastectomy procedures, and their desired chest appearance can differ from that of transgender or cisgender individuals. However, little is specifically known about surgical outcomes in nonbinary patients, as research in gender-affirming chest surgery has primarily compared cisgender versus transgender and gender-diverse people, without

specifically addressing nonbinary people. This study will assess surgical and post-operative complications between cisgender, transgender, and nonbinary adults undergoing mastectomy procedures.

**Methods:** ACS-NSQIP database was used to identify transgender and nonbinary patients who underwent mastectomy between 2018 and 2021 (CPT Codes 19300, 19301, 19303, and 19304), as well as cisgender patients who underwent mastectomy for cosmetic or cancer prophylaxis purposes. Baseline characteristics and surgery-related complications among cisgender, transgender, and nonbinary patients were assessed using analysis of variance tests, Fisher's exact test, unpaired t-tests, and multivariable regression models.

**Results:** 3,110 patients met inclusion criteria: 1,521 (48.9%) were cisgender, 1,536 (49.4%) were transgender, and 53 (1.7%) were nonbinary. More nonbinary mastectomies were performed in 2021 than in 2018-2020 combined. The cisgender cohort was older, had greater medical comorbidities, and experienced longer operative times than the other groups ( $p < 0.001$ ).

A total of 98 cisgender (6.4%), 34 transgender (2.2%), and none of the nonbinary patients underwent reoperation ( $p < 0.001$ ). Hematoma and seroma were the most common indications for reoperation (39.0%). With regards to infections, 72 cisgender patients had surgical site infections (4.8%), compared to 1 nonbinary (1.9%) and 16 transgender (1.1%) patients. Additionally, 16 cisgender patients had bleeding requiring transfusion (1.1%), compared to 2 transgender (0.1%) and none of the nonbinary patients ( $p = 0.003$ ). Other systemic complications had low incidence, and no statistical differences were identified between the cohorts. Overall, cisgender patients had the highest all-cause complication incidence ( $p < 0.001$ ).

After adjusting for confounding variables such as age, BMI, ethnicity, smoke, diabetes, transgender patients had a lower likelihood of reoperation (OR: 0.271; 95% CI: 0.164-0.449;  $p < 0.001$ ) or all-cause complications (OR: 0.218; 95% CI: 0.124-0.385;  $p < 0.001$ ) compared to cisgender patients. No significant wound or all-cause complications differences were identified between nonbinary and cisgender patients.

**Conclusions:** Gender-affirming mastectomy can be safely performed in nonbinary and transgender adults. Even when controlling for various comorbidities, transgender and nonbinary patients had better or equivocal complication outcomes compared to cisgender patients. Factors beyond the scope of the database, such as different surgical techniques, social determinants of health, and hormone exposure, may explain these

differences, and future research should elucidate these complication disparities.

## **Surgical and Patient-Reported Outcomes of Gender-Affirming Surgery in Lower- and Middle-Income Countries: A Systematic Review**

Abstract Presenter

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**Introduction:** Access to gender affirmation surgery (GAS) is contingent on availability of procedures, affordability, legality, and social norms. In regions with higher accessibility to GAS – typically high resourced, high-income countries - there may be corresponding higher generation of empirical evidence related to GAS. This is problematic on a global health policy level because surgical and patient-reported outcomes (PRO) data may not align with what is observed in low- or middle-income countries (LMICs). To-date, limited research has characterized the type of GAS, patient population, surgical outcomes or PROs associated with GAS in LMICs. This systematic review addresses this gap by examining GAS-related outcomes literature in LMICs.

**Methods:** Electronic databases of MEDLINE, Embase, Web of Science, CINAHL, and PsycINFO databases were searched with the help of a medical librarian. The World Bank classifications were used to determine a country's income group, i.e., middle income (MI) or lower income (LI). Peer-reviewed articles or conference abstracts that were published in any language, reported surgical or patient-reported outcomes of GAS, and were conducted in MI or LI countries were included. Studies reporting exclusively on surgeries for congenital disorders of sexual differentiation, reviews, case studies, editorials, letters to the editor, and animal studies were excluded. Title and abstract screening and full-text review were completed in duplicate, and 30% data extraction was checked by a second author to ensure rigor. Non-English studies were translated in

English. A priori designed data extraction form was piloted (n=25) and data elements extracted included study and sample characteristics, surgery, surgical outcomes and complications, and PROs.

**Results:** A total of 139 studies were included (63.3% peer-reviewed articles and 36.7% conference abstracts) from 14 LMIC countries. Most studies were in English (95%), and non-English studies were published in Chinese (n=3, 2.2%), Russian (n=2, 1.4%), and Persian (n=2, 1.4%). Most of the studies were conducted in Serbia (n=43, 31%), followed by Brazil (n=25, 18%), Iran (12%), Turkey (n=13, 9%), China (n=13, 9%), and Thailand (n=10, 7%). The most common procedure reported was vaginoplasty (n=53, 25%), followed by phalloplasty (n=40, 19%), metoidioplasty (n=30, 14%), mastectomy (n=26, 12%) and other surgeries (n=29, 14%). For vaginoplasty and phalloplasty, common complications included vaginal stenosis (incidence rate 0%-50%) and fistula formation (0%-11%), and urinary strictures (0%-37%) and fistulas (0%-52%), respectively. Among all studies, overall complication rates ranged from 0%-63%, revision surgery rates ranged from 0%-43%, and infection rates ranged from 0%-31%. Most studies reported PROs (n=91, 66%), however, out of the studies that reported PROs, more than half (n=60, 66%) did not use a validated PRO measure. Commonly reported PROs included satisfaction with aesthetic appearance, sexual well-being, sensation, and physical function (e.g., ability to urinate).

**Conclusion:** The GAS outcomes reported in LMICs differ from those in high- or upper middle-income countries. Substantial heterogeneity in surgical technique, outcomes measured, and complication rates was noted, precluding a meta-analysis. Future GAS research, especially in LMICs, will benefit from standardizing surgical outcomes data collected and using validated PRO measures.

## **Developing Practice Guidelines on Chest Masculinization: Designing Male Neo-Nipple Areolar Complex**

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**Introduction:** Successful nipple areolar complex (NAC) reconstruction greatly influences patient outcomes for transgender patients undergoing chest masculinization. Despite the recent rise in case volume, little is known on designing the ideal NAC that maintains its aesthetics in dynamic settings. This study aims to examine the characteristics of male NACs and their dimensional variability to help develop guidelines on designing neo-NAC to improve surgical and patient outcomes in transgender chest masculinization.

**Methods:** Thirty cis-gender male participants were enrolled. NAC height and width, sternal notch to nipple distance (SNND), and inter-nipple distance (IND) were measured in standing and supine positions with stable room temperature to prevent measurement bias. Other variables recorded included chest circumference, NAC angulation, body mass index, weight, height, age, and ethnicity. All measurements were taken in a private room with stable temperature ( $\sim 22^{\circ}\text{C}$ ) to prevent variability in data secondary to cold-induced NAC contraction.

**Results:** The mean years of age and BMI was 27.40 (range 19-76) and 24.78 (SD 3.05), respectively. Mean chest circumference and NAC angulation measured at 100.3 cm (SD 8.9 cm) and  $27.8^{\circ}$  (SD  $8.48^{\circ}$ ), respectively. Mean standing and supine measurements were as follows: NAC height 21.2mm (SD 3.9) vs. 23.4mm (SD 4.7), NAC width 29.0mm (SD 5.1) vs. 29.7mm (SD 5.6), SNND 20.8cm (SD 2.1) vs. 19.3cm (SD 1.8), and IND 22.4cm (SD 2.3) vs. 23.5cm (SD 2.5). NAC height-to-width ratio decreases from supine to standing, as well as IND, indicating a medialization of the NACs when upright. A multiple linear regression model did not find any significant confounding effects of age, BMI, chest circumference, or NAC angulation on NAC HWR with position changes.

**Conclusion:** Our findings suggest that during chest masculinization surgery, the design of male neo-NAC has a risk of being positioned too medial and elliptical with upright positioning. Care must be taken intraoperatively to account for changes in neo-NAC dimensions that occur with body position changes. We strongly recommend that surgeons determine the final position of the neo-NAC intraoperatively while having the patient in upright sitting position.

# **Association of Obesity with Surgical Complications after Gender-Affirming Mastectomy: A Systematic Review and Meta-Analysis**

Abstract Presenter  
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**Purpose:** Body mass index (BMI) is often used to determine surgical eligibility for gender-affirming mastectomy (GAM) (1). However, there is limited empirical data informing these criteria (2). Moreover, prior studies evaluating BMI and GAM complications have been limited to single-institution data. This is the first meta-analysis to evaluate the relationship between BMI and surgical complications after GAM across multiple institutions and surgical techniques.

**Methods:** A systematic review and meta-analysis was performed for all studies in the databases PubMed, Embase, and Web of Science that evaluated the relationship between BMI and surgical outcomes after GAM. Our institution's GAM cohort (n = 443) was also included in this analysis. Obesity was defined as BMI  $\geq 30$  kg/m<sup>2</sup>. Outcomes of interest included hematoma and seroma formation, surgical site infections, and wound and nipple-areola complex (NAC) complications. The fixed-effects Mantel-Haenszel method was used to synthesize results across studies.

**Results:** Of the 604 studies screened, 10 met the inclusion criteria. There were a total of 1339 patients, of which 519 (39%) were obese and 820 (61%) were non-obese. There were significantly higher odds of seroma formation (odds ratio [OR] = 2.2, 95% CI = 1.3–3.8, P = 0.01), NAC complications (OR = 2.0, 95% CI = 1.3–3.3, P < 0.01), and wound complications (OR = 4.4, 95% CI = 1.4–14.6, P = 0.01) in patients with obesity compared to those without obesity. There were no significant differences in hematoma formation (OR = 1.1, 95% CI = 0.6–1.9, P = 0.73) or surgical site infections (OR = 1.7, 95% CI = 0.8–3.6, P = 0.19).

**Conclusion:** While some GAM complications were more common in patients with obesity, serious complications like hematoma and infection were as likely to occur among patients with and without obesity. Patients with higher BMIs should be counseled about their increased risk for these complications. However, BMI cutoffs alone should not be used to determine surgical eligibility especially given GAM's

significant improvement in gender dysphoria and the low morbidity associated with these complications. Future studies evaluating patient-reported outcomes are critical to understanding the true impact of these potentially increased complications in patients with obesity. Additionally, more data is needed to understand differences in surgical risk among higher BMI classes.

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## **Quality of Life after Facial Feminization Surgery: A Systematic Review of Current Evaluations and Call for Standardization**

Abstract Presenter

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**Background:** Facial feminization surgery (FFS) is a collection of procedures of the head and neck aimed at achieving softer features to establish a more "feminine" appearance. While most commonly performed in transgender women, FFS applies to cis-gendered women as well. Ranging from coronal brow lifts, rhinoplasty and cheek implants, to frontal bossing reductions and tracheal shavings, FFS is a unique set of craniofacial procedures that address gender dysphoria, a debilitating mental health condition. Despite notable quality of life (QOL) improvements secondary to FFS, there is yet to be a standardized framework for evaluating patient-reported outcome measures (PROMs). This remains a major barrier in the field of gender affirming care. The purpose of this study is to examine the different PROMs reported in the literature and advocate for the optimization of QOL metrics for post-FFS patients.

**Methods:** An electronic database search of Ovid MEDLINE was completed according to PRISMA guidelines for articles pertaining to FFS and QOL. Study characteristics, QOL survey information, and patient demographics were collected. Specifically, we considered QOL to be assessed by postoperative satisfaction, revisions, regrets, and subjective surveys.

**Results:** In total, seventeen articles that met inclusion criteria were selected and reviewed from the 2,032 studies identified from our literature search. There was a total of 1,193 patients that underwent a variety of FFS procedures, including rhinoplasty, forehead reconstruction, cranioplasty, and lip-lift procedures, among others. Four studies exclusively used non-validated satisfaction rating questionnaires and four studies exclusively used non-validated QOL surveys. Seven studies exclusively used validated surveys, including the Nose feminization scale, SNOT-22, SWLS, SHS, PROMIS, and FACE-Q. Two studies used both a non-validated QOL survey and validated surveys, SF-36v2 and ANA.

**Conclusion:** Overall, there remains a massive discrepancy in surveys across studies assessing QOL in patients who have undergone FFS. The standardization and optimization of QOL metrics for this population is a necessary step towards improved outcomes and the inclusion of FFS as a reconstructive surgery under insurance. Questionnaires such as GENDER-Q are promising tools in addressing the aforementioned limitations. Garnering patient-reported outcomes in a standardized manner is particularly important due to the varying perspectives and procedures in gender affirming care, thereby providing invaluable feedback for surgeons.

## **A Comparative Analysis of Surgical Complications and Trends between Full and Partial Gender-Affirming Facial Surgeries: Insights from a NSQIP Study**

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**Background:** Gender-affirming facial surgery (GAFS) can be performed as a full, single-staged procedure (F-GAFS) or in multiple, partial stages (P-GAFS). P-GAFS addresses either the upper, middle, or lower facial thirds while F-GAFS includes procedures on multiple facial regions during a single anesthetic event. Potential advantages of P-GAFS include less operative time and allowing the face to fully heal before reconstructing a different facial region. Furthermore, patients can acclimate to their new appearance before a decision is made to pursue additional surgery. A key advantage of F-GAFS is that only one anesthetic event and postoperative recovery period are necessary, limiting patient-life disruptions.

One small single-center study found no statistically significant difference in surgical complications between F-GAFS and P-GAFS.(1) The purpose of our study is to compare safety profiles of F-GAFS and P-GAFS, including the relationship between sociodemographic and surgical characteristics with various complications.

**Methods:** The 2012-2022 American College of Surgeons National Surgical Quality Improvement Program (NSQIP) databases were queried for International Classification of Diseases, 9th Revision and 10th Revision codes specifying "gender dysphoria" or "transgenderism."

Using Current Procedural Terminology (CPT) codes, patients were categorized as having facial surgeries on the upper face, middle face, and lower face.(2) Patients who had surgery on two or more regions (e.g., upper and middle face) were classified as F-GAFS. Patients were excluded if they underwent a concurrent procedure unrelated to facial surgery.

Surgical complications included return to the operating room, hospital readmission, urinary tract infection, surgical site infection, and wound disruption. Two-sample t-tests and chi-squared tests compared patient characteristics and surgical outcomes. Logistic regression was used to assess the adjusted risk of F-GAFS.

**Results:** A total of 552 patients underwent GAFS, including 193 P-GAFS (35.0%) and 359 F-GAFS (65.0%) patients. F-GAFS patients, on average, had higher BMIs, and the mean operative time of F-GAFS was more than double that of P-GAFS ( $p < 0.001$ ). An increasing number of patients underwent GAFS during the study period: 5 patients in 2013, 27 in 2017, and 134 in 2022.

Nineteen patients (3.4%) had surgical complications. Fifteen patients had surgical site infections, three had bleeding requiring transfusion, and one had a pulmonary embolism. There were complications in 2.1% of P-GAFS patients ( $n=4$ ) and 4.2% of F-

GAFS patients (n=15). However, this difference was not statistically significant in bivariable analyses ( $p=0.23$ ) nor in a multivariable regression controlling for baseline characteristics (odds ratio: 1.15, 95% confidence interval: -1.21 - 1.49,  $p=0.84$ ).

**Conclusions:** Our findings underscore the increasing popularity of GAFS while also highlighting the safety of both F-GAFS and P-GAFS for transgender and gender-diverse patients. These results support informed decision-making to optimize aesthetic goals and complication outcomes. Insurers should guarantee coverage for both approaches, providing surgeons and patients the most flexibility in choosing a surgical strategy.

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## Trends in Revision Facial Feminization Surgery

Abstract Presenter

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**Purpose:** Gender Affirming Surgery (GAS) comprises a spectrum of surgical procedures intended to align individuals' physical characteristics with their gender identities, including Facial Feminization Surgery (FFS). FFS can be staged or as a single comprehensive procedure, depending on patient factors and surgeon preference. Patients may also choose to undergo secondary FFS should the results of the index operation not be satisfactory. The rate of unplanned secondary FFS and its contributing

factors have not been explored in the literature. This study aims to elucidate trends in FFS revisions to further improve care for transgender patients.

**Methods:** All surgeries from a single institution from 2012 to 2023 that were associated with any one or more of 95 CPT codes related to GAS were filtered for patients who had a diagnosis of transsexualism (F64). Manual chart review was then conducted to confirm that these procedures were performed for gender-affirmation and to collect variables including patient demographics, age at social transition, age when starting hormone replacement therapy, and reason for each procedure. Secondary FFS was separated into staged and unplanned, with unplanned FFS defined as there being no mention of staging in any pre-operative visit note for the initial FFS, or that the patient presented for secondary FFS due to dissatisfaction with the index procedure. A cohort of 134 patients who underwent 280 surgeries was included in chi-square analysis.

**Results:** 107 patients underwent FFS, and 37 (34.6%) of these patients underwent FFS surgery more than once for any reason. 21 (19.6%) underwent unplanned secondary FFS. Patients who received FFS as their initial GAS procedure were more likely to have revisions (43%) compared to those who first underwent top or bottom surgeries before FFS (24% and 14% respectively,  $p=0.0399$ ). There was no significant association between the age at initial FFS and rate of FFS revision, or time between social transition or hormone initiation and rate of FFS revision.

**Conclusion:** The socially, emotionally, and medically complicated process of transitioning looks different for each individual, based on their unique needs and desires. Notably, this study found that nearly one in five FFS patients underwent unplanned secondary procedures, which underscore the importance of refining the approach to FFS for transgender patients. Additionally, our findings reflect the evolving WPATH guidelines, which no longer mandate a defined period of social transition or hormone therapy before GAS, except for breast surgeries. Further investigation is warranted to identify factors influencing the need for revision FFS and to enhance surgical outcomes for patients undergoing gender-affirming procedures.

### **Characteristics of gender affirming feminizing body contouring surgery**

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**Introduction:** Transgender and gender diverse (TGD) individuals may elect to undergo body contouring liposuction +/- fat grafting to the buttock and hip. Feminizing body contouring (FBC) aims to fill trochanteric depressions, enhance posterior projection, and decrease the waist-hip ratio (1). There is currently little-to-no literature describing patients or outcomes after undergoing FBC.

**Methods:** Retrospective chart review of 139 consecutive patients who underwent 159 FBC procedures at single surgical practice from December 2019 to February 2024. Inclusion criteria: patients  $\geq 18$  years old with  $\geq 30$  day follow-up. Primary variables of interest were past medical history, hormone use history, fat donor and recipient sites, complication rates, and revision rates.

**Results:** 139 patients underwent a total of 159 procedures: 87.4% were primary, 10.0% primary revision, 1.8% secondary revision, and 0.6% tertiary revision. Procedures were completed by 3 surgeons within a single practice with the breakdown of 92, 50, and 17 cases respectively. Revision cases were performed by the same surgeon.

96.2% of patients had used hormones for an average 8.8 years (SD=8.7). Of those using hormones, 88.0% were taking estrogen, 46.5% taking spironolactone, and 20.1% taking progesterone. The average age at time of procedure was 36.9 years old (SD=10.0, range=21-67). Past medical history included depression (22.6%), anxiety (19.5%), positive HIV status (15.7%), HTN (11.9%), and asthma (9.4%). Average BMI was 29.1, SD= 4.7.

Donor sites included: abdomen (98.1%), back (95.9%), medial thighs (61.6%), lateral and/or medial thoracic area (37.7%), arms (31.4%), axillary (28.9%), mons pubis (10.7%), submentum (6.2%). Recipient sites included: hips (95.0%), buttocks (96.2%), breasts (3.1%), face (5.0%), labia majora (1.9%). Abdominoplasty was indicated for 12 patients (7.6%) and 5 (41.6%) received abdominoplasty. Average fat transferred per procedure was 2.2 L (SD=1.1, range: 0.3-4.5). Drains were used in 50.9% of patients.

All patients received IV antibiotics, lovenox, and sequential compression devices at time of operation and were placed in jackknife position for infiltration using 4mm cannulas. All



cases used power assisted liposuction. 89.3% of patients were instructed to suspend hormone use 2 weeks prior to surgery. All patients with an abdominal donor site (98.1%) were placed in abdominal compression postoperatively. 28.9% of patients attended at least one session of hyperbaric oxygen chamber therapy.

Complications included: contour deformity (6.3%), cellulitis (5.0%), seroma (2.5%), fat necrosis (1.9%), PE (0.6%). The readmission rate was 2.5%. 1.8% of patients required a blood transfusion.

**Conclusion:** FBC is a safe, efficacious, and customizable procedure for TGD patients. TGD patients may require higher volumes of fat transfer compared to cisgender women, as one study reported an average of 1.8 L (2) per procedure. Clinical counseling should emphasize potential need for revision due to fat loss or contour deformity.

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#### **Patient Reported Outcomes of Penile Inversion Vaginoplasty: A Single Center Prospective Study**

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**Purpose:** Penile inversion vaginoplasty (PIV) is among the most common genital gender-affirming surgeries (GAS) (Wright et al., 2023). Patient-reported outcomes are increasingly important in the assessment of GAS (Oles et al., 2022), however few studies have rigorously assessed outcomes of PIV. In this prospective study, we assessed satisfaction, body image and social function following PIV using the BODY-Q.

**Methods:** Individuals who underwent PIV at our institution between September 2018 and February 2023 were eligible for the study. The study was approved by our institution's IRB. All patients were over 18 years at the time of surgery. Surveys were administered preoperatively and postoperatively at 3.5 and 12 months. Clinical data, including complication and revision rates, were collected from the medical record preoperatively and 12-months postoperatively. The BODY-Q is a validated patient-reported outcome measure with subscales that measure quality of life (Poulsen et al., 2019). The body image and social function subscales were administered at all timepoints, and the satisfaction subscale at both postoperative timepoints. Outcomes were scored according to scoring guidelines and each bivariate analysis was performed using paired, non-parametric testing. Multivariable linear regression was performed to identify associations between satisfaction scores and demographic and clinical variables.

**Results:** Of the 76 patients who enrolled, 66 underwent surgery and 46 completed all 3 surveys. Body image scores were significantly higher postoperatively at both 3.5 months (Body Image: 61 IQR: [54;74],  $p<0.001$ ) and 12 months (Median: 65 IQR: [54;85],  $p<0.001$ ) compared with preoperative scores (Median: 38 IQR: [22;54]), but did not change significantly between 3.5 and 12 months ( $p=0.32$ ). Similarly, social function scores were significantly higher at 3.5-month (Median: 57 IQR: [46;71],  $p=0.008$ ) and 12-month (Median: 61 IQR: [48;74],  $p<0.001$ ) timepoints compared with the preoperative timepoint (Median: 52 IQR: [40;60]) and did not change significantly from 3.5 to 12 months ( $p=0.24$ ). Patients had high satisfaction scores postoperatively which did not change significantly ( $p=0.80$ ) between the 3.5-month (Median: 95 IQR: [75;100]) and 12-month (Median: 100 IQR: [82;100]) timepoints. After controlling for age, BMI, comorbidities and revisions, major complications (requiring reoperation or readmission) were negatively associated with satisfaction at both 3.5 months ( $p=0.005$ ) and 12 months ( $p<0.001$ ).

**Conclusions:** Gender-affirming vaginoplasty positively impacts body image and social function, which stabilizes by 3.5 months. Overall, participants had high satisfaction

following the procedure although satisfaction was negatively associated with major complications. In this prospective study, we affirm previous retrospective studies demonstrating the positive psychosocial impact of PIV, however longer-term prospective and multi-center studies remain important.

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## Gender-Affirming Chest Surgery in High BMI Adults: A Retrospective Analysis of Clinical Outcomes

Abstract Presenter  
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**Purpose:** Surgeons often use body mass index (BMI) cutoffs of 35 kg/m<sup>2</sup> for gender-affirming chest surgery (GACS) based on the longstanding belief that high BMIs are associated with greater surgical risk.<sup>(1)</sup> This disproportionately affects transgender and

gender diverse (TGD) individuals who may be unable to exercise due to chest dysphoria or use their weight to hide their chest. Current research suggests no significant association between BMI >35 kg/m<sup>2</sup> and complications related to GACS in adults.(2,3) However, studies have limited data on adults with BMI >40 kg/m<sup>2</sup>.(4) This study investigates the impact of high BMIs on GACS complications and revision rates.

**Methods:** A retrospective chart review of individuals undergoing GACS at our institution from January 2016 to October 2023 was performed. Individuals 18 years and over who were at least 90 days post-operation from either bilateral gender-affirming mastectomies or bilateral gender-affirming chest reductions were included. Demographic information, relevant operative records, post-operative complications (i.e. hematoma, seroma, infection, dehiscence, tissue necrosis) and revision history were collected and analyzed via descriptive statistics and bivariate analysis.

**Results:** A total of 159 individuals were included in the study. The mean age at time of GACS was 28.7 (SD=9.1). The mean BMI was 31.2 kg/m<sup>2</sup> (range=16.0 to 87.6, SD=10.1), with 13.8% (N=22) having a BMI >40 kg/m<sup>2</sup>. A total of 15 (9.4%) individuals had a complication within 90 days, 7 (4.4%) of which were a major complication that required return to the operating room. 12 (7.5%) individuals underwent a revision. Lastly, none of the cohort had a reversal (breast reconstruction) procedure. Having a BMI >40 kg/m<sup>2</sup> was associated with the risk of developing a complication in general (P=0.04), however, it was not associated with the risk of developing a major complication that required reoperation (p=0.25) or necessitating a revision (p=0.67). No other factors appeared to be associated with complications or revisions.

**Conclusions:** The rate of post-operative major complications and revisions for individuals who underwent GACS is similar regardless of BMI. Obesity alone may not be sufficient to limit access for individuals seeking GACS. Future studies evaluating patient reported outcomes in high BMI adults following GACS are necessary.

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## **The Impact of Peri-operative Blood Pressure Management on Hematoma Formation in Gender Affirming Top Surgery: A Retrospective Analysis**

Abstract Presenter

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**Purpose:** The study investigates the influence of intraoperative and perioperative blood pressure management on the occurrence of hematomas in gender-affirming bilateral mastectomy in transmasculine individuals. Prior research indicates that hematomas are a prevalent complication of mastectomy procedures. In 2001, Hussien et al. proposed that post-op hematoma forms due to intraoperative hypotension potentially concealing active bleeding, which becomes apparent once normotension is restored post-surgery. In this study, we aim to elucidate the relationship between blood pressure during intraoperative and perioperative period and hematoma formation, thereby guiding better perioperative care.

**Materials and Methods:** A retrospective analysis was conducted on a cohort of 109 transgender individuals who underwent bilateral mastectomy by the same surgeon at our institution between 2016 and 2020. Patients who developed postoperative hematomas were identified, and a comprehensive dataset of all patients was compiled.

Patients with incomplete data were excluded, yielding for 96 patients in total, with hematoma group n=8, non-hematoma group n=88. Data extracted includes demographics, baseline blood pressures from office visits, preoperative measurements an hour before procedure, all intraoperative blood pressure readings per anesthesia printed records, the maximum fluctuation of MAP, and immediate postoperative pressures. Preoperative comorbidities and hormonal treatment histories were also documented. An independent T-test assessed differences in average blood pressures between hematoma and non-hematoma groups, while logistic regression evaluated the influence of blood pressure variations on hematoma risk.

**Results:** From the 96 patients analyzed, 8 experienced hematomas requiring surgical evacuation. Baseline and preoperative blood pressures were similar between the non-hematoma (average BP 122.7/79.1, MAP 93.7) and hematoma groups (average BP 127.3/77.3, MAP 93.9), with no significant differences observed ( $p>0.05$  for all). Intraoperative data revealed the hematoma group had a significantly lower average diastolic pressure ( $p=0.014$ ) and MAP ( $p=0.027$ ). Postoperative measurements showed this group also had a significantly higher average diastolic pressure ( $p=0.028$ ) and MAP ( $p=0.026$ ). Logistic regression analysis revealed that a low intraoperative mean arterial pressure (MAP) significantly predicted hematoma occurrence ( $p=0.029$ , OR=0.863, 95% CI [0.755, 0.989]). In hematoma group, patients had MAP decreased greater than 20mmHg (21.7%) from baseline. In addition, increase in immediate postoperative MAP was also a significant predictor for hematoma formation ( $p=0.013$ , OR=1.140, 95% CI [1.028, 1.264]). Hematoma group had an average of 34.8% increase in immediate post-op from intraoperative levels. In contrast, the non-hematoma group showed a smaller intraoperative MAP decrease of 13.2% and a postoperative increase of 9.3%. Lastly, age, BMI, baseline, and preoperative blood pressures did not significantly predict hematoma formation ( $p>0.1$  for all).

**Conclusion:** The study reveals that lower intraoperative MAP and higher immediate postoperative MAP are associated with an increased risk of hematoma formation after bilateral mastectomy in transgender patients. These findings highlight the critical importance of maintaining stable intraoperative and immediate postoperative blood pressure levels to mitigate the risk of this complication. Notably, age, body mass index (BMI), and baseline blood pressure were not correlated with the incidence of hematoma, underscoring the importance of vigilant perioperative blood pressure management over these static patient factors.

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## **Patient Reported Outcomes After Gender-Affirming Surgery to the Chest Using a Validated Questionnaire**

Abstract Presenter

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**Introduction:** Gender-affirming surgery (GAS) aligns physical appearance with gender identity. While clinical outcomes of GAS are well-documented, understanding patient-reported experiences is vital. (1,2) This study uses the validated VMP-G, Mini Patient Reported to assess patient reported outcomes (PROs) after GAS to the chest. VMP-G assesses quality of life, self-concept, satisfaction, and gender dysphoria.

**Methods:** Participants seeking chest GAS from 2022 to 2023 completed the VMP-G preoperatively, at one-, six- and twelve- months post-surgery using the Research Electronic Data Capture survey tool (REDCap). VMP-G scores, range from 20 to 100 (higher scores indicating superior PROs). We compared outcomes and identified factors associated with higher scores at the each timepoint.

**Results:** Seventy-nine chest GAS patients (median age: 27; predominantly male) completed pre-operative surveys. One-, six-, and twelve-month post-surgery responses showed significant improvement in VMP-G scores compared to baseline (all  $p < 0.0001$ ), across all categories assessing quality of life, self-concept, satisfaction, and gender dysphoria.

Regression analysis revealed younger age associated with higher VMP-G scores across both GAS groups. In the post-operative period, there was a significant difference between mean VMP-G scores at the one month and each of the six- and twelve-months period yet there was no difference between the average scores between the last two timepoints.

**Conclusion:** PROs using the validated VMP-G significantly improved at one-, six- and

twelve months post-GAS to the chest, with stabilization of outcomes beyond the six-month recovery period.

## **Evaluation of surgical and psychological outcomes of gender affirmation top surgery in minors**

Abstract Presenter  
Daniel Medalie MD

**Introduction:** Gender Affirmation Top Surgery (GATS) has been found to promote wellbeing for transgender (TGD) adults; yet, very limited research exists on TGD minors who receive GATS. This study investigates post-operative surgical and psychological outcome variables (i.e., appearance congruence, gender identity acceptance, chest dysphoria, anxiety, depression, and social support) for TGD people who received top surgery as minors.

**Methods:** The N=46. The sample was acquired from a single surgeon who has a high volume top surgery practice. All patients received GATS between 2016-2023. TGD people who were at least 6 months post-operation (range 6 mo-7 years) and minors when they received top surgery were invited to complete the online survey consisting of demographics/clinical characteristics and validated measures (i.e., Transgender Congruence Scale (TCS), Chest Dysphoria Measure (CDM), Patient Health Questionnaire Anxiety and Depression Scale (PHQ-ADS), and Multidimensional Scale of Perceived Social Support (MSPSS)). Analyses consisted of descriptive statistics of validated measures. The results were compared to published pre-operative surveys of TGD adults and minors, as well as studies of anxiety and depression in cis minors. Surgical outcomes were compared to an equivalent number of adult GATS performed by the same surgeon during the same time frame.

**Results:** All patients underwent GATS as an outpatient. 36 patients underwent double incision mastectomy with free nipple grafting and 10 patients underwent sub-cutaneous mastectomy via a peri-areolar approach. There were no serious adverse events that required blood transfusion, IV antibiotics, re-admission to the hospital or an overnight stay. 1 hematoma that required a secondary evacuation procedure in clinic was encountered. There was no complete loss of free nipple grafts. The TCS average post-op composite score was 53 (SD5.97; range=38-60). The TCS appearance congruence average composite score was 40 (SD4.93; range=27-45). The TCS gender identity acceptance average composite score was 12.81 (SD2.37; range=3-15). The CDM average composite score was 1.80 (SD1.66; range=0-6). The PHQ-ADS average



composite score was 9.68 (SD8.94; range=1-41). The PHQ anxiety subscale average composite score was 4.84 (SD4.72; range=0-21). The PHQ depression subscale average composite score was 4.84 (SD4.63; range=0-20). The MSPSS average was 5.78 (SD1.23 range=1-7).

**Conclusions:** The surgical results in minors was equivalent to that of adults. The procedures were well tolerated with very low levels of complications. When comparing these results to published norms of pre-operative psychological outcomes for TGD minors, our post-operative outcomes show higher levels of appearance congruence (40 versus 26.80), lower levels of chest dysphoria (1.80 versus 30.50), and milder levels of anxiety and depression. Recently, top surgery in minors has been deemed controversial. At this time 19 states have implemented laws banning such surgery. Our findings show TGD minors who receive GATS experience good surgical post-operative outcomes that can significantly improve their psychological well being. These results are a step towards challenging the laws that currently ban the procedure.

## **Assessing Hypertrophic Scarring in Gender-Affirming Mastectomy: A Systematic Review**

Abstract Presenter  
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Esther Kim MD

**Purpose:** Hypertrophic scarring represents a significant concern in gender-affirming mastectomy (GAM) procedures, crucial for aligning patients' physical appearance with their gender identity. Despite extensive literature on factors contributing to hypertrophic scarring, research quantifying its incidence in GAM recipients remains limited. This systematic review aims to address this gap by summarizing rates of hypertrophic scarring following GAM reported in the literature.

**Methods:** A PROSPERO-registered systematic review adhering to PRISMA guidelines was conducted. Keyword searched including 'hypertrophic scarring' and 'gender affirming mastectomy' in PubMed, Web of Science, and Embase databases yielded 631

articles. Inclusion criteria focused on studies reporting hypertrophic scarring rates in GAM patients, excluding conference abstracts, meta-analyses, systematic reviews, and articles lacking quantitative measures of hypertrophic scars. Meta-analysis was conducted using Stata version 17.0 (College Station, TX, USA).

**Results:** Thirteen studies, comprising 2,327 cases of GAM, were included, predominantly single-center retrospective cohort studies (92%) with one cross-sectional survey study. Follow-up duration varied, with 30% of patients followed for less than one year. The pooled rate of hypertrophic scarring was 10% (95% confidence interval [CI] 7-14%). Silicone tape application, recommended in three articles, aimed to mitigate scarring. Revision rates for hypertrophic scarring were reported in eight articles, with an overall rate of 3% (95% CI 1-4%). Comparing between patients receiving preoperative testosterone and those who did not showed no difference in the rates of hypertrophic scarring in one study.

**Conclusion:** Hypertrophic scarring occurs in approximately 10% of GAM patients, with a 3% rate of hypertrophic scar revisions. Limited follow-up duration may under-represent hypertrophic scarring incidence, necessitating extended follow-up to accurately detect its development. Standardized classification systems for hypertrophic scarring in this context are crucial. Future research should focus on prolonged follow-up to accurately capture the hypertrophic scarring incidence and explore effective management and prevention strategies.

## **The Long-Term Impact of Gender-Affirming Hormone Therapy on Mental Health and Resource Utilization for Transgender and Gender-Diverse Individuals**

Abstract Presenter  
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**Purpose:** Transgender and gender-diverse (TGD) individuals experience disproportionate rates of mental health challenges, including anxiety, depression, and suicidality compared to cisgender individuals. Gender-affirming hormone therapy (HT) has been associated with improved psychosocial symptoms in TGD individuals. However, our understanding of the impact of HT on psychosocial functioning is limited based on studies with subjective assessments and short follow-up periods of 2 years or less. Here, we evaluate the utilization of mental health resources before and after HT, to assess long-term changes in suicidality, acute mental health care, and medication usage.

**Methods:** We conducted a retrospective chart review of TGD individuals who pursued HT at a single institution from January 2017 to July 2023. Patients were included if they had a history of suicidal ideations, suicidal attempts (SA), or acute mental health visit (ED visit or hospitalization). For each patient, outcomes were analyzed within equal before and after HT follow-up periods. Suicidality, non-suicidal self-injury (NSSI), acute mental health care visits, and psychotropic medication use were compared. The McNemar test, Wilcoxon signed rank test, and Chi-squared test were used to compare outcomes before versus after HT. A subgroup analysis of adolescent individuals (<26 years) was also performed.

**Results:** A total of 91 TGD individuals were analyzed with a median (interquartile range [IQR]) age of 18 (17-24) years. Within this population, 72 (79%) were adolescent individuals. The median [IQR] matched follow-up period was 2.9 [2.3-5.3] years before and after HT. A smaller percentage of patients in the total cohort reported SA (10 [11%], 22 [24%],  $P=0.012$ ) after HT. Among adolescents, there was a smaller proportion who reported SA (9 [13%]; 25 [25%],  $P=0.039$ ) and NSSI (13 [18%], 25 [35%],  $P=0.019$ ) after versus before HT. The number of prescribed psychotropic medications and acute mental health visits did not change between the two follow-up periods in the overall cohort. Among adolescents, however, the frequency of acute mental health visits declined from 0.47 visits/year (standard deviation [SD]: 0.48) to 0.25 visits/year (SD: 0.86) ( $p=0.017$ ). Patients who sought acute mental health care after HT initiation, compared with those who did not, were significantly more likely to have history of abuse (20 [50%], 11 [22%],  $P=0.004$ ) and unstable housing e.g., homelessness or transitioning between foster placements (12 [30%], 5 [12%],  $P=0.01$ ).

**Conclusion:** Our findings demonstrate improvements in psychosocial well-being after nearly three years of HT, which corroborates and expands upon the findings of prior studies with shorter-term follow-up. This study also provides the first report of the positive impact of HT on NSSI in adolescents. Characterization of patient and

psychosocial factors associated with increased risk of poor mental health outcomes is needed to better support TGD people throughout their transition.

## **Reassessing Body Mass Index as Qualifying Criteria for Gender-Affirming Mastectomy: An Outcomes Analysis and Tailored Surgical Approach**

Abstract Presenter

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**Introduction:** Transgender and gender non-conforming patients with a high BMI ( $>35$  kg/m<sup>2</sup>) are often denied gender-affirming mastectomy (GAM) due to concerns related to body habitus and increased risk of complications (1). Factors such as weight bias and concern for poor aesthetic outcomes may further dissuade surgeons from working with patients with high BMI (2). This study aims to evaluate the impact of BMI on surgical complications following GAM, comparing outcomes in patients with high BMI ( $\geq 35$  kg/m<sup>2</sup>) to those with normal BMI (18.5-24.9). Additionally, we introduce a tailored surgical approach aimed at reducing the risk of undesirable "dog-ear" deformities in overweight and obese patients.

**Methods:** A retrospective review was conducted to identify all GAM performed between January 2011 and September 2023 by a single surgeon. Patients were stratified by BMI to compare medical and surgical outcomes within 90 days postoperatively.

Demographics, comorbidities, and complications, including hematoma, seroma, dehiscence, unplanned observation, and other complications were analyzed. BMI groups were compared using an analysis of variance (ANOVA) F test for continuous variables and a Chi-square test for categorical variables. Multiple logistic regression analyses were conducted to examine the association between BMI cohorts and complications, adjusting for significant covariates on univariate analysis (age, race, hypertension, type II diabetes, sleep apnea, and asthma).

**Results:** Among 519 GAM patients, BMI cohorts included normal (n=118), overweight (n=134), class I obesity (n=110), class II obesity (n=79), and class III obesity (n=78).

Significant differences were observed between BMI groups for unplanned observation ( $p=0.0323$ ) and other complications ( $p<0.001$ ). "Unplanned observation" involved extended post-operative admissions and emergency encounters, while "other complications" encompassed issues such as cellulitis, edema, hypersensitivity, keloids, and paresthesias. There were no differences between BMI groups for hematoma, seroma, or dehiscence. After adjusting for significant covariates, patients with class III obesity had more unplanned observations than patients with normal weight ( $p=0.0193$ ). Other complications were significantly greater in overweight and obese cohorts compared to normal weight ( $p<0.05$ ).

**Conclusions:** Patients with a high BMI ( $>35\text{ kg/m}^2$ ) undergoing GAM did not exhibit an increased risk of common complications, such as hematoma, seroma, or dehiscence, within the first 90 days postoperatively compared to individuals with a normal BMI. However, they did have a greater likelihood of unplanned observation and other complications, including cellulitis, edema, and paresthesias. Given that patients were not at higher risk for serious complications, this study advocates for accepting patients seeking GAM at their existing weight without mandating preoperative weight loss. Furthermore, it emphasizes the importance of a customized surgical approach that addresses the entire chest contour, including the removal of excess lateral thoracic tissue, to achieve a flatter, squared-off appearance.

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## **Quantitative Assessment of Soft Tissue Changes Following Feminization Genioplasty**

Abstract Presenter(s)

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**Background:** As an element of facial feminization surgery (FFS), sliding genioplasty is considered the most effective approach for aligning chin morphology with more feminine ideals. While two-dimensional imaging analysis has previously been used to quantify soft-tissue changes after genioplasty, this study presents a novel three-dimensional (3D) morphometric assessment.

**Methods:** Patients who underwent feminization genioplasty at a large academic medical center were enrolled. To be included, patients needed to have a complete panel of 3D imaging pre- and post-operatively. 3D photogrammetric evaluation was performed to assess nasofacial angle, nasomental angle, facial angle, facial thirds, chin projection, chin height, chin width, and chin angles. For all measurements, standard anthropometric points were placed by two observers in a blinded fashion. Soft-tissue changes were correlated with hard-tissue changes measured through computerized tomography imaging analysis.

**Results:** Fourteen patients met the inclusion criteria. The mean time between the date of surgery and post-operative 3D imaging was  $10.70 \pm 8.93$  months. All measurements had substantial to almost perfect inter-rater reliability between the two raters. Pre- to post-operatively, the mean facial angle increased by  $2.07^\circ$  ( $p = 0.003$ ), chin height decreased by 1.16 mm ( $p = 0.033$ ), right chin angle increased by  $1.20^\circ$  ( $p = 0.031$ ), left chin angle increased by  $1.40^\circ$  ( $p = 0.017$ ), and chin width decreased by 1.59 mm ( $p = 0.034$ ). Soft- and hard-tissue chin projection changes were positively correlated ( $r = 0.524$ ,  $p < 0.001$ ).

**Conclusion:** The quantification and correlation of 3D soft- and hard-tissue changes following feminization genioplasty allow for a comprehensive evaluation of post-operative outcomes and the potential need for secondary, revision surgeries.

# **A Comparison of Patient Reported and Clinical Outcomes of Non-Binary Individuals and Transgender Men Following Gender Affirming Chest Surgery**

Abstract Presenter

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**Purpose:** Non-binary individuals who are assigned female at birth are increasingly presenting for gender affirming chest surgery (GACS) (Esmonde et al., 2019). Although GACS is known to positively impact psychosocial outcomes among binary transgender men (Lane et al., 2023), little is known about psychosocial outcomes following surgery in non-binary individuals. We compare patient reported and clinical outcomes of gender affirming chest surgery between non-binary individuals who were assigned female at birth and binary transgender men who underwent GACS at our institution.

**Methods:** We performed an institutional retrospective chart review. Demographic information, medical comorbidities, history of gender-affirming medical care, operative details, and complications were collected and compared between non-binary and binary patients. To evaluate postoperative psychosocial outcomes, an online survey was administered using REDCap at least 6 weeks following GACS. The survey included two widely used patient reported outcomes measures: the Gender Congruence and Life Satisfaction (GCLS) scale and the Chest Dysphoria Measure (CDM). Bivariate analysis was used to compare demographics, surgical outcomes and patient-reported outcomes between the non-binary and transgender male cohorts, and multivariate linear regression was performed to identify factors associated with patient reported outcomes scores.

**Results:** 281 patients were included in the study, of which 40.6% (n=114) identified as non-binary and 59.4% (n=167) identified as binary transgender men. Fewer non-binary patients used testosterone ( $p<0.001$ ). A greater proportion of binary transgender men (22.2%, N = 37) identified as Black or African American compared to non-binary

individuals (7.9%, N = 9). Non-binary patients underwent a wider variety of masculinizing chest operations than binary patients, with less non-binary patients electing for free nipple areolar complex grafts (NAC) ( $p<0.001$ ) and more non-binary patients undergoing breast reduction ( $p=0.001$ ). 137 (48.7%) patients responded to post-operative surveys. Non-binary and binary respondents had comparable scores on the overall GCLS ( $p=0.86$ ), GCLS chest subscale ( $p=0.38$ ) and CDM ( $p=0.40$ ). Absence of NAC grafts was associated with higher GCLS chest scores ( $p=0.004$ ) and non-binary identity was associated with decreased social gender recognition scores ( $p<0.001$ ).

**Conclusion:** Non-binary individuals have similarly positive outcomes following gender affirming chest surgery compared with binary individuals. Surgeons working with non-binary patients should be aware of increased heterogeneity in this population and seek to understand individual patients' goals and priorities. Future research is needed to understand the impact of intersectional racial identities on access to gender-affirming surgery for non-binary individuals.

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#### **Ink and Identity: A Scoping Review on Medical Tattooing and Gender-Affirming Care**

Abstract Presenter

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**Background/Purpose:** As of 2022, an estimated 1.6 million Americans identify as transgender or gender non-conforming, constituting a significant patient population with unique health needs(1). Gender-affirming surgery, hormone therapy, and behavioral health interventions are among the most popular and well-represented areas of gender-affirming care, and a growing number of resources are available to aid in gender transition. Medical tattooing carries promising implications in aesthetic outcomes as well as accessibility. Healthcare teams, LGBTQ+ resource centers, and tattoo businesses integrate medical tattooing with gender-affirming care, yet standards are underdeveloped and infrequently proposed in the literature. This review discusses applications of medical tattooing within gender-affirming care and identifies areas of need for future research.

**Methods:** A literature search was conducted electronically through PubMed database. The search included literature written in the English language and published within the date range February 2014 through 2024. The search terms "medical" and "tattoo" were combined with the "AND" operator, and the "NOT" operator was used to specify against literature on tattoo "removal" or "complications". Articles written on decorative tattooing, complications, or applications irrelevant to gender affirmation were excluded.

**Results:** The initial search yielded 668 publications, which were further subjected to exclusion criteria. After exclusion criteria were applied, 54 relevant articles were selected for review. Of the selected 54 articles, 42.6% covered surgical and tattooing techniques as well as clinical guidelines, 24.1% were review papers, 11.1% were studies on patient satisfaction, and 7.4% were case reports. When categorizing articles according to applications of medical tattooing, 40.7% were written on breast and nipple-areolar complex tattooing, 20.4% on head and neck tattooing or microblading, 3.7% on scar camouflage, 3.7% on tattoos used for health informatics, and 7.4% on a combination of applications. There were not any articles identified in the search that focused exclusively on the transgender patient population.

**Conclusions:** There are numerous applications of medical tattooing that promote gender affirmation, including nipple-areolar complex tattooing, scar camouflage, scalp microblading, permanent makeup, and health information storage. Although a growing number of gender-affirming healthcare providers refer patients to tattoo artists, medical tattooing specific to transgender patients has not been discussed in the literature. Given the nuances of gender dysphoria and its management, future studies must be conducted specifically within this population in order to evaluate the success of medical tattooing in addressing gender dysphoria, as well as the extent to which it is utilized. Further, due to its widespread and interdisciplinary uses, medical tattooing and related standards of care should continue to develop within the realm of healthcare, rather than

as an afterthought.

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## **Barriers to Gender-Affirming Care in Transgender and Gender-Diverse Individuals**

Abstract Presenter

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**Purpose:** Transgender and gender-diverse (TGD) individuals face frequent barriers to gender-affirming care (GAC), including insurance obstacles, financial and legal constraints, inadequate access to mental health services and poor social support. Our study aimed to identify the most prevalent barriers to GAC, focusing on those contributing to loss of follow-up and examining how these barriers differ with age.

**Methods:** We performed a retrospect review of patients who sought GAC at our multidisciplinary center for TGD care from September 2018 to September 2019. For patients who underwent intake, we evaluated patient charts and staff messages to ascertain reasons for lack of follow-up, and impediments to surgical or non-surgical services. Descriptive statistics were calculated. Bivariate analyses and univariate linear regression were performed.

**Results:** Of 577 patients who had an intake, the majority identified as transmasculine (n=319 [55%]), followed by transfeminine (n=205 [36%]), and non-binary (n=47 [8%]). Half the individuals who had an intake attended a clinic visit (n=284 [49%]) and were followed for a median (interquartile range [IQR]) duration of 16 (3-38) months. The most common barrier to GAC was insurance (159 [28%]), followed by obtaining behavioral

health letters (84 [15%]), followed by weight loss (76 [13%]). Of 104 patients with available insurance information, most patients had private insurance (n=76 [73%]). Patients with insurance as a barrier to care were more likely to have a shorter follow up (less than one year) (n=124 [62%]) as compared to a longer (more than one year) follow up (n=41 [48.8%]) compared with patients who had cited other barriers. Patients who had weight loss as a barrier were less likely to attend a clinic visit following intake (n=47 [61.8%]) as compared to those who did not have weight loss as a barrier (n=246 [49%], P=0.048). For every additional year of age, there was a corresponding 2% increase in the odds of having insurance as a barrier ( $1.023^{\text{Age}} - 1.64$ , 95% confidence interval [CI] [1.006, 1.040], P=0.009) and a 3% increase in the odds of having weight loss as a barrier ( $1.026^{\text{Age}} - 2.67$ , 95% CI [1.005, 1.048], P=0.016).

**Conclusion:** Weight loss and insurance coverage represent substantial impediments to access of GAC, particularly among older patients. Our study is the first to investigate how barriers to GAC vary across age and how common barriers to GAC affect patient's continuity of care.

## **Wound Disruption Causing Increased Reoperation Rates in Transfeminine Bottom Surgery? An Analysis of the NSQIP Database from 2010-2020**

Abstract Presenter  
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**BACKGROUND:** Gender affirmation surgery (GAS) has gained traction in recent years due to increased acceptance of transgender individuals and has shown therapeutic benefits for patients. Unfortunately, the literature is sparse on the causes of postoperative complications and re-operation rates post-bottom surgery. Evaluating surgical outcomes of male-to-female (MtF) bottom surgery remains an important step towards improving care for transgender patients undergoing GAS. Our study aims to evaluate postoperative complications with potential risk factors and re-operation rates following MtF surgery, with the ultimate goal of improving surgical outcomes in the transfeminine population.

**METHODS:** The American College of Surgeons-National Surgical Quality Improvement Program (NSQIP) database from 2010 to 2020 was utilized to identify patients undergoing GAS with the relevant CPT and ICD 9 and ICD 10 codes. Multivariate regression analysis was performed to identify risk factors for unplanned reoperation using the IBM SPSS statistical system. A risk-adjusted multivariate regression analysis controlling for BMI, age, race, smoking status, and diabetes was also performed to identify other risk factors using odds ratio (OR).

**RESULTS:** 651 cases of MtF bottom surgeries were identified. The adverse event that posed the highest risk for reoperation in this study was wound disruption/dehiscence (OR=73.85,  $p<0.001$ ). History of steroid use for a chronic condition (OR=11.56,  $p=0.05$ ) and longer operation times (OR=1.27,  $p=0.04$ ) were also shown to be risk factors. Patients who needed a red blood cell transfusion intraoperatively or 72 h postoperatively were 6.40 times more likely to undergo an unplanned reoperation compared to those who did not need a transfusion ( $p=0.05$ ).

**CONCLUSION:** Our results suggest that the choice of appropriate surgical technique, minimizing blood loss and operation length, and postoperative wound care are crucial in decreasing unplanned reoperation. These ideas can aid plastic surgeons to minimize the risk of postoperative complications and improve surgical outcomes in the MtF transgender population.

## **AI in Patient Education: Evaluating the Effectiveness of ChatGPT-3.5 in Providing Comprehensive and Safe Information on Gender-Affirming Surgery Mastectomy**

Abstract Presenter  
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Karen Li  
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**Introduction/Background:** Publicly available artificial intelligence (AI) in healthcare may transform patient education and reshape patient-provider relationships. Machine-learning language models such as ChatGPT are being increasingly applied to medical education (1). Gender-affirming surgery (GAS) refers to surgical procedures to help people transition to their self-identified gender. Given its extremely personal and

emotionally-charged nature, GAS recipients may have a variety of questions and concerns related to the procedure (2). Thus, plastic and reconstructive surgeons may rely on AI-driven chatbots as an accessible, accurate, and patient-driven educational model.

**Specific Aim(s):** This research investigates whether ChatGPT-3.5 can provide comprehensive, accurate, safe, and emotionally sensitive information about gender-affirming surgery (GAS) mastectomy. This research will determine whether AI-driven chatbots can serve as supplementary resources for patient education through the lens of GAS.

**Methods/Analysis:** Ten frequently-asked questions (FAQs) concerning pre- and post-operative topics were sourced from online forums and physician websites, then inputted into ChatGPT-3.5. The generated responses were assessed using validated readability score systems, including the Flesch-Kincaid Score, Coleman-Liau Index, and SMOG Score. ChatGPT-3.5 responses were evaluated by plastic and reconstructive surgeons (n=7) that perform GAS mastectomy to assess accuracy, comprehensiveness, and potential danger to patients via a Likert Scale from 1 (e.g., least accurate) to 10 (e.g., most accurate). Each physician also commented on the responses' strengths and weaknesses.

**Results:** A normal distribution of the responses' readability scores collectively displayed an average reading score of  $16.0 \pm 1$ , indicating a college or graduate level in comparison to the national average of an eighth-grade reading level. Collectively, the mean accuracy, comprehensiveness, and danger scores were  $8.8 \pm 0.5$ ,  $7.8 \pm 0.7$ , and  $2.2 \pm 0.4$ , respectively. Qualitatively, most physicians responded favorably to ChatGPT's practical advice, informative responses, even and considerate tone, acknowledgement of the variety of surgical techniques, emphasis on patient autonomy in surgeon selection, need to see a healthcare provider, and mention of mental health support. However, physicians also acknowledged instances of generic and unhelpful information, missing procedural details, incorrect and misleading assessments of post-operative estimates, support of debated or dangerous techniques, concern about labeling gender dysphoria as a psychological condition, and failure to emphasize mental help follow-up post-surgery.

**Conclusions:** While physicians acknowledge that ChatGPT-3.5 can sometimes provide generally accurate, comprehensive, and safe responses to FAQs pertaining to GAS mastectomy, certain concerns and generic answers warrant serious investigation of its future utility in patient education. While considering its potential limitations, ChatGPT-3.5 could serve as a useful supplementary education tool to patients in addition to

physician consultation.

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## **Subfascial Breast Augmentation in Gender Affirming Surgery**

Abstract Presenter

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The use of a subfascial plane for breast augmentation offers significant advantages to both subglandular and subpectoral planes. (1) But subfascial augmentation is only popularized with cis women, and still remains novel and poorly described for breast augmentation in trans women. (2) Breast augmentation in trans women introduces additional anatomic considerations when compared to the same procedure in cis women. Differences include thicker pectoralis muscles, wider chests, shorter nipple to inframammary fold distances, and less breast tissue. These anatomic differences make a subglandular approach for augmentation challenging due to a lack of soft tissue coverage, while a submuscular approach carries a substantial risk of animation deformity. To address these differences we investigated the benefits of the subfascial plane for breast augmentation in trans women. (3)

We conducted a retrospective review of patients that presented between 2021-2023 to a single site for gender affirming breast augmentation. Patients underwent a primary augmentation via inframammary fold incision and regular follow up at 1 week, 1 month, and 4 month intervals. Findings regarding patient complication rate and demographic factors were documented and compared to those in published literature.

35 patients were included in this study. The average age of included patients was 32 years old, with an average implant of 455ccs bilaterally. The average body mass index was 27, and every patient was on some degree of long term hormone therapy prior to

surgery. Only a total of 3 complications required reoperation: 1 case of capsular contracture, 1 unilateral hematoma, and 1 clinically significant seroma. No patients necessitated reoperation for unfavorable aesthetic results or nipple malposition. Overall, subfascial augmentation in trans women offers the benefits of a subglandular implant placement while also offering rates of capsular contracture, hematoma, and seroma comparable to subpectoral augmentation. We conclude that subfascial is an overall safe and aesthetically pleasing plane of augmentation that ideally addresses the anatomical and medical differences associated with trans women.

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## **Buccal Fat Pad Transposition for Midface Augmentation in Facial Feminization Surgery: A Case Series**

Abstract Presenter  
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**Introduction:** Midface augmentation and lower face fullness reduction is commonly performed in facial feminization surgery. Traditionally, approaches such as fillers, fat grafting, bone repositioning, and alloplastic implants have been performed. In the evolving landscape of FFS, we present a case series utilizing a pedicled buccal fat pad flap to augment the midface while reducing lower facial volume.

**Methods:** This case series consisted of 4 patients who elected to proceed with gender-affirming facial surgery to augment the midface and contour the lower face. Buccal fat transposition involves accessing the fat pad through an intraoral incision and resuspending the fat pad to the desired midface position. The fat pad is then secured to the periosteum in the desired position. Concomitant procedures performed included mandibular contouring and genioplasty, partial masseter muscle resection, and facial fat grafting.

**Results:** No postoperative complications were observed. Subjective improvement in midface fullness and a reduction in lower-face fullness were appreciated.

**Conclusion:** Our case series indicates that buccal fat pad transposition is a promising technique in gender-affirming facial surgery. Contrary to alternatives, such as fat grafting or implants alone, this method can simultaneously improve midface fullness while contouring the submalar and lower facial region. Careful patient selection, good fixation technique, and appropriate adjunctive procedure utilization are essential to achieve consistent results.

## **Gender-Affirming Ambulatory Mastectomy in a Time of Pandemic**

Abstract Presenter

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**PURPOSE:** Early in the covid19 pandemic, the College of Surgeons, Society of Plastic Surgeons and others advocated for broad changes in health care, including telemedicine and postponement of non-urgent procedures when feasible. Over time, several studies described increasing ambulatory discharges after oncologic mastectomy and implant-based breast reconstruction.(1) There is a paucity of literature exploring surgical outcomes of transgender and gender-diverse (TGD) patients during the pandemic;(2) we identified no studies focused on gender-affirming mastectomy. TGD patients experience implicit bias due to how electronic health records (EHR) report name, gender and pronouns. With direct release of EHR notes, patients may visualize documentation of their non-affirmed name or pronouns in health portals. Optimizing communication is a way to improve outcomes in gender-affirming surgery.(3) We sought to characterize the impact of ambulatory discharges after mastectomy, focused on a TGD cohort.

**METHODS:** This is a chart review of three years before/after institution of the covid19 state of emergency at our health system. Demographics include gender, affirmed name, incision type, infection, fluid collection. Unplanned healthcare-utilization (secure messaging or contact via after-hours triage line) was also analyzed. EHR was reviewed to infer whether patients may have been misgendered or deadnamed during hospitalization: analysis designed as 'cultural complications' (after Harris(4)), representative of putative harm from implicit bias. This de-identified study was deemed exempt by Institutional Review Board (IRB) of Duke University.

**RESULTS:** A cohort of 57 adults was identified, with two-thirds undergoing surgery post-pandemic. Overall, 35% identified as non-binary (NB) or genderfluid. Among NB patients, 20% chose to undergo mastectomy without nipple areolar complex (NAC) reconstruction. There were no statistically-significant differences in complications between ambulatory and overnight groups (hematoma, seroma, infection), nor when comparing incision type. Ambulatory patients may have a higher rate of unplanned healthcare utilization, but this was not statistically significant. Ambulatory and overnight patients were charted with non-affirmed name or pronouns (47% vs 62%): same-day-discharge did not increase likelihood ( $\chi^2=3.740$ ,  $p=0.0531$ ).

**CONCLUSIONS:** Ambulatory gender-affirming mastectomy can be a safe practice: we found no evidence of increased risk of post-surgical complications, unplanned healthcare utilization or misgendering. Even though EHR and surgical notes use affirmed names, patients can still be mis-documented during hospitalization. This emphasizes the value of verbal sign-outs, and suggests a mitigation strategy to be free-typing notes with patients' affirmed name and pronouns.

Areas for improvement included discharge instructions and ensuring patients could contact clinicians on-call after hours or share photographs should they be concerned. Gender-neutral terminology should be used whenever possible, especially with NB patients. An important finding is 20% of NB patients in our practice chose to undergo mastectomy without NAC. There is a paucity of research regarding best practices with NB or genderfluid patients. Several authors have called for increased attention to TGD patient-reported outcomes, involving those with lived experience.(5) Further studies are needed; ours represents the first report of gender-affirming mastectomy during the pandemic, providing insights on quality improvement.

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### **Topical Nitropaste Reduces Partial Free Nipple Graft Loss in Gender Affirming Mastectomy: A Randomized Controlled Trial**

Abstract Presenter  
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Abstract Co-Author(s)  
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**Introduction:** Topical nitroglycerin has been shown to improve wound healing and decrease flap necrosis after oncologic mastectomy. 1,2 Its impact after gender affirming mastectomy, however, has not been evaluated well. The purpose of this study is to investigate the effectiveness of topical nitroglycerin on patients undergoing double

incision mastectomy with free nipple grafts (DIFNG), especially regarding nipple graft and wound related outcomes.

**Methods:** Adult patients undergoing DIFNG from August 2022 to December 2023 at a tertiary university hospital were recruited for the study. Study participants were randomized into a control and treatment group. All surgeries were performed by the two senior authors using the same surgical technique and perioperative regimen. Control group had one-time, intra-operative application of bacitracin ointment to the nipple graft and surrounding mastectomy flap, while the treatment group had topical nitroglycerin (15mg each side) applied. They were evaluated at 5 days, 2 weeks and 6 weeks post-operatively for partial or total graft loss. Wound complications were evaluated as well. An ordinal logistic regression was performed to control for smoking status.

**Results:** A total of 93 patients were recruited with 46 participants in the control group and 47 participants in the treatment group. The two groups did not show any significant differences in demographics, comorbidities, ptosis grade, pre-operative hormone therapy or chest binding. Overall, partial nipple graft loss rate was 36.6% without any total graft loss. The incidence of partial graft loss was significantly lower in the topical nitroglycerin group compared to that of control group (21.3% vs. 52.2%,  $p = 0.00481$ ). There was no significant difference in wound complications (10.9% vs. 10.6%,  $p=1.0$ ).

**Conclusions:** One-time application of topical nitroglycerin around free nipple grafts in DIFNG is associated with a significant decrease in rates of partial nipple graft loss. There were no significant differences in wound complications.

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# **Socioeconomic Disparities and Their Effect on Postoperative Outcomes for Patients Undergoing Gender-Affirming Mastectomy**

Abstract Presenter

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**Purpose:** Gender-affirming mastectomy (GAM) is an integral aspect of transition process for transgender, gender-diverse, and nonbinary individuals, particularly those assigned female at birth. However, access to this vital healthcare intervention is often hindered by socioeconomic factors, among which the Area Deprivation Index (ADI), serving as a proxy of socioeconomic status (SES), holds significance. The ADI, a widely used measure in public health research, provides comprehensive understanding of social determinants influencing health outcomes and quality of life. It offers insight into SES within specific geographic areas. While lower SES have been associated with barriers to healthcare, its impact on postoperative outcomes in GAM remains understudied. This study aimed to assess the association between the ADI and postoperative outcomes in GAM patients.

**Methods:** A retrospective review of 415 patients who underwent GAM at a single institution between 2014 and 2023 was conducted. State-level ADI deciles were derived from the University of Wisconsin's Neighborhood Atlas, using patients' residential addresses. Lower ADI deciles indicated neighborhoods with the least deprivation, while higher ADI deciles indicated neighborhoods with the most deprivation. Patients were categorized into quintiles based on ADI. Univariate and multivariate analyses examined the impact of SES on postoperative outcomes.

**Results:** Of 415 patients who underwent GAM, 25.3% resided in the least deprived neighborhoods (ADI quintile 1), while 28.7% resided in the most deprived neighborhoods (ADI quintile 5). Patients from higher ADI quintiles faced greater geographical barriers to care, with longer distance to the hospital and increased travel time (203 miles and 217 minutes for quintile 5 versus 24 miles and 69 minutes for quintile 1). Additionally, patients from more deprived neighborhood showed a higher prevalence of major depressive disorder (MDD) (68.9% in quintile 5 vs. 54.3% in quintile 1). Surprisingly, postoperative complications did not significantly differ across

socioeconomic groups. Multivariate analysis showed that the use of post-operative drains was associated with a significantly lower odds of experiencing complications after GAM (OR 0.07, 95% CI 0.006-0.8,  $p=0.036$ ).

**Conclusion:** This study reveals that individuals undergoing GAM from socioeconomically deprived neighborhoods encounter significant geographic and mental health challenges. It echoes findings from published literature that have shown how socioeconomic disparities can impact various aspects of healthcare access and outcomes. For instance, studies in breast cancer patients have demonstrated that lower SES is associated with delayed diagnosis, less access to specialized care, and poorer overall survival rates. However, the findings from our study suggest that within the realm of gender-affirming surgeries the disparities in SES do not seem to manifest as disparities in postoperative outcomes. This aligns with broader discussions about the importance of equitable access to healthcare services, particularly for marginalized communities. Efforts to address these disparities have included interventions at multiple levels, such as improving access to insurance coverage, providing transportation assistance, and implementing culturally competent care practices. While our study did not find a direct link between SES and postoperative outcomes in GAM, it underscores the need for continued efforts to address socioeconomic disparities in healthcare access and outcomes.

## **Hand Session**

### **Biomechanical properties of epitendinous repair in the absence of a core suture**

Abstract Presenter: David Cardenas

Abstract Co-Author(s): Anca Dogaroiu, Muhammad Harirah MD, Andrew Zhang MD, Andrei Odobescu MD, PhD, Douglas Sammer MD

**Purpose:** The advantages of performing an epitendinous repair have been well described, and include greater tensile strength, greater resistance to gap formation, a smoother and less bulky repair, fewer adhesions, fewer ruptures, and better clinical outcomes (1,2). A recent survey found that 97% hand surgeons in the United States employ an epitendinous repair in addition to the core suture repair for zone II flexor tendon lacerations (3). The biomechanical characteristics of epitendinous repairs have

been studied. However, there is little information about the role of suture diameter and the number of crossing strands in epitendinous repairs. The purpose of this study is to determine whether the number of crossing strands or suture diameter affect the biomechanical characteristics of an epitendinous repair. In this study, we performed a biomechanical comparison of epitendinous flexor tendon repairs using a simple running technique with varying suture caliber and numbers of passes.

**Methods:** Thirty flexor pollicius longus (FPL), flexor digitorum profundus (FDP), and flexor digitorum superficialis (FDS) tendons were harvested from three cadavers and transverse zone 3 flexor tendon lacerations were produced. Tendons were repaired with only an epitendinous suture (no core suture) in 3 groups: 6-0 prolene with 6 passes, 5-0 prolene with 6 passes, or 5-0 prolene with 8 passes. Epitendinous repair strength was tested using an Instron materials testing machine.

**Results:** The use of 8 passes had significantly greater maximum load than 6 passes (21 +/- 7 N vs. 14 +/- 5 N,  $p < 0.05$ ), as well as significantly greater 2 mm gap resistance (8 +/- 6 N vs 4 +/- 2,  $p < 0.05$ ). Although 5-0 suture had a higher average maximum load than 6-0 suture, after adjusting for multiple hypotheses testing, this difference did not reach statistical significance (14 N +/- 5 vs. 10 N +/- 3,  $p = 0.10$ ). Failure mode for all groups was most often suture tear-through.

**Conclusion:** When considering an epitendinous suture to augment a flexor tendon repair, 8 passes provides almost 50% more epitendinous repair strength and greater 2 mm gap resistance than 6 passes when using 5-0 prolene. The choice of suture caliber may also have an impact on the strength of the repair, but more research is needed to determine if this impact is significant. This study demonstrates that a 5-0 epitendinous repair with 8 crossing strands has substantially greater strength and gap resistance when compared with 6 crossing strands.

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## Comparing the Relative Value of Elective and Traumatic Hand Surgery Procedures

Abstract Presenter: Robert George MD

Abstract Co-Author(s): Armin Edalatpour MD, Brett Michelotti MD, Caroline Bay

**Background:** The Resource-Based Relative Value Scale and its working relative value units (wRVUs) is one model for surgeon compensation. The number of wRVUs per Current Procedural Terminology (CPT) code has been negotiated considering the degree of technical skill required, expected time to completion, mental stress, and physical labor associated with each procedure.<sup>1</sup> Some studies have shown that acute surgeries are reimbursed at a lower rate than elective surgeries despite increased patient length of stay, more complications, and subsequently increased physician attention.<sup>2</sup> In this study, we aimed to compare the wRVU/min rate of elective hand surgeries as compared to traumatic hand surgeries.

**Methods:** We included consecutive elective and traumatic hand cases from a single academic institution from October 1, 2015 to July 1, 2023. Demographic data were collected in addition to CPT code, incision start/stop time, and wRVU amount. Cases with more than one CPT code assigned or CPT codes logged fewer than 10 times total were excluded from the dataset. Outliers greater than 2.5 standard deviations from the mean incision start/stop time per procedure were also excluded. Average RVU/min rates were calculated by procedure, specialty, and case type (trauma or elective) and weighted to better reflect the case mix. All averages were calculated as medians. Medians were compared using the Mann-Whitney-U test.

**Results:** A total of 9,977 elective cases and 2,666 trauma cases were included. The dataset consisted of 10 elective and 16 trauma procedures. Elective cases had an average wRVU/min rate greater than twice the rate for trauma cases (0.532 RVU/min vs. 0.191 RVU/min,  $p < 0.001$ ). "Endoscopic release of the transverse carpal ligament" (CPT 29848) was the elective procedure with the highest relative value rate at 0.799 wRVU/min, followed by "Fasciectomy, Palm Only" (CPT 26121) and "Carpal Tunnel Release, Open" (CPT 64721) at 0.455 and 0.414 wRVU/min, respectively. "Percutaneous skeletal fixation of distal radial fracture or epiphyseal separation" (CPT 25606) was the trauma procedure with the highest relative value rate at 0.396 RVU/min, followed by "Intra-articular DRF Repair, Open, 2 Fragments" (CPT 25608) at 0.213 wRVU/min and "Percutaneous Skeletal Fixation of Unstable Phalangeal Fracture, Each"

(CPT 26727) at 0.208 wRVU/min.

**Conclusion:** Despite the complexity and urgency of trauma procedures, we found a significantly lower average wRVU/min rate for traumatic hand surgeries as compared to elective hand surgeries.

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## Non-Invasive Management of De Quervain's Tendonitis: A State of the Art Review

Abstract Presenter: Abdullah Al Qurashi MD

**Objective:** The objective of this work is to evaluate existing literature on novel treatments in order to identify the most promising approaches and highlight their potential implications in clinical practice.

**Methods:** A systematic review and metaanalysis was conducted on studies reporting on De Quervain Tendonitis, following the PRISMA guideline statement. Data was extracted with a focus on overall success of treatment, success after multiple interventions within the time of study, and incidence of surgical interventions after treatment failure. Statistical analysis of single-arm studies was conducted using OpenMetaAnalyst and double-arm studies using RevMan, both with random-effects model implemented.



**Results:** 12 studies evaluated the effectiveness of corticosteroids and the overall success rate was high with an incidence of improvement reaching 81.9% (95% CI: 75.0% - 88.9%). It was also found upon subgroup analysis that an increased number of injections is associated with a higher treatment success rate. The implementation of ultrasound guidance for injections increased the improved rate to 91.7% (95% CI 86.1% - 97.3%). Using splinting in combination with 1 or 2 corticosteroid injections yielded an improvement rate of 64.2% (95% CI 45.5% - 82.9%). Analysis revealed that corticosteroids were a more effective treatment for De Quervain's disease over splinting, with a significant difference ( $P < 0.00001$ , CI=3.16 - 15.55). 11 studies investigated surgical intervention after treatment failure and found that the incidence of surgery due to treatment failure was very low, at 11.4% (95% CI 6.4% to 16.3%). The incidence of surgery after a combination of splinting and injections was higher at 18.5% (95% CI 4.6% to 32.5%). A subgroup analysis of success after multiple corticosteroid injections demonstrated that the incidence of improvement for the two-injection approach was 13.1% (95% CI 5.5% to 20.6%), whereas the three-injection approach showed a higher incidence of improvement at 30.4% (95% CI 25.2% to 35.6%).

**Conclusion:** The incidence of improvement in De Quervain disease following a combination of non-invasive management approaches is robust. In particular, repeated steroid injections with ultrasound guidance in combination with splinting decreases the need for surgical intervention.

## **Racial Disparities in the Receipt of Procedural Sedation for Pediatric Patients with Upper Extremity Injuries in the Emergency Department**

Abstract Presenter: Navya Baranwal

Abstract Co-Author(s): Elijah Persad-Paisley, Olivia Cummings, Alexandra Lee, Jesse Menville,  
Nidhi Shinde, Damon McIntire MD, Loree Kalliainen MD, FACS

**Purpose:** The objective was to evaluate racial/ethnic differences in analgesic administration for pediatric patients undergoing upper extremity procedures in ED.

**Methods:** A retrospective review of pediatric patients aged 12 years and younger who underwent upper extremity procedures by a plastic surgery resident in the ED between June 2015 and October 2023 was conducted. Included patients had the following upper extremity procedures: laceration repair, nailbed repair, reduction, incision and drainage, and amputation revision. Data on patient demographics included age, gender, race, ethnicity, and primary language. Pain management data collected included receipt of pain medications during the ED admission, procedural sedation, local anesthetic, and pain medication recommendations at discharge. Multivariate logistical regressions adjusting for age, gender, and primary language were used to elucidate the relationship between race/ethnicity and the receipt of pain management.

**Results:** A total of 403 pediatric patients who underwent an upper extremity procedure by a plastic surgery resident in the ED were identified (mean age  $6.23 \pm 3.74$  years). There were 260 (64.5%) male and 143 (35.5%) female patients and 194 (48.1%) non-Hispanic White, 54 (13.4%) non-Hispanic Black, 115 (28.5%) Hispanic, 7 (1.7%) Asian, and 33 (8.2%) "other race" patients. A total of 258 (64%) of patients received oral or intravenous pain medications during their ED admission, including ibuprofen, acetaminophen, ketorolac, or narcotics. Local anesthetic was utilized for 353 (87.6%) of patients and procedural sedation, either ketamine, midazolam, or both, was given to 281 (69.7%) of patients. Pain management recommendations for acetaminophen, ibuprofen, or narcotics at discharge were included in the medical chart for 328 (81.4%) of patients, either in the plastic surgery progress note or ED after visit summary documentation, which is provided to the patient at discharge.

Older patients had significantly lower odds of receiving procedural sedation (OR=0.72 [95% CI: 0.66–0.77];  $p<0.0001$ ). Female patients had higher odds of receiving pain management recommendations at discharge compared to male patients (OR=1.84 [1.05–3.34];  $p=0.03$ ). While there were no significant differences in receipt of pre-

procedural analgesic administration, local anesthetic, and discharge analgesic recommendations between racial/ethnic groups, non-Hispanic Black patients had significantly lower odds of obtaining procedural sedation compared to non-Hispanic White patients (OR=0.42 [0.20–0.87]; p=0.02).

**Conclusion:** In the ED of our institution, there is a discernible disparity in the administration of appropriate pre-procedural sedation among non-Hispanic Black pediatric patients. This observation suggests a potential bias in pediatric pain management strategies. To counteract this, we recommend the consideration of institution-level policies that advocate for 'opt-out' sedation protocols to ensure equitable pain management across diverse patient populations. We encourage further studies examining sedation receipt in other surgical procedures in the ED and for other institutions to investigate whether disparities exist in pediatric pain management in their hospitals.

## **Geographic Predictors of Distal Radius Fracture Outcomes: a Social Vulnerability Index Study**

Abstract Presenter: Kevin Hu

Abstract Co-Author(s): Alexander Kammien, Fortunay Diatta MD, Martin Kauke-Navarro MD, Jeremy Goss MD, David Colen MD

**Purpose:** This study investigated how social vulnerability index (SVI) influences the treatment outcomes of patients with distal radius fractures (DRF) undergoing open reduction internal fixation (ORIF).

**Methods:** Patients presenting with a DRF (ICD10-S52.5) were identified in the State Emergency Department Database for Florida, New York, and Wisconsin. Follow-up visit data were compiled from the respective State Ambulatory Surgery and Services Databases and State Inpatient Databases. Treatments were classified as no treatment, closed, or open (ORIF). Patients were assigned SVI values based on ZIP codes, and those with ambiguous SVI values were excluded. Multivariate logistic regression was used to assess the impact of overall SVI, as well as its four component themes (Racial and Ethnic Minority Status [RACE]; Socioeconomic Status [SES]; Household Characteristics [HOUSEHOLD]; and Housing Type & Transportation [TRANSPORT]), on the odds of open treatment and post-operative complications for patients who

received closed or open treatment. Resultant odds ratios can be interpreted as a comparison between a patient from the most vulnerable ZIP code (SVI = 1) versus a patient from the least vulnerable ZIP code (SVI = 0).

**Results:** From 2015 to 2020, among 68,986 patients (average age 47.1 years; 36.2% male), 73.1% received no initial treatment, 24.3% closed treatment, and 2.6% ORIF. Most patients continued with no treatment (57.4%, n = 39,615), 16.5% (11,405) with closed treatment and 26.0% (17,966) with ORIF. On multivariate logistic regression, higher RACE SVI increased the likelihood of ORIF (OR = 5.1), while high SES, HOUSEHOLD, and TRANSPORT SVI decreased it. Higher overall SVI was linked to an increased risk of wrist stiffness and ED revisits. SES SVI was inversely related to wound dehiscence, while HOUSEHOLD SVI was positively related to both wound dehiscence and surgical site infections. Wrist stiffness was positively related to SES and TRANSPORT SVI but negatively to RACE and HOUSEHOLD SVI. Lastly, overall SVI was not associated with DRF open treatment.

**Discussion:** SVI's components, rather than overall SVI, predict the type of DRF treatment and vary in association with surgical outcomes. Patient geography can greatly impact DRF outcomes but requires careful examination to isolate relevant causative factors.

### **Preoperative Lab Values are Predictive of Ulnar Nerve Decompression Surgery Outcomes Using A Receiver-Operating-Characteristic-Curve Analysis**

Abstract Presenter: Anitesh Bajaj

Abstract Co-Author(s): Rushmin Khazanchi BA, Rohan Shah, Joshua Weissman, Nishanth Sadagopan, Arun Gosain MD

**Purpose:** Ulnar nerve decompression surgery is often a non-emergent procedure, giving surgical care teams the ability to optimize patient profiles prior to surgery. Preoperative hematocrit, albumin, and creatinine levels have been identified as predictors of increased morbidity in surgical patients. The present study aims to analyze the impact of preoperative hematocrit, albumin, and creatinine on short-term outcomes after ulnar nerve decompression surgery.

**Materials and Methods:** Ulnar nerve decompression surgeries (CPT 64718) were queried from the American College of Surgeons National Quality Improvement Program (NSQIP) database from 2005-2020. Primary variables of interest were preoperative

serum hematocrit, albumin, and creatinine values. For each included case, a set of demographic, medical, and operative characteristics, alongside the latest preoperative serum lab value within 90 days preoperatively for hematocrit, creatinine, and albumin, was extracted. Outcomes included health resource utilization metrics, medical complications, and wound complications. Bivariate analyses, followed by a multivariate logistic regression, were performed. Outcomes with significance on both tests were analyzed using an Area Under the Receiver Operating Characteristic Curve (AUC) and cutoff analysis.

**Results:** In total, 945 patients with hematocrit, 419 patients with albumin, and 938 patients with creatinine were included. Increased hematocrit independently decreased the odds of return to the operating room (aOR: 0.899;  $p=0.025$ ), medical complications (aOR: 0.871;  $p=0.003$ ) and extended length of stay (aOR: 0.952;  $p=0.048$ ). Among male patients, hematocrit lab values of  $\leq 39.2\%$  (AUC: 0.68,  $p<0.001$ ) for extended length of stay,  $\leq 40.9\%$  (AUC: 0.68,  $p=0.018$ ) for return to operating room, and  $\leq 38.1\%$  (AUC: 0.72,  $p=0.012$ ) for medical complications were identified. Among female patients, hematocrit cutoff values of  $\leq 38.1\%$  (AUC: 0.59,  $p=0.013$ ) for extended length of stay and  $\leq 35.4\%$  for medical complications (AUC: 0.77,  $p<0.001$ ) were identified. No significant relationship was identified when analyzing serum albumin or creatinine on multivariate analysis.

**Conclusions:** Patients with increased preoperative hematocrit experienced lower odds of postoperative morbidity. These findings can aid in optimal timing of ulnar nerve decompression surgery. Moreover, this knowledge empowers patients to engage in informed discussions with their healthcare providers, fostering a collaborative approach to treatment planning and enhancing the likelihood of favorable surgical outcomes.

## **The Role of Vascularized Nerve Grafting in Upper Extremity Reconstruction: A Systematic Review**

Abstract Presenter: Helia Hosseini

Abstract Co-Author(s): Fortunay Diatta MD, Neil Parikh, Catherine Yu, Elijah Persad-Paisley,  
Elspeth Hill MD

**Purpose:** Vascularized nerve grafts (VNG) have been proposed as encouraging alternatives to conventional nerve grafting, yet there is ongoing debate regarding the

clinical advantages of the approach compared to standard grafting. This review aims to gather and analyze reported cases of upper extremity nerve repair using VNGs documented in the published literature.

**Methods:** In accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA) Pubmed/MEDLINE, Embase and Cochrane were searched. Inclusion criteria for this review were: 1) human subjects; 2) describing a vascularized nerve grafting procedure or suggesting a nerve and vascular supply for a potential vascularized nerve graft; 3) upper extremity nerve repair in clinical studies.

**Results:** Data was extracted from 45 clinical studies. Of 535 patients, the most common injury pattern was root avulsion and rupture (88.7%). The most utilized VNG was the ulnar nerve (72.8%), followed by nerve to long head of triceps (8.8%), sural nerve (8.2%), dorsal digital (3.0%), deep peroneal (2.7%) and other nerves (4.6%); most common recipients were median (57.6%), axillary (12.5%), musculocutaneous (11.9%), digital (10.6%) and other nerves (7.4%). Between patients who had medical research council scale scores, 69% had functional (M3 and above) motor and 72.7% sensory (S3<) recovery. In studies comparing vascularized grafting to standard grafting, 88% of VNG case outcomes showed added advantage.

**Conclusion:** Pooled data from systematically reviewing studies on non-vascularized nerve autografts, indicate that 71.8% of recipients reached S3 and above and 36.3% achieved M4 [1]. As for VNGs, 72.7% attained S3 and above, and 36.1% reached M4, which is comparable to non-vascularized grafts, bearing in mind that nerve gaps bridged by the mentioned non-vascularized autografts did not exceed 7cm and those bridged by VNGs ranged from 2 to 51cm, with mean length of 14.7cm. VNGs were also more likely to be used for poorly vascularized recipient beds. Overall, VNGs can increase the odds of functional gain in challenging conditions such as large nerve gaps, nerve avulsions, ruptures, scarred and irradiated beds. With the exception of well-known VNG options, literature on alternative VNGs is largely confined to case reports and series; with additional published cases, outcomes and basic science research needed to establish the role of VNGs in nerve repair.

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## **Assessing the Impact of Calcium Channel Blockers on Postmastectomy Complications: A TriNetX Data Analysis**

Abstract Presenter: Gioacchino De Sario Velasquez, MD

Abstract Co-Author(s): Abdullah Eldaly, Ricardo Torres-Guzman MD, Sahar Borna MD, Karla Maita MD, Francisco Avila MD, John Garcia MD, Olivia Ho MD, FRCSC, MMsc, MPH, FACS

**Introduction:** Breast cancer-related lymphedema is one of the most common causes of upper extremity lymphedema, with an overall incidence of 17% in breast cancer survivors (1). Previous research has determined many risk factors, including age > 65, obesity, radiation, chemotherapy, axillary node dissection, hypertension, and taxane therapy (2). However, additional research is needed to investigate other potential risk factors, including the usage of Calcium Channel Blockers (CCB). By identifying individuals at the greatest risk, it may be possible to enhance overall outcomes. This study aims to assess the relationship between the use of CCB with upper extremity lymphedema and cellulitis in postmastectomy patients.

**Methods:** This study was conducted with anonymized data accessed via the TriNetX platform, a database providing patient data from 75 healthcare organizations (HCOs). The analysis was performed at HCOs, with only aggregated results returned to the platform. We utilized ICD-10, CPT, and TNX-curated codes to build our cohorts. The analysis was conducted in February 2023 using the analytic tools built into the TriNetX platform. We compared mastectomy patients who underwent CCB therapy within 1 year of surgery (cohort 1) with those who did not (cohort 2). The cohorts were matched on age at Index, sex, race, ethnicity, BMI, diabetes mellitus, hypertension, cellulitis, acute lymphangitis, heart failure, chronic kidney disease, cancer, lymphadenectomy, type of mastectomy, type of breast reconstruction, radiotherapy, taxanes, and beta-blockers. The outcomes of interest were the development of lymphedema and the development of cellulitis in the first three years after mastectomy. The Risk Ratio (RR) with a 95% CI was calculated to assess cohort differences after matching.

**Results:** From 2003 to 2017, a total of 69,816 mastectomy encounters met our eligibility criteria. After propensity score matching, the patient count for each cohort was 8,779. The mean age at Index for cohorts 1 and 2 was 65.5 (SD 11.9) and 66.0 (SD 11.6), respectively. Moreover, 98.2% of the population was female, 63.5% was white, 800 patients developed lymphedema, and 2,263 patients developed cellulitis. The following patient characteristics showed statistical significance between cohorts: age at

Index ( $p=0.006$ ), hypertension ( $p=0.01$ ), heart failure ( $p=0.04$ ), diuretic use ( $p<0.001$ ), and BMI ( $p=0.005$ ). The cohort 1 displayed an increased risk of cellulitis (RR 1.105, 95% CI 1.023- 1.194,  $P= 0.011$ ). However, there was no significant difference in the development of lymphedema between the cohorts (RR 0.956, 95% CI [0.835 - 1.095], [ $p=0.51$ ]).

**Conclusion:** Our results suggest that the use of CCB within a year of mastectomy is an independent risk factor for cellulitis. The use of CCB within a year of mastectomy is not associated with the development of BCRL. More studies accounting for the unbalanced variables between the cohort are needed to support these results and eliminate potential confounders.

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## **Relief in 30 Minutes; A Pilot Study Examining the Impact of the Flexitouch Pneumatic Compression Device in Lymphatic Flow of Patients with Upper Extremity Lymphedema.**

Abstract Presenter: Kassandra Carrion

Abstract Co-Author: Dung Nguyen MD

**Purpose:** At-home management of upper extremity lymphedema can present challenges for patients who have limited range of motion or inability to execute self-manual lymphatic drainage (MLD). Older generation pneumatic compression devices (PCD) have been associated with complications such as worsening edema, lack of efficacy, and difficulty with device usage. Furthermore, patients who require PCD face difficulties obtaining insurance authorization for these devices. In this pilot study, we sought to understand whether the Flexitouch System (FT), can provide symptomatic relief, improve lymphatic drainage, and to assess lymphatic flow immediately before and



after pneumatic compression using ICG imaging.

**Materials and Methods:** Patients were injected with Indocyanine green (ICG) in the dorsal, subdermal webbed space, and mapped with SPY. SPY mapping was performed for patients with upper extremity stage II lymphedema secondary to breast cancer (BCRL) before and after 30 minutes of treatment with Flexitouch+ with Comfort East Garments Upper Extremity Jacket (Tactile Medical, Minneapolis, MN). Patient histories were examined via retrospective chart review. Pre and post treatment SPY imaging was filmed and interpreted by a single reviewer. Patient reported outcomes were measured using the Lymphedema Life Impact Scale (LLIS).

**Results:** 13 limbs across 8 female patients (4 healthy arms, 9 arms with lymphedema) were included in our analysis. 7 patients had unilateral lymphedema and 1 patient had bilateral lymphedema. 5 patients were injected bilaterally (10 arms), and 3 patients were injected unilaterally (3 arms). Patients were 60.18 $\pm$ 21.96 years old at the time of injection, and 75% (6 patients, 10 arms) had received surgical intervention to treat lymphedema 1.44 $\pm$ 1.48 years prior to injection. Patients had an average of 1.75 $\pm$ 1.49 surgical procedures to treat lymphedema: 4 patients had liposuction, 4 patients had VLNT, 4 patients had LVA, 2 patients had Biobridge placement, and 1 patient had LYMPHA. Patients had used a pneumatic compression device for an average of 185.43 $\pm$ 152.70 weeks, at a frequency of 6.75 $\pm$ 3.56 times per week. After 30 minutes of therapy, 100% (13) arms showed an improvement in lymphatic flow as measured by proximal migration of contrast. 100% (4) of healthy arms, and 66.7% (6) of arms with lymphedema showed an increase in linear lymphatic channels. ICG traveled the same speed in healthy arms as arms with lymphedema in 50% (2) patients with unilateral lymphedema who received bilateral injections. Patients reported significant improvement in limb pain ( $p=0.01$ ), heaviness ( $p=0.04$ ), tightness ( $p=0.04$ ) following FT therapy independent of surgical intervention or lymphedema laterality.

**Conclusion:** Our study showed enhancement in lymphatic flow in healthy limbs, limbs with lymphedema, and preservation of lymphatic drainage in those who have had lymphedema prevention surgery (LYMPHA) after only 30 minutes of pneumatic compression with the Flexitouch System. Furthermore, imaging suggests FT treatment may improve lymphatic flow speed to arms with lymphedema. Patient satisfaction data shows FT provides relief in upper extremity lymphedema symptoms. Future studies should examine the role of long-term FT usage and its effects on LV, BIS, and quality of life in upper extremity lymphedema patients compared with other existing pneumatic compression devices.

## **A Single Center's 13-year experience with a 3-stage Dermal Regeneration Matrix Approach to the Acute Management of Hand Burns**

Abstract Presenter: Tiffany Jeong

Abstract Co-Author(s): Mario Alessandri Bonetti MD, Jose Antonio Arellano MD, Sumaarg Pandya, Hilary Liu, Guy Stofman MD, Francesco Egro MD, Msc, MRCS

**Introduction:** Dermal regeneration matrix (DRM) has been demonstrated to be safe and beneficial in improving functional outcomes for the management of acute hand burns. DRM followed by split thickness skin graft (STSG) allows for a two-stage reconstruction for most operative hand burn injuries. Our site routinely implements a 3-staged approach with cadaver allograft at the first stage. The aim of this study is to compare the surgical and functional outcomes of 2-staged DRM reconstruction and 3-staged reconstruction.

**Methods:** A retrospective study was conducted to review surgical and functional outcomes of patients treated for hand burns. All patients seen from April 2009 and December 2022 with hand burns, for who objective hand measurements were available, were considered for the study.

**Results:** From 2009 to 2023, 227 patients were treated for hand burns. Of them, 44 patients had objective hand measurements and were included in the study. Patient (77.3% males, 22.7% females) mean age was  $39.3 \pm 16.1$  and the mean BMI was  $27.1 \pm 6.4$ . Patients suffered from  $1.3 \pm 1.4$  comorbidities. Patients were followed for  $22.0 \pm 25.0$  months. Most burns were full thickness (97.7%, n=43) and involved  $15.3 \pm 16.7\%$  TBSA. Patients suffered thermal injuries (93.2%, n=41) and electrical burns (6.8%, n=3). Many patients had bilateral hand involvement (52.3%, n=23). Most cases (n=27) received a 3-staged approach with cadaver allograft at first stage, dermal regeneration matrix (DRM) at second stage, and split thickness skin graft (STSG) for final reconstruction. Fewer cases received a 2-staged approach with DRM and STSG (n=10). No 3-staged cases required repeat STSG, while 40% of 2-staged cases required repeat STSG. Repeat STSG in acute management was significantly associated with patients who received the 2-staged ( $p < 0.01$ ). There was no significant difference in mean baseline DASH scores ( $p = 0.8033$ ) for patients that received cadaveric allograft during acute management ( $46.5 \pm 22.3\%$ ) when compared to those who did not ( $48.7 \pm 22.5\%$ ). After completing OT, the DASH scores remained comparable ( $p = 0.702$ ) for 3-stage ( $30.17 \pm 20.3\%$ ) and 2-stage ( $26.2 \pm 23.4\%$ ) management.

**Conclusion:** These data suggest a 3-stage approach may conserve autologous STSG, with fewer instances of repeat grafting. This approach may be especially useful when autologous skin is limited. Patients who received a 3-staged approach had comparable mean DASH scores when compared to patients who received a 2-staged approach, suggesting that a 3-staged approach does not diminish the functional benefits of DRM previously demonstrated in the literature.

## **Non-Operative Management of Significantly Displaced Phalangeal Head/Neck Fractures in the Pediatric Population**

Abstract Presenter: Caleb Bercu

Abstract Co-Author(s): Noah Llaneras, Yvette Elias, Jennifer Charles, Anna Pelligra MSN, APRN

Carolina Gonzalez, Aaron Berger MD, PhD

**Purpose:** There is limited data available on the remodeling potential of significantly displaced hand fractures of the periarticular phalanx in the pediatric population. Opportunities for closed intervention are limited by rapid healing and, at times, late presentation (1, 2). Open intervention on late-presenting pediatric hand fractures is often of questionable benefit, with its attendant risks including stiffness and nonunion (3). Here we seek to present our experience with non-operative management of significantly displaced pediatric hand fractures over the past 9 years.

**Methods and Materials:** A retrospective chart review was performed from 2014–2023 to identify patients with significantly displaced phalanx head/neck fractures that did not undergo reduction or formal operative intervention. An absence of tap tenderness (indicating impending/established malunion), as well as an absence of rotational deformity, led to a decision to pursue conservative management. Patients were followed clinically with management including brief immobilization followed by range-of-motion exercises under the supervision of a hand therapist when possible. Statistical analysis was performed using 2-tailed t-tests with Excel, with P value < 0.05.

**Results:** We identified 17 patients with a total of 18 periarticular phalangeal malunions. Average time from injury to presentation was 35 days (range, 2–271 days) with average follow-up of 87 days (minimum, 25 days). Initial and final sagittal plane angular deformities averaged 35.1° and 19.4° respectively (P < 0.05). In the coronal plane, angular deformities corrected from an average of 13.9° to 9.3° and found to be

statistically significant ( $P < 0.05$ ). Corrected fracture translation percent in the sagittal plane corrected and remodeled from  $46.4^\circ$  at presentation to  $31.5^\circ$  at follow-up ( $P < 0.05$ ). No patients demonstrated clinical findings warranting operative intervention. No patients experienced a loss of range of motion and no clinical rotational deformities were worsened with non-operative management.

**Conclusion:** In general, careful consideration should be taken when deciding if a patient may benefit from operative intervention. Radiographic follow-up was short for many patients, and we suspect longer follow-up imaging would demonstrate greater correction in all radiographic measurements. Our results from this retrospective review suggest that non-operative management of significantly displaced periarticular head/neck phalangeal fractures in the pediatric population can result in acceptable remodeling with satisfactory clinical outcomes.

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#### **Missing the Golden Window: Examining Time to Prosthetic Acquisition Following Upper Extremity Amputations**

Abstract Presenter: Julien Levy

Abstract Co-Author(s): Kian Pourak MD, Widya Adidharma MD, Stephen Kemp PhD, Rachel Hooper MD

**Introduction:** Following upper extremity amputations, initiating prosthetic fitting within 30 days of the procedure is critical for patients. This period is known as the "Golden Window". Prosthetic acquisition in this window is associated with higher rates of successful rehabilitation and return to work. Delays can negatively impact the quality of life and long-term productivity of amputees and increase risk of comorbidities and

healthcare costs. Unfortunately, more than 50% of patients fail to obtain prosthetics within this optimal timeframe. Increasing costs of prosthetic devices and complexities in insurance coverage have made achieving this target more challenging. The primary objective of this study is to quantify the time lag between amputation and prosthetic acquisition at our single institution to evaluate the feasibility of the Golden Window in current post-amputation rehabilitation. Secondary objectives include exploring the relationship between prosthetic acquisition and indication for amputation, as well as patient- and system-related factors to identify any potential barriers to access that could be addressed.

**Methods:** We conducted a retrospective analysis using our institution's 2010-2022 DataDirect Database to identify upper extremity amputees based on Current Procedural Terminology (CPT) codes. Patients under 18 years old, those with prior or concurrent major extremity amputations, and those who died within one year post-amputation were excluded. Chart reviews identified the time to prosthetic acquisition, including provisional or preparatory prosthetics. We performed descriptive statistics and multiple logistic regression.

**Results:** There were 95 patients included. Mean age was 50 years, and the mean Elixhauser score was 3.1. Most patients were male (78%) and white (84%). The indications for amputation included trauma (46%), oncologic (31%), and vascular (12%) cases. Plastic (PLA) and Orthopedic (ORTH) surgeons performed 36% and 59% of the amputations, respectively. Among the cohort, 57% of patients received prosthetics. Only 7% of those patients received prosthetics within 30 days of amputation, whereas 76% and 91% received prosthetics within 6 months and 1 year, respectively. Prosthetics were obtained by 59% of PLA patients and 57% of ORTH patients. Multiple logistic regression did not show significant associations with prosthetic acquisition for age, sex, race, Elixhauser score, indication, and surgeon subspecialty (Table 1).

**Conclusions:** This study emphasizes the challenge of achieving prosthetic acquisition within the Golden Window after upper extremity amputations. Patient demographics and surgeon subspecialties did not significantly impact prosthetic acquisition. Further research is needed to explore potential barriers and develop strategies to optimize the timing of prosthetic fitting. This may involve the establishment of a multi-disciplinary team employing a more aggressive and streamlined approach to initial prosthetic fitting. Surgeons at our institution should take our study's findings and the ramifications into account when counseling patients on the risks and benefits of amputation and advocate for addressing the delays in prosthetic acquisition encountered by their patients. We encourage surgeons and physical medicine and rehabilitation physicians at other

institutions to perform similar evaluations to identify any barriers to prosthetic acquisition that should be addressed.

## **Outcomes of Upper Extremity Revascularization Following Acute Limb Ischemia**

Abstract Presenter: Diane Jo

Abstract Co-Author(s): Fuad Abbas, Riley Marlar MD, Ryan Khalaf, Rommy Obeid, Mazen Al-Malak MD, Ying Ku DO, Antonio Rampazzo MD, Bahar Bassiri Gharb MD, PhD

**Purpose:** Acute limb ischemia (ALI) is a vascular emergency requiring prompt diagnosis and immediate surgical revascularization to salvage the affected limb. Treating upper extremity ALI requires a comprehensive exploration of the contributing factors, the timeline of tissue response, and the role of immediate clinical intervention. The objective of this study is to investigate the incidence, clinical presentation, and outcomes of upper extremity ALI, and examine their associations with various patient risk factors. Additionally, the study aims to identify potential predictors of poor outcomes in these patients.

**Methods:** A retrospective review was conducted on patients who underwent upper extremity revascularization for acute limb ischemia within the Cleveland Clinic Healthcare System between 2003 and 2023. Only patients with an ischemia time of less than 14 days were included. Demographic information, risk factors for hypercoagulability (including pre-existing medical conditions, medications, and substance use history), duration of ischemia, symptoms prior to revascularization, etiology of ischemia, length of hospitalization, and postoperative complications were analyzed.

**Results:** Three hundred sixty-six patients underwent revascularization for ALI during the study period. The average age of the patients was  $65.02 \pm 16.95$  years, and 69.7% were female. The most common etiologies of ALI included embolism from atrial fibrillation (21.5%) and iatrogenic injury (29.3%). Most patients had multiple sites of occlusion, most commonly with involvement of the brachial artery (89%). The median ischemia time for all patients was 12 hours (IQR=29.25). Presence of pain ( $p=0.024$ ) and paresthesia ( $p=0.037$ ) at the initial presentation were significantly associated with increased duration of ischemia. A total of 80 patients (21.9%) experienced complications, which included re-occlusion requiring re-thrombectomy ( $n=27$ ),

compartment syndrome requiring fasciotomy (n=19), wound necrosis (n=6) and/or persistent ischemia (n=2) requiring amputation, hematoma (n=21), dehiscence (n=3), and infection (n=2). Ischemia duration did not have a significant association with postoperative complications (p=0.13) or correlation with length of hospitalization (r=-0.06, p=0.25). Eleven patients (3%) received a prophylactic fasciotomy to prevent the development of compartment syndrome. The median ischemia duration in these patients was 14.5 hours (IQR=53.75), which was not significantly different to the patients without prophylactic fasciotomy (p=0.25), but symptoms of pallor (p=0.001) and cyanosis (p=0.0007) were more likely to be present in the patients who received prophylactic fasciotomy. Prophylactic fasciotomy was associated with increased complications (p=0.0012) with no significant change in length of hospitalization (p=0.83) compared to the patients without prophylactic fasciotomy.

**Conclusion:** Revascularization for upper extremity ALI is generally associated with a high rate of postoperative complications. Although increased ischemia duration may present with more pronounced symptoms, it is not a predictor of postoperative outcomes such as complications and length of hospitalization. Additionally, with no clear clinical indication for prophylactic fasciotomy following upper extremity revascularization, the increased risk of complications associated with this procedure may outweigh its intended benefit of preventing compartment syndrome.

## **Effectiveness and Patient Satisfaction of In-Office WALANT Endoscopic Carpal Tunnel Release**

Abstract Presenter: Taylor Blount

Abstract Co-Author: Joao Panattoni MD

**Introduction:** Carpal tunnel syndrome (CTS) is a common condition characterized by compressive median mononeuropathy at the wrist. Despite its high prevalence, there is a notable discrepancy between the number of individuals affected and those receiving treatment, potentially due to underdiagnosis, undertreatment, and various barriers to effective care. Traditional treatment options include open or endoscopic surgery, with the latter gaining popularity due to its minimally invasive nature, quicker recovery, and reduced postoperative pain. The WALANT method, utilizing local anesthesia with lidocaine and epinephrine, enables surgery without a tourniquet, minimizing discomfort and allowing the procedure to be performed in an awake patient, thus enhancing safety and convenience.

The study introduces a novel approach by integrating three techniques: endoscopic carpal tunnel release (ECTR), WALANT technique, and conducting the procedure in an office setting for cost-effectiveness and convenience. This retrospective chart review aims to evaluate the outcomes and patient experiences of this innovative method, purported to enhance recovery speed, safety, and overall patient satisfaction.

**Methods:** The study involved patients who underwent ECTR by a single surgeon from November 2021 to November 2023, assessing preoperative symptoms, and postoperative outcomes through questionnaires focusing on pain levels, satisfaction, and symptom improvement.

**Results:** A total of 315 patients underwent the procedure, with 222 surgeries analyzed after excluding those with conjoined procedures or incomplete follow-ups. The procedure demonstrated a significant reduction in symptom severity, with a notable decrease in preoperative symptoms from a median number of 5 to 0 postoperatively. Patient satisfaction was high, with 79.3% reporting their experience exceeded expectations, and an additional 18.5% reported it met their expectations. 82.9% reported they would highly recommend the procedure to others. The return to regular activities, averaged 8.65 days, with a median of 7 days. No postoperative infections were observed. Complete dissatisfaction was observed in 5 patients (2% of the total), who reported an experience worse than expected. Importantly, no patients demonstrated intolerance to Wide Awake Local Anesthesia with No Tourniquet (WALANT) surgery. During the surgical procedure, the mean pain score was less than one (mean of 0.63) on a 0-10 Numerical Rating Scale (NRS).

**Discussion:** The in-office WALANT ECTR represents a transformative approach in the treatment of CTS, offering patients a highly effective, minimally invasive, and patient-centered alternative to traditional surgical interventions. The significant improvements in patient outcomes, combined with high levels of satisfaction and quick recovery times, highlight the potential of this technique to revolutionize CTS treatment protocols and patient care standards.



## **Septic Wrist or Wrist Inflammation? An AI-based Predictive Model and a Risk Assessment Tool**

Abstract Presenter: Ying Ku DO

Abstract Co-Author(s): Ryan Khalaf, Riley Marlar MD, Mychajlo Kosyk MD, Diane Jo, R'ay Fodor, Mazen Al-Malak MD, Jacob Lammers MD, Lianne Mulvihill MD, Antonio Rampazzo MD, Bahar Bassiri Gharb MD, PhD

**Purpose:** The existing diagnostic criteria for septic wrist are non-specific, subjecting patients with non-infectious etiologies to surgical morbidity. This study aimed to create a septic wrist AI prediction model and develop a score-based risk assessment tool.

**Methods:** An IRB-approved retrospective review was conducted on patients with a presumed septic wrist diagnosis (2003 – 2022). Patients were excluded if neither arthrocentesis nor open drainage was performed. Kruskal Wallis algorithm was employed to identify potential predictors of septic wrist based on factors including comorbidities (autoimmune diseases, immunosuppression, prior crystalline arthropathy, prior septic arthritis, IVDU, smoking), penetrating trauma, fever, multi-joint involvement, inflammatory markers (ESR/CRP/WBC), serum uric acid, blood cultures, imaging, and synovial fluid analysis. Subsequently, Naïve Bayes classifier was utilized to populate a prediction model based on the identified predictors. Concurrently, an independent score-based risk assessment tool was developed using traditional multivariate analyses. In this tool, each predictor received a standardized risk score of 1, and the optimal cutoff for classifying patients with septic wrist was established. Performance of both methods were evaluated with ROC curve.

**Results:** 205 (70 females and 135 males) patients were included with an average age of  $60 \pm 16$  years. The median length of hospitalization was 6 [8] days and follow-up duration 1 [3] months. 95 (46.3%) patients had septic wrist confirmed with Gram stain/culture, 79 (38.5%) patients received alternative diagnoses (crystalline arthropathy, tenosynovitis, cellulitis, abscesses, ligamentum injury, and arthritic flare), and 31 (15.1%) patients had undetermined diagnoses. Concomitant septic wrist and crystalline arthropathy was identified in 11 patients (5%). The optimized Naïve Bayes prediction model included 7 predictors (no synovial crystals, positive blood culture, multi-joint involvement, age, history of septic arthritis, IVDU, and penetrating trauma) with a sensitivity of 89.5%, specificity of 80%, and an AUC of 0.89. The score-based risk tool comprised 4 predictors (negative synovial crystals, positive blood culture, negative history of crystalline arthropathy, and multi-joint involvement), resulting in a risk score ranging from 0 to 4. Classifying patients with septic wrist at a score of  $\geq 2$  yielded an

optimized sensitivity of 64%, specificity of 84%, and AUC of 0.78.

**Conclusions:** Both the AI prediction model and the traditional statistical score-based risk assessment tool can offer valuable support for clinical decision-making in cases of suspected septic wrist. The most significant predictors for septic wrist include multi-joint involvement, absence of synovial crystals, and positive blood culture.

## **Rate, Timing, and Risk Factors of Finger Replant Failure**

Abstract Presenter: Anna Lee

Abstract Co-Author(s): Sarah Fournier, Lynn Orfahli MD, Elliot Le MD, Mark Greyson MD

**PURPOSE:** Replanting severed digits poses technical challenges with varying success rates. Prior studies note a decline in national digit replantation occurrences, but no post-2010 follow-up exists.[1] Limited research explores long-term complications or necessary revision surgeries post-successful replantation. We aim to delineate digit replantation incidence, patient outcomes, and pinpoint risk factors necessitating further revision procedures.

**METHODS:** Digital replantation data were extracted from TriNetX, a global health research database, using CPT and ICD-10 codes. Information on patient demographics, comorbidities, injury mechanisms, and subsequent surgeries was collected. Patients were identified by digit replantation (CPT-20816, CPT-20822, CPT-20824, CPT-20827), with or without any subsequent digit amputation (CPT-26952, CPT-26910, CPT-26951). Injury mechanisms included crush (ICD10-S67), powered hand tools or machinery (ICD10-W29), being struck by objects or sports equipment (ICD10-W20, W21, W22, W23), and knife injuries (ICD10-W26).

Descriptive statistics were compiled on subsequent revision surgeries, such as skin or soft tissue debridement, neurolysis, hardware removal, bone or joint repair, and tendon advancements or repair. Revision amputation (RA) incidence, replantation survival rates, and risk factors were analyzed using risk percentages, odds ratios with 95% confidence intervals (CI), and Chi-Squared tests with a significance level of 0.05.

**RESULTS:** Between 1/1/1990 and 12/23/2023, there were 1,221 patients who underwent digit replantation, with 1,040 (84%) identifying as male, and 782 (64%) as

Caucasian. Replant cases per year hit a low of 11 in 2007, rising to a peak of 101 in 2019. More replants were attempted on thumbs and metacarpophalangeal amputations, though not statistically significant.

Subsequently, 456 (37%) underwent RA. The incidence of RAs was 28 (6.2%) post-operative day 1 (POD1), 37 (8.1%) on POD3, 25 (5.5%) on POD7, and 17 (3.8%) on POD14. Of the 456 patients who required RA, 191 (42%) occurred by POD7 and 365 (99%) occurred by POD365. The 7, 30, and 90-day survival rates for replanted digits were 84%, 68%, and 65%, respectively.

Injury mechanism was not significantly associated with RA risk. Within one year of the initial replant, 50 patients underwent RA underwent debridement prior to their eventual amputation (11%), which is more than successful replant patients (49[6.4%]; OR=1.8; CI=1.19-2.72). Skin or soft tissue debridement, hardware removal, and tendon repairs did not have statistical differences between the two groups.

**CONCLUSION:** Since the national report on digital implants using data from 2010, the incidence of digital replants has steadily increased compared to previous studies.[1] Replanted digits that survive beyond 14 days typically remain viable, with the majority of failures occurring within the first year post-surgery. The absence of a significant association between injury mechanisms and replant success may be due to improper or incomplete use of ICD codes. Understanding the risk factors affecting short- and long-term success, along with the need for revision surgeries, is crucial for surgical planning and patient counseling post-traumatic amputation. Since a significant limitation of our research lies in our inability to associate a specific replanted digit with its corresponding amputation, future studies could explore the development of a database to access more granular data.

[1] Reavey PL, Stranix JT, Muresan H, Soares M, Thanik V. Disappearing Digits: Analysis of National Trends in Amputation and Replantation in the United States. *Plast Reconstr Surg*. 2018 Jun;141(6):857e-867e. doi: 10.1097/PRS.0000000000004368. PMID: 29794703.

## **Treatment Monitoring of Carpal Tunnel Syndrome Using Shear Wave Elastography: A Pilot in Vivo Study**

Abstract Presenter: Casey Martinez MS

Abstract Co-Author(s): Kevin Renfree MD, Nathaniel Hinckley, Annika Hiredesai, Nirvikar Dahiya, Kevin Renfree

**Purpose:** Carpal Tunnel Syndrome (CTS) is the most diagnosed peripheral compressive neuropathy. The diagnosis of CTS is typically clinical, however shear wave elastography (SWE) may be an interesting non-invasive tool to test properties of the median nerve (MN). Currently, shear wave elastography (SWE) is the only clinically available method capable of quantitative assessment of soft tissue stiffness. SWE has been used to non-invasively assess the stiffness of the MN and can be used for diagnosing carpal tunnel syndrome (CTS). Research is limited in this area and there has been no previous study attempting to correlate treatment outcomes with pretreatment diagnostic results. Our study underscores the necessity for a deeper comprehension of the pathophysiology underlying CTS and the need for a more critical evaluation of the traditional treatment of CTS using corticosteroid, as these injections may not affect median nerve stiffness or swelling like we once thought. The purpose of this study is to correlate SWE measurements with patient-reported outcomes and analyze changes in SWE in response to corticosteroid injection.

**Methods:** Ten patients (18 hands) were included based on CTS-6 score and proximal cross-sectional area (CSA) of the MN > 10mm<sup>2</sup>. Patients completed a Boston Carpal Tunnel Questionnaire and underwent evaluation with ultrasound and SWE protocol. After 6 weeks, patients were re-evaluated with the same metrics, treatment failure was recorded as need for carpal tunnel release (CTR).

**Results:** Five patients (six hands) went on to CTR. Patients needing CTR had inferior post injection FSS ( $p=0.03$ ) and SSS ( $<0.01$ ). Those not undergoing surgery had smaller cross sectional diameters of the median nerve proximal to the carpal tunnel post treatment ( $p=0.03$ ). There was no significant difference in velocity or pressure in the MN on SWE or CSA on ultrasound before or after injection. Elastography was not associated with the need for CTR.

**Conclusions:** While some patients undergoing injection for CTS did have clinical improvement, we did not detect changes in the MN with regard to SWE or CSA. Our findings suggest corticosteroid injections may not affect MN swelling or elastography.

This study furthers our understanding of one of the most common hand pathologies, potentially prompting healthcare practitioners to reevaluate their approach to CTS management due to the highlighted limitations in current knowledge and practices. The absence of changes in MN characteristics with corticosteroid injections suggests a need for further research into the efficacy of this traditional treatment. Additionally, the study questions the clinical utility in use of SWE in predicting symptom relief post- injection or the need for carpal tunnel release. These findings may drive clinicians to explore alternative diagnostic tools to improve our understanding of prognostic indicators, and, therefore, patient care outcomes.

## **Evaluating ChatGPT's Accuracy in Identifying Bones from Hand Radiographs**

Abstract Presenter: Sophia Pressman

Abstract Co-Author(s): Sahar Borna MD, Cesar Abraham Gomez Cabello MD, Syed Ali Haider M.B.B.S., Antonio Forte MD, PhD, MS

**INTRODUCTION:** By leveraging natural language processing and machine learning capabilities, artificial intelligence models like OpenAI's ChatGPT (1) show potential providing medical knowledge, such as answering questions regarding common hand surgeries (2). A recent update has allowed users to directly upload images into ChatGPT-4. However, there is little research on whether ChatGPT can accurately interpret medical images such as radiographs. Accurate interpretation of hand imaging by ChatGPT can support clinical decision-making, especially for hand surgeons. This study aims to evaluate ChatGPT-4's accuracy in identifying bones within hand radiograph images when presented with visual cues.

**METHODS:** A single posterior-anterior (PA) radiograph of an anatomically normal hand was utilized to create 30 figures, each featuring annotations of different bones using red circles or arrows. Fifteen bones of interest were annotated: proximal phalanx of the fifth digit, middle phalanx of the second digit, distal phalanx of the first digit, second metacarpal, first metacarpal, all eight carpal bones, radius, and ulna. Sixty images were presented individually to ChatGPT with a prompt to identify the annotated bone. A scoring system was employed to assess correctness; full accuracy was scored as 10 points. Responses featuring multiple bones were penalized two points. Descriptive statistics were used to analyze results, and a paired, two-tailed t-test was conducted to compare accuracy between images annotated with circles and arrows.

**RESULTS:** ChatGPT provided a completely correct, partially correct, and completely incorrect identification for five (8.3%), 49 (81.7%), and six (10%) bones, respectively. The five images in which ChatGPT provided a completely correct identification all used circles. ChatGPT's average accuracy score was  $4.1 \pm 3.0$ . ChatGPT demonstrated slightly higher accuracy for circle-annotated images than arrow-annotated ones ( $4.6 \pm 3.0$  vs.  $3.5 \pm 2.9$ ), but this was not statistically significant (p-value 0.11). ChatGPT was asked only to identify the one circled or indicated bone; however, ChatGPT listed more than one bone for 18 (30%) of responses. The average response identified  $1.3 \pm 0.6$  bones (range 1-4). Although only four images had an annotated scaphoid, ChatGPT reported this being the annotated bone in 34 (56.7%) of images. However, ChatGPT failed to identify the triquetrum, pisiform, trapezoid, capitate, and hamate in any of its responses. The fifth metacarpal was not annotated in any images; however, ChatGPT identified this bone in 15 (25.0%) of responses.

**CONCLUSION:** ChatGPT-4 shows potential but notable limitations in bone identification within hand radiographs. While partially correct, it struggles with full accuracy and frequently provides multiple bone responses. Additionally, misidentification of the scaphoid and fifth metacarpal suggests that despite its ability to process visual cues, ChatGPT's responses are ultimately driven by statistical patterns within training data rather than genuine image interpretation. While ChatGPT has potential in clinical practice, significant development and refinement are required before reliable image interpretation.

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# The Discrepancy of Motor to Sensory Axon Counts in the Ulnar Nerve: A Systematic Review and Meta-Analysis

Abstract Presenter: Meredith Cox

Abstract Co-Author(s): Emmanuel Emovon, Joshua Kim, Daniel Joh MD, Suhail Mithani MD

Neill Li, Christian Zirbes

**Hypothesis:** The ulnar nerve provides critical motor function such as wrist flexion, opposition, and intrinsic hand function. Given this role, extensive efforts are made to restore hand function after injury through repair, grafting, or nerve transfer. Proximally, the ulnar nerve may also serve as a fascicular donor to restore elbow flexion and extension. However, despite use of nerve transfers and microsurgical techniques to optimize nerve repair and grafting, outcomes remain variable. We hypothesized this variability results from sub-optimal pairing of donor and recipient motor axons due to a scarcity of ideally situated axons. We thus sought to review the literature to assess motor and sensory axon differences throughout the ulnar nerve to further inform and optimize our care and use of the ulnar nerve.

**Methods:** We systematically reviewed MEDLINE and PUBMED databases using the search term "(ulnar nerve) AND ((fascicle) OR (axon))." Inclusion criteria was anatomic studies of human adult cadavers, with quantitative data on axons or fascicles from non-pathologic specimens published in a peer-reviewed journal. Weighted means and standard deviations of total, motor, and sensory axon counts at different levels of the ulnar nerve, ranging from the axilla to distal branches at the wrist, were reported.

**Results:** After reviewing 472 articles, 13 were analyzed. At the level of the axilla, studies report 28,097 [SD 2920; range 14234 – 40379] total axons, including 3,583 (12.8%) [3054; 2670 – 4171] motor axons. At the mid-forearm level, 20,259 [could not calculate; 12267 - 30914] axons were reported, and 1,199 (5.92%)[241; 1,199 – 1,199] motor axons. The ulnar nerve is reported to increase to 26,897 [SD 4966; 26,897 – 26,897] axons proximal to the pronator quadratus, where 2,326 (8.65%)[SD 1019; 1216 - 2913] motor axons can be found. At the level of the wrist, the ulnar nerve has 26,610 [3133; 26,610 - 26,610] axons of which 1,230 (4.62%) [SD 256.4; 1203 – 1427] are motor axons. Finally, distal to the wrist, 2,080 [SD 704; 1368 – 2634] motor axons can be found, with no studies reporting total axon numbers at this level.

Ultimately, in addition to a large range in axon counts, a lack of reporting clarity was discovered. Some articles reported total axon counts in the MBUN, others reported

motor axon counts in the ulnar nerve at a level, and the rest some other permutation of these options. Few articles reported both total and motor axon counts at a level or within a fascicle.

**Conclusion:** The current literature on axon counts in the ulnar nerve and its fascicles is highly variable. However, it appears that motor axons contribute to only a small portion of the ulnar nerve, composing anywhere from 4.62% to 12.8% of the total number of axons in the nerve. Interestingly, though one would expect that the percent contribution of motor axons would increase moving distally, the literature indicates fluctuations up and down from the axilla to the hand. Ultimately, these findings reflect the continued need for further detailed evaluation of the microarchitecture to improve reinnervation with the ulnar nerve.

## **Advancing Glenohumeral Dysplasia Treatment in Brachial Plexus Birth Injury: A Comparison of the End-to-End versus End-to-Side Spinal Accessory to Suprascapular Nerve Transfer Techniques**

Abstract Presenter: Joey Kurtzman

Abstract Co-Author(s): Nathan Khabyeh-Hasbani, Mandana Behbahani, Erin Meisel, Steven Koehler

**Purpose:** This study investigates the outcomes of end-to-side (ETS) nerve transfers versus end-to-end (ETE) nerve transfers for surgical treatment of glenohumeral dysplasia (GHD) due to brachial plexus birth injury (BPBI).

**Methods:** BPBI infants presenting with persistent weakness of the upper trunk and functional limitations of the shoulder with concomitant GHD confirmed by ultrasonography who either underwent ETS or ETE nerve transfer of the spinal accessory nerve (SAN) to the suprascapular nerve (SSN) between January 2022 to December 2023, were included in the study. Calculations of the alpha angle on serial ultrasound images and AMS scores for shoulder abduction (SA), forward flexion (FF), and external rotation (ER), prior to and following either approach were used as outcome measurements. Statistical analysis of the outcomes of each approach was conducted using a Wilcoxon Signed Rank Test. Further analysis was conducted using a Mann-Whitney U Test, Fisher's Exact Test, and t-tests when applicable. The level of significance was set at  $p < 0.05$ .



**Results:** Seven patients underwent ETS nerve transfer and five patients underwent ETE nerve transfer within the study period. Following an ETS approach, all seven participants demonstrated significant improvement of alpha angle measurements on ultrasound findings ( $p < 0.05$ ), full recovery of ER (AMS of 7) ( $p < 0.05$ ), and functional recovery of SA and FF shoulder function (AMS of 6 or 7) ( $p < 0.05$ ). Additionally, following an ETE approach, all five participants demonstrated significant improvement of alpha angle measurements on ultrasound findings ( $p < 0.05$ ), functional recovery of SA and FF ( $p < 0.05$ ), but with no significant difference in AMS ER scores ( $p = 0.066$ ). When comparing the changes of outcome measurements prior to and following the two different treatment modalities, there was no significant difference for either outcome measurement. Overall, when comparing the two treatment modalities in their ability to correct GHD, a Fisher's Exact Test did not find any significant difference ( $p = 0.15$ ). Importantly, two out of the five patients who underwent ETE for GHD required further operations (external rotation tendon transfers) to correct shoulder function, while none of those who underwent ETS required secondary procedures.

**Conclusions:** In our study, both the ETS and ETE cohorts demonstrated success in resolving GHD (measured on ultrasonography). Both cohorts also demonstrated significant improvement in functional AMS shoulder scores, with the exception of the ETE cohort in AMS ER. Comparison of the ETS and ETE techniques demonstrated no significant differences in changes of AMS scores and found no overall difference between either modality to correct for GHD following BPBI.

## **Surgical Debridement in Open Distal Phalanx Fractures, What is the Evidence?**

Abstract Presenter(s): Omar El Sewify Hbsc, Marion Sylvain MD

Abstract Co-Author: Johnny Ionut Efanov MD

**Aim:** Irrigation and Debridement (I&D) are crucial steps in the management of open fractures serving to mitigate the risk of infection and promote optimal wound healing. Currently, there are no established guidelines for managing open fractures of the distal phalanx. The timing of I&D in the context of open distal phalanx fractures remains a subject of debate, with variability in clinical practice and a lack of standardized protocols. This systematic review aims to highlight the temporal application of surgical I&D in open distal phalanx fractures and its impact on complication rates.

**Method:** A systematic review was completed following the 2020 PRISMA guidelines using Medline, Embase and Cochrane. The title and abstract as well as the full-texts

were screened in duplicate. Data was extracted by two independent reviewers, while conflicts were resolved through consensus with a third reviewer. Primary outcomes focused on fractures utilizing surgical debridement and irrigation. Additionally, patient characteristics, administration of antibiotics, functional outcomes and complications were analyzed as means of central tendency.

**Results:** Seventeen articles were included in the systematic review, yielding a total of 798 patients accounting for 703 debridement procedures . The average age was 9.2 years old, and men were predominant (61%). The majority of patients underwent immediate (<24 hour) I&D 86.7% (567/654 patients), while the average follow-up time following treatment was 9.2 months (n =12 studies). Amongst the patients subject to debridement, an infection rate of 5.22% was recorded (26/498 patients). Additional complications included mal-union and misalignments in 2.76%, physeal closure disturbances in 16.1%, and nail bed deformities in 19.2%. Additionally, complications based on timing of I&D revealed a 0% (0/220 patients) rate under 8 hours, a rate of 5.76% (20/347 patients) between 8-24 hours and a 72.4% (21/29 patients) rate of complications above 24 hours.

**Conclusions:** Surgical debridement and irrigation of open distal phalanx fractures yield favorable outcomes with low rates of infection and mal-union. In addition to reducing the risk of complications, this modality demonstrates favorable results in terms of range of motion and patient satisfaction with minimal adverse effects. Most notably, this review emphasizes the importance of timely and thorough debridement and irrigation in the management of open fractures of the distal phalanx. By providing clinicians with evidence-based recommendations, this review aims to inform clinical practice and optimize patient outcomes in this challenging clinical scenario.

## **A Guide to the Americans with Disabilities Act for Hand and Upper Extremurgeons: Understanding Patient Experiences and Legal Challenges Associated with Upper Extremity Prosthetics**

Abstract Presenter:  
Alyssa Reese MD

Abstract Co-Author(s)  
Aidan O'shea  
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Giap Vu MD  
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**Introduction:** The Americans with Disability Act (ADA) safeguards individuals with disabilities, including those related to upper extremity mobility, from discrimination. The purpose of this study was to investigate the nature of ADA complaints initiated by individuals with upper extremity prosthetic devices. In doing so, the aim was to provide hand and upper extremity surgeons with valuable insights into the ADA and its relationship with patient care.

**Methods:** The Westlaw Campus Research legal database was searched for all cases involving clients with finger, hand, and arm prosthetics. Cases were included if at least one plaintiff with an upper extremity prosthetic initiated an ADA complaint related to their prosthetic. No limitation was placed on whether the prosthetic was functional or for cosmetic purposes. Characteristics of each case were collected, including the location where the case was initiated, the type of ADA complaint, plaintiff and defendant demographics, and case outcomes.

**Results:** After removal of duplicates, 557 cases were identified, of which 16 cases met inclusion criteria. Cases were initiated throughout the United States; the majority of states had one case except New Jersey and Florida which each had two cases. The majority of prosthetic-wearers were male (N=13, 81.3%) and only one case involved a pediatric client. The alleged discrimination most commonly took place in the workplace (N=12, 75%), followed by correctional facilities (N=2, 12.5%), an amusement park (N=1, 6.3%), and a housing authority (N=1, 6.3%). The location of discrimination was reflected in the frequency of ADA Title involvement; Title I: Employment, Title II (Public Services) and Title III (Public Accommodations) were noted in 12 (75%), 3 (18.8%) and 1 (6.3%) of the cases, respectively. Physician evaluations were mentioned in 10 (62.5%) of the cases.

**Conclusion:** Hand and upper extremity surgeons may benefit from ADA-related education that would enable them to better understand patient experiences and improve counseling on the legal challenges surrounding the use of upper extremity prosthetics. This study underscores the need for advocacy initiatives aimed at improving patient awareness of their workplace rights.

## **Osteochondroma of the Proximal Interphalangeal Joint: Case Series and Management Recommendations**

Abstract Presenter: Caleb Bercu

Abstract Co-Author(s): Yvette Elias, Carolina Gonzalez, Anna Pelligra MSN, APRN, Aaron Berger MD, PhD

**Purpose:** To investigate if early surgical intervention for osteochondromas in or around the proximal interphalangeal joint (PIPJ) in pediatric patients will result in improved functional outcomes and decreased angular deformities.

**Methods and Materials:** A retrospective chart review was performed from 2014 to 2023 to identify patients with osteochondroma within-or in close proximity-to the PIPJ. Eight patients were identified with osteochondromas affecting the PIPJ. Surgery was recommended for patients with angular deformities or restricted range of motion. Radiographic imaging, treatment and outcomes were reviewed. We classified the osteochondromas into three types based on radiographic locations as originally described by Ohnishi et al., 2011. A goniometer was utilized to measure passive range of motion of the affected digits. Radiographs and clinical imaging were used to measure digit angulation. A 1-tailed t-test ( $P < 0.05$ ) was performed for statistical analysis with Excel.

**Results:** Eight patients with osteochondroma affecting the PIPJ were identified; three of these patients carry a diagnosis of multiple hereditary exostosis (MHE). All patients underwent surgical excision of the osteochondroma. The average age at surgery was 6.25 years. Seven tumors presented dorsally, and one presented on the volar aspect of the digit. Two tumors blocked flexion; three tumors blocked extension; all tumors caused an angular deformity. Pre-operative and post-operative angulation improved from an average of  $14.4^\circ$  to  $5.4^\circ$ , it was significantly improved ( $P < 0.05$ ). Operative intervention was performed on all patients. No serious complications were encountered.

**Conclusion:** Osteochondroma affecting the PIPJ in pediatric patients can lead to functional deficits and deformity, necessitating early surgical intervention. Our retrospective study demonstrates that excision of osteochondromas in/around the interphalangeal joints leads to improvements in angulation and range of motion. We recommend tumor excision when tumors lead to clinodactyly and/or if they affect any part of the joint surface.

## **Operative Firework injury of the thumb: injury pattern and treatment algorithm**

Abstract Presenter: David Cardenas

Abstract Co-Author(s): Anca Dogaroiu, Muhammad Harirah MD, Brandon Bruce, Andrei Odobescu MD PhD, Douglas Sammer MD, Andrew Zhang MD

**Purpose:** According to the United States Consumer Product Safety Commission, an estimated 10,200 emergency department visits occurred in 2022 because of firework-related injuries (1). The hand, wrist, and fingers are the most affected by firework explosions, representing 29% of documented injuries (1). Though a small percentage of firework-related hand injuries require surgery, these patients often sustained devastating injuries resulting in significant life-long impairment (2). Firework blast trauma most commonly affects the hands and occurs along a spectrum of severity ranging from minor burns to mangle injuries. The thumb accounts for 40% of hand function (3). Proper thumb function depends on several factors: length, sensation without chronic pain, a functional CMC joint and thenar muscle, and a supple first web space. There is a paucity in the literature focusing on reconstruction of thumb injuries resulting from firework explosions. Based on a retrospective chart review of our institution's trauma I center with frequent exposure to these high-energy blast injuries, a detailed treatment algorithm is proposed.

**Methods:** Patients who underwent operative management for firework-related hand injuries at a level one trauma center between January 2009 and December 2023 were retrospectively reviewed for demography, injury pattern and treatment. General descriptive statistics were performed.

**Results:** Seventy-four patients who sustained severe firework blast injuries to the hand were reviewed. Thumb injuries were treated in 59 patients (80%). A majority of these, 52 patients, involved both the thumb and the first web space (88%). A wide range of surgical treatments were employed, and often several different techniques were used for the case. Amputation (60%) was performed most frequently, followed by skin grafting (36%) and primary closure (32%). Local and free flaps were performed in 35% of the cases.

**Conclusions:** In this study, we summarized patient demographic, injury pattern, and treatment for operative firework blast hand injuries at a large metropolitan level 1 trauma center. A majority of operative firework injuries to the hand involve the thumb and first web space. It's paramount to preserve or restore length, sensation, mobility of the thumb and a supple first web space. Proximal thumb injuries tend to require more aggressive treatment of the first web space. In case of devastating proximal injuries involving the CMC joint, creating a stable and well-positioned sensate post is acceptable. Given the predominant involvement of the thumb and the first web space in these injuries and the paramount importance of the thumb in normal hand function, we focused on treatment of the thumb. To this end, we propose a treatment algorithm to guide surgical management of thumb and first web space blast injuries.

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#### **Preoperative Hematocrit as a Prognostic Tool in Brachial Plexus Surgery**

Abstract Presenter

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Arun Gosain MD

**Purpose:** Given the increasing incidence of brachial plexus injuries and costs of brachial plexus surgery in the US, \$66 million in 2006, maximizing outcomes and preventing complications is the best approach to providing high-value care (1). However, there is still a lack of knowledge pertaining to the influence of laboratory values in patients undergoing brachial plexus surgery. This study aims to elucidate the effect of preoperative hematocrit, albumin, and creatinine values on complication rates after brachial plexus surgery.

**Materials and Methods:** The ACS NSQIP database was queried for occurrences of brachial plexus neurolysis from 2011-2020. CPT 64713 as well as concurrent ICD-9 codes (353.0, 953.4) and/or concurrent ICD-10 codes (G54.0, S14.3XXA, S14.3XXD, S14.3XXS) were used to define the cohort. For each patient, the latest serum hematocrit, creatinine, and albumin within 90 preoperative days of surgery was selected. Additional covariates spanned demographics, medical history, and operative characteristics. Outcome variables of interest were tracked to 30 days postoperatively and included aggregate medical complications, wound complications, non-home discharge, return to OR and extended length of stay (eLOS), defined as the 75th percentile of each analysis cohort.

Within each cohort, an independent two-tailed t test was initially performed to assess for difference in lab values between patients that had an outcome of interest versus those who did not. For any lab value-outcome pairs that demonstrated significance, multivariate logistic regression controlling for covariates was conducted to assess the independent predictive ability of the serum lab value. If significance was again achieved, an area-under-the-receiver-operating-characteristic-curve (AUC) estimate was generated. From this curve, an optimal lab value cutoff point was determined using the Youden's Index.

**Results:** A total of 272 patients with serum albumin, 899 patients with serum hematocrit, and 793 patients with creatinine were included in the study cohort. Multivariate analysis revealed that increases in hematocrit decreased the odds of wound complications (aOR: 0.713; 95% CI: 0.572 – 0.889; p=0.003). In males, AUC analysis found a predictive hematocrit cutoff of  $\leq 42.7\%$  for wound complications (AUC:  $0.81 \pm 0.258$ , p=0.033). In females, AUC analysis found a predictive hematocrit cutoff of  $\leq 39.0\%$  for wound complications (AUC:  $0.82 \pm 0.207$ , p=0.007). Bivariate analysis showed lower creatinine levels in patients experiencing an eLOS (0.81 mg/dL vs. 0.88 mg/dL, p = 0.005). Multivariate analysis found that increases in creatinine decreased the

odds of eLOS (aOR: 0.124; 95% CI: 0.028 – 0.552; p=0.006).

**Conclusions:** Increased hematocrit was independently associated with decreased odds of short-term wound complications in this brachial plexus surgery cohort. In addition, predictive cutoff values were identified that can be used to identify patients at risk of complications. Equipped with this knowledge, surgical teams can make informed risk-stratification decisions in the preoperative setting to prevent undesirable outcomes. Future studies are needed to assess the efficacy of interventions that aim to optimize laboratory values before surgery.

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## **Barriers to Care in Obstetric Brachial Plexus Palsy: Assessing the Impact of Area of Deprivation Index and Urban-Rural Locale on Patient Recovery**

Abstract Presenter  
Alexander Comerci

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**Background:** Obstetric brachial plexus palsy (OBPP) can lead to lifelong disability, resulting in significant social, psychological, and economic consequences for patients and their families. Coordinated care of infants with OBPP requires specialized follow-up with a multidisciplinary care team, including plastic surgeons and occupational therapists, over the course of many years. Due to the complex coordination required for establishing consistent care, a patient's socioeconomic and geographic context may impact the level of care they are able to receive. This study aims to assess the role that socioeconomic context has on the clinical and surgical outcomes of infants with OBPP by means of the Area of Deprivation Index (ADI) and geographic locality.



**Methods:** A retrospective study was performed of infants with OBPP who presented to the brachial plexus clinic of Children's Hospital of Pittsburgh from 2008 to 2020. ADI and urban-rural locale were determined based on address and zip code. Outcomes of interest included complete recovery, defined as Active Movement Scale (AMS) score equal to 105, surgical intervention, and follow-up duration. Multivariate regression analysis was performed to assess for variables associated with outcomes for OBPP.

**Results:** A total of 195 patients met inclusion criteria. Seventy-three (37.4%) patients underwent surgical intervention for exploration or nerve grafting, at an average age of  $1.3 \pm 2.2$  years. Median ADI was 76 (range 3-100). Thirty-two percent (31.8%) of patients were from a rural locale. Twenty-three percent (23.3%) of patients were from a non-white background. On multivariable regression analysis, rural location was significantly associated with a decreased incidence of surgical intervention (OR 0.5, CI 0.256-0.982,  $p=.04$ ). Higher ADI was significantly correlated with lower AMS scores at 9 months and at most recent follow-up ( $R^2 = -0.31$ ,  $p=.004$ ;  $R^2=-0.136$ ,  $p=.04$ , respectively). Patients of non-white racial backgrounds were significantly associated with lower birth weights compared to white patients ( $p=.04$ ), lower AMS scores at 3 months ( $p=.004$ ), lower AMS scores at 6 months ( $p = .009$ ), 9 months ( $p<.001$ ), post-operatively ( $p=.01$ ), and at most recent follow-up ( $p <.001$ ). The proportion of patients achieving full-recovery was not significantly different between groups based on race, ADI quartiles, and Urban-Rural geography. There was no difference between groups based on ADI, race, and rural locale for average age at referral, age at surgery, and duration of follow-up.

**Conclusion:** Socioeconomic status is an intricate relationship between multiple factors. This study demonstrates that geographic location and race may impact functional movement outcomes and surgical intervention for OBPP. Additionally, our findings highlight the importance of regular follow-up for patients with OBPP as well as the reevaluation of resources available for those with socioeconomic hardship. At an initial visit and regular follow-up visits, providers should screen patients for barriers to accessing routine care, such as transportation or scheduling conflicts, and attempt to alleviate these barriers.

## **Pediatric Hand Trauma in Underserved Populations**

Abstract Presenter  
Meeti Mehta BS

Abstract Co-Author  
Alexander Davit III, MD

**Introduction:** Underserved populations are disproportionately affected by trauma and include patients from racial minorities, low-income, and rural residence. This study describes pediatric hand injuries in these groups and assesses their risk of injury.

**Methods:** This was a retrospective cohort of pediatric patients referred to our hand clinic from 2010-2020. Patients were stratified by race, median household income, and geography. Population and socioeconomic data were obtained from the United States Census Bureau. Area Deprivation Index (ADI) was calculated and stratified by the top 50% (most disadvantaged neighborhoods) and bottom 50% (least disadvantaged neighborhoods). Charts were abstracted, summary statistics were calculated, and relative risks (RR) were computed via binomial regression. Significance was assessed at  $\alpha=0.05$ .

**Results:** 1,311 patients were referred for hand trauma. The median age was 11.2 years. 465 patients (35.5%) were female, 388 (29.6%) were a minority race, 107 (8.2%) lived in rural locations, and 158 (12.1%) had a median annual household income < \$43,000. 969 patients (73.9%) lived in neighborhoods with the top 50% ADI. Compared to urban children, rural children were more likely to have fingertip injuries (14% vs 1.6%, RR 8.48, CI 4.46-16.14,  $p<0.001$ ). Compared to Caucasians, minority-race children were more likely to have violent (10.6% vs 2.9%, RR 3.63, CI 2.27-5.81,  $p<0.001$ ) or self-inflicted mechanisms of injury (4.9% vs 2.3%, RR 2.16, CI 1.18-3.98,  $p=0.01$ ), but less likely to have fingertip injuries (11.3% vs 19.5%, RR 0.61, CI 0.45-0.82,  $p<0.001$ ), index finger injuries (10.6% vs 15.5%, RR 0.69, CI 0.50-0.96,  $p=0.02$ ), and open fractures (10.1% vs 15.0%, RR 0.63, CI 0.46-0.88,  $p=0.005$ ). Compared to children from less disadvantaged neighborhoods, children from the top 50% ADI neighborhoods were more likely to have violent mechanisms of injury (6.0% vs 2.9%, RR 2.08, CI 1.08-4.03,  $p=0.02$ ), and less likely to have vascular injuries (1.2% vs 2.6%, RR 0.44, CI 0.21-0.96,  $p=0.04$ ). No significant differences were found when comparing children from different income levels.

**Conclusions:** The greater prevalence of fingertip injuries in rural children relative to urban children highlights the ongoing need for rural hand specialists. Children from minority races and disadvantaged backgrounds were more likely to suffer from hand trauma due to violence compared to their Caucasian and less disadvantaged counterparts. These findings may represent the impacts of the social determinants of health.

## **Brachial Plexus Birth Injury Microsurgical Interventions in a Resource-limited Setting: Cases from Lusaka, Zambia**

Abstract Presenter

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**Introduction:** Brachial plexus birth injury (BPBI) results from upper limb traction during delivery. While the incidence of BPBI has decreased in high-income countries (HICs), low- and middle-income countries (LMICs) still face a high prevalence, e.g., 27.2% in one African nation.<sup>1</sup> Timely surgical intervention is crucial for functional recovery in infants without spontaneous resolution of BPBI, including nerve grafting and/or transfers prior to one year of age. Although safe and essential surgery as a public health approach is gaining traction, microsurgical BPBI interventions have historically not been utilized in short term global outreach in LMICs who face a greater burden of BPBI.<sup>2</sup> This study assessed the feasibility of microsurgical BPBI interventions in a resource-limited setting (RLS).

**Methods:** Surgicorps International collaborated with Beit-CURE Children's Hospital Lusaka to evaluate LMIC pediatric BPBI patients without access to care outside of physiotherapy programs. A visiting HIC plastic surgeon, along with additional staff, assessed patients for operative or non-operative treatment. BPBI surgeries were performed by the visiting HIC plastic surgeon with repeat evaluation performed at a one-year post-operative visit. Interventions were limited by lack of pediatric anesthesiologist and pediatric ICU specialists, necessitating surgeries <3hrs, excluding high-risk infants, and ruling out nerve grafting due to post-operative care limitations. LMIC hospital facilities provided necessary equipment including well-equipped modern operating rooms and anesthesia equipment, while specialized equipment was donated, including microsurgical instruments, high power loupe magnification, and nerve stimulators.

**Results:** During a one-week period, twelve LMIC patients (5 months to 12 years) were evaluated, and two aged 11 and 15 months underwent nerve transfers (double fascicular transfer for elbow flexion and spinal accessory to suprascapular nerve

transfer for external rotation and abduction). At one-year post-operative follow-up, both showed improved function with Active Movement Scale (AMS) of 6 and 7 respectively for anti-gravity elbow flexion and 6 and 6 respectively for shoulder abduction. Another patient (21 months) underwent tendon transfers (pectoralis major lengthening, subscapular release, latissimus dorsi and teres major transfer to infraspinatus), showing significant increased range of motion in external rotation and abduction. Three patients were recommended non-operative interventions. No acute surgical complications occurred.

**Conclusion:** While nerve grafting is standard in HICs for BPBI, this study provides proof of concept for safe and effective microsurgical BPBI intervention in a LMIC with a formerly unmet surgical need. Challenges in staff and equipment availability were addressed, emphasizing the potential for positive surgical outcomes with minimal risk in a RLS. Future efforts should continue to explore non-operative interventions, telehealth follow-up, and the development of formal microsurgical training programs for Zambian surgeons to enhance sustainable care.

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## **The Association of Surgical Setting with Opioid Prescribing Patterns Following Wide-Awake Trigger Finger Release**

Abstract Presenter

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**Background/Purpose:** Wide-awake and office-based hand surgeries are increasingly common. The association of these techniques with postoperative pain and pain control has garnered recent attention. A prior study demonstrated that office-based trigger finger release (TFR) were associated with decreased perioperative opioid prescriptions compared to those performed in the operating room (1). The current study provides an in-depth analysis of the association between surgical setting and perioperative opioid prescriptions for wide-awake TFR.

**Methods:** Patients undergoing TFR between 2010 and 2021 were identified in PearlDiver, a national administrative claims database. Exclusion criteria were age <18 years, <6 months of preoperative data, <1 month of postoperative data, bilateral TFR and concomitant hand surgery. To identify wide-awake cases, patients with procedural codes for general anesthesia, monitored anesthesia care, sedation and regional blocks were excluded. Patients were stratified by surgical setting (office or operating room), then matched based on age, sex, Elixhauser Comorbidity Index score and geographic region. Patients with prior opioid prescriptions, opioid dependence, opioid abuse, substance use disorder, chronic back/neck pain, generalized anxiety and major depression were identified. Perioperative opioid prescriptions (those filled within 7 days before or 30 days after surgery) were characterized. Logistic regression and linear regression were used for multivariate analysis of filled prescriptions and MME of prescriptions.

**Results:** There were 16,604 matched wide-awake TFR patients in each cohort. In the cohort of office-based patients, 4,993 (30%) filled a prescription for perioperative opioids, in contrast to 8,763 (53%) patients who underwent surgery in the operating room. This disparity was statistically significant in both univariate and multivariate analyses (odds ratio 0.37; 95CI 0.35–0.39;  $p < 0.001$ ). Univariate analysis indicated that office-based surgeries were linked to lower morphine milligram equivalents (MME) in opioid prescriptions than those performed in operating rooms (median of 140 vs 150, respectively). However, multivariate analysis demonstrated that opioid prescriptions for office-based surgeries were actually associated with greater MME ( $p = 0.009$ ).

**Conclusions:** Patients undergoing office-based TFR were less likely to fill perioperative opioid prescriptions but were prescribed opioids with greater MME. In wide-awake TFR, it appears that a disparity may exist in patient and provider beliefs about postoperative pain control. Future patient- and provider-level investigations may produce insights into perceptions of postoperative pain and pain control, which may be useful for reducing opioid prescriptions across surgical settings.

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**All-terrain Vehicle (ATV)-Related Distal Upper Extremity Injury Rates and Patterns**

Abstract Presenter

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**Purpose:** ATV-related upper extremity injuries are commonly seen and treated in the emergency room. Despite existing research on patterns of injuries in ATV-related trauma, there has not been a comprehensive study on patterns of upper-extremity injuries from ATV use. The aim of this study was to examine the incidence, patterns, trends, and characteristics of ATV-related distal upper extremity injuries across the United States using the US Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS) database to better understand these injury trends and outcomes.

**Methods:** In this study, the NEISS database was utilized to investigate distal upper extremity injuries specifically related to the use and operation of ATVs during a 10-year period from 2013 to 2022. The queried injuries encompassed the lower arm, wrist, hand, and fingers. The query was conducted using NEISS product codes for different types of ATVs, including three-wheeled ATVs, four-wheeled ATVs, ATVs with more than four wheels, and ATVs with an unspecified number of wheels. Demographic factors such as age, sex, race, and incident location were also examined in the analyzed dataset. The injuries were further assessed to include diagnosis, involved body parts, and disposition. The injuries were also categorized based on their locations and further subcategorization was done for forearm injuries to include ulna, radius, both, and unspecified.

**Results:** Since 2013, there has been a steady decline in the national estimate of total ATV-related injuries from 111,155 to 81,831 in 2022. There has been a gradual uptrend in the amount of distal upper extremity ATV injuries, with a peak of 19,973 in 2020. The

number of male patients reported was approximately twice the number of female patients (68.87%, 2,268/3,292 vs. 31.13%, 1025/3,292). Adolescents between the ages of 10 to 19 experienced the highest incidence of ATV-associated distal extremity injuries (41.1% of reported, 37.3% of national estimate), followed by patients between the ages of 20 to 29 (19% of reported, 19.5% of national estimate). The most commonly reported location of incidents were sports fields (18.9%, 625) followed by home (557, 16.9%). Of the reported cases, most were examined, treated, and discharged (2833, 86%) and another 10% (327) were admitted.

Among all the injuries listed, fractures were the most common reported injury across all body parts, occurring in 49.1% of all distal upper extremity injuries (1,740/3,541). Of the 883 reported forearm fractures, 40.5% involved the radius, 7.6% involved the ulna, 17% involved both bones, and 34.9% were unspecified.

**Conclusion:** This study demonstrated a predominance of injuries in males and the 10-19 age group and fractures as the most reported associated distal upper extremity injury type. Given that the rate of ATV-related upper extremity injuries has not followed the declining trend of overall ATV-related injuries, more attention should be focused on the effectiveness of upper extremity injury prevention such as rider education and the utilization of safety equipment in the form of arm restraints that keep the upper extremities in the vehicle, especially during rollovers.

## **Phalangeal Fractures in Pediatric Hand Trauma: An Analysis of Epidemiology and Risk Factors**

Abstract Presenter  
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**Purpose:** Phalangeal injuries are the most common pediatric hand trauma, but the epidemiology and injury patterns for this group are not well described. This study examines the pediatric hand trauma population and injury characteristics to identify risks associated with phalangeal fractures.

**Methods:** This was a retrospective cohort of pediatric hand trauma patients from 2010-2020. Patients were grouped into phalangeal and non-phalangeal injury cohorts. All charts were abstracted for demographic and clinical details. Population estimates and socioeconomic data were obtained from the United States Census Bureau. Summary statistics were computed, and a binomial regression was used to compute relative risks (RR). Significance was assessed at  $\alpha=0.05$ .

**Results:** 1,311 patients sustained hand trauma, with 690 (52.6%) phalangeal fractures. Demographic factors, including female gender (RR 1.17, CI 1.01-1.36,  $p=0.03$ ) and age between 6 and 12 years (RR 1.55, CI 1.33-1.80,  $p<0.001$ ), were associated with increased risk of phalangeal fracture. Median household income between \$43,000 and \$53,999 was associated with an increased risk of phalangeal injury (RR 1.28, CI 1.02-1.61,  $p=0.03$ ). The most common mechanisms of phalangeal fracture were sports ( $n=288$ , 41.7%), door slam ( $n=130$ , 18.8%), falls ( $n=82$ , 11.9%), play ( $n=67$ , 9.7%), and household mishap ( $n=63$ , 9.1%). Sports-related mechanisms (RR 1.68, CI 1.42-2.00,  $p<0.001$ ) and door slams (RR 1.50, CI 1.15-1.96,  $p=0.003$ ) were associated with a greater risk of phalangeal fractures. Fingertip injury was the most common soft tissue injury ( $n=138$ , 20.0%), and phalangeal fractures were more likely to involve concomitant fingertip injuries (RR 1.18, CI 1.04-1.33,  $p=0.01$ ). Phalangeal fractures were more likely to be open (RR 1.35, CI 1.26-1.45,  $p<0.001$ ) or classified as buckle (RR 1.61, CI 1.43-1.82,  $p=0.02$ ) or Salter-Harris fractures (RR 1.62, CI 1.46-1.81,  $p<0.001$ ), and were less likely to be displaced (RR 0.83, CI 0.76-0.91,  $p=0.03$ ). 82 patients (11.9%) required surgery; phalangeal fractures were associated with an increased risk of requiring buddy taping (RR 1.50, CI 1.27-1.77,  $p=0.001$ ), nailbed repair (RR 1.23, CI 1.03-1.47,  $p=0.04$ ), and splinting (RR 1.16, CI 1.04-1.29,  $p=0.008$ ) than other hand fractures.

**Conclusions:** This represents the largest reported cohort in pediatric hand trauma to date, and our findings highlight several risk factors for phalangeal fracture. Younger females with fingertip injuries are at highest risk for phalangeal fracture. In addition, phalangeal fractures were more likely to present with complex fracture patterns. These findings can aid in the emergent evaluation of phalangeal fracture, allowing for early referral to hand specialists.



## **Development of a Microsurgical Algorithm for Correction of Glenohumeral Dysplasia in Patients with Brachial Plexus Birth Injuries**

Abstract Presenter

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Abstract Co-Author(s)

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**Purpose:** Brachial plexus birth injury is a common condition with a wide variation in occurrence globally. The range of potential outcomes spans from spontaneous recovery to incapacitating impairment, notably affecting the shoulder joint in the form of glenohumeral dysplasia (GHD). We propose an algorithm for early correction of GHD in infants diagnosed with brachial plexus birth injury (BPBI) within 12 months of life, recalcitrant to nonoperative care, where there is appropriate time for remodeling after nerve recovery. In this investigation, we evaluate outcomes of patients in which our algorithm was applied.

**Methods:** According to our algorithm, an intra-operative nerve stimulator is utilized and conduction prior to neurolysis is recorded. Conduction at 0.5 milliamps (mA) is considered normal if the child demonstrates muscle function under anesthesia that corresponds to an induced full range of motion (ROM) against gravity (a simulated "Active Movement Scale" of 7). Shoulder external rotation (ER) is necessary to prevent GHD and must be restored, so this is carefully assessed. Neurolysis of the brachial plexus commences with systematic removal of the cicatrix from the involved aspects of the roots, trunks, divisions, and supraclavicular branches, etc. Nerve stimulation is then repeated. If nerve stimulation at 0.5mA demonstrates full range of ER outside the plane of gravity, no further surgery is performed – we presume the child will recover function. If such motion is achieved with 2mA stimulation or greater, an end-to-side (ETS) nerve transfer of the spinal accessory nerve (SAN) to the suprascapular nerve (SSN) is performed. To proceed with an end-to-end (ETE) nerve transfer of the SAN to the SSN, one of two conditions must be met: either (1) no conduction is achieved after neurolysis at 2mA; or (2) after neurolysis, the patient demonstrates less than full ROM with gravity eliminated at 0.5mA and 2mA.

**Results:** Twelve patients (average age: 8.5 months) underwent surgery for GHD using the algorithm. The follow up period for the ETS group was an average of 7.9 months (Std dev 2.1), and the follow up period for the ETE group was 13.8 months (Std dev

5.0). At the onset, all patients demonstrated shoulder dysfunction as evidenced by ultrasonography and abnormal AMS scores of shoulder abduction, ER, and forward flexion. All patients failed nonoperative treatment. Five patients underwent ETE nerve transfer, and seven patients underwent ETS SAN to SSN transfer using this algorithm. Ten of twelve patients (83%) had resolution of GHD as determined by postoperative ultrasonography and improved AMS scores. Of the surgical interventions, two ETE nerve transfer patients required reoperation using ER tendon transfers.

**Conclusions:** Due to the lack of definitive treatment protocols for GHD ranging from closed reductions and arthroscopic releases to nerve and tendon transfers, this algorithm can assist surgeons in tackling this difficult problem. From our results, 83% of infants treated using this algorithm had resolution of GHD.

## **An Assessment of Nonunion Rates in Ballistic Hand Fractures**

Abstract Presenter  
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**Introduction:** Ballistic hand fractures (BHF) result from high-velocity, destructive impact, creating complex multi-structure injury patterns which can lead to high non-union rates. We sought to determine factors that may predict these higher complication and non-union rates and assess our management strategy of these fractures.

**Methods:** Patients with BHF from 2016-2023 were identified from an institutional database. Charts and radiographs were reviewed for demographics, smoking status, treatment modality (including use of bone grafting), size of bone gap at the fracture, presence of comminution and, if comminuted, fractures were further categorized by presence and quality of remaining bone stock at the fracture site (ie: (1) complete loss of bone stock, with no bone existing between fracture fragments (NC); (2) partial bony

contact (PC); or (3) full bony contact (FC), with comminuted fragments remaining within the gap and  $>80\%$  contact with a minimum of ninety-day follow up. Our primary endpoint of interest was union at ninety days. Union was determined based on radiographic and clinical findings at follow-up visits. Univariate and multivariate analysis was performed to determine factors associated with nonunion.

**Results:** Seventy-seven fractures in 48 patients met inclusion criteria, of which 81% (N=62) were comminuted. Fractures were compared by severity of bone loss across the fracture site. A significant difference existed between groups, as measured by maximum bony gap (FC: 1.7 mm vs. PC: 11.3 mm vs. NC: 33.1 mm,  $p < 0.001$ ). Non-comminuted fractures had an average gap of 0.63 mm.

The majority of fractures were treated with Kirschner-wire fixation or immobilization alone, followed by open reduction and external fixation (48.1% vs. 31.2% vs 13.0% vs 7.8%). When treatment modality was compared against severity of missing bone stock, there was no statistical difference, regardless of severity of bone loss, in how fractures were managed ( $p=0.367$ ). No fractures underwent primary bone grafting.

Overall, 22% of fractures achieved union at ninety days (N=17). Of these, 94% (N=16) were either not comminuted or belonged to the FC group. Univariate analysis demonstrated loss of bone stock (NC and PC) was associated with significantly higher rates of non-union compared to FC fractures (90% and 95.2% vs 64.5%,  $p = 0.018$ ). Additionally smoking and concurrent tendon injury were also associated with non-union ( $p=0.010$ , 0.043). On multivariate logistic regression, bone gap (in mm) was an independent predictor of non-union at 90 days ( $p=0.018$ ).

**Conclusions:** BHF lead to high rates of non-union, as they are frequently comminuted and have significant loss of bone stock. Due to many factors like soft tissue loss and inadequacy of bone stock, less invasive methods of treatment are frequently used, such as Kirschner-wires or immobilization alone, which ultimately lead to low union rates. We believe surgeons should consider a planned two-stage surgical reconstruction when presented with BHF, as it may alleviate the overall poor union results. Following initial stabilization and adequate soft tissue coverage, we recommend considering a planned second surgery for conversion to internal fixation, with a low threshold to perform secondary bone grafting, especially in the settings of large bony defects.

## **Transcriptional Landscape and Molecular Alterations in Muscle Tissue Associated with Carpal Tunnel Syndrome**

Abstract Presenter

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**Introduction:** Carpal Tunnel Syndrome (CTS) is the most prevalent entrapment neuropathy affecting the upper extremity, characterized by tingling, numbness, weakness, and pain in the hand and fingers. It impacts approximately 5 to 10% of the general adult population, with annual medical costs totaling up to \$2 billion. Despite surgical treatment some patients do not recover full muscle function. This study explores the complex molecular pathways within the abductor pollicis brevis (APB) associated with CTS, including inflammation, muscle atrophy, fibrosis, oxidative stress, and regeneration.

**Methods:** APB muscle samples were collected from patients undergoing open carpal tunnel release with mild to severe CTS. Total RNA extraction was performed, followed by analysis using quantitative real-time polymerase chain reaction (qRT-PCR).

**Results:** qPCR analysis unveiled significantly elevated gene expressions of MyoD, Myogenin, Foxo-3, Nf- $\kappa$ B, and Fasn in the severe CTS group compared to both moderate CTS and mild CTS control groups. Additionally, irreversible muscle denervation markers Cystatin C and Decorin were markedly induced in the severe CTS group, with no significant change in the moderate CTS group. Conversely, the atrophy marker gene, Murf1, exhibited high induction in the moderate CTS group, while its expression in the severe CTS group was not elevated suggesting Nf- $\kappa$ B regulated expression of Murf1 may be an early marker of muscle damage.

**Conclusion:** Understanding the timing and molecular mechanisms responsible for muscle loss in CTS allows for the identification of potential biomarkers and therapeutic targets to reverse muscle damage as well as helps guide timing for surgical release to avoid irreversible muscle loss.

## **Effectiveness and Use of Autologous Fat Graft Injections in the Treatment of Base of Thumb Osteoarthritis: A Comprehensive Systematic Review and Meta-Analysis**

Abstract Presenter  
Hatan Mortada MD

**Introduction:** Trapeziometacarpal osteoarthritis (TMOA) is a common form of hand osteoarthritis that can be treated using several surgical and non-invasive modalities. Regenerative medicine has been widely regarded as a promising therapy option for many medical conditions. This research aimed to evaluate the effectiveness of autologous fat graft injections in improving pain relief, function, and quality of life in patients with TMOA.

**Methods:** In line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic literature search was conducted using Cochrane, MEDLINE, Google Scholar, and EMBASE to identify relevant studies. Extracted data focused on measurements of pain relief, treatment complications, and indicators of improved hand function. A meta-analysis using a single-arm design was performed with the STATA software, using random effects model with a 95% confidence interval.

**Results:** A total of 341 studies were identified for screening. Six studies were eligible for inclusion in the review. After 12 months of follow-up, autologous fat grafting led to a statistically significant reduction in pain ( $p = 0.00$ ). However, changes in grip strength were not statistically significant ( $p = 0.15$ ). Out of 192 total cases, 16 (8.0%) experienced complications requiring additional surgery.

**Conclusion:** Autologous fat grafting significantly relieves pain in TMOA, but functional improvements are not significant, and 8.0% need surgical intervention for complications. More rigorous, long-term RCTs are essential to evaluate its efficacy and safety against standard TMOA treatments.

## **"Lymphangiosarcoma Management and Outcomes: A Retrospective Study from a Single Institution"**

Abstract Presenter  
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Abstract Co-Author(s)  
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**Introduction:** Lymphangiosarcoma (LAS) is an aggressive cutaneous angiosarcoma, often occurring in association with chronic lymphedema. While LAS most often diagnosed in the upper extremities following axillary lymph node dissection or local radiation therapy for breast carcinoma, it may also affect other organs. However, due to its rarity, neither pathogenesis nor a standard treatment strategy has been established. This retrospective analysis aims to contribute insights into the management and outcomes of lymphangiosarcoma through a comprehensive review of cases from a single institute.

**Methods:** A retrospective medical record review of patients with a diagnosis of lymphangiosarcoma from 1976 to 2022 was done. Clinical details including demographics, history, risk factors and comorbidities, operative course, postoperative complications, outcomes, and recovery were recorded. Descriptive analysis was done on the data points.

**Results:** 37 patients were included in the final analysis. The mean age at the diagnosis of this patient population was  $61.6 \pm 16.6$  years, with a mean BMI of  $29.7 \pm 8.6$  kg/m<sup>2</sup>. 11 (29.7%) patients were male. Hypertension was noted in 21 out of 32 cases, cardiovascular disease in 7 out of 33 cases, and chronic lymphedema in 29 out of 35 cases where data were available. LAS location included 15 cases (40.5%) in the upper extremities alone, 12 cases (32.4%) in the lower extremities alone, and 10 cases (27.0%) in other areas. Among these patients, 17 out of 37 (45.9%) had history of prior surgeries, with 8 out of 29 (27.6%) received prior chemo and 17 out of 33 (51.5%) underwent prior radiation where data was available. Surgical intervention was done in 31 out of 37 (83.8%) diagnosed cases, with a median time from diagnosis to surgery of 29 days (range: 2-1246). Additionally, chemotherapy and radiation therapy were administered in 19 cases (51.4%) and 9 cases (24.3%), respectively. The median survival time from date of diagnosis to either death or available last follow up is 28.4 months (range: 0.2-563.2), with recurrence of 24 (64.9%) out of 37 cases.

**Conclusion:** In conclusion, this study highlights the diverse management approaches and outcomes of Lymphangiosarcoma (LAS) at our institute. With no standardized treatment protocol due to its rarity, surgical intervention emerged as a prominent therapeutic modality, with proportion of patients undergoing chemotherapy, and radiation. The median survival time highlights the challenges in managing this condition, with a notable recurrence rate.

## **Extradigital Glomus Tumors of the Upper Extremity: Systematic Review of Atypical Tumor Presentations Proximal to the Hand**

Abstract Presenter

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Abstract Co-Author(s)

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Elad Fraiman

**Introduction and Objective:** Extradigital glomus tumors, rare neoplasms found primarily in digits, present significant diagnostic challenges when occurring in upper extremities, often leading to misdiagnoses and delayed treatment. Characterized by symptoms like pinpoint pain and cold sensitivity, they mimic other vascular or neural pathologies. This study aims to elucidate the diagnostic intricacies of extradigital glomus tumors.

**Methodology:** A systematic review was conducted using PubMed and Google Scholar, focusing on literature up to April 1 2023. We included 37 studies, primarily case reports and retrospective reviews, emphasizing English-language articles on extradigital glomus tumors in the upper extremity.

**Results:** The total sample size was 136, with the average symptom duration before treatment or diagnosis being nearly six years. The most common locations were forearm (n=39, 28.6%) and lower extremity (n=28, 20.5). The studies revealed a high rate of misdiagnosis, with the two largest studies showing misdiagnosis rates of 48% and 84%. Common symptoms included pinpoint tenderness (86%) and pain (70%). Additional symptoms like painful swelling, hand clumsiness, and night-time pain were reported. Diagnostic imaging varied; MRI was the most common modality. Immunoreactivity studies predominantly showed SMA positivity (81.25%).

**Conclusion:** Extradigital glomus tumors are more prevalent than previously recognized, with a significant likelihood of misdiagnosis. This misidentification often leads to prolonged symptomology. While imaging is helpful, it frequently falls short in specific diagnosis, highlighting the importance of clinical suspicion and thorough diagnostic approaches. Our study underscores the need for greater awareness and a multidisciplinary strategy in diagnosing and treating extradigital glomus tumors.

## Demographic Disparities Concerning Upper Extremity Replantation

Abstract Presenter

Ricardo Torres-Guzman MD

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**Introduction:** While replantation can significantly improve a patient's quality of life following upper extremity amputation, it can be a difficult surgery requiring advanced microsurgical skill. Previous studies have shown a decrease in the rate of replantation following upper extremity amputation. While it is known that surgeons are less likely to choose to replant, the factors that determine which patients are selected for replantation have not been adequately investigated.

**Purpose.** This study aims to analyze the demographic, geographic and temporal factors impacting the decision to replant after upper extremity amputations.

**Methods:** The National Inpatient Sample (NIS) was queried from 2016 to 2020. ICD-10 diagnosis codes for complete and partial traumatic amputations of the upper extremity were used to identify cases. Amputations at level of the upper arm, the forearm, the wrist, the hand and the digits were included. ICD-10 procedure codes were utilized to differentiate between revision amputations and replantation or revascularization.

**Results:** A total of 3,760 amputations occurred from 2016 to 2020. Of the total amputations, 117 (3.11%) were above the elbow, 90 (2.39%) were at the forearm, 96 (2.55%) were at the wrist, 612 (16.28%) were in the hand, and 2,845 (75.66%) were of the digits. 2,468 (65.64%) of the amputations were classified as partial, and 1,292 (34.36%) were classified as complete. Replantation was attempted in 1,331 (35.40%) of cases. The rate of replantation did not change significantly over time ( $p = 0.587$ ). Upon univariate analysis, rates of replantation differed significantly across hospital census regions ( $p = 0.004$ ), with New England performing the most replantations (46.53%), and the West South Central performing the least (30.98%). Rates of replantation also decreased significantly in non-white patients ( $p < 0.001$ ), patients in lower income quartile ( $p < 0.001$ ), patients on Medicare or Medicaid ( $p < 0.001$ ), and in patients living in more rural areas ( $p = 0.001$ ). Similar results were found upon multivariate analysis. Patients in a higher income quartile (Odds ratio (OR): 1.15,  $p < 0.001$ , 95% confidence



interval (CI): 1.07 – 1.22), complete amputations (OR: 1.22,  $p = 0.007$ , 95% CI: 1.06 – 1.42), and patients with private or self-pay insurance (OR: 1.05,  $p = 0.007$ , 95% CI: 1.00 – 1.09). Additionally, patients from more rural areas (OR: 0.94,  $p = 0.004$ , 95% CI: 0.90 – 0.98), non-white patients (OR: 0.94,  $p = 0.032$ , 95% CI: 0.88 – 0.99), and older patients (OR: 0.99,  $p < 0.001$ , 95% CI: 0.98 – 0.99). Hospital census region ( $p = 0.658$ ) and the level of injury ( $p = 0.379$ ) did not significantly impact the probability of replantation.

**Conclusion:** While rates of replantation have remained steady over time, there are significant disparities in which patients undergo replantation. Non-white patients, older patients, patients from rural areas, patients from lower income quartiles, and patients on Medicaid or Medicare were less likely to undergo replantation.

## **Is Prenatal Ultraviolet Dose Associated with Risk of Limb Reduction Defects? A National Birth Analysis.**

Abstract Presenter  
Giap Vu MD

Abstract Co-Author(s)  
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**Purpose:** The etiology of limb reduction defects remains unclear. Maternal ultraviolet (UV) exposure has not been shown to influence the risk of limb reduction defects in newborns. This study investigated the association between prenatal UV dose and the risk of limb reduction defects in the United States (U.S.)

**Methods:** The U.S. 2014 and 2015 Natality Data were utilized ( $n = 7,986,908$ ). Mean daily county-level population-weighted erythemally-weighted daily UV dose was calculated over two specific periods for each live birth, namely the first trimester and the three months prior to conception. Multivariable logistic regressions controlled for household demographics, prenatal characteristics, infant characteristics, and socioeconomic factors.

**Results:** Of 7,693,026 live births included, 1044 (0.014%) had limb reduction defects. Higher mean daily UV dose during the three months prior to conception was associated

with statistically significantly lower odds of limb reduction defects (aOR = 0.99 [0.99, 0.99],  $p < 0.001$ ). The odds of limb reduction defects were independent of the mean daily UV dose during the first trimester (aOR = 0.99 [0.99, 1.00],  $p = 0.373$ ). The models suggested several other risk factors for limb reduction defects, including lower maternal education level (aOR = 1.34 [1.07, 1.67] for high-school non-graduates and below compared with high-school graduates/GED holders,  $p = 0.010$ ), maternal pre-pregnancy diabetes (aOR = 2.29 [1.43, 3.67],  $p < 0.001$ ), presence of other congenital disorders (aOR = 31.2 [24.9, 39.1],  $p < 0.001$ ), and forms of government insurance as the payment method for delivery (aOR = 1.26 [1.04, 1.53] for Medicaid compared to private insurance,  $p = 0.019$ ; and aOR = 1.89 [1.28, 2.79] for Indian Health Service/CHAMPUS/TRICARE or other government insurance programs compared to private insurance,  $p = 0.001$ ).

**Conclusions:** Higher daily maternal dose of UV during the three months prior to conception, but not during the first trimester, was associated with decreased odds of limb reduction defects after controlling for a number of covariates. Our study suggested that UV may be implicated in limb development in an indirect fashion via prenatal events leading up to the conception of the embryo, but not directly during fetal development per se. The analysis also indicated proxies of lower socioeconomic status as risk factors for limb reduction defects. Further studies are needed to confirm the associations and elucidate their mechanisms.

## **Factors affecting Outcomes after Free Functional Gracilis Muscle Transfer for Elbow Flexion in Brachial Plexus Injury: A Systematic Review and Meta-Analysis**

Abstract Presenter

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**Purpose:** Free functional gracilis muscle transfer (FFGT) is a useful option for reconstruction of elbow flexion following brachial plexus injury (BPI) presenting late or with no usable nerve donors. In this systematic review and meta-analysis, we aimed to investigate variables associated with superior outcomes. Specifically, the efficacy of

single vs double FFGT and the choice of donor nerve for neurotization of the FFGT were evaluated.

**Methods:** Meta-analysis was conducted using a random effects model using Review Manager software (RevMan) 5.4 and OpenMeta Analyst of studies that provided postoperative Medical Research Council (MRC) grade for elbow flexion, DASH, and VAS scores, quantitative elbow flexion strength, and range of motion (ROM). A meta-regression analysis was performed to identify factors associated with improved outcomes.

**Results:** Thirty-seven studies, with 1607 patients, were analyzed. Single FFGT was reported in 34 studies (n=1398), and double FFGT was reported in 10 studies (n=209). The mean follow-up duration was  $37.3 \pm 21.1$  months. Following single FFGT, 75.4% and 48.9% achieved MRC grades >3 and >4, respectively. Following double FFGT, 100% achieved MRC grade >3 and 62.7% >4. Subgroup analysis showed a significant difference in MRC grade >3 and >4, favoring double FFGT over single FFGT ( $P<0.05$ ). Overall, FFGT innervated by spinal accessory nerve (SAN) had significantly better recovery of MRC grade >3 ( $P<0.05$ ) compared to other innervating nerves. Subgroup analysis comparing single and double FFGT innervated by SAN showed no significant difference in recovery of elbow flexion. Meta-regression analysis showed a significant negative correlation between the patient's age and the probability of achieving an MRC grade of > 3 and 4 ( $P<0.05$ ). The pooled mean postoperative DASH score (n=8 studies, 671 patients) for single FFGT was 37.8 (95% CI: 33.67, 41.98), and a random effects meta-analysis of 27 patients from 3 studies showed a significant improvement from the preoperative DASH score with a mean difference of -13.86 (95% CI [-23.57, -4.15];  $P<0.05$ ). The mean postoperative VAS score (n=5 studies, 576 patients) was analyzed as 3.38 (95% CI: 2.96, 3.80). A meta-analysis of 2 single FFGT studies comparing postoperative and preoperative VAS scores showed a significant improvement after the procedure (Mean Difference: -0.88, 95% CI [-1.55, -0.21];  $P<0.05$ ). Mean elbow flexion strength after single FFGT (n=4 studies, 210 patients) was analyzed to be 2.60 kg (95% CI [1.94,3.27]). The mean range of motion of elbow flexion (ROM) of 609 patients (n=9 studies) undergoing single FFGT was 94.3 degrees (95% CI: 87.8, 100.8), whereas, for patients undergoing double FFGT, it was 118.7 degrees (95% CI:113.6, 123.8) with significant subgroup differences between the two procedures, favoring double FFGT ( $P<0.05$ ).

**Conclusion:** FFGT innervated by SAN had the best functional outcomes. Double FFGT was superior overall to single FFGT. Comparing outcomes specific to single/ double FFGT innervated by SAN, there was no significant difference, showing that the choice

of donor nerve is most important. Increasing age was a significant risk factor for poorer outcomes.

## **Contemporary Management of Thumb Ulnar Collateral Ligament Injuries: A Survey of Hand Surgeons**

Abstract Presenter

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**Introduction:** Injuries of the digital collateral ligaments are common and most frequently involve the thumb metacarpophalangeal (MCP) joint. The thumb MCP joint ulnar collateral ligament (UCL) is at particular risk with either chronic radial deviation forces or by an acute hyperabduction mechanism.

Historically, ligament repair was performed either by direct repair/reinsertion or reconstruction with an autologous tendon graft. The use of suture tape (e.g. Internal Brace™ [IB]) is a relatively new technique available to augment repair of the thumb MCP joint UCL. Evidence indicates that suture tape provides biomechanical support to allow for more rapid rehabilitation and return to activities. There is no consensus best surgical practice for UCL repair and reconstruction, and the utilization of suture tape techniques are not well understood. In this study, we sought to assess the practice patterns amongst American Society of Surgery of the Hand (ASSH) members.

**Methods:** This research study is an on going national survey assessing the surgical management of thumb MCP joint UCL injuries. Institutional IRB was obtained. A comprehensive 17-question survey was created using Qualtrics (Qualtrics, Provo, UT). After submission and approval from the ASSH, a contact list containing all surgeon members was obtained. The survey was emailed January of 2024. This dataset represents a 1-month snapshot of our ongoing three-month survey. Qualtrics was utilized for survey analysis.

**Results:** A total of 312 surgeons responded to the survey (9% response rate). Respondents were orthopedic surgeons (264/312, 84.6%), plastic surgeons (37/312, 11.9%) and general surgeons (11/312, 3.5%). The majority (235/312, 75.6%) had been in practice for at least 5 years. 62.8% (196/312) reported performing 5-15 UCL repairs /reconstructions per year.

When treating the digital collateral ligament (thumb MCP joint UCL), if there is sufficient remaining ligament for repair, only 0.6% (2/312) surgeons performed repair with suture tape only, while 48.4% (151/312) performed direct repair with suture tape augmentation, and 50.3% (157/312) performed direct or suture repair. If there is not sufficient ligament for repair, 18.6% (58/312) performed repair with suture tape only, 56.1% (175/312) performed autologous graft with suture tape augmentation, and 21.8% (68/312) performed reconstruction with autologous graft only. The majority of respondents (200/312, 65.2%) stated the biggest concern with using suture tape alone for UCL repair/reconstruction is instability/long-term durability.

**Conclusion:** This is the first study attempting to understand current practice in management of digital collateral ligament injuries. These data indicate that suture tape is widely utilized for UCL injuries, especially in cases where there is not sufficient ligament for repair.

## **Vascularized Bone Flaps in Diaphyseal Osseous Gap Reconstruction of the Upper Extremities: An Updated Review**

Abstract Presenter  
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**Background:** Segmental defect reconstruction of upper extremity diaphyseal defects (UEDDs) can be managed with multiple techniques. While free vascularized bone flaps (VBF) have been well characterized for treating large segmental defects, much of the literature is broad and lacks adequate granularity to inform clinical decision-making in

the upper extremities. In this study, we sought to characterize and summarize the available literature on VBF reconstruction for UEDDs.

**Methods:** A scoping review was conducted using PRISMA-ScR guidelines on major databases. Inclusion criteria included patient-level data on upper extremity diaphyseal segmental defects of the radius, ulna, or humerus reconstructed with free vascularized bone flaps requiring microsurgical anastomosis. Exclusion criteria included non-diaphyseal reconstructions, non-upper extremity defects, non-vascularized reconstructions, review articles, and outcomes studies without patient-level data. In Python, descriptive statistics and unadjusted odds ratios were calculated for primary union and each complication using surgical indications as exposure events.

**Results:** Overall, 3,122 articles were screened to identify 54 eligible studies comprising 364 patients. Indication for reconstruction was atrophic non-union in 125 (34.3%) patients, post-oncologic in 125 (34.3%), septic non-union in 56 (15.4%), and acute trauma in 36 (15.4%). The free fibula flap (FFF) was the most utilized vascularized bony graft, constituting 272 (74.7%) reconstructions. The medial femoral condyle (MFC) (69, 19.0%) and scapular (8, 2.2%) flaps were the next most used. Mean defect size was  $8.53 \pm 5.14$  cm, recipient vessels were most commonly brachial (41, 32.8%) or radial (27, 21.6%) arteries, and plates with screws (73, 58.4%) were the most used form of fixation. Primary union was achieved in 317 (87.1%) cases within  $6.03 \pm 4.19$  months. Delayed union (29, 8.0%), malunion (4, 1.1%), reoperation (61, 16.8%), and non-union (18, 5.0%) were observed in a minority of patients. Graft fractures were over fivefold more likely with oncologic etiologies (OR=5.5, 95% CI=1.46-20.76).

**Conclusions:** VBFs demonstrate excellent reconstructive outcomes characterized by high primary union rates. FFF is the most utilized VBF for reconstructing UEDDs, particularly for spanning large defects >6cm and hostile wound beds. The length and architecture of the bone make it a "like-for-like" match with the radius and ulna. MFC flaps are optimal for smaller defects <6cm, with thin, pliable geometry that makes them suitable for extra-articular bony reconstruction. The MFC flap is well-poised for use in recalcitrant non-unions and hostile wound beds, posting high union rates in this study. A size demarcation of 6cm should be adopted when deciding between FFF and MFC flaps.

# **Early intervention improves functional recovery in congenital peripheral nerve hypoplasia associated with constriction band syndrome: a comparative case study and literature review**

Abstract Presenter

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**BACKGROUND:** Constriction band syndrome (CBS) has rarely been associated with congenital peripheral nerve hypoplasia (CPNH) which can significantly impair motor function of the upper extremity. Prior case reports suggest that constriction band release between 3 months and 5 years of age are largely unsuccessful;(1,2) the few cases demonstrating neurologic recovery involved constriction band release with nerve decompression at 1 week,(3) 3 weeks,(4) and 14 weeks of life.(5) Thus, Mohan et al. suggest that intervention performed within the first month of life provides the best chance of motor recovery in cases of CPNH associated with CBS.(3)

**PURPOSE:** We present two case reports of CPNH associated with CBS and conduct a literature review supporting the practice of early intervention, even within the first few hours of life.

**METHODS:** Case 1 is a male infant who was born with a left upper extremity constriction band causing venous congestion with concern for vascular compromise, compartment syndrome, and ulnar and median motor palsies. He was operated on emergently at 3 hours of life for complete excisional constriction band release with z-plasty, brachial artery exploration, forearm fasciotomies, and decompression of median and ulnar nerves. Intra-operative findings were notable for hourglass constriction of the median and ulnar nerves. Case 2 is a male infant with a left upper extremity constriction band and CPNH who presented in a delayed fashion. He underwent constriction band release with z-plasty and full decompression of the median, radial, and ulnar nerves at 9 months of age. We also conducted a literature review of CPNH associated with CBS.

**RESULTS:** In Case 1, the patient initially demonstrated minimal motor activity other than active wrist extension suggesting severe ulnar and median motor palsies. Post-operatively, he developed progressive clawing of the fingers, and by 6 months post-operatively he was able to actively flex the fingers with a strong grip and resolution of clawing demonstrating complete median and ulnar motor recovery with no residual

deficits. In Case 2, the patient initially presented with severe radial nerve palsy and moderate median and ulnar motor dysfunction. Post-operatively he demonstrated limited ulnar recovery with weak wrist and finger flexion but failed to recover active wrist or finger extension. He thus underwent free functional muscle transfer 8 months post-operatively for wrist extension. Case reports of CPNH associated with CBS suggest that constriction band release and nerve decompression at 3 months of age or later fail to provide regain of motor function, but earlier intervention may result in variable motor recovery.

**CONCLUSIONS:** Our experience with early versus delayed constriction band release in children with associated CPNH supports the principle of early intervention for maximal functional recovery. We recommend early diagnosis of upper extremity CBS, in utero if possible, followed by prompt evaluation by a pediatric hand surgeon at the time of birth. If there is suspicion for CPNH at birth, urgent excisional constriction band release and nerve decompression should be performed. Early recognition and intervention, including within the first few hours of life, provides the best chance of full functional recovery.

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#### **Hand Infection Encounters in the Emergency Department in the Presence of Concomitant Psychiatric Diagnoses: A Nationwide Cosmos Study**

Abstract Presenter

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**Background:** Hand infections make up a significant proportion of patients evaluated by the hand surgeon in the emergency department. There are multiple comorbidities that increase a patient's risk of developing a hand infection including diabetes mellitus, immunosuppression, and intravenous drug use. Despite this, there is a paucity of literature on the impact comorbid psychiatric diagnoses have on the rates of patient presentation to the emergency department for management of a hand infection. The goal of this study was to evaluate rates of patient presentation for hand infection in the presence of a comorbid psychiatric diagnosis and compare this to the general population.

**Methods:** We performed a retrospective case control study based on data from Cosmos, a nationwide Epic® electronic health record database. All emergency room encounters related to hand infections over a three-year period from 2020-2023 were evaluated for the presence of a comorbid psychiatric diagnosis within the patient's problem list. The rates of hand infection between the control population were then compared to rates in patients with a documented psychiatric diagnosis. Statistical analysis was performed using GraphPad Prism version 10.0.0 with a significant p-value set at 0.05 and 95% confidence intervals for odds ratios calculated using the Woolf logit method.

**Results:** Data analysis included 94,210,226 unique encounters representing 42,786,312 individual patients. The rate of presentation for hand infection in patients with a concomitant psychiatric diagnosis was significantly higher than in patients without history of a psychiatric disorder (0.06% versus 0.01%,  $p < 0.0001$ ). When evaluating subgroups of psychiatric diseases based on the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria, the rate of presentation for hand infection remained significantly higher for patients with schizophrenia and psychotic disorders (0.06% versus 0.01%,  $p < 0.0001$ ), bipolar disorder (0.8% versus 0.01%,  $p < 0.0001$ ), depressive disorders (0.05% versus 0.01%,  $p < 0.0001$ ), anxiety disorders (0.05% versus 0.01%,  $p < 0.0001$ ), and trauma and stressor related disorders (0.05% versus 0.01%,  $p < 0.0001$ ).

**Conclusions:** The rate of presentation for hand infections to the emergency department in this study was significantly higher in patients with a comorbid psychiatric

diagnosis. An understanding of risk factors for the development of hand infections can help guide the practitioner in appropriate assessment and management of this complex problem.

## **Larger Lymphatic Vessel Caliber During Lymphatic Microsurgical Preventive Healing Approach (LYMPHA) is Associated with Lower Lymphedema Rates**

Abstract Presenter  
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**Background:** The incidence of Breast Cancer Related Lymphedema ranges from 15-40 % after a complete axillary lymph node dissection (ALND) depending on other treatment modalities like chemotherapy, radiation, and the extent of dissection (1). The Lymphatic Microsurgical Preventive Healing Approach (LYMPHA) reduces the risk of lymphedema after ALND (2). We identified surgical factors of LYMPHA that influence lymphedema rates focusing on the lymphatic vessel caliber utilized.

**Methods:** A single-institution retrospective cohort study included breast cancer patients undergoing ALND and LYMPHA from April 2021 to November 2022 with a follow-up of at least one year. Lymphedema was defined as a Lymphedema Index (L-Dex) (Bioimpedance Spectroscopy) measurement outside the normal range ( $\pm 10$  L-Dex unit) or an increase of  $\geq 10$  units from baseline. The primary outcome was the correlation between the L-Dex of patients with a lymphatic caliber of  $\leq 0.6$  mm vs  $> 0.6$  mm. The secondary outcome was to assess the difference in the L-dex from baseline after a follow-up of one year.

**Results:** 58 patients with documented lymphatic caliber were analyzed. The mean age and BMI were 52.1 years [SD 11.2] and 27.2 [SD 5]kg/m<sup>2</sup> respectively. We divided

them into two cohorts: patients that had lymphatic caliber  $\leq 0.6$  mm 55.2 % (n=32) vs  $>0.6$  mm 44.8% (n=26). The demographic characteristics and cancer stage were equally distributed between both cohorts. Treatment factors like receipt of taxane-based chemotherapy, radiation, number of nodes resected, number of positive nodes, and number of anastomoses that influence lymphedema rates were equally distributed between both cohorts. The median baseline L-Dex in patients with a lymphatic caliber  $\leq 0.6$  mm was 2.25 [2.85] and 2.80 [2.69] for lymphatic caliber  $> 0.6$  mm ( $p=0.76$ ). After one-year follow-up, the L-Dex was 4.20 [7.74] for lymphatic caliber  $\leq 0.6$  mm and 1.80 [2.42] for lymphatic caliber  $>0.6$  mm ( $p=0.006$ ). The L-Dex difference from baseline was higher for lymphatic caliber  $\leq 0.6$  mm compared to  $>0.6$  mm (3.15 vs 2.65,  $p=0.02$ ). 6 patients (10%) developed lymphedema, all of whom had a lymphatic caliber  $\leq 0.6$  mm. A larger lymphatic caliber was associated with a lower L-Dex at 12 months ( $p=0.01$ ). It was also associated with a lesser difference from the baseline after one year which was maintained on univariate analysis ( $p=0.02$ ) and multivariate analysis controlling for radiation, chemotherapy, and number of lymph nodes excised ( $p=0.04$ ).

**Conclusion:** Lymphatic vessel caliber  $>0.6$  mm during LYMPHA with ALND is associated with a lower postoperative L-Dex and less increase from the baseline L-dex score. The present analysis highlights an opportunity for collaboration in a multi-institutional study to improve the standardization of LYMPHA.

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## Outcomes of Myoelectric Prosthetic Fitting on Activity Performance in Patients with Traumatic Brachial Plexus Injuries (BPI) after Elective Amputation

Abstract Presenter  
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**Background:** Despite advancements in traumatic brachial plexus injury (BPI) management, reconstructive surgical techniques are not feasible for all patients, leading to amputation. Recently, myoelectric prosthetic capabilities have greatly enhanced terminal prosthetic grasp and release, leading to improved skillfulness of prosthetic use. The aim of this study was to evaluate the function and activity performance of prosthetic fitting with myoelectric controls for upper extremity amputees after BPI.

**Methods:** A retrospective analysis of adult patients with amputation after BPI at a single clinic was performed. Patients that underwent myoelectric prosthesis (MEP) fitting after amputation were included. Demographics, mechanisms of injury, amputation characteristics and outcomes were collected from medical records. The Disabilities of the Arm, Shoulder and Hand (DASH) outcome measure, to evaluate the impact of impairment, Visual Analog Scale (VAS) to evaluate pain, and the Activities Measure for Upper Limb Amputees (AMULA) to evaluate activity performance were collected. Prosthesis usage, satisfaction and signal transducers were also recorded. Paired t-tests were used to compare outcomes.

**Results:** Sixty patients with BPI between were identified. Of these, 13 patients (90% male, average age of 34 years at time of BPI) were fitted with MEPs with electromyographic signal control from muscles not normally associated with the intended function (nonintuitive control) after elective amputation. Among these, 10 patients underwent trans-radial amputation and 3 patients underwent trans-humeral amputations. Amputations occurred to the dominant limb in 3 out of 13 patients. Reasoning for amputation included lack of function or desiring more function. Disability (DASH) did not significantly differ, with average scores of 53 pre-amputation compared to 51 post-amputation (DASH score,  $p=0.17$ ). Average pain score were also not significantly different post-amputation (6.6 versus 4.4, mean difference 2.2,  $p=0.054$ ). Linear transducers were used in 60% to fit MEPs and in 40%, traditional electrodes were used. AMULA scores denoted a significant improvement in activity performance after use of prosthesis ( $p=0.0005$ ). All patients demonstrated functional terminal grasp and release with an average use of 6 hours per day. Hundred percent of patients found their fitted MEP useful during daily activities and were satisfied after an average of 4 months follow-up.

**Conclusions:** Elective upper extremity amputations following BPI did not decrease pain and disability significantly. However, validated AMULA scores found that activity performance using MEPs improved significantly. Patients used their prosthetics around 6 hours per day with a hundred percent satisfaction rate and functional terminal grasp and release.

## **Safety and Efficacy of Vascularized Lymph Node Transplantation: Three-Year Prospective Outcomes**

Abstract Presenter  
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Joseph Dayan MD

**PURPOSE:** Although the safety and efficacy of vascularized lymph node transplant (VLNT) have been confirmed up to two years post-surgery, there is limited published data regarding outcomes beyond this timeframe. This prospective study aimed to assess postoperative outcomes at the three-year mark utilizing both objective and subjective metrics.

**METHODS:** All patients underwent VLNT at a tertiary cancer center between November 2014 and January 2023. Outcomes were assessed using 2 validated patient-reported outcome metrics (PROMs), limb volume, bioimpedance, need for compression, and incidence of cellulitis.

**RESULTS:** A total of 110 patients were included with the following donor sites: omentum (80.0%), axilla (9%), supraclavicular (5%) and groin (2.5%). The mean follow-up time was  $32.5 \pm 11.2$  months. A significant improvement across all outcome measures was recorded at 36 months postoperatively: 30.7% average reduction in limb volume ( $p=0.02$ ), 44.1% improvement ( $p=0.01$ ) in bioimpedance (LDEX) scores ( $p=0.001$ ), 36.7% improvement in the Lymphedema Life Impact Scale scores ( $p=0.03$ ) and 97% reduction in cellulitis ( $p=0.001$ ). 46% of patients no longer required compression. No cases of donor site lymphedema were recorded (0%).

**CONCLUSION:** Vascularized lymph node transplant (VLNT) results in sustained enhancements in both overall limb volume and quality of life, extending beyond the initial two years post-surgery and up to 36 months postoperatively.

## **Functional comparison of the use of allografts vs. Autologous grafts in patients with hand tendon reconstruction.**

Abstract Presenter

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The incidence of hand injuries in our country amounts to up to 160,250 per year. Of all of them, tendon injuries, whether flexor tendons (TF) or extensor tendons (ET), represent up to 30% of all consultations referred to the emergency department (1,2). Depending on the characteristics of the injury, treatments can be performed. either with autologous grafts (taken from the same individual) or allogeneic grafts (obtained from a cadaveric donor) (3,4)

The purpose of this study is to know if there is a functional difference between reconstruction using autologous grafts compared to reconstruction with allogeneic grafts for tendon injuries of the hand.

A search was carried out for patients with a history of tendon injuries of the hand treated by the plastic and reconstructive surgery service of the CMI Toluca in a period between January 2015 to March 2023. Questionnaires such as the QDash-Score were carried out for the functional evaluation of the injured hand as well as Likert-type satisfaction surveys and objective tests using a dynamometer and goniometer to evaluate strength and the resulting ranges of mobility.

The sample consisted of 10 male patients (76.9%) and 3 female patients (23.1%). The median age was 40 years (IQR 35, 57), with a range of 21 to 61 years. The most affected finger was the fourth finger, in 6 patients (46.2%), followed by the second finger in 3 patients (23.1%) and the third finger in 2 patients (14.4%). Both the first finger and the fifth finger were injured in only one patient (7.7%), an autologous graft was used in 5 patients (38.5%) and an allogeneic graft was used in 8 patients (61.8%). Patients with an allogeneic graft presented a significantly smaller decrease in the flexor angle of the distal interphalangeal joint than patients with an autologous graft ( $p=0.02$ ), with a difference between healthy hand and injured hand of  $11.0^{\circ}$  (SD 15.3) and  $39.8^{\circ}$  (SD 12.7), respectively (difference  $28.8^{\circ}$ , 95% CI 10, 47). The other functional characteristics did not show significant differences. However, patients with allogeneic

graft showed a smaller difference between healthy and injured hand in the proximal interphalangeal flexor angle ( $p=0.09$ ).

Among the conclusions drawn in this study, a clear trend is observed towards a better result in the objective tests of mobility ranges and coarse and fine grip strength for hands reconstructed with allogeneic grafts, as well as in subjective tests such as the Q-Dash score and the Likert questionnaire in which the percentage of disability was slightly lower for the allogeneic graft group and the percentage of satisfaction was higher respectively. It is worth remembering the importance of the timely recognition of tendon injuries of the hand, as well as the adequate identification of the injured structures, which are of vital importance for the plastic and reconstructive surgeon to reestablish the function or functions lost secondary to tendon disruptions, vascular or nerve injuries of the hand.

### **Carpal Tunnel Syndrome: An Analysis of Racial Disparities and the Effects of Social Determinants of Health on Operative Intervention**

Abstract Presenter

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**Background:** Health disparities are multifactorial and remain a national and international public health problem with a significant financial burden. To this end, this study aimed to evaluate how racial/ethnic backgrounds and social determinants contribute to healthcare disparities in patients with carpal tunnel syndrome (CTS), including the time to and rates of surgical treatment.

**Methods:** A national insurance-based database (PearlDiver inc.) was utilized for this retrospective study of 308,662 patients with CTS. Patients with ICD-9 and ICD-10 codes corresponding to "hand pain" and a diagnosis of CTS between 2014 and 2016 were identified using corresponding ICD-9 and ICD-10 codes. Subsequent carpal tunnel release was identified using its corresponding CPT codes and time from diagnosis to treatment was compared among racial groups.

**Results:** Black and Hispanic patients were found to have significantly prolonged time to diagnosis and time to treatment of their CTS compared to White Patients. Patients of any racial or ethnic minority were 52-59% less likely to undergo CTR compared to White patients. Having any reported SDOH decreased the odds of undergoing CTR by 46%. In addition, males and people from the South and Midwest were more likely to undergo surgical release compared to females and patients from the Northeast.

**Conclusion:** Racial and social disparities are present when diagnosing and treating carpal tunnel syndrome predisposing patients to delays in operative intervention. It is important to build increased recognition of these issues in the medical community and put forth tangible goals to work toward equity in operative intervention.

### **Long-Term Patient-Reported Outcomes After Pediatric Fingertip Injuries**

Abstract Presenter  
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**Introduction:** Fingertip injuries are common among children, peaking in incidence at two years of age. A paucity of data exists in the literature regarding recovery and patient-reported outcomes (PROs) following these frequent injuries. This study aims to evaluate PROs regarding upper extremity function and fine motor skills following treatment of pediatric fingertip injuries.

**Methods:** Institutional Review Board approval was obtained. Children evaluated for fingertip injuries in the emergency department and clinic between July 2018 and March 2023 at a Level 1 children's hospital in a large metropolitan city in the United States were identified. Inclusion criteria included age at injury <18 years. Demographics were collected. Pediatric Upper Extremity – Short Form 8a and Pediatric Upper Extremity Function – Fine Motor, ADL forms were administered to included patients with available contact information. The PROMIS scoring guide was used to determine statistically



significant differences from age-matched controls. PROMIS scores were compared to national age-matched control averages using Student's t-test.

**Results:** 184 patients were identified for inclusion – of these, 92 patients had verifiable contact information. 49.5% of patients were male, 50.5% female. Mean age of patients was 4.73 years (range <1-16 years). Injuries were most commonly due to crush injuries inside doors (48.4%) and predominantly affected the third/fourth digits of each hand ( $p=0.028$ ). Most patients (61.4%) treated in the emergency department underwent repair. Repairs included bedside soft tissue only (43.8%), bedside soft tissue and nailed (48.2%), and operating room intervention (8.0%). 22/92 (24%) parents/guardians completed both surveys. Average follow-up time from injury to survey completion was 584 days (~1.6 years). 8/184 (8.0%) of patients underwent additional procedures later. For all injury and repair types, children treated for fingertip injuries showed no significant difference in reported upper extremity function ( $p=0.345$ ) or fine motor skills ( $p=0.458$ ) compared to national averages using PROMIS surveys.

**Conclusions:** Children treated for fingertip injuries at our institution reported favorable PROs. There is no long-term difference in fine motor or upper extremity function PROs for children treated for fingertip injuries compared to age-matched controls. Future directions could include evaluation of psychological impact of the injured finger aesthetic and need for additional procedures based on injury patterns.

### **Effectiveness of Platelet-Rich Plasma Injection as an Adjunct Treatment to Arthroscopy for TFCC Injury: A Retrospective Cohort Study**

Abstract Presenter  
Hatan Mortada MD

**Background:** Triangular fibrocartilage complex (TFCC) injuries can be a significant source of dysfunction in patients [1]. Platelet-rich plasma (PRP) has gained attention as an adjunctive treatment in patients who receive arthroscopic repair of TFCC injury, with studies suggesting that PRP may improve patient outcomes [2]. The current study aims to evaluate and compare the use of PRP as an adjunctive treatment in patients undergoing arthroscopic repair of TFCC tears.

**Methodology:** This retrospective study reviewed patients who had arthroscopic TFCC repair between 2021-2022. Physical exams were conducted pre and post-treatment, recording flexion, extension, radial/ulnar deviation of affected and contralateral wrists. Pre- and post-operative VAS pain scores and Quick DASH function scores were

compared to assess improvements.

**Results:** A total of 33 patients (20 male, 13 female) with a mean age of  $30.55 \pm 9.17$  years were included. 16 received PRP injections adjunct to arthroscopic TFCC repair, while 17 had repair alone. No significant differences existed preoperatively between groups in wrist function or pain ( $p > 0.05$ ). The mean postoperative follow-up was  $3.94 \pm 1.66$  months. The PRP group showed greater improvement in Quick DASH scores (mean change  $7.75 \pm 5.91$ ) compared to the non-PRP group. No significant difference was seen in pain VAS between groups.

**Conclusion:** The use of PRP as an adjuvant for TFCC injuries after arthroscopic repair remains debated. In our study, patients receiving PRP after arthroscopic repair of peripheral TFCC tears showed significant improvement in Quick DASH scores. Further prospective studies are needed to confirm these findings.

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## **The Platypus and the Plastic Surgeon - Clinical Experiences of Australian Plastic Surgery, Native Wildlife, and the Dangers Down Under**

Abstract Presenter

Hugo Loveday MBBS

Animal bites and stings have become a regular feature of Plastic Surgery trauma lists in Australia. Although they rarely require reconstruction, these bites and stings often affect the hands and/or require the attention of a soft tissue surgical specialist. Despite the association of snakes, spiders and crocodiles with Australia, most of these injuries are from domesticated cats and dogs. In this paper, however, we consider more atypical (and perhaps novel) culprits in the form of Australian native wildlife. The first case we present is of a platypus sting to the palm of a middle-aged woman. With its duck-like bill, beaver-like tail and reptilian-like egg laying, the platypus is one of Australia's more peculiar mammals. Few Australian – let alone American - practitioners would be sufficiently familiar with the platypus' mammology to know that this animal even has a venomous spur, which is located on the underside of the rear legs of the male platypus.

The venom, which is produced in greater quantities during mating season, is not cytotoxic to humans but does cause profound pain and swelling. At the time of writing, only a single case report has been published in respect of a platypus sting (Tonkin & Nardine, 1994). That report, describes the patient as requiring a 6-day admission for pain refractory to opioid analgesia after a platypus sting. We present a case of a platypus sting to the zone III palm which, due to its depth and location, required operative exploration and washout, with the patient being discharged the following day and on opioid-free simple analgesia at one week post-admission. Although platypus stings are exceedingly rare and the limitations of drawing conclusions from isolated cases, our patient had a significantly better outcome than the published experience. From freshwater to land, the second case we present is of an elderly woman being mauled in her own bed by a wombat. The wombat is a quadrupedal, furry and rotund herbivore with long claws on its front paws for digging burrows. Wombats are typically reclusive and timid, and there are no published reports of attacks against humans. In this case, the patient was sleeping in their own bed, with doors open for airflow in the Australian summer, when they were mauled on the lower limbs. The patient sustained numerous subfascial wounds requiring surgical washout and debridement by the Plastic Surgery team. Together, these cases provide insight to the rare and interesting Plastic Surgery admissions and operative intervention in attacks by usually docile and reclusive native Australian animals.

M.A. Tonkin, J. Negrine, Wild platypus attack in the Antipodes A case report, The Journal of Hand Surgery: British & European Volume, Volume 19, Issue 2, 1994, Pages 162-164, ISSN 0266-7681, [https://doi.org/10.1016/0266-7681\(94\)90155-4](https://doi.org/10.1016/0266-7681(94)90155-4).

## **Incidence and Predictors of Pediatric Hand and Wrist Ganglion Cyst Surgery**

Abstract Presenter

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**Purpose/background:** Ganglion cysts are non-cancerous growth of the hand and wrist commonly found in the pediatric population, affecting as much as 10% of patients under the age of 20 (1). Previous studies have identified that pediatric cysts may present with unique epidemiological characteristics and require different treatment algorithms than adult cysts (2). However, many of these studies were limited by small sample sizes and may not be representative. The present study utilized a national administrative claims database to investigate the age-related incidence of pediatric ganglion cysts and predictors of pursuing surgical excision.

**Methods:** Patients who were diagnosed with a hand or wrist ganglion cyst were identified from the PearlDiver Mariner161 insurance claims database. Exclusion criteria were ganglion cyst diagnoses in more than one location, an insurance type that was not commercial or Medicaid, missing characteristics such as sex or region, age older than 18, and records active for fewer than 2 years. Ganglion cyst treatments such as bracing, aspiration/injection, surgery, and revision surgery were identified in addition to the use of diagnostic imaging.

Patients diagnosed with a ganglion cyst and the proportion that underwent surgery were stratified by age at the initial recorded diagnosis. Non-linear exponential fit and simple linear regression were used to analyze these trends respectively. The likelihood of proceeding to surgical excision and revision surgery was analyzed using univariate and multivariate analysis. Time to surgical excision for different cyst locations was analyzed using a log-rank test.

**Results:** Approximately 37,021 pediatric patients with a ganglion cyst located on the hand or wrist were identified. The number of patients that were diagnosed at each age increased exponentially (R-squared: 0.9494), while the proportion of patients diagnosed at each age that underwent surgical excision increased linearly (R-squared: 0.9699). Increased age (OR: 1.07, 95% CI: [1.06, 1.08],  $p < 0.0001$ ), female sex (OR: 1.37, 95% CI: [1.26, 1.48],  $p < 0.0001$ ), and utilization of x-ray for diagnosis (OR: 1.77, 95% CI: [0.98, 1.69],  $p < 0.0001$ ) were associated with greater likelihood of pursuing surgery while cyst location on the hand (OR: 0.54, 95% CI: 0.49, 0.60],  $p < 0.0001$ ) was predictive of not receiving surgery compared to wrist-located cysts. Differences in 2-year time to surgical excision for patients with hand- or wrist-located ganglion cysts were statistically significant as determined by Kaplan-Meier survivorship analysis, with wrist-location cyst receiving operation at a greater rate initially and more overall ( $p < 0.0001$ ). Among patient demographic and treatment characteristics, female sex was predictive of an increased likelihood of receiving a surgical revision (OR: 1.57, 95% CI: [1.04, 2.44],  $p = 0.0368$ ), and all cases of recurrence involved wrist-located cysts.

**Conclusions:** The current study presents a nationwide analysis of ganglion cyst prevalence and treatment characteristics in the pediatric population. The proportion of patients undergoing surgery for ganglion cysts increased linearly with age, demonstrating that there is no specific cutoff where the treatment algorithm changes. Moreover, specific predictors for receiving surgery and recurrence after surgery were identified. These are important to consider during patient counseling and surgical planning respectively.

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## Reevaluating Pediatric Nailbed Injuries: Are We Overtreating Simple Cases?

Abstract Presenter

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**Purpose:** Pediatric fingertip injuries involving the nailbed are extremely common, yet there is still no consensus on treatment protocols. The literature shows a range of practice patterns, and the current practice of repairing simple nailbed laceration injuries may result in overtreatment (1). The aim of this study is to assess whether there are specific variables in our population that could predict which patients with nailbed lacerations may have equivalent outcomes with fewer procedural interventions.

**Methods:** A retrospective chart review was conducted at a single children's hospital for patients 0-18 years old with nailbed injuries from September 2017 through September

2023. Patients were excluded from the study if no x-ray was obtained at their initial visit or if they lacked at least one follow-up visit. Patients were excluded for complicating injuries such as Seymour or Salter-Harris fractures, or complete amputation of the digit. Descriptive statistics were generated. Chi-square and Fisher exact tests were used to analyze categorical variables and the Kruskal-Wallis for continuous variables.

**Results:** 238 patients were included in the study, accounting for 254 fingertip nailbed injuries. 131 were male (55.04%), 107 were female (44.96%), and the mean age at time of injury was 6.12 years. Median follow-up was 16 days following nailbed repair and trephination, and 9.5 days following conservative treatment. Two hundred forty-two (95.28%) injuries were due to crush injury of which 148 (58.27%) were attributed to a door. Nearly half of patients (46.85%) injured the surrounding tissue, 67 (26.38%) with subungual hematoma, and 114 (44.89%) with partial or complete nail avulsion. One hundred eighty-two patients (71.7%) sustained a distal phalanx fracture with the majority characterized as tuft (79.67%) and average displacement of 0.8 mm (range 0-36 mm). Nailbed laceration repair with suture or glue was the most common intervention: 60% treated by emergency department (ED) staff, 89.1% by plastic surgery, and 85.1% by orthopedics. Conservative treatment was less common, 28% by ED staff, 8.7% by plastics, and 5.7% by orthopedics. Trephination was least common: 12% by ED staff, 2.2% by plastics, and 9.2% by orthopedics. Outcomes were analyzed by type of repair (removal and repair, trephination, conservative). There were no differences in infection rates among treatment groups: nailbed repair (3%), trephination (0%), and conservative (2.9%) (p-value = 0.61) or complication rates (0.5%, 0%, 2.9%, respectively) (p-value = 0.21). Of the 7 patients with infection, 6 (85.7%) were repaired with nail removal and repair while 1 (14.3%) was conservatively managed with splinting. Five of the 7 (71.4%) received antibiotics at their initial visit.

**Conclusion:** For simple nailbed injuries in our pediatric population, patients had consistently good early outcomes irrespective of intervention. The incidence of overall complications in nailbed injuries is low. The traditional approach requiring nail plate removal, repair, and often sedation may represent overtreatment. Further study into long-term outcomes, and prospective investigation into conservative treatment of uncomplicated nailbed injuries is warranted.

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## Outcomes of Glenohumeral Dysplasia Following Brachial Plexus Birth Injury Using the Sup-ER Orthosis

Abstract Presenter

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**Purpose:** This study investigates the efficacy of the Supination-External Rotation (Sup-ER) orthosis in addressing the progression of glenohumeral dysplasia (GHD) in patients with brachial plexus birth injuries (BPBI). Although previous research studies have examined the success of the Sup-ER orthosis based on Active Movement Scale (AMS) scores, this study examines whether the Sup-ER orthosis would produce similar results if the outcome variables also included serial, objective ultrasound measurements.

**Methods:** The Sup-ER orthosis was fabricated for twenty infants diagnosed with GHD subsequent to BPBI. AMS scores of shoulder abduction (SA), forward flexion (FF), supination (Su), and external rotation (ER), as well as alpha angle measurements from ultrasound findings were collected prior to and at each follow-up visit following the fabrication of the Sup-ER orthosis. The success of the Sup-ER orthosis in correcting GHD was confirmed through ultrasound findings and improving AMS scores, leading to the discharge of patients from care. Failure to rectify GHD necessitated a transition to operative management for the patient. Analysis of the outcome measurements were conducted using a two-tailed paired sample t-test. The level of significance was set at  $p < 0.05$ .

**Results:** Fourteen out of the twenty patients (70%) fabricated with the Sup-ER orthosis successfully demonstrated resolution of GHD on ultrasound and improvement of AMS scores. The average time of fabrication of the Sup-ER orthosis to the time of discharge from the orthosis was 17.4 (SD 8.3) weeks. In these patients, average SA was 6.6 (SD 0.8) ( $p < 0.05$ ), SF was 6.6 (SD 0.8) ( $p < 0.05$ ), ER was 6.7 (SD 0.6) ( $p < 0.05$ ), and Sup was 6.8 (SD 0.8) ( $p = 0.08$ ) following discontinuation of the orthosis. Additionally, in these patients the average alpha angle following treatment with the Sup-ER orthosis was reduced to 14.4 (SD 4.9) ( $p < 0.05$ ). Of the remaining patients (30%), the

implementation of the Sup-ER orthosis failed to resolve GHD as evidenced by either ultrasound findings or AMS scores. These patients had to undergo further microsurgical intervention.

**Conclusions:** The Sup-ER orthosis is effective in resolving glenohumeral dysplasia, as evidenced by improving AMS scores and serial, objective ultrasound measurements, and should be advocated for in the routine care of patients with BPBI. However, in contrast to previous studies demonstrating universal success of the orthosis, this study shows that a certain portion of patients will fail conservative therapy and require microsurgical intervention.

### **Evaluating Predictors of Revision Surgery in Vascularized Reconstruction for Kienbock's Disease: A Multi-Center Analysis of Over 30 Years of Operative Experience**

Abstract Presenter

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**Background and Purpose:** Kienbock's disease is a rare form of idiopathic lunate osteonecrosis that can lead to insidious carpal collapse, wrist pain, and dysfunction. While early-stage disease can be managed with offloading procedures or scaphocapitate fusion (SCF), revascularization procedures have been proposed as an alternative to potentially halt disease progression (1,2). Early evidence suggests lunate revascularization leads to improved patient-reported and functional outcomes at the cost of higher surgical revision rates. The purpose of this investigation is to identify predictive factors that lead to operative revision and conversion to salvage procedures for disease management (3).

**Materials and Methods:** A multi-center, retrospective study was performed on patients undergoing revascularization surgery for Kienbock's disease from January 1976 to December 2023 from our multi-center institutional database. Relevant demographic, radiographic, and clinical data were collected. Functional and patient-reported outcomes were obtained and analyzed. Hazard ratio and survival analyses were performed to



evaluate predictors of unplanned return to the operating room or conversion to a salvage procedure.

**Results:** A total of 99 patients undergoing revascularization [n=90 pedicled vascular bone grafts (VBGs), four free VBGs, and four arteriovenous implantations] were identified with an average follow-up of 13.1 (51.8) months. 28.2% (28/99) had to return to the operating room for an unexpected complication, including 5.1% (5/99) for infection, 2.0% for (2/99) recalcitrant pain, 9.1% (9/99) for a hardware complication, and 14.1 (14/99) for a nonunion requiring salvage conversion. Survival analysis revealed median time to revision of 2 months for infection, 11 months for hardware complication, and 13 months for conversion to salvage procedure, respectively ( $p=0.61$ ). Hazard ratio analysis of graft type, revision surgical indication, gender, age, hand dominance, and Lichtman stage revealed a protective association with older age and unplanned operative intervention, with a hazard ratio (95% Confidence Interval) of 0.95 (0.91-0.98).

**Summary:** While evidence points to the superiority of functional outcomes in vascularized bone grafting in Kienbock's disease (3), over a quarter of patients had to return to the operating room for an unexpected complication, and 14% required a conversion surgery in the setting of nonunion. These real risks need to be weighed against the relative benefit provided by revascularization in the setting of conventional surgical interventions including lunate offloading and salvage procedures.

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# **Importance of the Dorsoradial Ligament Instability in Thumb Carpometacarpal Osteoarthritis and a Novel Use of Suture Tape Stabilization with Trapezial Sparing Arthroplasty**

Abstract Presenter

Meghan McCullough MD

Abstract Co-Author(s)

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**INTRODUCTION:** Instability and dorsoradial ligament attenuation have been increasingly recognized as critical factors in the development and progression of thumb carpometacarpal (CMC) osteoarthritis. There has also been recognition of the biomechanical value of preserving native anatomy with trapezial-sparing techniques, such as meniscus arthroplasty. We hypothesize that suture tape augmentation of the dorsoradial ligaments at the time of trapezial sparing arthroplasty may play an important role in providing post-operative CMC stability and improving long-term pain and function.

**METHODS:** Our standard technique for CMC meniscus arthroplasty was performed using a dorsal arthrotomy, debridement of the distal articular surface of the trapezium, and placement of meniscus allograft secured by fiberwire suture to the trapezium surface. After right dorsal capsular closure, an internal brace suture tape was placed using suture anchors from the dorsal trapezium to the first metacarpal base. Retrospective review was performed of patients undergoing this technique, with demographics, prior intervention, and radiographic grade of arthritis collected. Radiographic dorsal subluxation was measured pre and post-operatively (reported as quadrants with 1 representing 0-25% joint subluxation, up to 4 representing 75-100%). Post-operative outcomes including pain scores, range of motion and patient satisfaction were compared pre-operatively to final follow-up at an average of 6 months. Any complications and re-operation were recorded.

**RESULTS:** Thirty-three patients underwent thumb CMC arthroplasty with dorsoradial ligament internal brace augmentation from October 2020 through December 2023. Average age was 62 years (range 46 to 79) and 61% were female. Pre-operatively, average Eaton stage was 2.52. Twenty-five patients underwent previous corticosteroid injection, 19 had attempted bracing, and five had undergone previous surgery to the

affected joint. At final follow-up, mean dorsal subluxation was 1.87, improved from a mean of 2.09 preoperatively. Mean pain at rest was 1.54 and pain with activity was 3.39 on a 10-point scale. One patient had symptomatic retained suture, while three others reported recurrence of pain after initial improvement, which did not require additional intervention. No other complications were noted. No revision or secondary surgeries were performed.

**CONCLUSION:** This series demonstrates the safety and efficacy of suture tape augmentation of the dorsal capsule for CMC stabilization in a trapezial sparing arthroplasty technique. The role of the dorsoradial ligament in thumb CMC stability and its implications for the progression of arthritis and pain is becoming more recognized in the literature. Further long-term study is needed to evaluate for durability of the technique over time, impact on progression of arthritis and any long-term complications.

### **Single Versus Double Fascicular Transfer for Brachial Plexus Injuries: A Systematic Review and Meta-Analysis with Meta-Regression**

Abstract Presenter  
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Abstract Co-Author(s)  
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Syeda Hoorulain Ahmed MD  
Alexzandra Mattia  
Cameron Gerhold  
Kevin Hao  
Harvey Chim MD

**Objective:** The primary objective of this study was to assess whether double fascicular transfer (DFT) has superior outcomes compared to single fascicular transfer (SFT) for reanimation of elbow flexion.

**Methods:** Medical Research Council (MRC) grade for elbow flexion was recorded and compared before and after surgery. The effect size was calculated using the risk ratio (RR) and results were compared across different interventions. A meta-regression analysis was performed to further compare the outcomes between SFT and DFT controlling for level of injury.

**Results:** A total of 59 studies with 1402 patients (mean age  $29.3 \pm 7.9$  years old) were included in the review. The average duration from the time of injury to surgery was  $6.2 \pm 4.8$  months. C5-C6 injury had the best outcomes, with 91.6% and 74.8% of patients recovering MRC grade 3 and 4, respectively. With C5-C7 injury, 86.0% and 69.2% of patients recovered MRC grade 3 and 4, respectively. With C5-C8 injury, 70.9% and 56.4% recovered MRC grade 3 and 4, respectively. Subgroup analysis comparing the severity of BPI showed no significant difference ( $P < 0.05$ ). The aggregated mean DASH score was 38.3 for the SFT group and 27.3 for the DFT group. Meta-regression demonstrated that DFT and C5-C6 injury were significant predictors for achieving MRC grade 3, while DFT and shorter duration of surgical delay were a significant predictor for achieving MRC grade 4.

**Conclusion:** When controlling for the level of injury, DFT is associated with greater likelihood of achieving MRC grade 3 and 4 power compared to SFT in patients undergoing surgical management of brachial plexus injuries. A shorter duration of surgical delay was a significant predictor for achieving MRC grade 4.

## **Effect of Oral Postoperative Steroids on Surgical Site Infection in Adult Upper Extremity Surgery**

Abstract Presenter  
Yufan Yan MD

Abstract Co-Author(s)

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Joshua Cohen  
Steven Koehler

**Hypothesis:** Postoperative edema is a common problem in upper extremity surgery that can contribute to significant pain and stiffness. Oral corticosteroid medications have great potential to provide an easily accessible solution, but fear that they might increase risk of postoperative infection has limited their usage. We hypothesize that postoperative oral corticosteroid treatment is safe and will not increase the risk of surgical site infections in adult upper extremity surgery.

**Methods:** A retrospective study was performed at a single institution between

November 2021 and November 2023. All adult patients who underwent clean upper extremity surgery including both soft-tissue and hardware implantation cases were collected. Exclusion criteria included patients under the age of 18, administration of antibiotics in the immediate postoperative period, and those with less than 30 days of follow-up. Patient demographic factors and operative details were collected including age, sex, BMI, laterality, smoking status, medical comorbidities calculated as Charlson Comorbidity Index, administration of perioperative antibiotics, prescription of postoperative oral steroids, and length of procedure. Primary outcome measures were diagnosis of surgical site infection by 14 days and 30 days. Secondary outcomes included management with antibiotic treatment, operative washout, or hardware removal if diagnosed with an infection. Categorical variables were compared using Fisher's exact test, and continuous variables were compared using Wilcoxon rank-sum test. Significance was defined by p-value < 0.05.

**Results:** A total of 958 patients were included for analysis – 249 received a one-week course of postoperative oral steroids (methylprednisolone) and 709 did not. The two groups were similar in terms of demographic factors and comorbidities. Both groups had identical surgical site infection rates of 4.4% with no statistical difference. There was a significant difference in the distribution of hardware (18% vs. 31%) versus soft tissue (82% vs. 69%) cases between the steroids and no steroids groups, respectively, so sub-group analysis was performed. This demonstrated that there was no difference in infection rates between the steroid and no steroid cohorts when separated into hardware implantation group and soft tissue group.

**Summary points:** Postoperative oral steroid administration is safe in adult upper extremity surgery and does not increase the risk of surgical site infection even with hardware implantation.

## **Functional Outcome of Replantation following Elbow and Arm level Crush Avulsion Amputation**

Abstract Presenter  
Hari Venkatramani MD

**Introduction :** The first replantation done in the world was an arm level replant done in 1962. Since then many centres across the world have been attempting this difficult level replantation. Literature is sparse on functional outcome achieved in such cases.

Aim of our study is to evaluate the outcome of major replantation of crush avulsion amputations at elbow and arm level.

**Methods:** From 2000 to 2019, 33 elbow and arm level replantation have been done at our institution. Of these 30 were successful. 21 patients who had a minimum follow up of 1 year were available for review. Average follow-up period is 32 months (1 to 13 years). There were 20 male and 1 female patients. Mean age was 28 years (10-60 years). 16 cases (71.42 %) were due to industrial accidents, of which conveyor belt injury accounted for 40%. The levels of the replantation were - forequarter (n=1), proximal arm (n=11), distal arm (n=4), elbow (n=5). Motor and sensory evaluation and Chen's Grading was done for evaluation.

**Results:** Overall success rate was 90.9% (n=30) with three failures. 21 patients were analysed by Chen's criteria. Chen 1 – 0, Chen 2 – 9, Chen 3 – 12, Chen 4 – 0. Chen 2 (Good) patients (9/21) were able to resume gainful activity. Chen 3 (Fair) patients (12/21) were satisfied and used their hand for activities of daily living. 13 secondary procedures were performed in nine patients to improve the outcomes.

**Conclusion:** All 21 patients had fair to good results with useful function and protective sensations. They had high levels of satisfaction with psychological well being. As all had protective sensation, they fare better than those with prosthesis fitted at arm level. Hence replantation in carefully selected individuals gives high rates of success and patient acceptance.

## **Thumb and finger collateral ligament reconstruction using cadaveric knee medial collateral ligament allograft**

Abstract Presenter  
Meghan McCullough MD

Abstract Co-Author(s)

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Theo Brown  
Kylie Tanabe  
David Kulber MD

**INTRODUCTION:** Thumb and finger collateral ligament tears can present a challenging clinical problem due to poor healing potential of the injured ligament. Current surgical techniques are limited: primary repair is not always feasible due to poor tissue quality, augmentation with tendon graft can lead to stretching and recurrent instability, and internal brace augmentation can be complicated by over-tightening, stiffness, and infection. Cadaveric knee medial collateral ligament (MCL) allograft has previously been studied in vitro and shown good biomechanical properties that may lessen graft attenuation long-term. We describe the feasibility and early outcomes for a novel technique for collateral ligament reconstruction/repair using augmentation with cadaveric knee MCL allograft.

**METHODS:** Adult patients undergoing thumb and finger collateral ligament repair were screened for participation in the study at a single academic institution. For metacarpophalangeal (MCP) repairs, the torn collateral ligament was repaired in a standard fashion and cadaveric knee MCL allograft was secured using anchors in the metacarpal head and proximal phalanx base. For proximal interphalangeal (PIP) repairs, bone tunnels and fiberwire suture were used to secure the graft. Patient demographics, VAS pain scores, and radiographs were collected pre-operatively and at 6 weeks, 6 months, and 1 year post-operatively. Post-operative complications were recorded.

**RESULTS:** A total of 8 patients were enrolled from September 2023 to January 2024 - 3 patients undergoing thumb MCP ulnar collateral ligament repair, 4 patients undergoing finger PIP collateral repair, and 1 patient undergoing finger MCP collateral repair. The cohort included 5 males and 3 females, ages ranged from 24 to 70 years old, and 3 patients had prior failed surgery on the affected joint. Indications for surgery included instability in the setting of primary osteoarthritis (3), instability in the setting of post-traumatic arthritis (2), and subacute traumatic ligament injury (3). All patients undergoing PIP ligament repair had concomitant meniscus arthroplasty. To date, 5 patients have completed 6-week follow-up. Average pain score at rest decreased from 3.4 pre-operatively to 1.4 post-operatively, while pain scores with activity decreased from 5.4 to 3.2. No complications are noted, and radiographs demonstrate appropriate joint alignment with no evidence of arthritis progression in any patients at an average of 68 days of follow-up.

**CONCLUSION:** Cadaveric knee collateral ligament allograft appears to be a promising alternative to tendon graft and internal brace augmentation by providing similar biomechanical properties as the native ligament. Longer-term follow-up as part of the present study will provide information on expected pain and function outcomes of the current technique.

## **Evaluating Gaps in Hand Surgery Fellowship Applications: A Critical Look at Academic Contributions to Hand Surgery**

Abstract Presenter

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**Introduction:** Hand surgery is a unique subspecialty that exists at the intersection of orthopedic surgery and plastic surgery. However, the percentage of hand surgery fellows from a plastic surgery background has dropped to nearly 10% over the past decade for unclear reasons. This study sought to evaluate the mentorship in plastic surgery, using publications as a proxy, to determine if academic exposure is a limiting factor in plastic surgery residents pursuing hand surgery fellowships.

**Methods:** All published articles in the Journal of Hand Surgery and Hand from 2011-2020 were reviewed. The lead author and senior author were extracted, and preferred gender, as available on online documentation, articles, or references, were marked as male, female, or other (representing nonbinary and genderqueer). The training background of authors was recorded as orthopedic surgery, plastic surgery, or other based on the listed affiliation.

Article topics were categorized as fracture, nerve, pediatric, reconstructive (traumatic soft tissue surgery), shoulder/elbow, soft tissue (nontraumatic soft tissue surgery), tendon, tumor/oncology, and hand/wrist arthritis. The author h-index was recorded as a measure of author impact.

Statistical analysis was completed using chi-squared tests with Bonferonni corrections or generalized estimating equations as appropriate.

**Results:** A total of 3150 articles were reviewed. Plastic surgeons comprised 25% of all authors, twice as high as the rate applying into hand surgery. Approximately 5% of papers had both plastic and orthopedic surgery authors. Plastic surgeons were overrepresented in nerve, pediatric, and reconstructive papers compared to the population average. By the h-index, plastic surgery trained authors and orthopedic



surgery trained authors had equivalent impact. This gap was more pronounced when looking at female authorship in each discipline, as only 18% of orthopedic surgery trained first authors and 9% of orthopedic surgery senior authors were female, compared to 26% and 16% of plastic surgery trained authors ( $p < 0.01$ ). These values showed no discernable trend over the decade.

**Conclusions:** Plastic surgeons publish at a proportional rate to their participation in hand surgery, suggesting adequate academic exposure. This also suggests that extrinsic pressures outside of mentorship in hand surgery may be driving plastic surgeons away from hand surgery fellowships. Maintaining the contribution of both fields to hand surgery is critical in ensuring further development of the field and optimal patient outcomes

### **Access to Certified Hand Therapists in Mississippi: The Cost of Accessible Care**

Abstract Presenter

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Access to a certified hand therapist plays a crucial role in enhancing post-surgical functional outcomes and reducing morbidity in complex hand surgery and trauma cases. Unfortunately, the availability of Certified Hand Therapists (CHT) is uneven across regions, particularly in less populous states such as Mississippi. The financial and time-related burden of traveling to a CHT to receive appropriate rehabilitation care impacts patients recovering from hand surgery and hand trauma. This study investigates the accessibility of CHT services in Mississippi by analyzing physical proximity to certified hand therapists and assessing the resultant economic implications, specifically focusing

on transportation costs.

County level distances to the nearest CHT were mapped and evaluated. The associated cost of personal vehicle transport was calculated using 2024 Internal Revenue Service (IRS) standard mileage rates of \$0.67 per mile. Distance from a CHT and travel costs were stratified based on published 2023 Rural Urban Continuum Codes (RUCC).

One-way ANOVA analysis revealed a significant difference in both the distance traveled to CHT and the associated travel costs when stratified by RUCC (ps <0.05). On average, the distance to a CHT in Mississippi is 27.6 miles or 55.2 miles round trip, incurring a cost of \$36.98 per visit. However, residents of the farthest county from a CHT travel 86.4 miles or 172.8 miles round trip, resulting in a financial burden of \$115.78 per visit to a certified hand therapist.

This heightened cost for individuals residing farthest away poses substantial geographic, economic, and time-related barriers to accessing CHT services. Moreover, these barriers have a pronounced impact on the well-being of patients and their families, considering the frequency of required visits for adequate rehabilitation and functional recovery, typically occurring once or twice per week over several months. This study emphasizes the urgency of addressing disparities in CHT access to ensure equity across the state.

## **The Accuracy of Artificial Intelligence Models in Hand/Wrist Fracture and Dislocation Diagnosis: A Systematic Review and Meta-Analysis**

Abstract Presenter  
Chloe Wong MD

Abstract Co-Author(s)  
Alice Zhu  
Heather Baltzer MD

**Background:** Early and accurate diagnosis is critical to preserve function and reduce healthcare costs in hand and wrist injury patients. As such, artificial intelligence (AI) models have been developed for the purpose of diagnosing fractures through imaging. The purpose of this systematic review and meta-analysis is to determine the accuracy of AI models in identifying hand and wrist fractures and dislocations.

**Methods:** Adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Diagnostic Test Accuracy guidelines, Ovid MEDLINE, Embase, and Cochrane Central Register of Controlled Trials were searched from their inception to October 10, 2023. Studies were included if they utilized an AI model (index test) for detecting hand and wrist fractures and dislocations in pediatric (<18 years) or adult (>18 years) patients through any radiologic imaging, with the reference standard established via image review by a medical expert. Results was synthesized via bivariate analysis. Risk of bias was assessed using via the QUADAS-2 tool. This study was registered with PROSPERO (CRD42023486475).

**Results:** A systematic review identified 36 studies. Most studies assessed wrist fractures (27.90%) via X-ray imaging (94.44%), with radiologists serving as the reference standard (66.67%). AI models demonstrated an AUC 0.946, positive likelihood ratio 7.690 (95% CI 6.400-9.190) and negative likelihood ratio 0.112 (0.0848-0.145) in diagnosing hand and wrist fractures and dislocations. The diagnostic accuracy of unaided clinicians in diagnosing hand and wrist fractures and dislocations was as follows: AUC 0.953, positive likelihood ratio 11.000 (8.240-14.600), and negative likelihood ratio 0.157 (0.102-0.228). In comparison, the diagnostic accuracy of AI-aided clinicians in diagnosing hand and wrist fractures and dislocations was: AUC 0.972, positive likelihood ratio 19.100 (13.600-26.000), and negative likelihood ratio 0.129 (0.0734-0.206). There was a significant difference in positive likelihood ratio between the diagnostic performance of unaided vs. AI-aided clinicians in diagnosing hand and wrist fractures and dislocations (p-value 0.0032). Examining only studies characterized by a low risk of bias, sensitivity analysis did not reveal any difference from the overall results.

**Conclusion:** In demonstrating the accuracy of AI models in hand and wrist fracture and dislocation diagnosis, we can justify further validation and feasibility studies, as well as its clinical integration. Strengths of this study include rigorous methodology, robust synthesis of 36 studies, and moderate overall certainty of evidence per GRADE assessment.

## **Complex Forearm Reconstruction After Tumor Resection**

Abstract Presenter  
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**Background:** Despite the advances in microsurgery, upper limb reconstruction remains challenging, especially in the forearm due to its complex anatomy and functional demands. Successful management requires a multidisciplinary approach between orthopedic and plastic surgeons, as well as effective postoperative rehabilitation. The purpose of this study is to report our experience with complex forearm reconstruction following extensive tumor resection to provide the best possible reconstructive solution in a single operation.

**Methods:** A retrospective review was conducted on patients who underwent complex forearm reconstruction after tumor at Mayo Clinic Rochester between 1994 and 2024. Demographics, operative details, functional outcomes, and complications were collected. Variables were analyzed using appropriate statistical tests.

**Results:** Twenty-eight patients were identified, with an average age of  $49.3 \pm 22.2$  years at the time of the surgery. The defects resulted from tumor removal including sarcoma (89.3%, n=25), schwannoma (3.6%, n=1), desmoid tumor (3.6%, n=1), and giant cell tumor of bone (3.6%, n=1). The types of complex reconstructions included the free fibula flap (42.8%, n=12), pedicled radial forearm flap (10.7%, n=3), anterolateral thigh flap (42.8%, n=12), and flow-through greater saphenous vein perforator flap (3.6%, n=1). In addition, 5 patients received vascularized nerve grafts and 12 patients underwent skin grafting within the same operation. The average oncologic defect was 9.8 cm. The average BMI at the time of surgery was 27.4 kg/m<sup>2</sup>. The median follow-up period was 6.5 years, ranging from 3 months to 30 years. The reoperation rate was at 67.8% (n=19) given the malignancy of the original diagnosis and the procedure's complexity. Reasons for reoperation included five tumor recurrences, three hardware removals due to discomfort and decreased function, two tenolyses, eight flap debulking, two wound debridement due to infection, eight scar revisions, and two flaps underwent re-exploration. There was one amputation due to sarcoma recurrence. There was no flap failure or compartment syndrome occurred among this cohort. Two patients have passed away as of 2/28/2024, both aged over 80, due to causes unrelated to their reconstructive procedures. Eleven patients returned to regular employment. The average QuickDash score was 35.9 indicating a mild disability in activities. The average pronation was 65.2 degrees and the average supination was 60 degrees. All patients achieved acceptable functional outcomes with the assistance of hand therapy. The

average pain score in the affected extremities was 0.2 (0=no pain, 10=severe pain). Donor-site morbidity was minimal, with only one case experiencing wound dehiscence in the medial aspect of the anterior thigh.

**Conclusions:** Preservation of the upper limb and restoration of hand function are the primary goals of complex forearm reconstruction. While reoperation and complication rates may not be low due to the complexity of the anatomy and surgical techniques, successful reconstruction can maximize functional recovery, as well as minimize the likelihood of amputation.

## **Effect of Virtual Reality Technology on Patient Anxiety During WALANT Procedures**

Abstract Presenter  
Joshua Deyoung

**Introduction:** Procedures performed using Wide-Awake Local Anesthesia No Tourniquet (WALANT) allow hand surgery patients to avoid the drawbacks of general anesthesia, while also allowing providers to perform procedures in clinics. However, having patients awake during the procedure can cause operative anxiety. One recently proposed solution has been the incorporation of Virtual Reality (VR) technology during WALANT procedures. We hypothesize using VR during WALANT guided procedures will reduce patient anxiety during the operation.

**Methods:** 84 participants undergoing WALANT procedures were randomly assigned to either the VR group (n=40) or the control group (n=44). VR patients viewed one of the "Our Planet" docuseries videos on a Meta Quest 2 VR device during their procedure. The control group underwent WALANT with no device. Patient reported outcomes (PROs) including pre-operative and post-operative surveys regarding anxiety (APAIS), surgical satisfaction (SSQ-8), and VR side-effects (VRISE) were administered to both groups to subjectively assess patient anxiety. Additionally, objective anxiety measurements were acquired using pre-operative, intra-operative and post-operative systolic (SBP) and diastolic blood pressures (DBP) and heart rates (HR). Two-tailed independent t-tests were used with an alpha of 0.05.

**Results:** There were no differences in mean procedure time between groups (p=0.358). There were no significant differences in any of the validated questionnaires we administered pre- and post-operatively as subjective metrics. However, the post-

operative APAIS score was lower in the VR group (11.25) than the control group (13.55) ( $p=0.09$ ). The objective metrics we examined as a proxy for anxiety showed a significant difference between the control and VR groups regarding sitting HR prior to the procedure. The mean HR for the VR group was 81 bpm while for the control group it was 76 bpm ( $p=0.04$ ). However, the paired mean difference between pre-op sitting HR and post-op sitting HR showed no difference between groups ( $p=0.149$ ). There were no other significant differences in objective metrics between groups, including pre-operative sitting or supine vitals (SBP, DBP, HR), intra-operative supine vitals, and post-operative sitting vitals.

**Discussion:** We had several novel findings that deviated from our hypothesis. (1) The subjective patient anxiety questionnaires did not show any significant differences between groups. The APAIS survey score decreased from 12 to 11.25 for the VR group while only decreasing from 13.88 to 13.54 for the control group. This larger decrease for the VR group approached significance and may indicate greater reductions in anxiety over the course of a WALANT procedure for the VR group. (2) The VR group saw a larger decrease in mean sitting HR when comparing HR before the procedure to HR after the procedure, which may indicate anxiety reduction over the course of the entire WALANT procedural experience, but not necessarily reduction in intraoperative anxiety. These trends demonstrate that VR may impact patient experience throughout an entire WALANT procedure, as opposed to a targeted reduction in intraoperative anxiety.

**Summary/Conclusion:** Virtual reality technology has the potential to improve patient experience during WALANT and reduce the sympathetic response induced by being awake during surgery, but does not objectively reduce intraoperative arousal or anxiety.

## **Correlation between Relative Value Units and Operative Time for Peripheral Nerve Surgeries**

Abstract Presenter  
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Abstract Co-Author(s)  
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**Purpose:** Work Relative Value Units (wRVU) are used by hospital systems to quantify and evaluate surgeons' performance levels. Prior wRVU analyses have shown plastic

surgery procedures to be amongst the more undervalued procedures when operative time is taken into consideration (1). Peripheral nerve surgery, a niche and rising subset of plastic/hand surgery has been analyzed from a pure reimbursement standpoint, finding decreased reimbursement over time (2), but without respect to wRVUs. The authors aimed to compare wRVUs allocated to peripheral nerve-related surgical procedures based on their associated operative times and analyze potential implications.

**Methods:** A retrospective analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) was performed, and relevant CPT codes for peripheral nerve procedures were identified from 2005 to 2021. The efficiency was determined by using wRVU per unit time that was calculated using the median operative time for each procedure. Co-relation was performed between the median operative time with wRVU and wRVU per minute.

**Results:** The analysis included 21 CPT Codes with 2402 procedures. The median operative time for procedures involving neuroplasty, suturing of a peripheral nerve, and nerve grafts/transfers were 63.75 minutes, 100 minutes, and 153.7 minutes respectively. Nerve grafts and transfer had the highest operative of 153.78 minutes. "Suture of digital nerve, hand or foot; each additional" had the shortest operative time of 18.5 minutes as an individual procedure. Nerve grafts and transfers generated the maximum wRVU (Mean 16.35) while neuroplasty generated the minimum wRVU (Mean 7.24). The procedure generating a maximum RVU of 20.92 was "Nerve graft including harvest, multiple strands, arm, >4 cm". While the procedure generating a minimum RVU of 4.68 was "Neuroplasty; nerve of hand or foot". Procedures involving the suturing of peripheral nerves generated the highest wRVUs per minute (0.158 wRVU per minute). Nerve Grafts and transfers generated the least wRVUs per minute (0.09 wRVU per minute). Longer operative times were associated with greater wRVUs. Neuroplasty ( $R=0.86$ ) and procedures involving nerve suturing ( $R=0.84$ ) had a strong correlation to the median operative time. Nerve grafts and transfer, although requiring the maximum time and generating a maximum wRVU had a positive but moderate co-relation with the median operative time ( $R=0.67$ ). There was a negative correlation between all the procedures and wRVU per minute.

**Conclusions:** Longer operative procedures for nerve grafts and transfers were designated with higher wRVU. Surgeons were reimbursed less per operative unit time for these surgical procedures. Nerve grafts and transfers resulted in reduced compensation in wRVUs per minute compared to procedures like neuroplasty or those involving suturing of a peripheral nerve. More complex surgical procedures often yield less financial remuneration, highlighting the disparities in the remuneration system

within peripheral nerve procedures.

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**Electrodiagnostic evaluation of intrinsic hand re-innervation after ulnar nerve anterior interosseous nerve (AIN) super-charged end-to-side (SETS) and end-to-end (ETE) transfer**

Abstract Presenter  
Chantal Valiquette MD

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**Rethinking Recovery: Beyond the 18-Month Milestone in Nerve Transfer Surgery**

Abstract Presenter  
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Abstract Co-Author(s)  
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Orest Fylyma

**Introduction:** Nerve transfer surgery has revolutionized reconstructive surgery, providing optimism to patients with debilitating nerve injuries. Literature states that recovery amongst patients plateaus around 18 months post-nerve transfer(1,2). Happenstance, the authors had the opportunity to re-examine patients years after their initial nerve transfer surgery and noted further improvements in function compared to their last follow-up at 18 months post-surgery; thereby, questioning the established belief that nerve recovery following nerve transfer plateaus at 18 months. This study seeks to investigate the recovery trajectory beyond this accepted timeline whilst



providing insights into patients' experiences undergoing nerve transfer procedures.

**Methods:** Patients were included in the study if they had undergone nerve transfer surgery and were more than 5 years post nerve transfer. A telephone survey was conducted, focusing on patient-reported outcomes using a Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. Qualitative analysis and interviews were employed to elucidate patients' perceptions of recovery and functional status over the extended post-surgical period. Patients were re-examined to compare their current British Medical Research Council (BMRC) muscle grade to the previously documented 18-month post nerve transfer muscle grade, a minimum of 5 years previous.

**Results:** Of 68 contacted patients, feedback was obtained from 23 patients who underwent surgery between 5 and 9 years ago (response rate = 33.8%). Presenting complaints varied among patients, leading to diverse recovery trajectories; however, 15 (65.2%) patients reported continued and meaningful functional recovery beyond the original follow-up timeline. Of the patients who had upper limb surgery (n=21), their current upper limb function reported DASH score average was 22.1, 95% Confidence Interval (CI) [13.8, 30.4]. 19 (82.6%) patients resumed work and/or pre-illness leisure activities. The average satisfaction score is 4.0 out of 5, (95%CI [3.5, 4.5]). 21 (91.3%) patients expressed willingness to undergo the procedure again.

**Discussion:** Our study unveils a nuanced narrative of sustained improvement in upper limb function well beyond the presumed 18-month milestone. Contrary to prevailing expectations, our findings indicate that recovery post-nerve transfer surgery is dynamic, marked by ongoing gains in neuromuscular function and quality of life. Significantly, most respondents expressed satisfaction with surgical outcomes, citing tangible enhancements in daily activities and overall well-being. Furthermore, the majority of patients expressed readiness to undergo the procedure again if found in similar circumstances, highlighting the profound impact of nerve transfer surgery on their lives.

This study aims to address the traditional recovery timeline in nerve transfer surgery whilst advocating for a patient-centric approach by recognizing prolonged and dynamic recovery trajectories. Emphasizing the enduring benefits of nerve transfer procedures, our findings hold crucial implications for clinical practice, emphasizing the necessity of extended follow-up and personalized rehabilitation strategies to optimize outcomes for patients undergoing nerve transfer surgery.

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## **Upper extremity surgery in Hirayama disease: a case series and literature review**

Abstract Presenter

Elad Holzer MD

Abstract Co-Author

Jennifer Giuffre MD

**PURPOSE:** Hirayama disease (HD) is a rare, nonfamilial, monomelic amyotrophy in which patients present with muscle atrophy and weakness of the forearms and hands, either unilateral or bilateral, and without sensory loss. Current treatment guidelines describe the role of conservative treatments including cervical collars and neurotropic medications, as well as spinal surgery in select patients. (1, 2) Upper extremity surgery has not yet been incorporated into the treatment algorithm of HD. The objective of this study is twofold: to present a case series of HD patients treated with the incorporation of nerve and tendon transfers and joint fusions into the existing treatment algorithm and to perform a literature review of interventions.

**METHODS:** Three cases of HD treated surgically with nerve and tendon transfers and fusion are retrospectively reviewed. The subjective and objective results from surgery are reported. A literature review is performed on PubMed using "Hirayama disease" and "peripheral nerve surgery", "nerve transfer", "tendon transfer", "hand surgery" or "upper extremity surgery" as search terms to identify studies describing surgical treatment of HD outside of spinal surgery.

**RESULTS:** Three HD patients (4 limbs) were identified. The average age was 23 years-old (range: 16-33). Patients presented with intrinsic muscle atrophy, hypothenar and thenar atrophy. The disease had been present for an average of 6.5 years (range: 1.5-15) prior to referral. Two patients had unilateral involvement while one had bilateral involvement. Two patients (3 limbs) were treated with an anterior interosseous (AIN) to ulnar motor nerve transfer while a patient with delayed presentation underwent thumb metacarpophalangeal joint fusion and Zancolli lasso to the fingers. All patients had subjective and objective improvements post-operation.

The literature reveals three independent case reports of HD patients treated with upper extremity surgery. Two papers describe using a tendon transfer while one paper describes an AIN to ulnar motor nerve transfer. All patients demonstrated functional improvements in follow-up. (3, 4, 5)

**CONCLUSIONS:** HD can be successfully treated with a combination of upper extremity surgery and nerve transfers. To the authors' knowledge, this is the first literature review and the largest case series presenting such interventions in HD.

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### **"Unveiling the Symptomatic Neuroma Conundrum: A Comparative Analysis of Elective versus Emergent Digit Amputations in 907 Patients"**

Abstract Presenter

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**Objective:** We aimed to investigate the difference in neuroma rates between elective

and emergent amputations and the contributing factors to persistent pain.

**Background:** The literature extensively covers the rates of symptomatic neuromas; however, there is a lack of investigation into comparing neuroma rates between elective and urgent surgeries.

**Methods:** A retrospective review of 907 patients from 2015-2023 met inclusion criteria. Those who were primarily treated with digit amputations following any injury were included. Demographic data, comorbidities, body mass index, workers compensation cases, surgical data, digit (zone) injuries, and indications for surgery were noted. A total of 1171 amputations were identified. Continuous variables were described as mean and standard deviation, and categorical variables were described as frequencies with percentages. Chi-squared test was used to compare categorical variables. The Shapiro-Wilk test was used to test normality. The student's t-test was used for comparison of means of continuous data. A logistic regression analysis was conducted for predictors of neuromas and persistent pain. A p-value of less than 0.05 was considered significant.

**Results:** At a mean follow-up duration of 5 months, individuals who received elective procedures (n=401) exhibited a neuroma rate of 4%, whereas those who underwent emergent surgeries (n=506) had a neuroma rate of 3.2% (p=0.5). Patients were predominantly male (74%) with an average age of 52 years. Comorbidities were more frequent in patients who underwent elective surgeries. Thirty-two neuromas were identified. Of the 32 patients, 18 (56%) who developed symptomatic neuroma underwent secondary surgery for neuroma pain, with a median time to surgery of (4) months (IQR, 1.5-4.5). All patients who underwent surgery except for 3 had desensitization therapy before and after surgery. For 18 patients who underwent secondary surgery, the neuroma was excised, and nerve endings were cut proximally to retract in 9 (50%). The digital nerve endings were coapted to each other in 4 (22%), targeted muscle reinnervation (TMR) technique was utilized in 2 (11%), the proximal nerve ending was buried in adjacent tissue (muscle) in 1 (5%), excision and cauterization was used in 1 (5%) and regenerative peripheral nerve interface (RPNI) in 1 (5%). At long-term follow-up, 111 patients reported persistent pain, which we examined for causality.

**Conclusion:** The neuroma incidence after revision amputation is 3.5%. Blast injuries, age, zone 5 injuries, sarcoma, papillary adenocarcinoma, and 3 or more amputated digits positively influenced the rate of neuromas. Hypertension was the only factor that was associated with reduced neuroma rates. Female gender, alcohol abuse, rheumatoid arthritis, vasculitis, blast injuries, zone 4 and zone 5 injuries, 3 or more amputated digits, middle finger, and ring finger injuries were the predictors of persistent

pain. Traction neurectomy and cauterization of the nerves were associated with low neuroma incidence (3.7% and 2.2%, respectively) and persistent pain (13% and 15%, respectively). Nerve coaptation had the highest neuroma rate (26%) and persistent pain rates (40%). We are unable to draw conclusions about RPNI and TMR due to our limited cases. Multicenter studies with objective pain assessment are warranted.

## **Cost-Utility Analysis of Trapeziectomy and Ligament Reconstruction Tendon Interposition vs. Suture Suspension Arthroplasty for Thumb Carpometacarpal Joint Osteoarthritis**

Abstract Presenter  
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**Background:** Thumb carpometacarpal joint osteoarthritis (CMCJ OA) is a common degenerative condition with reduced quality of life as a result of pain, stiffness, and disability. Previous literature has established benefits of operative management; however the choice of operative technique remains controversial.

**Purpose:** We sought to perform a cost-utility analysis to compare the traditional operative strategy, trapeziectomy with ligament reconstruction and tendon interposition (T+LRTI), with newer methods of suture suspension arthroplasty (SSA) for patients with CMCJ OA.

**Methods:** A Markov microsimulation model was created to model a hypothetical cohort of patients with CMCJ OA presenting with a painful thumb and having failed conservative management. Two surgical treatment strategies: 1) T+LRTI and 2) SSA were compared from a hospital perspective. Outcomes included clinical outcomes (complication and revision rates) and cost-effectiveness outcomes (cost (in 2023, CAN\$) and quality-adjusted life-years (QALY)) over a patient's lifetime. The willingness to pay (WTP) was set at \$50, 000/QALY.

**Results:** Higher complication rates were observed with T+LRTI (14.56% compared to 9.8%). Secondary revision surgery was more common for SSA (7.06% compared to

5.65%). Overall, SSA generated an incremental QALY of 0.25 compared to T+LRTI. T+LRTI was less costly over a patient's lifetime: \$2842.21 compared to \$2855.66. SSA generated an incremental cost-effectiveness ratio (ICER) of \$53.80/QALY compared to T+LRTI.

In modeling uncertainties of key model parameters (utility, cost, revision, complication and success), the primary outcome, ICER, was most sensitive to costs of the operation. Particularly, the cost of the operation for SSA resulted in a spread of the ICER between -3488.79 and 10958.55. The subsequent two-way sensitivity analyses compared the costs of the operation for LRTI + T and SSA and demonstrated that SSA remains the favored procedure.

**Conclusions:** Suture suspension arthroplasty was the most cost-effective strategy (ICER \$53.80/QALY), regardless of parameter level uncertainties. These are important findings for policy makers and clinicians working within a universal health care system.

## **Are Antibiotics Necessary in Pediatric Upper Extremity Surgery?**

Abstract Presenter

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**Hypothesis:** Administration of antibiotic prophylaxis has been extensively analyzed in adult upper extremity surgery, but data in the pediatric population is still limited. There is no consensus on whether antibiotic prophylaxis is necessary in clean pediatric upper extremity cases. We hypothesize that antibiotic prophylaxis is not necessary and there is no difference in postoperative surgical site infection rates regardless of preoperative antibiotic administration.

**Methods:** A retrospective cohort analysis was performed on all pediatric upper extremity surgical cases performed at a single institution by seven pediatric orthopaedic surgeons between November 2021 and November 2023. All clean, soft tissue and hardware implantation cases were included. Exclusion criteria included patients over the

age of 18, administration of antibiotics in the immediate postoperative period, and those with less than 30 days of follow-up. Patient demographic factors and operative details were collected including age, sex, BMI, laterality, medical comorbidities calculated as Pediatric Comorbidity Index, administration of perioperative antibiotics, hardware type, and length of procedure. Primary outcome measures were diagnosis of surgical site infection by 14 days and 30 days. Secondary outcomes included management with antibiotic treatment, operative washout, or hardware removal if diagnosed with an infection. Categorical variables were compared using Fisher's exact test, and continuous variables were compared using Wilcoxon rank-sum test. Significance was defined by p-value < 0.05.

**Results:** A total of 338 patients were included for analysis – 133 received antibiotic prophylaxis and 205 did not. The two groups were similar in terms of demographic factors and comorbidities. Overall postoperative infection rate was very low at 1.2%, and there was no difference in infection rates between the group who received antibiotic prophylaxis and the group who did not. Infection rate in the antibiotic prophylaxis group was 0.8% and in the no antibiotics group was 1.5%. Antibiotic prophylaxis was significantly more likely to be administered in hardware cases versus soft-tissue cases (p-value<0.001). Sub-group analysis showed that implantation of hardware was not associated with an increased risk of infection, and again there was no difference in infection rates with or without antibiotic prophylaxis in hardware cases.

**Summary points:** Antibiotic prophylaxis is not necessary in pediatric upper extremity surgical cases even when implantation of hardware is involved. Hardware implantation is not associated with increased risk of infection.

## **Innovating Flexor Tendon Repair Training**

Abstract Presenter

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**Purpose:** Flexor tendon repair is a technically demanding procedure, and surgical simulation may accelerate the learning curve of junior residents. Herein, the purpose of this project was to develop a training program with a 3D printed simulator to teach flexor tendon repair.

**Methods:** A 3D printed flexor tendon repair simulator was developed to include a surgical platform and an anatomically representative set of finger bones. Replaceable transparent silicone tendons are threaded through pulleys, and tension can be adjusted. We also produced an instructional video that covers core and epitendinous suturing.

With this curriculum, we held 3 separate 2-hour simulation workshops for 11 residents, and these participants were evaluated on their ability to perform cadaveric tendon repairs before and after the workshop. For evaluation, human cadaver fingers were disarticulated and mounted on a separate 3D printed platform, specifically designed to secure the tendons under tension. Participants were anonymously recorded and objectively graded, and anonymous recordings of two hand surgery attendings served our control group. Survey data was also collected to assess model realism, educational utility, and overall usefulness.

**Results:** Early results indicate that the 2-hour simulation workshop improves resident confidence and skill in flexor tendon repair. Additionally, the simulator's realism, educational utility, and overall usefulness received grades of 4.3/5, 4.3/5, and 4.7/5, respectively.

**Conclusions:** A 3D printed surgical simulator was developed for flexor tendon repair. Feedback has been uniformly positive, and results indicate improvement in junior resident confidence and skill. Because it can be 3D printed en masse, the device potentially has wide applicability within the hand surgery training curriculum.



## **Migraine - Peripheral Nerve Session**

### **Aesthetic Outcomes of Transverse vs. Longitudinal Incision Techniques in Occipital Nerve Decompression Surgery**

Abstract Presenter

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**Introduction:** Surgical treatment of occipital headaches involves the decompression of peripheral occipital nerves. While the literature extensively describes the longitudinal midline incision approach, our group employs the transverse approach. (1-4) The aesthetic outcomes of both incision techniques remain unexplored.

**Methods:** Patients undergoing surgical decompression for occipital headaches were instructed to provide images of their exposed occipital scalp scar. Evaluation was conducted using the Stony Brook Scar Evaluation Scale (SBSES) and the Scar Cosmesis Assessment and Rating (SCAR) scale by three independent plastic surgeons. SBSES scores range from 0-5 (higher indicating better outcomes), while SCAR scores range from 0-15 (higher indicating worse outcomes). Comparisons were made between transverse and longitudinal scars, with factors influencing scores identified.

**Results:** Forty patients (average age: 47; 73% female) participated, with 28% having longitudinal midline scars and 72% having transverse scars. Patients with transverse scars exhibited higher SBSES scores (4.2 vs. 3.6;  $p=0.044$ ) and lower SCAR scores (3.0 vs. 4.6;  $p=0.016$ ). Longitudinal scar patients displayed more suture marks (SBSES:  $p=0.018$ ; SCAR  $p=0.003$ ) and wider scar spread (SBSES:  $p=0.013$ ; SCAR:  $p=0.038$ ) compared to transverse scar patients. On regression analysis, higher BMI was associated with worse SCAR scores ( $p=0.015$ ) and nearing significance in SBSES scores ( $p=0.057$ ).

**Conclusion:** Our study reveals superior aesthetic outcomes with the transverse incision approach for occipital nerve decompression surgery compared to the longitudinal midline technique. Transverse scars exhibited higher SBSES scores and lower SCAR

scores, indicating better cosmesis. Notably, longitudinal scars were associated with more prominent suture marks and wider scar spread.

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## **Understanding the Ideal Headache Surgery Candidate: An Analysis of Patient Diagnoses and Referral Sources**

Abstract Presenter  
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Robert George MD

**Background:** Even though surgical treatment for headaches and migraines has proven to be a safe and effective therapy, headache surgery remains a controversial topic. The debate regarding the effectiveness of headache surgery is partly fueled by the fact that the ideal candidate for successful headache surgery is not entirely elucidated. The objective of this study was to assess the diagnosis and referral trends of headache surgery patients to attempt to characterize the ideal surgical candidate.

**Methods:** We retrospectively analyzed patients who underwent headache surgery between August 1, 2012 and May 17, 2017. Patients were administered three questionnaires pre- and post-operatively: the Headache Impact Test, the Migraine Disability Assessment Test, and the Migraine-Specific Quality-of-Life Questionnaire. Improvement in at least two of three of these questionnaires was considered a

successful outcome. Diagnoses were collected as they were described in patients' charts. Referral sources were also collected. Patients were assigned into one of two cohorts based on if their surgery improved their symptoms or not. Univariate analysis was conducted for categorical variables using the Chi-square test of independence.

**Results:** Forty-one patients were eligible for analysis. Thirty-two (78.0%) patients reported successful outcomes at a mean postoperative follow-up time of 8.0 months (range, 6.0 to 15.0 months). Both successful and unsuccessful patient cohorts had a median number of two descriptive diagnoses. A diagnosis of "migraine" was the most frequent diagnosis for improved patients (n=9). "Chronic migraine" and "Chronic migraine without aura" were the most frequent diagnoses for patients without improvement (n=3, each). Most patients were referred to plastic surgery by a neurologist (n=20, 48.8%) however this was closely followed by self-referrals (n=15, 36.6%). There were no significant differences in the frequency of a descriptive diagnosis or referral source between both cohorts.

**Conclusions:** Our results suggest there are no significant differences regarding number of diagnoses, type of diagnoses, or referral source between successful and unsuccessful headache surgery patients, unfortunately providing no further clarity in identifying successful headache surgery candidates. However, our study demonstrates the importance of accessibility of headache surgery. Interestingly, while many patients were referred by neurologists, a considerable number of patients were self-referred. As a result, plastic surgeons should be aware of this as they organize their headache surgery practices. Evaluating patients only after a referral from a neurologist may pose as an unnecessary barrier to treating patients who suffer from what is often a debilitating condition. Future research with respect to access to headache surgery would be beneficial for increasing delivery of care to patients and collaboration with neurology and primary care colleagues.

## **Academic Influence and Industry Funding in Nerve Allograft Research**

Abstract Presenter  
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**Introduction:** Surgical approaches to peripheral nerve defects have been the subject of significant research in recent years. A direct result of this trend is rapidly increasing rates of acellular nerve allograft use despite limited high-quality, comparative evidence of efficacy.<sup>1,2</sup> Simultaneously, non-research payments to clinicians by the nerve allograft industry exceeds \$10,000,000 over the last decade. In this study, the authors hypothesized that nerve allograft-related academic influence would correlate with industry funding.

**Methods:** PubMed studies and citations on nerve allografts in fourteen high impact plastic and reconstructive surgery journals were reviewed. An adjacency matrix containing all authors was used to generate a co-authorship network, and degree centrality - a quantitative measure of influence within a network - was calculated for each one.<sup>3</sup> Using national provider identifier (NPI) numbers, Open Payments (OP) data on non-research associated funding from 2013-2022 for all authors was summated. Finally, Spearman's rank correlation and simple linear regression were used to analyze the relationship between centrality and payments received.

**Results:** 185 studies were included, with 581 unique authors (nodes) and 2,406 co-authorships (ties) between them. Mean centrality for all authors was 8.3 (SD = 7.8). Among authors with exceptional network influence (centrality > 10, 75th percentile; n = 113), 56 were clinicians with valid NPIs and therefore eligible for inclusion in the OP database. 44 (79%) of these authors received at least one payment from the nerve allograft industry. A total of \$2,360,653 was distributed to these authors, 83% of which (\$1,952,496) went to the top 25 of them. Spearman's rank correlation revealed a moderate ( $0.4 < \rho < 0.6$ ) positive correlation between centrality and payments received ( $\rho = 0.52$ ,  $p < 0.001$ ). Simple linear regression demonstrated an estimated 18% increase in total pay per additional unit of centrality ( $p < 0.001$ ; 95% CI 8%, 25%).

**Conclusions:** This research underscores a significant connection between academic influence and financial support from the nerve allograft industry. Such results warrant discussion concerning conflicts of interest in clinical research and best practices for mitigating potential bias related to commercially backed medical products. However, it remains unclear if academic influence is a target of industry, or if industry support sustains academic success.

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## Analyzing Google Search Trends for Migraine Surgery and Nurtec® in Response to Public Announcements

Abstract Presenter

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**Background:** Nurtec, a versatile migraine medication, has gained popularity. However, awareness of migraine surgery remains uncertain.

**Methods:** Following a descriptive approach, this cross-sectional study utilized Google Trends data as of December 1, 2023, to analyze internet search patterns. Approval from Vanderbilt University's institutional review board and adherence to STROBE guidelines were confirmed. Monthly Relative Search Volume (RSV) data for "migraine surgery," "Nurtec," and "Rimegepant" were collected from January 1, 2004, to November 11, 2023, within the United States. Statistical analysis involved determining mean monthly RSV values and percent changes for critical periods.

**Results:** For "Nurtec," a significant surge in RSV occurred from March 2020 to April 2020 (344%). Additional peaks were observed from June 2020 to July 2020 (66%), October 2020 to December 2020 (169%), May 2021 to June 2021 (33%), and May 2023 to June 2023 (14%). "Migraine surgery" exhibited a notable 400% increase in RSV from March 2005 to May 2005. However, post-2006, RSV for "migraine surgery" consistently remained low without noticeable peaks.

**Conclusion:** The analysis of RSV trends for "Nurtec" and "migraine surgery" from 2004 to 2023 reveals the impact of pivotal events and marketing strategies on public interest. The distinct peaks in "Nurtec" RSV align with FDA approvals and marketing campaigns, highlighting the medication's accessibility. Conversely, the consistently low RSV for "migraine surgery" indicates limited awareness, emphasizing the need for enhanced promotion and education regarding surgical interventions.

## **Nerve Injury with Dexmedetomidine (Precedex), Bupivacaine, and Combined Injections**

Abstract Presenter  
Sai Pinni

Abstract Co-Author(s)  
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David Chi MD PhD  
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Matthew Wood  
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**Purpose:** Dexmedetomidine (Precedex) is an alpha-2 adrenoreceptor agonist that prolongs anesthesia and duration of nerve block when administered intravenously with local anesthesia. In facial plastic surgery, Precedex has demonstrated intraoperative and postoperative benefits for rhytidectomy and palatoplasty patients. With perineural administration of Precedex as a nerve block adjunct, preliminary studies report conflicting data suggesting that Precedex can either protect or exacerbate lidocaine-induced nerve injection injury. Thus, this study aimed to better characterize the safety profile of Precedex and its potential for peripheral nerve injury using a nerve injection model.

**Methods:** Lewis rats received a 50uL intrafascicular injection into the sciatic nerve using one of the following agents: (1) normal saline (negative control), (2) bupivacaine (positive control), (3) Precedex, (4) combination of bupivacaine+Precedex (combo group). Bupivacaine was used as a positive control instead of lidocaine given its role as the preferred local anesthetic used in nerve blocks. Sciatic nerve injections were proximal to the trifurcation, and injection sites were marked 1mm proximally and distally with 10-0 nylon suture. At a 2-week endpoint, sciatic nerves were harvested for light

microscopy and quantitative histomorphometry. Outcomes included percent area injured, myelin g-ratio, and percent nerve. Injured area was determined qualitatively based on disruption of normal nerve architecture. Myelin g-ratio is the ratio of the inner-to-outer diameter of a myelinated axon.

**Results:** Sciatic nerves had minimal damage after intrafascicular saline injection (negative control), as expected, with an average percent area injured of 2%. Percent area injured was 24% for bupivacaine (positive control), 17% for Precedex, and 19% for combo. There were significant differences in percent area injured between saline and each of the three anesthetic agent groups: saline vs bupivacaine ( $2\pm5$  vs  $24\pm18$ ,  $p=0.004$ ), saline vs Precedex ( $2\pm5$  vs  $17\pm9$ ,  $p=0.01$ ), and saline vs combo ( $2\pm5$  vs  $19\pm9$ ,  $p=0.003$ ). There were no significant differences in percent area injured with any direct comparison of the three anesthetic agent groups: bupivacaine vs Precedex ( $24\pm18$  vs  $17\pm9$ ,  $p=0.3$ ), bupivacaine vs combo ( $24\pm18$  vs  $19\pm9$ ,  $p=0.5$ ), and Precedex vs combo ( $17\pm9$  vs  $19\pm9$ ,  $p=0.7$ ).

The Precedex group had a significantly higher percentage of nerve tissue in the uninjured nerve areas compared to the bupivacaine group ( $61\pm3$  vs  $55\pm5$ ,  $p=0.008$ ), whereas bupivacaine vs combo and Precedex vs combo did not show significant differences. Percentage of nerve tissue in uninjured areas was significantly higher compared to that in injured areas within each group: bupivacaine ( $55\pm5$  vs  $12\pm7$ ), Precedex ( $61\pm3$  vs  $5\pm7$ ), combo ( $57\pm6$  vs  $13\pm7$ ); all  $p<.001$ . There were no significant differences in myelin g-ratio between any groups for both uninjured and injured nerve.

**Conclusion:** Our findings demonstrate both the local anesthetic bupivacaine and dexmedetomidine (Precedex) cause nerve damage when administered individually through intrafascicular nerve injections. In addition, a combined injection of both agents also causes nerve damage, but Precedex does not appear to exacerbate nerve injury when administered in combination with bupivacaine. Awareness of the potential for neurotoxicity is important for physicians administering these agents, especially when working with sedated patients. Physicians may find these results useful when counseling patients.

# Machine Learning Models for Surgical Risk Assessment in Brachial Plexus Birth Injury

Abstract Presenter  
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Alexander Allori MD  
Neill Li

**Purpose:** Brachial plexus birth injury (BPBI) may cause long-term functional disabilities in the affected upper extremity. Predicting which patients are likely to undergo nerve grafting and/or transfer can enhance medical decision-making by facilitating close follow-up, therapy, and when appropriate, surgical intervention. Here, we sought to develop a machine-learning model to predict the risk of requiring a nerve reconstruction in patients with BPBI and identify risk factors for progression to surgery.

**Methods:** A single-institution retrospective study was performed on patients (aged 1 year or younger) with BPBI from January 2014 to September 2023. Variables with redundant features (Pearson coefficient > 0.6) or those missing over 80% of values were excluded. Term Frequency-Inverse Document Frequency (TF-IDF) was used to extract data from the initial clinical note evaluating brachial plexopathy. The primary outcome was any nerve procedure. Following an initial logistic regression, two random forest models were developed as a part of this study. The first was a model utilizing structured data only, including clinical and demographic features. A second model employed a combination of structured data and unstructured clinical notes. We compared the performance of both models to assess the optimal approach to predicting surgical intervention risk.

**Results:** 355 patients were included in model development, with 57.2% females, median diagnosis age of 36 days (IQR [0-109 days]) and median BMI of 15.0 (IQR [13.5-17.1]). Other features included area deprivation index (Mean [SD] = 61.6 [22.6]), Elixhauser score (Mean [SD] = 0.1[0.3]), and race (27.0% White, 40.6% Black). A logistic regression model using these variables showed a significant association between higher BMI and nerve reconstruction ( $p=0.04$ ,  $OR=1.49$ ,  $95\% CI=[1.01, 2.20]$ ). Utilizing these seven features in the random forest model for structured data achieved an AUC of 0.77 ( $SE\pm0.07$ ) and accuracy of 0.83 ( $SE\pm0.04$ ). The variables with the



greatest impact on model predictions were BMI and age of evaluation. The model utilizing both structured features and unstructured notes achieved an AUC of 0.94 (SE±0.06) and accuracy of 0.94 (SE±0.02). The most important words as identified by Gini Importance were "concerns" and "weakness".

**Conclusions:** Two machine learning models were developed to predict the need for nerve reconstruction in BPBI. In the first model using structured variables, BMI was the most important predictor, consistent with the rationale that larger babies have more significant traction and avulsion injuries at birth. Age of evaluation was the second most important factor, indicating that a delay in referral for BPBI evaluation may put a child at greater risk for requiring nerve reconstruction. The second "multimodal" model was trained on both structured data and unstructured clinic notes. The multimodal model demonstrated superior performance compared to the structured-variable-only model, with improved predictive capability as early as the first encounter. Therefore, a multimodal machine learning approach that merges structured clinical features with unstructured notes can serve as a valuable adjunct to clinical decision-making, aiding in early identification of patients that may benefit most from timely surgical intervention.

## **Optimizing Direct Muscle Neurotization: Comparative Analysis of Techniques for Optimal Nerve Insertion for Enhanced Neuromuscular Reinnervation**

Abstract Presenter  
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**Introduction:** Conventional methods of nerve repair, such as neurorraphy, nerve transfer, and nerve grafting, may not be feasible options if the distal nerve stump is not preserved after peripheral nerve injury. Direct muscle neurotization involves inserting a proximal nerve stump directly into the muscle, which becomes particularly relevant when other options have been exhausted. The increased sensitivity for acetylcholine in denervated muscles enables the inserted nerve to spread out nerve fibers throughout the muscle and reinnervate the neuromuscular junctions. Despite promising outcomes reported in literature, direct muscle neurotization remains not widely used in clinical practice. Previous studies described great variations in their nerve insertion technique.

Hence, this study aims to investigate whether differences in reinnervation outcomes can be observed based on different nerve insertion techniques in a platysma flap in rats.

**Material & Methods:** This study included 42 male Sprague Dawley rats, weighing between 240-380g. In all rats a 1.5 x 1.5 cm large platysma flap, innervated by the cervical branch of the facial nerve, was elevated without interfering with its vascular supply. In the positive control group the healthy platysma was harvested immediately. In all other groups the platysma was denervated by cutting and coagulating the cervical branch. In the four experimental groups a nerve transfer was performed by inserting the marginal mandibular nerve of the facial nerve into the muscle directly. Depending on the experimental group, the nerve was inserted either close or far away from the original nerve insertion and either spread into fascicles or kept intact. No re-innervation procedure was performed in the negative control group. Rats were sacrificed at 8 and 12 weeks postoperatively. During the terminal surgery, electrophysiology testing was performed measuring the compound muscle action potential (CMAP) and single fiber electromyography (SFEMG). The muscle flap was harvested, weighted and stained for immunohistochemistry and immunofluorescence. The distal end of the marginal mandibular nerve was epoxy embedded and stained with toluidine blue for histomorphometric analysis.

**Results:** Successful reinnervation of the platysma muscle flap was achieved in all experimental groups. Full denervation of the platysma flap was confirmed by sacrificing two rats of the negative control group 14 days postoperatively. SFEMG indicated that the re-innervation of the platysma flap ranged from a minimum of 44% to a maximum of 92%. The highest observed CMAP amplitude was 1.12mV in the experimental group that underwent neurotization with the marginal mandibular nerve being separated into fascicles and sutured far away from the original nerve entry point. Comparison of the SFEMG showed no profound differences between the experimental groups and the healthy control group. However, substantial differences were observed when comparing the CMAP of the healthy platysma flap to the experimental groups. SFEMG and histology showed different patterns of reinnervation depending on the nerve repair technique.

**Conclusion:** In conclusion, our study demonstrated the influence of different nerve insertion techniques on neuromuscular reinnervation following direct muscle neurotization. Successful reinnervation of the platysma flap was achieved in all experimental groups, highlighting the efficacy of direct muscle neurotization for muscle reinnervation.

## **Social Deprivation is Associated with Increased Pain in Patients Presenting for Targeted Muscle Reinnervation**

Abstract Presenter  
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**Introduction:** Neuropathic pain following nerve injury is debilitating and negatively impacting the overall quality of life. (1) Targeted muscle reinnervation is an efficacious technique for management of neuropathic pain. (2) However, it has been identified that access to this technique is unequally available for many geographical locations. (3) Therefore, the aim of this study was to evaluate the association between area deprivation index (ADI) and pre-operative pain in patients undergoing TMR for treatment of neuropathic pain.

**Methods:** Patients who underwent TMR for neuropathic pain in the extremities, prospectively enrolled at our tertiary care clinic, were eligible for inclusion. A chart review was conducted on socioeconomic, surgery, and comorbidity parameters. Pre-operative pain scores on a 0-10 index, and the ADI, reflecting deprivation status on a 0-100 scale, were collected. (4)

**Results:** A total of 162 patients from 13 different states were included, of which 119 were amputees (73.5%). The median ADI was 25 (IQR: 16-41) and the median pre-operative pain score was 6 (IQR 5-8). A higher ADI was independently associated with higher pre-operative pain ( $\beta=0.027$ ,  $p=0.013$ , 95%CI [0.0049-0 .0404])). The time interval from nerve-injury-to-TNR was not associated with ADI ( $p=0.273$ ).

### **Summary:**

- Patients undergoing TMR for treatment of neuropathic pain who are from more socially deprived settings have increased pain experience upon initial evaluation, despite having similar time from amputation to TMR.
- These findings highlight the importance of identifying patients presenting from socially deprived settings as this may impact their physical and mental health along with their coping mechanisms, resulting in increased pain.
- To reduce the gap between surgical care provided for amputee patients from more

deprived areas and their potentially different needs, personalized care should be practiced in an attempt to understand individual needs based on differences in pre-operative pain and mental wellbeing.

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### **Glutamate Carboxypeptidase II Expression Changes in Denervated and Reinnervated Muscles**

Abstract Presenter

Keith Kuo

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**Purpose:** No imaging modality can reliably identify muscle denervation acutely after nerve injury and monitor for muscle reinnervation in the chronic period after injury or repair. We recently identified glutamate carboxypeptidase II (GCPII) expression as a

novel biomarker for muscle denervation and demonstrated that an FDA approved PET imaging agent, 18F-DCFPyL, could detect changes in muscle GCPII expression. In this study we define how long 18F-DCFPyL remains elevated in denervated muscles after nerve injury and reinnervated muscles after nerve repair.

**Methods:** A total of 20 male Lewis rats underwent right sciatic to femoral nerve transfer. This allowed for simultaneous monitoring of denervated sciatic nerve-innervated muscles and reinnervating femoral nerve-innervated muscles over time. The animals were divided into 5 postoperative timepoints: 2-, 4-, 8-, 12-, and 16-weeks (n=2-5 rats/group). At each timepoint, we performed ex vivo biodistribution studies after intravenous injection of 18F-DCFPyL. Muscle uptake was calculated using an automated gamma counter and expressed as percent injected dose per gram of wet tissue (%ID/g). We additionally performed near-infrared imaging (NIR) using a fluorescent GCPII ligand, YC27, at the 5 postoperative timepoints. Changes in muscle GCPII expression were evaluated using immunohistochemistry (n=10).

**Results:** At 4-weeks post-surgery, the denervated gastrocnemius muscle had 1.88 times greater 18F-DCFPyL uptake compared to the unoperated gastrocnemius muscle (p=0.04). The reinnervated vastus medialis (VM) at 4-weeks post-surgery had 2.34 times greater 18F-DCFPyL uptake compared the unoperated side (p=0.03). There was a statistically significant decrease in the difference of 18F-DCFPyL uptake between the reinnervated VM and unoperated VM at 4- and 8-weeks (p=0.04), 4- and 12-weeks (p=0.02), and 4- and 16-weeks (p=0.03). Similar trends were seen on NIR imaging, with increased YC27 uptake in the denervated gastrocnemius muscle at all timepoints and decreasing uptake of the anterior thigh musculature over time. On histology, denervated gastrocnemius muscle demonstrated predominance of CD68+/GCPII+ cells in the first 4-weeks of the surgery with a shift to CD68-/GCPII+ cells at 8-, 12-, and 16-weeks.

**Conclusion:** GCPII expression remains elevated in denervated rodent muscles for at least 16 weeks after nerve injury. Reinnervation reduces GCPII expression in rodent muscles by 8-weeks after nerve repair. 18F-DCFPyL is a promising PET agent for non-invasive diagnosis and monitoring of nerve injuries.

### **Three-Dimensional Facial Topography in Pediatric Facial Palsy: Understanding Asymmetrical Facial Contours**

Abstract Presenter  
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**Purpose:** Objective assessment of facial movements remains pivotal for diagnosis, treatment planning, and monitoring rehabilitation progress for pediatric patients with facial palsy (FP). Traditional assessment methods primarily rely on clinical grading scales, which may not quantify the dynamic kinematics and three-dimensional (3D) characteristics of facial expressions. 3D video photography offers an accurate depiction of pediatric facial palsy, mirroring the eye's perception of depth and spatial relationships, thus enhancing the understanding of dynamic expressions and facial contours. The aims of this study were two-fold: 1) to utilize curvature analysis as a method for determining patient-specific depth and morphology in patients with facial palsy and 2) to quantify 3D morphologic dynamics of the nasolabial fold (NLF), cheek, and periorbital region during smiling, comparing the affected side to the unaffected side, and against normative data from control subjects.

**Methods:** Pediatric patients with FP and an age/sex-matched control group were selected. 3D video photography was used to capture facial movements from a neutral expression to a maximum smile. A custom MATLAB algorithm was implemented to assess the concavity and convexity of the facial surface, providing a detailed representation of the facial topography. In addition, a 40-vertex curve along the NLF-cheek-orbit facial contour was extracted from patient-specific 3D-face meshes for both the affected and unaffected sides of patients with FP and the right and left sides of control patients. This allowed for quantification of excursion and asymmetry for affected vs. unaffected sides in patients with FP and comparisons with the control group.

**Results:** 3D videos of 8 pediatric patients with FP and 8 control patients were collected and analyzed. The FP cohort's average age was 13.6 years, while the control group's average age was 13.3 years. FP etiology in the cohort was 37.5% congenital (n=3), 37.5% acquired (n=3), and 25% idiopathic (n=2). Differences in the curvature of the face are intensified during facial animation, especially in regions of interest including the nasolabial folds, cheek, and periorbital region. Visual analysis identified areas of concavity (blue) and convexity (red). Excursion and asymmetry were quantified on a per-patient basis along the NLF-cheek-orbit facial contour.

**Conclusions:** Curvature analysis offers new insights into the 3D morphological dynamics of facial concavity and convexity in pediatric FP, highlighting the degree of asymmetry between the affected and unaffected sides. The magnitude of asymmetry

between the patient with FP's excursion compared to the control group's could allow surgical treatments to be tailored to an individual patient's dynamic anatomy by identifying and quantifying facial region-specific asymmetry.

## **MRI Evaluation of Neuromas in Oncological Amputees**

Abstract Presenter

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**Introduction:** Tumors in the extremities may require amputation for oncologic cure, however, symptomatic neuroma following amputation is a primary cause of neuropathic pain. (1) It remains unknown to what extent time affects neuroma growth and whether morphology influences pain intensity. (2-3) Therefore, we aim to assess whether time influences radiographic neuroma size and shape, and their association with pain intensity in oncological amputees.

**Methods:** Oncological patients who underwent traditional extremity amputation without adjunctive nerve techniques such as Targeted Muscle Reinnervation (TMR) or Regenerative Peripheral Nerve Interface (RPNI) were included. MRIs were assessed post-amputation and prior to potential neuroma surgery. Pain of the residual limb, expressed on a Numeric Rating Scale (NRS, 0-10) within 3 months of the MRI assessment, and presence of neuropathic pain symptoms, were collected from chart review. Neuromas were classified as symptomatic neuromas or non-symptomatic neuromas based on description of pain with neuropathic symptoms. Two musculoskeletal radiologists independently assessed the MR images and described MRI features for each neuroma. Any discrepancy was solved by a third musculoskeletal radiologist serving as independent adjudicator. Neuroma size was expressed as the radiological Neuroma to Nerve Ratio (NNR).

**Results:** Sixty patients were included in this study, of which 27 (45.0%) were female

and 49 (81.7%) were lower extremity amputees. A total of 78 neuromas were identified on MRI, of which 56 (71.8%) were symptomatic with a median pain score of 3.5 (IQR 2.0-5.0). The median radiographic NNR of all neuromas was 2.0 (IQR 1.5-2.9). NNR was not significantly different between symptomatic and asymptomatic neuromas ( $p=0.665$ ), and varying pain intensity ( $p=0.471$ ). A larger NNR was associated with longer time-to-neuroma excision interval ( $p=0.011$ , Spearman's  $\rho=0.285$ ), and a smaller proximal nerve width ( $p<0.001$ , Spearman's  $\rho=-0.596$ ). Symptomatic neuromas were associated with upper extremity amputation ( $p=0.001$ ), T2 heterogeneity ( $p<0.001$ ) and presence of distal heterotopic ossification of the adjacent residual bone ( $p=0.029$ ). T2 heterogeneity ( $p=0.003$ ), perineural edema ( $p=0.031$ ), enlarged fascicles ( $p=0.042$ ) and presence of distal heterotopic ossification of the adjacent bone ( $p=0.024$ ) were associated with more painful neuromas.

### **Summary:**

- As assessed on MRI, smaller nerve caliber was associated with a larger NNR, and radiographic neuroma size increased with time.
- Size (NNR) did not influence neuroma pain intensity.
- MRI features associated with neuroma pain intensity were identified, and these findings may aid in physician awareness of neuromas in the oncological population and patient selection for surgical neuroma treatment.

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## **The Effect of Mesenchymal Stem Cells and Surgical Angiogenesis on Functional Recovery of Decellularized Nerve Allografts in a Rabbit Peroneal Nerve Defect Model**

Abstract Presenter

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**Background and Aim :** Reconstruction of nerve injuries using nerve allograft still results in inferior regeneration and motor outcomes to the nerve autograft. Nerve regeneration after nerve injury is thought to be enhanced by modulating the local microenvironment of the nerve reconstruction site through the interaction of mesenchymal stem cells (MSCs) and surgical angiogenesis. Each treatment separately has resulted in improved nerve regeneration in rat nerve reconstruction models. The purpose of this study was to investigate the effect of MSCs and surgical angiogenesis, alone or in combination, on functional recovery in a larger animal model for clinically relevant translation.

**Methods and Materials:** Ninety New Zealand White rabbits were divided into five groups of 18 animals each. Unilateral 30-mm peroneal nerve defects were repaired with (i) autografts, (ii), decellularized allografts, (iii) decellularized allografts wrapped in a pedicled superficial inferior epigastric artery fascia flap (SIEF) to provide vascularization, (iv) decellularized allografts seeded with adipose-derived mesenchymal stem cells (MSCs), or (v) decellularized allografts seeded with MSCs and wrapped with a SIEF flap. Nerves harvested from Dutch Belted rabbits served as donors and were processed using a five-day decellularization protocol described by Hundepool et al (2017).<sup>1</sup> Sixteen and 24 weeks after surgery, functional recovery of nerve regeneration was assessed using electrophysiology (compound muscle action potential, CMAP), muscle force measurement (isometric tetanic force, ITF), wet muscle weight, ankle contracture angle, and weight ratio pre-operative and at sacrifice. Ultrasonography of the tibialis anterior muscles was used to non-invasively measure the muscle cross-sectional area to evaluate muscle atrophy and reinnervation at baseline, and every four weeks until sacrifice.

**Results:** Autografts were found to be significantly superior compared to all groups at 16 weeks with respect to cross-sectional muscle area, electrophysiology, muscle force measurement, and wet muscle weight. Allografts vascularized with SIEFs were statistically comparable to autografts at 24 weeks with respect to cross-sectional muscle area ( $p=0.06$ ), electrophysiology ( $p=0.07$ ), muscle force measurement ( $p=0.24$ ), and wet muscle weight ( $p=0.19$ ). Autografts were significantly superior to all other groups at 24 weeks. No differences were found in the ankle contracture angle or the weight ratio pre-operative and at sacrifice between all groups for both time points. Normalization of all parameters was not observed at 24 weeks.

**Conclusions:** Surgical angiogenesis with an adipofascial SIEF flap to the nerve allograft successfully improved functional recovery in a long nerve gap model, comparable to the nerve autograft, while the addition of MSCs did not alter functional outcomes. This study suggests that surgical angiogenesis is more important in improving nerve regeneration compared to cellular modulation of the nerve micro-environment. Future studies are needed to investigate the limited impact of MSCs in a long nerve gap despite success in smaller animal models and evaluate later time points to adequately assess long-term outcomes.

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## **Nerve Decompression Surgery in Headache Patients with Comorbid Chronic Pain Disorders**

Abstract Presenter

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William Gerald Austen Jr., MD

**Introduction:** Nerve decompression surgery is an effective treatment for patients with headaches due to extracranial compression neuropathies. A proportion of headache patients who undergo this surgery have comorbid chronic pain disorders. We analyzed this subpopulation of patients and whether the presence of comorbid chronic pain disorders effect surgical outcomes.

**Method:** A prospective cohort study was conducted of 1223 headache patients who were screened for nerve decompression surgery between 2012 and 2023. Data included patient demographics, headache characteristics, the presence of comorbid chronic pain and associated diagnoses at the time of screening, site of nerve decompression surgery, and headache outcomes at 12 months postoperatively. Headaches were evaluated in terms of frequency (pain days per month), intensity (0-10), duration (hours) and Migraine Headache Index (MHI). Outcomes included percent reduction in MHI and reoperation. Surgical success was defined as a 50% or greater

reduction in MHI. Univariable logistic regression analysis was performed.

**Results:** A total of 336 patients underwent nerve decompression surgery involving the greater occipital nerve (71.9%), lesser occipital nerve (43.8%), supraorbital/supratrochlear nerves (41.5%), zygomaticotemporal nerve (25.3%) and auriculotemporal nerve (10.1%). Comorbid chronic pain disorders were present in 47.9% of patients and associated diagnoses included musculoskeletal disorders (17.1%), fibromyalgia (10.6%), upper or lower extremity radiculopathy (9.6%), temporomandibular joint (TMJ) disorder (9.6%), thoracic outlet syndrome (4.2%), trigeminal neuralgia (4.1%), Ehlers-Danlos syndrome (1.9%) and small fiber neuropathy (1.4%). Patient demographics including age, BMI and gender were similar between patients with and without comorbid pain disorders ( $p>0.05$ ). The mean preoperative headache pain frequency was 26.4 ( $\pm 6.3$ ) days per months, intensity 8.6 ( $\pm 1.4$ ), duration 19.5 ( $\pm 9.4$ ) hours and MHI score 134.4 ( $\pm 95.1$ ) and were similar between both groups ( $p>0.05$ ). Patients with comorbid pain disorders had significantly longer symptom duration before surgical treatment ( $21.1\pm 14.5$  years versus  $16.5\pm 13.2$  years,  $p<0.05$ ), had significantly more associated sensory, motor and autonomic symptoms ( $6.1\pm 3.0$  versus  $4.8\pm 2.5$ ,  $p<0.05$ ), had significantly higher rates of psychiatric disorders including depression, anxiety and suicide attempts (68.5% versus 46.9%,  $p<0.01$ ), consulted significantly more specialties prior to nerve decompression surgery ( $2.8\pm 1.9$  versus  $2.2\pm 1.5$ ,  $p<0.05$ ), had significantly more opioid use (35.5% versus 18.5%,  $p<0.05$ ) and had significantly poorer mean percent nerve block response (71.1% versus 89.8%,  $p<0.05$ ). Trigger sites addressed with nerve decompression surgery were similar between patients with and without comorbid chronic pain disorders ( $p>0.05$ ). Postoperatively, patients with comorbid chronic pain disorders were significantly less likely to achieve at least a 50% reduction in MHI score as compared to patients without chronic comorbid pain disorders (75.1% versus 86.2%,  $p<0.05$ ) and underwent significantly more reoperations (12.7% versus 3.7%,  $p<0.05$ ).

**Conclusion:** Comorbid chronic pain disorders are commonly seen in headache patients screened for nerve decompression surgery. These patients may be at risk of poorer surgical outcomes. These findings may help guide evaluation for surgical candidacy as well as preoperative patient counseling.

## **Surgical outcomes following distal nerve decompression in patients with Trigeminal Neuralgia**

Abstract Presenter

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**Purpose:** Patients with headache disorders may present with compression of distal trigeminal nerve branches as well as other head and neck nerve branches such as the occipital nerves. In addition to these distal compression neuralgias, a coexisting diagnosis of trigeminal neuralgia of proximal origin may be present. This overlap in diagnoses complicates treatment. Therefore, this study aims to investigate the therapeutic effects of distal nerve decompression surgery in patients with coexisting trigeminal neuralgia from a proximal origin.

**Methods:** The charts of 1,112 patients who underwent screening for nerve decompression surgery were retrospectively reviewed. Patients with trigeminal neuralgia who underwent nerve decompression surgery were included. Data regarding preoperative and postoperative pain characteristics were collected.

**Results:** 17 (1.5%) patients met the inclusion criteria and underwent occipital decompression (n=15, 56%) (n=13 GON decompression, n=10 LON decompression), frontal decompression (n=5, 19%) (SON/STN decompression) and temporal decompression (n=6, 22%) (n=4 ZTN decompression, n=2 ATN decompression). The average time of postoperative follow-up was 17 ( $\pm$ 12) months. Among the patients that underwent occipital decompression, 11 (73%) patients reported  $\geq$ 80% pain relief, 1 (6.7%) patient reported  $\geq$ 50% pain relief and 3 (20%) patients reported  $\leq$ 20% pain relief. For frontal and or temporal decompression, only 2 (28%) patients achieved substantial pain relief (100% and 50%) while 5 (71%) patients experienced  $\leq$ 20% pain relief.

**Conclusions:** Our results demonstrate that occipital nerve decompression is an effective treatment for alleviating occipital neuralgia in individuals with coexisting proximal trigeminal neuralgia. However, the outcomes of frontal and temporal decompression were less favorable.

## ORAL PENTOXIFYLLINE REDUCES ATROGIN-1 AND MURF-1 UPREGULATION IN DENERVATION-INDUCED SKELETAL MUSCLE ATROPHY

Abstract Presenter

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**Purpose:** Denervation induces muscle atrophy by accelerating myofibrillar protein catabolism, via protein degradation pathways such as the ubiquitin-proteasome system, mediated by two E3 ubiquitin ligases: muscle atrophy F-box (MAFbx/atrogin-1) and muscle RING-finger protein-1 (MuRF-1). Both ligases act as early markers, reaching peak expression by day 3 post-injury, coinciding with the period of most rapid muscle loss following denervation. (1) Functional recovery relies on muscle integrity during re-innervation, necessitating increased efforts to minimize the amount of muscle degeneration following denervation. Pentoxifylline (PTX), a methylxanthine derivative that non-selectively inhibits PDE, has been shown to suppress the production of proinflammatory cytokines such as TNF- $\alpha$ , which mediate proteasome-dependent muscle catabolism through the transcription factor NF- $\kappa$ B. Although previous studies have demonstrated the ability of methylxanthines to reduce Atrogin-1 and MuRF-1 expression in burn-induced muscle injury, cancer cachexia, and sepsis, there is currently no evidence on the role of PTX in decreasing denervation-induced muscle loss. (2) This study aims to assess whether oral PTX administration can mitigate early-stage denervation-induced muscle atrophy in a rat sciatic nerve denervation model.

**Materials and methods:** Ten male Lewis rats, aged 8-10 weeks, underwent complete transection of the sciatic nerve. To prevent spontaneous reinnervation of the denervated muscle groups, the proximal end of the divided sciatic nerve was transposed to the anterior thigh and coapted to the distal end of the divided femoral nerve. The rats were then randomly assigned to two groups: one receiving PTX and the other receiving no

treatment (n=5 rats/group). PTX was administered at a dose of 100mg/kg via oral gavage once daily for three days. After this period, the lateral gastrocnemius (LG) muscle was harvested and homogenized in a lysate buffer, and the resulting supernatant was utilized for assessing Atrogin-1 and MuRF-1 levels using ELISA. Statistical analysis of results was performed on R version 4.2.3. Group averages, presented as median [IQR], were compared using the Wilcoxon Rank-Sum test.

**Results:** At three days post-denervation, PTX-treated LG muscle samples exhibited a significant reduction in Atrogin-1 levels (Median PTX: 1.55 pg/1ug protein, IQR: [0.29]; Median No treatment: 2.73 pg/1ug protein, IQR: [1.05],  $p=0.01$ ), indicating a reduction of approximately 43.1% when compared to the untreated group. PTX-treated LG muscle samples also demonstrated a significant reduction in MuRF-1 levels (Median PTX: 3.91 pg/1ug protein, IQR: [1.09]; Median No treatment: 5.00 pg/1ug protein, IQR: [0.16],  $p=0.01$ ), indicating a 20.2% decrease compared to the untreated group.

**Conclusion:** The use of oral PTX shows promise in alleviating initial denervation-induced muscle atrophy. Further research is required to investigate the potential role of PTX in enhancing functional recovery in the context of chronic denervation injury.

## **The Use of Grayscale Muscle Ultrasound to Indicate Muscle Recovery after Peripheral Nerve Reconstruction**

Abstract Presenter  
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**Background and Aim:** Currently, few, if any, non-invasive quantitative outcomes measures are clinically utilized to longitudinally evaluate peripheral nerve regeneration after major mixed motor/sensory nerve reconstruction. Neuromuscular disease has been shown to result in atrophy, fibrosis, and fatty infiltration of the muscle, all of which can be visualized on ultrasound as decreased muscle thickness or area, altered muscle texture, and increased muscle echointensity. Changes in echointensity, measured in grayscale value, can be assessed visually and quantified by computer analysis of the echogenicity from the region of interest within the muscle. This study aimed to assess the validity of grayscale muscle ultrasound analysis for the longitudinal evaluation of

functional muscle reinnervation in a rabbit peroneal nerve defect model. Additionally, it aimed to evaluate its accuracy by correlating grayscale muscle ultrasound to previously validated functional motor recovery outcomes.

**Methods and Materials:** Eighteen New Zealand White rabbits underwent a 30-mm peroneal nerve reconstruction with autografts or decellularized allograft. Nerves harvested from Dutch Belted rabbits served as donors. Standardized ultrasound measurements of the bilateral tibialis anterior muscles were performed prior to surgery and at 4, 8, 12, 16, 20 and 24 weeks postoperatively, and included cross-sectional muscle area, mean gray value (MGV), and mean gray value normalized for area (MGVA). The MGV was divided by cross-sectional area to quantify the normalized MGVA, to correct for weight gain of the rabbit during the survival period. At 24 weeks, functional motor recovery was evaluated using isometric tetanic force (ITF) and compound muscle action potential (CMAP). Outcomes were compared between operated (left) and unoperated (right, control) sides within groups and as a ratio (L/R) across groups. MGVA data was compared with ITF and CMAP measurements by calculating the Spearman correlation coefficient.

**Results:** The cross-sectional muscle area (L/R) of autografts was superior to allografts at 4, 12, 16, 20 and 24 weeks ( $p < 0.03$  for all comparisons). MGVs of the operated side were significantly higher for autografts at 4, 8 and 12 weeks, and for allografts at 12, 16, 20, and 24 weeks ( $p < 0.01$  for all comparisons), compared to their unoperated sides (control). Similar patterns were seen in both groups for MGVA (operated versus control side). Comparison of the MGVA L/R ratio between groups reflected faster denervation and reinnervation of autografts, illustrated by a peak at 8 weeks for autografts, with allografts showing a higher peak at 12 weeks. MGVA (L/R) demonstrated a strong correlation with ITF (L/R) for autografts ( $\rho = -0.7$ ) and allografts ( $\rho = -0.87$ ), but inconsistent with CMAPs (L/R).

**Conclusions:** Quantitative muscle ultrasound, measuring muscle area and echointensity, demonstrated to be a valid, accurate, and non-invasive tool for evaluating motor recovery in a rabbit peroneal nerve reconstruction model. Clinical translation of grayscale ultrasound holds great promise as an outcome measure and provides valuable insights into muscle health and structural changes following nerve reconstruction, aiding early detection of complications, guiding rehabilitation programs, setting realistic patient recovery expectations, and bridging the gap between basic science research and clinical applications.

# Do Female and Male Chests Feel the Same? A Comprehensive Quantitative Sensory Analysis

Abstract Presenter: Katya Remy MD

Abstract Co-Author(s): Katherine Carruthers MD  
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**Introduction:** There is an increasing interest in chest sensory function in the field of plastic surgery due to a heightened awareness regarding sensory loss following surgery, including breast reconstruction, gender-affirming mastectomy, as well as gynecomastia surgery. While baseline quantitative sensory and pain thresholds have been established in various anatomic areas, there is little knowledge on baseline chest sensation in females and males as well as possible gender differences. Therefore, this study aimed to conduct a comprehensive quantitative sensory analysis to determine if female and male chests feel the same.

**Methods:** This cross-sectional study evaluated a total of 120 chests in 60 subjects (30 females and 30 males). Quantitative sensory testing (QST) was performed on quadrants of the nipple areola complex (NAC) and surrounding chest skin. QST included mechanical detection using Semmes-Weinstein monofilaments, two-point discrimination, vibration detection, pin prick, cold detection, warm detection and heat pain using a thermal sensory device, and pressure pain detection using an algometer. Sensory testing followed the QST protocol by the German Research Network on Neuropathic Pain (DFNS).

**Results:** The mean age of the study population was 28.1 years ( $\pm 4.5$ ) and BMI 26.9 kg/m<sup>2</sup> ( $\pm 5.5$  kg/m<sup>2</sup>). Demographics were similar between females and males ( $p > 0.05$ ). Males were more sensitive than females to mechanical detection at both the NAC ( $3.34 \pm 0.32$  versus  $3.95 \pm 0.46$ ,  $p < 0.0001$ ) and chest ( $2.91 \pm 0.11$  versus  $3.64 \pm 0.54$ ,  $p < 0.0001$ ), vibration detection at the NAC ( $8.0 \pm 0.0$  versus  $7.48 \pm 0.42$ ,  $p < 0.0001$ ) and chest ( $8.0 \pm 0.0$  versus  $7.08 \pm 0.34$ ,  $p < 0.0001$ ), two-point discrimination at the NAC (62% versus 42%,  $p < 0.05$ ) and chest ( $2.7 \text{ cm} \pm 3.0 \text{ cm}$  versus  $5.5 \text{ cm} \pm 1.3 \text{ cm}$ ,  $p < 0.0001$ ) and pin prick at the NAC ( $8.0 \pm 0.0$  versus  $27.8 \pm 21.5$ ,  $p < 0.0001$ ) and chest ( $8.0 \pm 0.0$  versus  $23.6 \pm 17.0$ ,  $p < 0.0001$ ). Males could also feel cold sooner than females at the NAC ( $27.3^\circ\text{C} \pm 1.6^\circ\text{C}$  versus  $24.7^\circ\text{C} \pm 5.0^\circ\text{C}$ ,  $p < 0.001$ ) and chest ( $26.3^\circ\text{C} \pm 1.2^\circ\text{C}$  versus  $23.8^\circ\text{C} \pm 1.2^\circ\text{C}$ ,  $p < 0.001$ ), as well as warmth at the NAC ( $35.8^\circ\text{C} \pm 1.4^\circ\text{C}$  versus  $39.6 \pm 3.6^\circ\text{C}$ ,  $p < 0.0001$ ) and chest ( $36.6^\circ\text{C} \pm 1.2^\circ\text{C}$  versus  $38.9^\circ\text{C} \pm 3.2^\circ\text{C}$ ,  $p < 0.0001$ ). In contrast, heat pain was felt sooner in females as compared to males at both the NAC ( $43.0^\circ\text{C} \pm 3.3^\circ\text{C}$  versus  $44.2^\circ\text{C} \pm 2.7^\circ\text{C}$ ,  $p < 0.05$ ) and chest ( $43.4^\circ\text{C} \pm 2.4^\circ\text{C}$  versus



45.4°C±2.4°C, p<0.001). Pressure pain was also felt sooner in females as compared to males at both the NAC (86.1kPa±73.5kPa versus 217.7kPa±72.1kPa, p<0.0001) and chest (102.6kPa±65.1kPa versus 267.5kPa±89.5kPa, p<0.0001).

**Conclusion:** The quantitative sensory functions of female and male chests are significantly different. While males were significantly more sensitive to mechanical detection, two-point discrimination, vibration, pin prick and temperature detection, females had significantly lower sensory thresholds to heat and pressure pain detection. This knowledge helps to better understand baseline sensory functions at the chest and the presence of gender differences in this anatomic area.

### **Fat versus Muscle Flap-Comparison of techniques to protect the Greater Occipital Nerve after decompression**

Abstract Presenter  
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**Background:** Traditionally, Greater Occipital Nerve (GON) neurolysis is followed by elevation of a subcutaneous fat flap that is wrapped around the nerve for cushioning and protection from scar tissue that will form after surgery. However, this technique places the nerve in a more superficial and exposed position, and allows for potential interaction of axons with the dermis. More recently, techniques to bury the nerve under trapezius and semispinalis muscle have been employed in order to position and cushion the nerve deep in the soft tissues. In this article, both techniques are discussed and postoperative results are analyzed and compared.

**Methods:** We retrospectively identified patients that underwent screening for occipital nerve decompression surgery between 2010 and 2023 at three centers. All adult patients that had primary GON decompression surgery were included. Pain frequency (pain days per month), -intensity (scale of 0-10) and duration (in hours) was collected preoperatively and at 3 months and 12 months follow-up in a prospective fashion.

Manual chart review was performed to collect data regarding type of flap used, complications and reoperations. Patients who underwent GON decompression followed by fat flap were compared to those who underwent decompression followed by muscle flap.

**Results:** Among the patients who were screened (n=1713), 317 (19%) patients underwent GON decompression surgery. The procedure was performed using a fat flap in 203 (64%) patients and using a muscle flap in 114 (36%) patients. The mean follow-up was 9 ( $\pm 4.1$ ) months. When comparing postoperative pain characteristics between the fat and the muscle flap group after the last intervention, the median pain days per month decreased by 15 (0-27) versus 16 (8-25) days ( $p=0.191$ ), the median pain duration was reduced by 10 (0-24) versus 12 (3-22) hours ( $p=0.225$ ) and the mean pain intensity decreased by 4 ( $\pm 4$ ) versus 5 ( $\pm 2$ ) points ( $p=0.419$ ), respectively. The reoperation rate was significantly higher in the fat flap group as compared to the muscle flap group (n=24, 12% vs n=5, 4.4%,  $p=0.045$ ). The reasons for reoperation included recurrent pain (n=17, 71% fat flap; n=3, 60% muscle flap) and persistent pain (n=7, 29% fat flap; n=2, 40% muscle flap). Postoperative complications were similar between groups and included wound infections (2.2%), seroma (1.6%) and wound dehiscence (1.0%) ( $p=0.674$ ).

**Conclusion:** In comparing fat flap versus muscle flap techniques for GON decompression, both methods effectively reduced pain with no significant difference in pain characteristics. However, the muscle flap approach resulted in a lower reoperation rate, suggesting this option may provide better long-term pain relief.

### **Predictive Value of Pre-operative Pain Sketches in Lower Extremity Amputees Undergoing Secondary Targeted Muscle Reinnervation for Treatment of Neuropathic Pain**

Abstract Presenter  
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**Introduction:** Targeted Muscle Reinnervation (TMR) is an effective surgical treatment for neuropathic pain in amputees. (1) Qualitative descriptions of pain could enhance the understanding of symptomatic improvement following surgery. (2) Pain sketches can be used to depict this, and have been used in various neuropathic pain conditions, including amputees who underwent prophylactic TMR at time of amputation. (3-4) Our aim is to assess whether pre-operative pain sketches, drawn by lower extremity (LE) amputees, can predict surgical outcomes following Secondary TMR surgery in amputees with preexisting neuropathic pain.

**Methods:** Eligible patients were LE amputees who underwent Secondary TMR surgery between 2017 and 2023. Pain sketches and pain scores were prospectively collected both before and after surgery. Pain progression, as categorized by pre-operative pain sketches, was analyzed and assessed for improvement, defined as reaching the Minimal Clinically Important Difference (MCID). (5) The transition to different pain sketches and the occurrence of phantom drawings were evaluated for their association with improvement.

**Results:** Fifty-eight patients were included, of which 18 (31.1%) depicted diffuse pain (DP), 26 (44.8%) depicted focal pain (FP) and 18 (24.1%) depicted radiating pain (RP) in their pre-operative sketch. FP sketches were associated with the lowest pre- (p=0.002) and post-operative (p=0.045) pain scores and most frequently progressed to sketches indicating "no pain" (p=0.007). RP sketches were associated with the least pain improvement, the lowest likelihood of achieving the MCID, and were more prevalent in patients with diabetes or depression (p<0.050). RP sketches were associated with phantom drawings (p<0.001); no other sketch types progressed into RP sketches at the final follow-up.

**Summary:**

- In LE amputees who underwent Secondary TMR, pre-operative pain sketches may predict pain progression.
- FP sketches were associated with the most improvement. These may specifically reflect pain related to symptomatic neuromas, which could be more responsive to surgical intervention than pain that is more diffuse or even centralized.
- RP sketches were associated with worse outcomes, which may indicate the activation of different central neuronal pathways, distinct from those involved in neuroma pain or

phantom limb pain alone.

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## Rapid, Detergent-Free Method for Creation of Acellular Nerve Allografts

Abstract Presenter

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**Introduction:** Peripheral nerve injury remains an unsolved clinical challenge, with sensorimotor recovery especially poor for larger nerve gaps. To this date, autologous grafts (autografts) remain the gold standard for repairing transected nerves. Nerve allografts avoid several complications of autografts and have now been successfully applied in several clinical scenarios with promising efficacy. Despite this progress, there remains the potential for improvement. A potential shortcoming of several allograft protocols is the use of detergents, which ensure comprehensive breakdown and

removal of cellular material, but also require long treatment times to remove residue and may destabilize graft durability. Detergent-free methods, on the other hand, may result in insufficient removal of cellular material, raising the likelihood of rejection by the host as well as physical and biological barriers to the pathfinding of regenerating axons.

**Materials and Methods:** We developed a new detergent-free approach for creating nerve allografts that avoids the above limitations. Rat sciatic nerves were subject to sequential cycles of sodium hydroxide treatment to disrupt cells and membranes; nucleases to destabilize nucleic acids; and agitation to clear debris. Preparation of acellular grafts was complete in less than 24 hours. Grafts were characterized using immunohistochemical approaches to evaluate clearance of cellular material and structural integrity; spectrophotometric methods to evaluate clearance of nucleic acids; and Schwann cell implantation into the graft to evaluate biocompatibility.

**Results:** Trichrome labeling and anti-laminin immunolabeling demonstrated preserved extracellular matrix and basal lamina structure. Spectrophotometry demonstrated nucleic acid reduction of over 90% compared to untreated controls. Schwann cells transfected with green fluorescent protein (GFP) were injected into the acellular grafts ex vivo, and repopulated the scaffold, demonstrating cyto-compatibility of the graft. Outcomes were superior or comparable to other published allograft fabrication approaches.

**Conclusions:** Our findings demonstrate the feasibility of generating biocompatible, detergent-free nerve allografts, with comparable cellular and nucleic acid clearance to other preparation methods as well as retained structural stability. Future directions will evaluate the use of these grafts in pre-clinical regenerative applications.

## **Treatment Strategy for Oral-Ocular Synkinesis after Facial Palsy: A Clinical Stratification using Palpebral Fissure Ratio**

Abstract Presenter  
Daiki Kitano MD

**Introduction:** Oral-ocular synkinesis, a sequela following facial nerve palsy, significantly compromises the patients' quality of life.

**Methods:** This retrospective analysis considered 10 cases of oral-ocular synkinesis between April 2022 and March 2024. We favored hypoglossal-facial nerve side-to-side

neurorrhaphy (cross-link) for cases with synkinesis and persistent incomplete paralysis within one year of onset [1]. For cases occurring one year or later from the onset, 10-15 units of botulinum toxin (BTX) were subcutaneously administered into the affected orbicularis oculi muscle every three months, aiming at synkinesis alleviation. This BTX treatment was combined with mirror biofeedback (MBF) therapy (BTX+MBF) [2]. Persistent synkinesis cases underwent selective orbicularis oculi myo-neurectomy [3]. Synkinesis severity was classified into four categories based on the palpebral fissure ratio (PFR, %) at rest (rPFR) and during oral movement (mPFR). We analyzed the average PFR and patient-reported numerical rating scale (NRS) scores before and after treatment.

**Results:** Type I (blepharospasm): rPFR 100% and mPFR 100%. BTX administration alleviated muscle spasm, improving NRS score from 10 to 6 in one patient. Type II (moderate): rPFR 80-99% and mPFR 20-99%. BTX improved rPFR from 93.1% to 100.0%, mPFR from 69.5% to 100.7%, and NRS from 10 to 8.1 in five patients, including one who underwent cross-link surgery. Type III (severe): rPFR 0-79%, or mPFR 0-19%. BTX improved rPFR from 66.4% to 78.8%, mPFR from 19.8% to 69.3%, and NRS from 10 to 6.5 in two patients, with one cross-link surgery. Selective orbicularis oculi myo-neurectomy in another patient resulted in significant improvement. Type IV (fluctuating type): PFR fluctuates. BTX did not significantly improve this type; rPFR from 96.7% to 80.5%, mPFR from 75.1% to 52.3%, and NRS from 10 to 9.5 in two patients.

**Discussion:** Type I, II, and III responded to BTX administration. Type I showed alleviation of muscle spasm. Type II normalized completely, while type III required surgical intervention. Type IV (BTX non-responders) were indicated for supportive therapy rather than surgery.

**Conclusion:** Stratifying synkinesis severity using PFR proved valuable for determining treatment strategies and predicting outcomes.

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## Neuroma to Nerve Ratio: Does Size Matter?

Abstract Presenter

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**Introduction:** Anatomic and morphological features of neuromas have been explored in imaging studies (1-2). However, there has been limited research into these features using ex-vivo, excised human neuroma specimens. Moreover, knowledge on how neuromas evolve over time and whether their size correlates with pain remains limited. Therefore, in this study, we aim to investigate the influence of time on neuroma growth and size and the clinical significance of neuroma their interactions.

**Methods:** Patients undergoing neuroma excision were prospectively included between January 2022 through September 2023. Neuroma specimens were obtained intra-operatively and standardized measurements of dimensions, expressed as the neuroma-nerve-ratio (NNR), were conducted with image analysis software ImageJ. Pain data (Numeric rating scale, 0-10) was prospectively collected during pre-operative evaluation, and patient factors were collected from chart review. Additionally, we conducted preliminary experimental axonal staining of two neuroma specimens.

**Results:** Fifty terminal neuroma specimens from 31 patients were included in this study. Amputees comprised 92.3% of the population, of which 3 were upper (10.7%) and 25 were lower extremity (89.3%) amputees. The median neuroma diameter was 9.90mm (IQR 6.87-14.23mm) with a median proximal normal native nerve diameter of 3.68mm (IQR 2.11-7.61mm), resulting in a median NNR of 2.45 (IQR 1.68-3.11mm). The median time from injury until neuroma excision was 7.01 years (range 0.32 – 40.4

years). NNR was not associated with preoperative pain ( $p=0.079$ ) or with nerve distribution ( $p=0.305$ ). Time from injury to neuroma excision was significantly associated with a larger NNR ( $p=0.002$ ), and with a smaller proximal nerve width ( $p=0.003$ ). A smaller proximal nerve diameter was also associated with a larger NNR ( $p<0.001$ ). Also, sensory nerves were associated with a larger NNR, compared to mixed nerves (Fig. 4). The preliminary experimental axonal staining of two neuroma specimens demonstrated that the composition of a neuroma of a sensory nerve (i.e. sural nerve) mainly consists of diffuse and disorganized sensory axons (neurofilament-positive), while a mixed nerve neuroma (i.e. sciatic) demonstrates disorganized sensory as well as motor axons (neurofilament and ChAT-positive).

### **Summary:**

- In this study we observed that neuroma size, expressed as NNR, does not correlate with pain severity.
- NNR and the diameter of the proximal nerve demonstrated a negative correlation, indicating that larger nerve diameters tend to result in relatively smaller neuromas.
- The time-to-neuroma-excision was significantly associated with larger NNR, suggesting continued growth and development of neuromas over time.
- Preliminary axonal staining data suggests that motor axons constitute a significant portion of the volume of the neuromas of mixed nerves. Yet, regeneration and reinnervation following nerve injury occur in both efferent motor and afferent sensory axons.
- These findings may assist surgeons and researchers in better understanding of symptomatic neuroma development.

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## **Peripheral Nerve Injury After Deoxycholic Acid (Kybella) Injection**

Abstract Presenter

Sai Pinni



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**PURPOSE:** Deoxycholic acid (Kybella) is a drug commonly injected in non-surgical aesthetic procedures to locally reduce subcutaneous fat. Kybella treatment has been reported to have adverse effects, one of which can cause marginal mandibular nerve injury with noticeable functional deficits when injected to target submental fat. As an adipocytolytic agent, Kybella may damage the lipid-rich myelin surrounding peripheral nerves. Given that limited basic science studies investigating this agent have been performed to date, this study seeks to characterize the nerve injury associated with Kybella.

**METHODS:** Using a sciatic nerve injection model in rats, intrafascicular and extrafascicular injections of deoxycholic acid (Kybella) were compared to intrafascicular lidocaine (positive control) and intrafascicular saline (negative control) injections. All agents were administered in a 50  $\mu$ L volume to the sciatic nerve proximal to its trifurcation. Injection sites were delineated with 10-0 nylon suture 1mm proximal and distal to the injection. Nerves were harvested at a 2-week endpoint for histomorphometric analysis and electron microscopy.

**RESULTS:** Intrafascicular saline injection caused minimal injury to sciatic nerve. Comparing the area of healthy nerve with injured nerve fibers marked by scarring and fibrosis, the percent area of injured sciatic nerve was 78% in the intrafascicular Kybella group, 49% in the extrafascicular Kybella group, and 40% for the intrafascicular lidocaine group. There was a significant difference between the intrafascicular lidocaine and Kybella groups ( $p=0.003$ ), as well as the intrafascicular and extrafascicular Kybella groups ( $p=0.045$ ). The g-ratio assessing axonal myelination was not significantly different between the lidocaine (0.58), Kybella (0.58 and 0.56), and saline (0.56) injection groups.

**CONCLUSION:** Initial results suggest deoxycholic acid (Kybella) is capable of extensive nerve injury. Although Kybella is a known adipocytolytic agent, its mechanism of damage does not seem to involve myelin. Physicians administering Kybella for non-surgical aesthetic treatment of excess fat should counsel patients appropriately based

on these findings. Appropriate knowledge of surgical anatomy is recommended for those practitioners providing Kybella injections.

## **Migraine Surgery: Is It A Headache to Fund?**

Abstract Presenter

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**Purpose:** Migraine surgery has become a life-altering solution for patients who have struggled with migraines for years, sometimes decades. As life changing as the surgery can be, many insurances still consider surgery to be investigational and therefore do not provide coverage. Patients are then forced to seek other means to solve their financial dilemma. The objective of our study was to describe the prevalence of GoFundMe (GFM) campaigns as a way to gauge the financial burden faced by the patients undergoing migraine surgery.

**Methods:** On 18 December 2023, GoFundMe.com was queried for migraine surgery. Any campaigns in the U.S. fundraising for migraine surgery or related expenses were included. Campaigns that were uplicates, for charities or other surgeries were excluded. The primary outcome was campaigns' percentage of its goal met. Descriptive statistics were performed, and multivariate linear regression was used, adjusting for sex and race; significance was set at  $p < 0.05$ .

**Results:** Overall, 998 campaigns were screened. Of the 43 campaigns included for analysis, patients were most commonly white (90.7%), female (83.7%), resided in the South (39.5%), and had surgeon out-of-network or no coverage (53.5%). Campaigns raised a median of \$4,126 (IQR: 1,640-8,129), requested a median of \$15,000 (IQR:

8,500-20,000), and met campaign goal by a median of 29.3% (IQR: 13-72). The majority of campaigns had a photo with the patient smiling (79.1%), and the most common ancillary expenses were lodging (30.2%) and pre/post operative appointments (30.2%). There were no differences observed in percentage of campaign goal met when analyzed by sex, race, transportation expenses, and patient smiling in campaign photo.

**Conclusions:** Our study showed that while migraine surgery is rising in popularity, patients are not using crowdfunding to fund this surgery that is usually not covered by insurance. In those that do utilize this resource, most of them are not able to raise enough to cover their surgeries, leaving patients stranded to figure out the surgery expenses on their own. Our study illuminates this problem so that plastic surgeons treating these patients are aware of the surgery's financial burden and can properly counsel their patients on potential financial resources. Furthermore, compared to other crowdfunding studies, our study showed a relatively lower fundraising success rate, mirroring the fact that migraine surgery itself has not been fully accepted in the medical field. Since only few centers are currently offering this life-changing surgery, our study supports the notion that patients must foot a high bill for travel expenses surrounding this surgery.

## **Examining Socioeconomic Disparities in Brachial Plexus Birth Injuries: A Multicenter Public Health Analysis**

Abstract Presenter  
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**Purpose:** The primary objective of this investigation is to analyze and compare the socioeconomic characteristics of infants diagnosed with brachial plexus birth injuries (BPBI) at two high-volume, distinct healthcare systems in the United States.

**Methods:** All BPBI cases initially diagnosed between November 2021 and November

2023 at either institution, New York ("NY") or Los Angeles ("LA"), were included in the analysis. To stratify patients based on socioeconomic background, the Child Opportunity Index (COI) was utilized. COI scores and quintiles were assigned based on nationally normed ZIP code-level data, with a lower COI score signifying a lower childhood opportunity. For analysis, continuous variables underwent two-tailed, unpaired t-tests, while categorical variables were assessed using chi-squares. The significance level was set at  $p < 0.05$ .

**Results:** When comparing the LA ( $n = 117$ ) and NY ( $n = 107$ ) cohorts, the overall COI of LA and NY averaged 37.1 (SD 27.3) and 17.3 (25.6), respectively ( $p < 0.05$ ). Similarly, when comparing the average child opportunity scores in the health and environment domain (31.5 SD 22.7 and 63.8 SD 12.5), social and economic domain (37.2 SD 26.5 and 14.7 SD 25.1), and education domain (41.3 SD 29.5 and 24.4 SD 27.3) when nationally-normed, there was a statistically significant difference between the mean scores of LA and NY, respectively. While there was a significantly higher number of patients from NY than LA falling into the categories of very low or low in the education domain, social and economic domain, and overall COI when normalized nationally or at the state level, the distributions of these categories in the LA cohort were more evenly spread across the cohort.

**Conclusions:** Our findings challenge the previously held notion that BPBI infants primarily originate from lower socioeconomic backgrounds: at one location (LA), the child opportunity scores of BPBI infants were distributed among the COI quintiles. While this study does not explain these trends, the results suggest the need to reconsider how we describe the associations with BPBIs. This reevaluation may contribute to dispelling the theory that such injuries are confined to a specific socioeconomic group and our findings support the need for a widespread, multicenter national examination of BPBI socioeconomic factors.

## **Molecular Alterations in Nociceptive and Mechanosensitive Traits of the Trapezius Fascia in Occipital Neuralgia Patients**

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**Introduction:** Headache surgery has now been well-established as a viable option for those suffering from chronic head pain or occipital neuralgia refractory to conventional treatment modalities. The surgery involves decompression or neurectomy of the affected nerves, namely the major or minor occipital nerves. While occipital neuralgia surgery shows promising reduction in painful perception, the causal neurobiological mechanisms of occipital neuralgia or potential nerve compression remain scarcely explored. In this study, we analyzed fascial tissue in patients undergoing neurolysis or neurectomy of the major or minor occipital nerves using specific molecular markers for nociception or mechanosensitive perception.

**Methods:** Eleven patients (mean age 43; 54% female) with occipital neuralgia were enrolled in the study. Tissue samples (major and minor occipital nerves, trapezius fascia, and periosteum) were harvested during decompression and neurectomy procedures. Additionally, uninjured trapezius fascia samples from patients with no history of chronic headaches (n=5) undergoing spinal closure procedures were harvested as a control. The specimens were processed for multicolor immunofluorescence staining using specific molecular markers (neurofilament, PGP9.5, TRPV1, CGRP, Piezo2, and S100). The images were acquired using a confocal microscope, and z-stacked images were compiled for 3D reconstruction. The neural and nociceptive entities within the fascia were analyzed using ImageJ.

**Results:** The major (n=4) and minor (n=7) occipital nerves across all patients showed signs of nerve compression based on the axonal architecture. Fascia tissue specimens demonstrated a vast neural network encompassing axons of different calibers (0.2-3  $\mu\text{m}$ ). Additionally, the fascia of headache patients showed high CGRP expression levels within the neural components compared to the control samples, indicating an adrenergic nociceptive nature of these axonal populations (Figure 1). Moreover, specific fluorescence staining of consecutive slices of the fascia samples (n=3) revealed mechanosensitive entities resembling Meissner corpuscles across the fascia samples.

**Conclusion:** The findings of this study suggest that pathological fascia tissue contributes to the nociceptive perception in occipital neuralgia patients. Moreover, the nociceptive and mechanosensitive neural network within the fascia tissue may shed light on the intrinsic neurobiological pathomechanism responsible for occipital neuralgia.

# Unveiling the Diagnostic Potential of MRI Neurography in Diverse Peripheral Nerve Disorders

Abstract Presenter  
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**Introduction:** Peripheral nerve compression disorders can pose diagnostic challenges when standard diagnostic modalities fail to show an abnormal finding, despite the patient having clinically relevant symptoms on exam. This can make it difficult to determine when to refer the patient for surgery or committing to surgical intervention. This study explores MRI Neurography's diagnostic utility in various disorders.

**Purpose:** Our aim is to demonstrate the effectiveness of MRIN in guiding surgical decisions, particularly when integrated into an algorithmic approach.

**Methods:** We retrospectively analyzed patients (n=56) with neurogenic thoracic outlet syndrome (nTOS) (7), piriformis syndrome (17), meralgia paresthetica (13), occipital nerve compression (9), and chronic inguinal pain (10) from January 2021 to December 2022 who underwent MRIN as component of the diagnostic work-up to help guide surgical interventions based on the findings. High-resolution imaging identified nerve compression and anatomical abnormalities. Outcomes were assessed for symptomatic relief and surgical success.

**Results:** In the cases of nTOS (n=7), EMG was normal/inconclusive in all, MRIN located compressive structures allowing for accurate diagnosis and brachial plexus decompression and/or neurolysis +/- first rib resection, scalenectomy, pectoralis minor release, targeted muscle reinnervation, relieving all patients of their symptoms. MRIN was positive for sciatic nerve impingement indicating piriformis syndrome in 15 cases. Piriformis tendon release, and neurolysis of gluteal and sciatic nerve led to pain resolution/improvement (83%). In meralgia paresthetica (n=13), MRIN positive for compression of the lateral cutaneous femoral nerve (n=7), 6 had symptoms resolution, 1 patient with a history of complex regional pain syndrome had persistent pain but still reported symptom improvement. One case of migraine where MRIN showed occipital nerve compression was treated with neuroma excision, neurolysis and TMR of left

GON/LON/cervical nerve. MRIN done in 9 cases of chronic inguinal pain, revealed neuromas in inguinal nerves, and treatment with triple denervation surgery resulted in 7.5 points mean difference decrease in postoperative mean VAS score.

**Conclusion:** MRIN is a powerful tool that is underused by physicians and can help confirm peripheral nerve compression disorders and surgical planning by visualizing nerves and identifying compression, enhancing outcomes.

## **A Comparative Analysis of Early Patient-Reported Outcomes in Endoscopic versus Open Carpal Tunnel Release**

Abstract Presenter

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**Background:** Carpal tunnel syndrome (CTS) is a common median nerve neuropathy, constituting 90% of all neuropathies.[1] Treatment options for CTS range from conservative measures to surgical intervention, with options including open or endoscopic carpal tunnel release (CTR). Although both surgical approaches aim to decompress the median nerve through transverse carpal ligament division, they vary in incision size and instrumentation.[2] It is unknown how these differences affect early post-operative outcomes, as a consensus has not been reached in the literature.[3] Presently, several randomized controlled trials have investigated post-operative outcomes between open and endoscopic CTR using validated patient measures.[4, 5] However, to date, no prospective-matched cohort analysis has assessed the early post-operative outcomes using well-defined hand and upper extremity patient-reported outcome (PRO) measures such as the Disabilities of the Arm, Shoulder, and Hand (DASH) and Patient-Reported Outcomes Measurement Information System (PROMIS) surveys. Hence, this study seeks to fill this gap, focusing on early PROs.

**Methods:** We conducted a single-institution prospective cohort study of patients undergoing either endoscopic or open carpal tunnel release as index operations from August 2023 to January 2024. Patients planning to undergo CTR were enrolled before their surgery. At enrollment, the following patient demographic data were recorded: age, sex, race/ethnicity, BMI, comorbidities, and insurance status. Exclusion criteria included age < 18, previous need for revision, EMG-documented peripheral neuropathy, and uncontrolled diabetes. Outcome variables measured included QuickDash Outcome and PROMIS scores. These were evaluated preoperatively and postoperatively at 1 week and 6 weeks.

**Results:** Seventy-six patients were included. The endoscopic (n = 27) and open (n = 49) CTR cohorts were comparable when assessing age, sex, race/ethnicity, BMI, insurance status, and comorbid conditions. Preoperatively, there were no significant differences in QuickDash and PROMIS scores between the two cohorts. Postoperatively, patients undergoing endoscopic CTR exhibited significantly improved QuickDash and PROMIS Upper Extremity scores at 1 week compared to the open CTR cohort (p = 0.0419 and p = 0.0145, respectively). However, at 6 weeks postoperatively, no significant differences in PROs were observed between the two cohorts.

**Conclusions:** In this prospective matched cohort analysis, patients undergoing endoscopic CTR demonstrated significantly improved upper extremity function and decreased disability at 1 week postoperatively as evidenced by a greater improvement in QuickDASH and PROMIS scores. While endoscopic CTR facilitated an earlier return to function and relief of symptoms compared to open CTR, these differences normalized by the sixth week after surgery.

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## **A cost-utility analysis of palliative care involvement for patients with severe burn injuries**

Abstract Presenter  
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**Purpose:** Palliative care involvement has been shown to improve quality of life and decrease overall costs in patients facing life-limiting conditions. However, evidence on its cost and cost-effectiveness in burn care is lacking. We therefore aimed to assess the cost-effectiveness of palliative care involvement for adult patients with severe burns.

**Methods:** We assessed the cost-effectiveness of standard burn treatment with or without inpatient palliative care involvement for patients admitted to a burn unit with severe burns, defined as a Baux score  $\geq 100$  and total body surface area (TBSA)  $> 20\%$ , from a health system perspective. We developed a Markov cohort model to assess lifetime health outcomes (Quality-adjusted Life Years, QALYs), cost (in 2023 CAN \$), discounted at 1.5%, and cost-effectiveness (Incremental Cost-Effectiveness Ratio, ICER, threshold at \$50,000/QALY) for palliative care. Strategies were compared across 12 scenarios with different combinations of patient age, TBSA, and inhalation injury. Our model was informed by published literature. We conservatively assumed that palliative care involvement improves quality of life with no associated cost savings (base case). Across scenarios, we determined the cost saving and quality of life improvements required for palliative care consultation to become cost-effective. We conducted deterministic sensitivity analysis to assess the robustness of our findings.

**Results:** Palliative care was not cost-effective across the 12 scenarios in the base case analysis with no palliative-associated cost savings. ICERs ranged from \$259,788 to \$573,942 per QALY gained. Expected lifetime incremental cost for inpatient palliative care involvement ranged from \$280-\$3,296, while incremental QALYs gained ranged from 0.0005-0.013 per person. However, scenario analysis indicated that during hospitalization, cost savings of \$17 to \$43 per person per day or a utility gain of 0.16-

0.35 per person would render palliative care cost-effective.

**Conclusions:** We described the minimum cost savings and quality of life improvement required from inpatient palliative care involvement to achieve cost-effectiveness in the treatment of severe burn injuries. Previous literature on hospitalized patients reports significant cost savings with palliative care involvement, averaging \$174/day for patients discharged alive and \$374/day for patients who die (1) - well above the threshold for cost-effectiveness identified in our study. These findings suggest that inpatient palliative care may be cost-effective in severe burn injuries and support the implementation of palliative care policies in burn care.

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## **A Meta-Analysis of Surgical Interventions for the Treatment of Hidradenitis Suppurativa**

Abstract Presenter

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**INTRODUCTION:** Hidradenitis suppurativa (HS) is a disease characterized by chronic inflammation of apocrine glands in the axillae, inframammary folds, groin, perineal, and perianal regions that greatly impacts the patient's quality of life, commonly measured by the Dermatologic Life Quality Index (DLQI) [1, 2]. The DLQI scale ranges from 0 to 30, with a higher score indicating a greater degree of impact on quality of life [3]. HS is usually characterized by the Hurley staging system, which includes 3 stages of increasing severity [1, 4]. Antibiotic and immunotherapy are typically the starting treatment for early stages of HS, while surgery is generally reserved for Hurley Stage 2

or 3 diagnoses [1, 5]. This study focuses on the surgical interventions for HS and their impact on DLQI scores.

**METHODS:** A systematic review and meta-analysis were performed in accordance with the PRISMA guidelines to assess the treatment efficacies of surgical interventions with regards to patient quality of life, using DLQI as our primary outcome. Search terms included 'hidradenitis suppurativa' and 'DLQI'. Baseline and post-intervention mean and standard deviation DLQI were analyzed for significance. 22 studies were included, and subgroup analysis was conducted on eight surgical studies.

**RESULTS:** All studies showed a decrease in DLQI after the operation for HS treatment. Nine of the twelve studies reported a post-operative mean DLQI score of 5 or less, which correlates to a minimal effect on daily life. Subgroup analyses, based on region of operation, Hurley Stage classification, and type of operation did not provide significant clarification on the factors contributing to the improvement in quality of life for HS surgical patients. The subgroup analysis of procedure type showed that the wide local excision (WLE) with photodynamic therapy (PDT) group experienced the greatest mean difference of 21.59 (95% CI: 19.5, 24.03).

**DISCUSSION:** This meta-analysis supports surgery as an effective treatment for HS. Many HS patients have comorbidities such as obesity and an extensive smoking history, both of which factors greatly impact surgical outcomes [1, 4]. However, because of the variety of antibiotic and immunologic treatments prior to surgery, along with the subjective nature of the DLQI metric, it is difficult to discern the best surgical plan for patients. Nonetheless, WLE with either a flap or photodynamic therapy displays promising results for HS patients. More research regarding surgical options for HS, including analysis of post-operative complications and recurrence of symptoms, should be conducted to establish an effective treatment plan.

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### **A new concept for supercharged renal transplantation: microsurgical anastomosis of an accessory renal artery in vivo**

Abstract Presenter  
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**Background:** Vascular anastomosis in living donor renal transplantation is usually performed by a urologist only. The diameter of the renal artery is large enough to be anastomosed under a surgical loupe. One of its anatomic variants is multiple renal arteries (MRAs), including the main trunk of the renal artery and the accessory renal arteries (ARAs), and the reported incidence of grafts with MRAs is relatively high (18%–30%). Anastomosis of small ARAs under a surgical loupe is challenging; therefore, ARAs with a diameter of 2 mm or less are sometimes ligated. However, all ARAs need to be anastomosed, if possible.

In urology, a common technique of arterial reconstruction of MRA grafts is to conjoint the renal arteries ex vivo during bench surgery. In our institution, anastomosis is performed in all patients with ARAs using microsurgery and a microscope to expand the perfusion area. Furthermore, supercharging for ARAs is performed in vivo to reduce ischemia time.

**Methods:** This was a retrospective review of 11 consecutive patients undergoing renal transplant from a living donor with microsurgical supercharging and MRA grafts from September 2018 to April 2022 at Osaka Metropolitan University Hospital. We assessed

patient characteristics and surgical outcomes.

**Surgical procedure:** A urologist anastomosed the main trunk of the renal artery to the internal iliac artery or the external iliac artery and the renal vein to the external iliac vein. After the blood flow was restored in the graft, microsurgical supercharging was performed in vivo. The recipient arteries to be anastomosed to ARAs were selected depending on the arterial condition of recipient site. The first choice of the recipient artery was a branch of the internal iliac artery; the second was the deep inferior epigastric artery, including the superior pedicle; and the third was the external iliac artery in an end-to-side fashion.

**Results:** Upper polar arteries were identified in all patients, and lower polar arteries were identified in three patients. Fourteen ARAs were anastomosed to recipient arteries: five to a branch of the internal iliac artery, five to the deep inferior epigastric artery, and four to the external iliac artery. The mean diameter of ARAs was 2.2 mm. The mean cold ischemia time was 78 minutes, which was not longer than that in usual living donor renal transplantation. The mean time of ARA anastomosis under microscope was 67 minutes. No vascular complications were found. The patency of ARAs was identified using a renogram and ultrasound. The median serum creatinine level was 1.36 mg/dl. No graft failure occurred.

**Conclusions:** Supercharging in vivo under a microscope is safe and does not challenge the microsurgeon. We believe that a microsurgery could deliver a successful anastomosis in small-caliber ARA and contribute to a favorable outcome of supercharged living donor renal transplantation.

## **A Rare Clinical Entity – Bilateral Encephalocele with Concomitant Bicornal Craniosynostosis and Agnathia: A Case Report and Review of the Literature**

Abstract Presenter  
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**Background:** Craniosynostosis occurs in approximately 1:2000 to 1:2500 births, of which 5-15% involve multiple sutures(1). Encephalocele is observed in 1:10,000 live

births(2). Herein we report a rare variant of bicoronal craniosynostosis with bilateral temporal encephaloceles, cleft palate, and almost complete agnathia with only symphysis present. Only few reports in the literature note concomitant craniosynostosis and encephalocele formation. These highlight diminished fetal activity due to neural tube defects and no article to date has described the development of an encephalocele in-line with the synostotic suture(3). This case and literature review describe a rare variant of craniosynostosis and a novel in-line encephalocele with subtotal agnathia.

**Methods:** A literature review was undertaken using Pubmed, Web of Science, Scopus, and Google Scholar databases. Keywords used included "neural tube defect craniosynostosis" and "encephalocele craniosynostosis". A single clinical case is described.

**Surgical Management of Clinical Case:** Craniofacial abnormalities were first detected in utero. Genetic evaluation was unrevealing for known syndromic craniosynostosis causes. A custom approach to the surgical management of the rare variant was undertaken. The patient underwent cranial vault suturectomy with bicoronal craniosynostosis suture release at 3 weeks of life for progressive expansion of encephalocele. At five months old, the skull had re-fused, and the patient underwent posterior vault distraction. With growth, the child had an improved cranial shape and made major developmental strides. He subsequently underwent fronto-orbital advancement at age 2 for the management of residual fronto-facial and calvarial deformity.

**Results:** A literature review demonstrated limited reports of associated cephaloceles and craniosynostosis with no reports of 'in-line' encephaloceles. In total, five cases were identified, including occipital and frontonasal encephaloceles and coronal, sagittal, and pansutural craniosynostosis. Apert syndrome was reported in one case while the remaining four had no associated syndrome(4). Surgical intervention began as early as 15 days of age (range 15 days-13 years) for encephalocele repair with or without ventriculoperitoneal shunting. Two patients underwent encephalocele repair without later craniosynostosis repair owed to sudden death or pneumonia months following first surgical intervention. Craniosynostosis repair was performed as a second stage procedure in one patient while encephalocele repair and craniectomy were performed in the same stage in two patients(5). Three surviving patients were reportedly doing well at last postoperative follow up (range 3-6 months).

Despite wide, early suturectomies and standard approaches in this patient, there was a persistence of the encephalocele and re-fusion of affected cranial sutures in this case. The child's neurodevelopment and functional status improved significantly with

progressive interventions, most recently at 3 months post-fronto-orbital advancement. Ongoing challenges for this patient include continued home ventilation and gastrostomy tube feedings. Additionally, the patient has persistent right-sided congenital ptosis.

**Conclusions:** This case demonstrates the advantages of early and staged surgical interventions in a uniquely complex presentation of craniosynostosis with concomitant bilateral temporal encephaloceles and severe mandibular deficiency. To our knowledge, this is the first such reported clinical entity combination.

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#### **A Regional Model for Craniofacial Surgical Care in the Eastern Caribbean States: a 20-year Review**

Abstract Presenter

Annie Chen-Carrington

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**Introduction:** Low-middle-income countries (LMICs) suffered the highest age-standardized rates (ASRs) of incidence of deaths and DALYs from orofacial clefts

(Wang, et al). Short-term missions have been a strategy for surgeons from high-income countries to support surgical needs in LMICs. However, these missions have come under criticism due to issues with sustainability and continuity of care. A more sustainable model of care is essential to address these inequities in the distribution of pediatric surgical care, particularly in populations where the prevalence of surgical needs is low, yet unmet. Starting in 2019, we expanded specialty pediatric surgical services, including craniofacial services. We describe our experience from 20 years of implementing a Regional Model for diagnostic clinics with centralized surgical care as a potential model for global craniofacial programs. We describe why this model is appropriate in the Eastern Caribbean Region and the composition of our referral network of craniofacial and plastic surgery services.

**Methods:** We used retrospective data of patients receiving craniofacial care from our organization in the Eastern Caribbean Region from 2002-2023 to provide a cross-sectional descriptive analysis of services provided. We then conducted online surveys to construct network mapping of the craniofacial services available in the Eastern Caribbean Region.

**Findings:** From 2005-2023, we provided 295 craniofacial and plastic surgery services to the Eastern Caribbean Region, representing an average of 21 craniofacial surgeries annually from 2019, 2022-2023. We developed a referral network map of our organization's craniofacial and plastic surgery services, providing evidence for the establishment of a Regional Model for craniofacial surgery in the Eastern Caribbean.

**Discussion:** In partnership with regional health agencies and governments, our Regional Model aims to provide comprehensive pediatric craniofacial care to children in the Eastern Caribbean with critical healthcare services often unavailable in these small island nations. The model decentralized diagnostic clinics while maintaining centralized surgical care, increasing access to craniofacial services more cost-effectively. While this regional model has been described, our study provides a network referral of craniofacial services available in the Eastern Caribbean Region. Understanding best practices and models to implement global craniofacial programs that increase surgical access in LMICs will continue to be important to the growth and development of the global surgery field. This regional model provides a framework for other global surgery programs, especially in other regions where resources and incidence of surgical needs are low and unmet. The technology of network mapping can be used to establish a needs assessment of plastic surgery and neurosurgery services available in the region. Understanding best practices and models to implement global surgery programs that increase surgical access in LMICs will continue to be important to the growth and development of the global surgery field.



## **A Review of the Literature: Mitigating Hair Loss Among Scalp Laceration Repair Techniques**

Abstract Presenter

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Scalp lacerations present challenges for both emergency room physicians and plastic surgeons due to the scalp's unique anatomy and rich blood supply. The complexity of these wounds, combined with the potential for hair loss and cosmetic concerns, emphasizes the critical role of effective closure techniques.

**Purpose:** The study aims to assess the efficacy of different closure techniques for scalp lacerations in preserving hair and achieving optimal patient outcomes.

**Methods:** A comprehensive systematic literature review was conducted using three major databases: PubMed, Embase, and Google Scholar, covering publications from 1850 to 2023. The inclusion criteria comprised studies reporting clinical outcomes of scalp laceration repairs using sutures, staples, or flap techniques, with a specific focus on hair loss as a postoperative complication. Data extraction was performed independently by the research team, and any discrepancies were resolved through discussion and consensus.

**Experience:** The final analysis included eleven studies involving a total of 439 patients. Closure techniques encompassed traditional methods such as sutures and staples, as well as innovative approaches like the hair apposition technique (HAT) and various flap procedures. Follow-up assessments were conducted at intervals ranging from 7 to 14 days post-repair, focusing on parameters such as pain, cosmetic satisfaction, hair loss, and complications.

**Results:** The findings revealed distinct differences in outcomes among the different closure techniques. Sutures and staples were associated with higher rates of cosmetic dissatisfaction, pain, and hair loss compared to HAT. Notably, the HAT demonstrated shorter emergency department stays, lower complication rates, and minimal hair loss, while maintaining comparable or higher levels of patient satisfaction. Additionally, flap techniques, including advancement, transposition, and rotation, exhibited promising results in managing larger scalp defects, with satisfactory hair growth observed in the majority of cases.

**Conclusions:** The management of scalp lacerations poses a multifaceted challenge for emergency room physicians and plastic surgeons alike, predominantly stemming from the scalp's distinct anatomical features and rich vascularity. This systematic literature review critically examines the existing gap in research regarding the impact of different closure techniques with a specific focus on sutures, staples, and HAT, and their implications for aesthetic complications - notably hair loss following scalp laceration repairs. Our findings suggest that a nuanced approach to scalp laceration management can contribute to elevated patient satisfaction, avoid complications, and enhance aesthetic results. This research informs healthcare providers on the gamut of scalp repair techniques and their differential outcomes especially with regard to hair loss ultimately improving quality of care for scalp trauma patients.

## **Analysis of Lateral Ventricular Volume Changes in a Patient with Nonsyndromic Sagittal Craniosynostosis and Slit Ventricle Syndrome Following Posterior Vault Distraction**

Abstract Presenter  
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**Purpose:** The purpose of this study was to investigate the impact of posterior vault distraction surgery on lateral ventricular volume in a patient presenting with nonsyndromic sagittal craniosynostosis and concurrent Slit Ventricle Syndrome (SVS). Posterior vault distraction may benefit patients with SVS by reducing postoperative

shunt revisions and other complications related to elevated ICP. However, comprehensive volumetric analyses of the lateral ventricles and their implications in predicting long-term outcomes for SVS within the broader context of craniosynostosis have yet to be described.

**Methods:** We conducted a case report involving a patient with nonsyndromic sagittal craniosynostosis and SVS. Syngo.via imaging software was used to conduct volumetric analysis of the lateral ventricles on preoperative and postoperative CT imaging. Two age and sex-matched patients who underwent PVDO for nonsyndromic sagittal craniosynostosis without SVS were chosen as controls. Postoperative volumetric analyses were performed using follow-up CT imaging following completion of activation phase of distraction.

**Results:** Preliminary data reveal significant differences in preoperative lateral ventricular volume for the patient with SVS compared to the controls. Preoperative lateral ventricular volume was 1.98 cm<sup>3</sup> in the patient with SVS compared to 8.17 cm<sup>3</sup> in the age and sex-matched controls. Following posterior vault distraction, the patient's lateral ventricle volume increased to 6.24 cm<sup>3</sup> versus the age-sex matched controls, increasing by much smaller amount to 8.81 cm<sup>3</sup>.

**Conclusion:** This case study highlights the notable change in volume of the lateral ventricles in a patient with SVS and sagittal craniosynostosis after undergoing posterior vault distraction. Further investigation and more extensive studies are warranted to confirm these findings and explore the potential for therapeutic management of patients with craniosynostosis and slit ventricle syndrome.

## **Analysis of Physician and Hospital Reimbursements for Breast Reconstruction**

Abstract Presenter  
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Essam Hashem

Breast reconstruction is the third most common reconstructive surgery done by plastic surgeons; most of these reconstructions use implants [1]. One factor limiting access to health care is insurance reimbursement for surgery. Autologous reconstruction is labor intensive with poor reimbursement rates [2]. There is limited data regarding hospital charges versus collections or physician charges versus collections [3]. The purpose of this study is to determine the costs and reimbursements for the operating room and physician at a county hospital.

A retrospective review of charges and collection was completed using the CPT codes 19357(expander) and 19042(delayed implant) from 10/2018 to 10/2023. The charges and collection were obtained for both the operating room and physician. The data was collected for all procedures completed on the day of the surgery and specifically for their corresponding code.

Most of the patients had either Managed Medicaid (31%) or Medicare (24%) insurance. The delayed implant reconstruction with combined procedures had a mean operating room charge of \$15,925.48 and physician charge of \$8,730.31. The average reimbursement from insurance for the operating room and physician were 17% and 12% of the charges, respectively. The mean length of stay was 0 days. The expander placement with combined procedures had an operating room charge of \$46,282.68 and physician charge of \$9,587.51. The mean reimbursement from insurance for the operating room and physician were 20% and 16% of the charges, respectively. The mean length of stay was 0.6 days. The mean collection for CPT code 19357 and 19042 were \$722.63 (16%) and \$462.10 (16%), respectively. The Unmanaged Medicaid physician reimbursements were denied.

Overall, insurance companies have control over the reimbursement of procedures. Our results show poor physician reimbursement rates, especially for unmanaged Medicaid patients. Without reimbursement a surgeon's ability to provide the most common form of breast reconstruction may be limited in these patients leading to even greater disparities between privately insured and government-sponsored patients [3].

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## **Antibiotic Eluting Collagen-based Hydrogel Improves Wound Healing in Murine Model of Biofilm Infected Wounds**

Abstract Presenter

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**Introduction:** In 2018 it was estimated that 8.2 million people had wounds accounting for an estimated associated cost of \$28.1 billion to \$96.8 billion.<sup>1</sup> It is believed that over 90% of chronic wounds contain biofilms, making them difficult to treat due to increasing antibiotic resistance and a constantly evolving microbiome.<sup>2</sup> Collagen-rich hydrogel (cHG), a biocompatible hydrogel that is simple to manufacture and enhances neovascularization, is a promising way to treat these challenging wounds. This study assesses the efficacy of an antibiotic-eluting collagen-rich hydrogel (cHG+abx) for the topical treatment of a wound colonized with Methicillin-Resistant *Staphylococcus aureus* (MRSA) using an established murine model of biofilms.

**Methods:** Using a stented wound model, 120 mice were divided into four groups: control (wound only), infection only (IO), infection+cHG (IcHG), and infection+cHG augmented with antibiotic (IcHG+ABX). On post-operative day (POD) 2, infection groups were inoculated with MRSA biofilms; on POD 4, a standard occlusive dressing with or without cHG or cHG+ABX was applied. Group specific dressings were replaced every other day until sacrifice on POD 5, 8, 14, or 17. Rate and quality of wound healing was assessed via wound histology. Systemic symptoms were monitored with temperature, weight, and hematologic labs.

**Results:** Histological analysis demonstrated the IcHG+ABX group had significantly

shorter wound lengths than the IO group at POD 5 ( $3263.97\mu\text{m} \pm 79.10\mu\text{m}$  vs  $3518.87\mu\text{m} \pm 160.82\mu\text{m}$ ,  $p<0.001$ ), POD 8 ( $1408.06\mu\text{m} \pm 104.037\mu\text{m}$  vs  $3096.07\mu\text{m} \pm 91.29\mu\text{m}$ ,  $p<0.001$ ), and POD 14 ( $1057.19\mu\text{m} \pm 133.70\mu\text{m}$  vs  $240.19\mu\text{m} \pm 153.08\mu\text{m}$ ,  $p<0.001$ ). Additionally, the ICHG+ABX group had significantly decreased inflammatory tissue thickness at POD 5 ( $251.05\mu\text{m} \pm 53.73\mu\text{m}$  vs  $313.32\mu\text{m} \pm 169.71\mu\text{m}$ ,  $p=0.0126$ ), POD 8 ( $199.83\mu\text{m} \pm 112.19\mu\text{m}$  vs  $388.49\mu\text{m} \pm 179.11\mu\text{m}$ ,  $p<0.0001$ ), and POD 14 ( $39.39\mu\text{m} \pm 30.80\mu\text{m}$  vs  $134.61\mu\text{m} \pm 137.55\mu\text{m}$ ,  $p<0.0001$ ). No animals were sacrificed due to illness or signs of distress during the experiment. Diagnostic labs showed normal renal and liver function for all ICHG+ABX mice.

**Conclusion:** Human-derived collagen hydrogels are a promising carrier of antibiotics to topically treat biofilm-colonized wounds. We demonstrated that human-derived collagen hydrogel effectively eliminated MRSA biofilms in vivo and accelerated wound closure rate while reducing inflammation without adverse systemic effects. cHG offers a biocompatible, topical option with dual functionality; antibiotic-augmented collagen hydrogels eliminate wound biofilms while accelerating wound healing.

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## **Artificial Intelligence has Potential to Improve the Literacy of Aesthetic Patient Information**

Abstract Presenter  
Austin Chen MD

Abstract Co-Author  
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**Purpose:** The advent of artificial intelligence (AI) software has spurred a number of applications to consolidate data but also perform tasks, both of which have potential to augment patient care. The aim of this study is to assess the usefulness of the AI search

engine ChatGPT in the aesthetic field for patients via evaluation of the accuracy and literacy of the information it can provide.

**Materials and Methods:** Ten of the most common aesthetic procedures were selected as the search topics. Patient information on these topics from The Aesthetic Society website were extracted, along with outputs from the ChatGPT search. ChatGPT was then asked to improve on the readability of its outputs. Readability scores were compared between The Aesthetic Society and ChatGPT, as well as between ChatGPT (pre-readability adjustment) and ChatGPT (post-readability adjustment), via t-tests. Readability was analyzed using established tests: Coleman-Liau, Flesch-Kincaid, Flesch Reading Ease Index, FORCAST Readability Formula, Fry Graph, Gunning Fog Index, New Dale-Chall Formula, New Fog Count, Raygor Readability Estimate, and Simple Measure of Gobbledygook (SMOG) Readability Formula.

**Results:** The mean reading grade level for patient information extracted from The Aesthetic Society website was 9.55 at the high school grade level whereas mean reading ease scores was 61.23 at the standard level. Mean reading grade level for aesthetic information extracted from ChatGPT was 12.12, whereas mean reading ease score was 47.87, falling in the difficult level. Mean reading grade level for ChatGPT (post-readability adjustment) was 6.65 and mean reading ease score was 71.23 at the fairly easy level. There was a significant difference in reading grade level and reading ease ( $p < 0.001$ ) between both The Aesthetic Society and ChatGPT aesthetic information, as well as between ChatGPT (pre-readability adjustment) and ChatGPT (post-readability adjustment). ChatGPT text was accurate in comparison to that of The Aesthetic Society, although shorter in length and scope.

**Conclusion:** Although ChatGPT extracted patient information at baseline is significantly more difficult than that from The Aesthetic Society, with both above that of the average American adult middle school level, ChatGPT does have potential to efficiently create accurate, more readable texts to improve health literacy for aesthetic patients.

## **Assessment of Multimodal Non-Opioid Analgesia in Postoperative Pain Management for Gender-Affirming Mastectomy**

Abstract Presenter  
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**Introduction:** The opioid crisis and concerns over the risks associated with opioid medications have led to an increased exploration of non-opioid analgesics for managing postoperative pain. This approach is especially important for patients receiving gender-affirming surgeries like gender-affirming mastectomy (GAM), who may face an increased risk of substance use disorders from the stress and mental health challenges associated with gender incongruence and societal stigma. As postoperative opioid prescriptions are a significant contributor to the opioid crisis, it is crucial for healthcare providers to explore and adopt alternative strategies for pain management. Although evidence supporting non-opioid analgesia exists across various surgical domains, its application specially in GAM remains underexamined. As the prevalence of GAM rises, identifying strategies to enhance postoperative care is vital. This study aims to evaluate efficacy of multimodal non-opioid analgesic regimen in patients undergoing GAM.

**Methods:** This was a prospective study of patients undergoing GAM at the University of California, San Francisco (UCSF) compared to historical control patients in randomized surgeon blinded regional block study. Similarly, those who were under 18 years old, had a history of opioid use disorder, chronic pain syndromes, and/or neuropathy were excluded from this study. Patients were discharged with 100 mg gabapentin and 500 mg acetaminophen tablets to take as needed. Additionally, pain levels were recorded in a pain diary utilizing a visual analog scale, and medication intake was logged for the first postoperative week. One month postoperatively, patients completed an online quality of recovery survey through a Qualtrics form. Comparisons were made with a historical cohort of patients treated with 0.5 mg hydrocodone. Data analysis was performed using Stata version 17.0 (College Station, TX, USA) and utilized descriptive statistics along with t-tests.

**Results:** To date seven patients were enrolled in the non-opioid postoperative regime and were compared to 21 patients who received the opioid-based regimen after GAM. There was no significant differences in age (27.5 versus 32.1 years,  $p=0.27$ ) and case duration (156.0 versus 142.1 minutes,  $p=0.26$ ) between the cohorts. Postoperative pain scores were comparable across both cohorts, ranging from 2.0 to 3.5 in the opioid group and 2.3 to 4.4 in the non-opioid group, with no significant differences at any time point. Data collected on medication intake revealed peak consumption patterns: the



opioid cohort showed maximum intake on postoperative days 0 and 1, whereas the non-opioid cohort peaked on days 3 and 4. On average, 2.4 tablets of hydrocodone were consumed on post-operative day 0 and 2.2 tablets on day 1. Conversely, an average of 6.5 tablets of acetaminophen and 3.0 tablets of gabapentin were consumed on day 3, and 5.7 tablets of acetaminophen and 2.7 tablets of gabapentin on day 4. Regarding the postoperative survey, an average score of 8.6/10 was recorded across the domains of physical health, psychological well-being, and social well-being, highlighting excellent outcomes following surgery.

**Conclusion:** Preliminary findings suggest that multimodal non-opioid analgesic regimen may effectively manage postoperative pain in GAM patients. As the study progresses, integrating an opioid-sparing approach to postoperative care following GAM is recommended for consideration.

## **Autologous Breast Reconstruction in Patients with Hypercoagulability Disorders: A Case Series of Twenty-Four Flaps**

Abstract Presenter  
Nicholas Fadell

Abstract Co-Author(s)  
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**Purpose:** Autologous tissue transfer has become the gold standard of breast reconstruction. Patients with disorders of hypercoagulability represent a unique population at increased risk of thromboembolic events. Many surgeons use additional anticoagulation medications, beyond standard venous thrombosis prophylaxis, to reduce this risk. Most current literature on this topic centers on lower extremity reconstruction, and data on breast reconstructions is sparse. The purpose of this study is to review thrombotic-related surgical outcomes in hypercoagulable patients undergoing free flap breast reconstruction.

**Methods:** A retrospective case series was conducted at a single institution examining data from June 2018 to December 2023. Patients were included if they underwent autologous free flap breast reconstruction during a hypercoagulable state due to

heterozygous factor V Leiden, antiphospholipid syndrome, sickle cell trait, sickle cell anemia, protein S deficiency, methylenetetrahydrofolate (MTHFR) mutation, or perioperative hormone therapy with tamoxifen. Patient data collected included the cause of hypercoagulability, age, sex, BMI, past medical history, medications, and perioperative anticoagulation regimen. Thrombosis-related complications examined included total flap failure, fat necrosis observed clinically and requiring surgical debridement, and deep venous thrombosis/pulmonary embolism (DVT/PE). Patients were divided into two categories: those who received standard DVT prophylaxis with weight-adjusted low molecular weight heparin (Lovenox) during hospital stay and those who received additional anticoagulation such as postoperative oral aspirin and intraoperative intravenous (IV) heparin. Confidence intervals were calculated for proportions and Fisher's exact tests were performed.

**Results:** Out of 575 patients, 14 patients with a total of 24 free flaps were reviewed. This included 19 (79%) deep inferior epigastric perforator (DIEP) flaps, four (17%) transverse upper gracilis (TUG) flaps, and one (4%) transverse rectus abdominis muscle (TRAM) flap. Five flaps were performed with routine perioperative Lovenox, and nineteen flaps were performed with additional anticoagulation medication. The patient group that received additional anticoagulation experienced a higher percentage of uneventful postoperative courses compared to the standard anticoagulation group (79% versus 60%,  $p = 0.568$ ) and a lower rate of fat necrosis requiring surgical debridement (5% versus 40%,  $p = 0.099$ ). In the cohort with additional anticoagulation, one patient (5%) experienced total flap loss on postoperative day two, and one patient experienced DVT/PE on postoperative day eight. Additional anticoagulation regimens used included 5000 units IV heparin intraoperatively (16 flaps, 84%), daily 81 mg aspirin postoperatively until discharge (8 flaps, 42%), and continuation of Lovenox after discharge (2 flaps, 11%).

**Conclusions:** Autologous breast reconstruction in hypercoagulable patients appears safe with the addition of anticoagulation beyond DVT prophylaxis. A larger sample size is needed to further examine complication rates and determine optimal anti-thrombotic regimens. Risks with autologous tissue transfer for patients with hypercoagulability can be mitigated with appropriate chemoprophylaxis.

### **Autologous fat transfer for carpometacarpal osteoarthritis**

Abstract Presenter  
Emily Saurborn

Abstract Co-Author(s)

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**Introduction:** The thumb carpometacarpal joint (CMC) is the second most common joint of the hand to develop arthritis (1). Current interventions are either simply temperative or surgically invasive, requiring long recovery and destruction of the joint (2). Autologous fat transfer is emerging as a minimally invasive solution to reduce pain and improve function in patients with CMC arthritis.

**Purpose:** The purpose of this study is to analyze the effect of autologous fat transfer on outcomes in patients with basilar thumb arthritis.

**Methods:** Twenty-five patients with CMC arthritis underwent autologous fat transfer under fluoroscopic guidance. Autologous fat was harvested from the abdomen and separated with non-adherent gauze (Telfa). After processing, 2 ml of fat was injected into the CMC joint. All patients were placed in a prefabricated orthoplast splint for 2 weeks immediately after undergoing fat transfer.

Patients completed Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire both preoperatively and postoperatively at 1 month, 6 months, 12 months, and 24 months. Paired t-tests were used to compare pre-treatment to post-treatment DASH scores. Significance was set at a p-value <0.05 (95% CI).

**Results:** Of the 25 patients, 18 patients were women, and 7 patients were male. Radiographically, patients were staged between Eaton-Littler stages II and IV: 8 patients stage II, 8 patients stage III, 6 patients stage IV, and 1 patient was not classified. The average preoperative pain score on a visual analog scale was 8.28 out of 10. The average preoperative DASH score was 52.99 (N=25) (SD=14.51), 95% CI [46.99, 58.98]. The average postoperative DASH score at 1-month follow up was 27.82 (N=24) (SD=15.04), followed by an average DASH score at 6-month follow-up of 22.16 (N=16) (SD=14.12), an average DASH score at 12-month follow-up of 26.45 (N=16) (SD=18.81), and an average DASH score at 24-month follow-up of 15.41 (N=6) (SD=9.26). Significant improvements in DASH scores were reported at the 1 month, 6-month, 12-month and 24-month follow up ( $p < 0.01$ ). No adverse events were observed.

**Conclusion:** Autologous fat transfer for the treatment of CMC osteoarthritis significantly improved DASH scores in our cohort. Our patients' 50% improvement in DASH scores at 12-months highlights the clinical significance of autologous fat transfer as a longer

lasting alternative to steroid injection and less invasive alternative than trapeziectomy. Additional study of fat transfer is warranted to better understand the physiologic mechanisms and longer term benefits.

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## **Benefits of exoscope in head and neck reconstruction**

Abstract Presenter

Shinichi Higuchi MD

**PURPOSE:** Recently, 4K 3D exoscope has been developed, enabling high-precision images to be obtained. Because there is no need to look through the lens, the surgeon can perform surgery in any posture he or she likes, which reduces the burden on the body. The small size of the exoscope body allows the camera arm angle to be adjusted freely, making it possible to perform surgeries at angles that were previously difficult, such as looking up position. On the other hand, it is necessary to become accustomed to the operation of the exoscope, and previous studies reported that the time required for vascular anastomosis is longer than that for surgery using a microscope. Our institution adopted the Olympus ORBEYE exoscope system in April 2022 and has been using it for head and neck reconstruction. We evaluated head and neck reconstruction using the ORBEYE.

**Material:** Sixty consecutive patients who underwent free flap reconstruction using the ORBEYE at our institution were included in the study. Surgical time, blood loss, perioperative complication rate, time required for arterial and venous anastomosis, and time spent using an exoscope were investigated. Head and neck reconstructions performed using a microscope were used for comparison. Comparisons were also made between the first 30 and second 30 patients who underwent surgery using an exoscope.

**Results:** There were no significant differences in any of the parameters between the microscopic and the exoscopic surgery groups. Significant reduction of anastomosis time was observed in the latter 30 cases compared to the first 30 cases. The comparison of the anastomosis time, blood loss, and perioperative complication rate were not significantly different between the exoscope and microscope groups.

**Discussion:** The advantages of using an exoscope are as follows: (1) Surgery can be performed in a comfortable posture with the head up. (2) The camera is easy to handle due to its small size, and the angle of the arm can be adjusted freely. (3) The screen on the monitor can be shared. Although there are some reports that the transition from microscope to exoscope is smooth, the first 30 cases gave the impression that it took some time to get used to it. In fact, the time to use the microscope and the time for anastomosis of arteries and veins decreased significantly, suggesting that it takes time to become accustomed to the use of the microscope.

**Conclusion:** It took time to become accustomed to the use of the exoscope. Once accustomed, the time required for vascular anastomosis was comparable to that of surgery under a microscope, and therefore the advantages of the exoscope were maximally enjoyed.

## **Case Report: Effective Management of a Stage IV Pressure Ulcer with Fish Skin Grafts**

Abstract Presenter  
Anvitha Madhavaram

Abstract Co-Author  
Richard Simman MD

**Purpose:** Pressure ulcers represent a significant clinical challenge, particularly at advanced stages, due to their impact on patient morbidity, healthcare costs, and quality of life. Stage IV pressure ulcers require innovative treatment strategies to promote healing. Recent advancements have introduced acellular fish skin grafts as a promising option for wound management, leveraging their bioactive properties to facilitate tissue repair. This case report details the successful application of acellular fish skin grafts in treating a Stage IV pressure ulcer in a 38-year-old male, showcasing the potential of this novel treatment modality.

**Case Presentation and Methods:** A 38-year-old male with a past medical history of paraplegia presented with a Stage IV pressure ulcer on the left hip. The ulcer measured 0.5x0.4x2.6 cm<sup>3</sup>, with exposed bone and significant tissue loss. Despite conventional treatments, including debridement and standard dressings, the ulcer showed minimal improvement and slow healing. The treatment strategy was revised to include acellular fish skin grafts. The patient underwent two applications of the fish skin matrix, with each application following wound debridement with ulcer most recently measured at ulcer measured 0.3x0.4x1.3 cm<sup>3</sup>.

**Discussion:** Acellular fish skin grafts, derived from the North Atlantic cod (*Gadus morhua*), offer a novel approach to wound care, particularly for challenging cases such as Stage IV pressure ulcers. These grafts are not only rich in omega-3 fatty acids, which possess anti-inflammatory properties and promote wound healing, but also provide a conducive scaffold for cell migration and tissue regeneration (1). Their structural similarity to human skin makes them an excellent option for facilitating the healing process in complex wounds.

In this case, significant healing was observed with the first fish skin matrix application. This outcome is consistent with the literature, which suggests that acellular fish skin grafts can accelerate wound healing, reduce the risk of amputation, and improve patients' quality of life compared to standard care (2). Furthermore the grafts' effectiveness in managing hard-to-heal lower extremity chronic ulcers, supports their use in similar complex wound scenarios.

The rapid and complete healing of the Stage IV pressure ulcer in this patient underscores the potential of acellular fish skin grafts as a viable treatment alternative for advanced pressure ulcers. This case contributes to the growing body of evidence supporting the integration of biotechnological advancements into wound care protocols, potentially offering substantial benefits for patients with difficult-to-heal ulcers. Further research and clinical trials are warranted to explore the full scope of applications for acellular fish skin grafts in wound management and to establish standardized treatment guidelines.

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## **Case-Control Study of Plastic Surgery Influencers**

Abstract Presenter

William Lee

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**Introduction:** Physicians have primarily used websites to advertise their practice to patients, but now the transition to modern social media platforms like TikTok has provided an opportunity for any physician to engage with the broader general population more frequently, advertise their practice with highly stimulating media, empower patients with more knowledge, and prevent the dissemination of misinformation (Cho, Furnas, Rohrich 2019). This case-control study provides a comparison between plastic surgeons who are widely known and popular on TikTok (Influencers) and plastic surgeons who use TikTok but have no large following (Casuals). We searched and collected analytics from TikTok's plastic surgery Influencers, defined as an account with equal to or over 100,000 followers, and Casual users, defined as accounts between 10,000 and 100,000 followers, over a three week period from December 2023 to January 2024. Our goal was to examine and categorize the different types of content both groups produce, then note any association between certain content types and either Influencer or Casual status.

**Methods:** We queried TikTok with several search terms, such as "plastic surgeons of TikTok" and "plastic surgery", and placed accounts into either the Influencer or Casual group. Exclusion criteria were accounts pertaining to residency programs, organizations, unrelated fields, practicing outside of the U.S., with 10,000 followers or less, and accounts lacking enough posts for analysis. For each account, demographic information from a holistic view of their account and data of their most recent thirty posts

were collected. Using the Casuals as a reference group, odds ratios (OR) with 95% confidence intervals were calculated via the Prism GraphPad's tool for each different type of content, then grouped into categories based on similarity.

**Results:** Fifty-eight Casuals and forty-three Influencers were included in the study. Out of twenty-three separate content types, seven demonstrate an association, although insignificant, with Influencer status: Patient Consult, Patient Interview/Testimonial, Patient Follow-up, Medical Advice, Educational, Day in the Life, Trends. Three content types were significantly associated with Casual status: Procedure Videos, Advertising Procedures, Replying to Questions/Comments.

**Conclusion:** The seven types of content produced by plastic surgeons on TikTok that appear to have an association, although insignificant, with Influencer status focus on the patient's perspective of the plastic surgeon and their practice, notably patient interviews, patient testimonials, and patient follow-ups. In addition to educational content, this information is very valuable to patients who are considering plastic surgery and want to learn more before proceeding. However, too much detail is unappealing. The significant association with Casual status for accounts that produce videos of the operations plastic surgeons perform, often without sensitive content warnings, and the plastic surgeon replying to questions or directly advertising procedures, suggests this type of media with great detail may not be preferred for viewers.

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## **ChatGPT 4.0's Efficacy in the Self-Diagnosis of Non-Traumatic Hand Conditions**

Abstract Presenter  
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**Purpose:** Patients face several barriers in scheduling medical appointments, including work constraints, financial burdens, and limited appointment availability (Chapman et. Al, 2022). With the digitalization of healthcare, patients are increasingly turning to the Internet to self-diagnose. Online symptom checkers, however, have demonstrated low diagnostic accuracy (Wallace et al., 2022). Given the rapid advancement of artificial intelligence, natural language processors like ChatGPT 4.0 have emerged as alternatives to traditional search engines. Although some studies have explored the efficacy of ChatGPT 4.0 in making clinical diagnoses, there is limited literature investigating ChatGPT's diagnostic accuracy for upper-extremity musculoskeletal conditions (Kuroiwa et al., 2023). This study explores ChatGPT 4.0's utility as an interim diagnostician for common non-traumatic hand conditions. Secondly, this study evaluates the terminology ChatGPT associates with each condition by assessing its ability to generate condition-specific questions from a patient's perspective.

**Materials and Methods:** Five common hand conditions were identified: trigger finger (TF), Dupuytren's Contracture (DC), carpal tunnel syndrome (CTS), de Quervain's tenosynovitis (DQT), and thumb carpometacarpal osteoarthritis (CMC). Author-generated questions were created by synthesizing symptoms from patient-facing medical websites. The validity of author-generated questions was verified by a board-certified hand surgeon. ChatGPT was then queried using the list of author-generated questions. For each query, authors recorded the frequency of correct diagnoses, differential diagnoses, recommendations to seek a healthcare provider, common symptoms, disease causes, diagnostic tests, treatments, and risk factors. Chi-squared tests were run in R Statistical Package and used to compare response quality between conditions for author-generated questions. ChatGPT was further prompted to produce its own questions using the following query: "You are a patient. Ask a doctor about symptoms that you are having of [diagnosis] without knowing that is the diagnosis." A Python script was used to count the most common terms in ChatGPT-generated questions.

**Results:** For the author-generated questions, ChatGPT's diagnostic accuracy significantly differed between conditions ( $p < 0.005$ ). While ChatGPT was able to diagnose CTS, TF, and DQT with 100% accuracy and DC with 96% accuracy, it correctly diagnosed CMC only 60% ( $n=15$ ) of the time. Additionally, there were significant differences between the number of times ChatGPT provided differential diagnoses ( $p < 0.005$ ), diagnostic tests ( $p < 0.005$ ), and risk factors for each condition ( $p < 0.05$ ). ChatGPT recommended visiting a healthcare provider for 97% ( $n=121$ ) of the

author-generated questions. Analysis of ChatGPT-generated questions showed four of the top ten most used terms were shared between DQT and CMC.

**Conclusions:** The study results suggest that ChatGPT 4.0 has excellent potential to be used as a preliminary diagnostic tool. Although analyses showed significant variation in some categories of qualitative output between conditions, ChatGPT was able to reach a correct diagnosis over 95% of the time for four out of the five conditions. Along with asking ChatGPT to provide preliminary diagnoses, our study further identified potential language patterns that ChatGPT uses to describe common hand conditions. Future studies should build on these findings by investigating factors that improve or worsen AI's diagnostic power, and by studying the implications of patient utilization of ChatGPT.

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## ChatGPT for Plastic Surgeons: Paving the Way Towards Statistical Literacy

Abstract Presenter

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**Introduction:** ChatGPT's Code Interpreter is a new feature accessible to premium users that integrates code generation and execution into the unified GPT-4 environment. The advent of this tool has the potential to democratize access to statistical analysis for all physicians, including plastic surgeons. Statistical knowledge and data analysis are critical tools in the armamentarium of the modern-day plastic surgeon, as evidence-based medicine underpins patient care and the advancement of surgical techniques. Despite the acknowledged importance of statistics in medicine,

many physicians are constrained by an inadequate understanding of statistical principles or limited access to data analysis tools. Even the new, more tech-savvy generation of plastic surgeons has encountered a similar dilemma, as studies have shown that plastic surgery residents recognize the value of biostatistics yet lack the knowledge to apply it. Hence, our goal is to investigate Code Interpreter's suitability as a statistical aid for plastic surgeons. Our hope is for plastic surgeon-scientists to gain a comprehensive grasp of statistics through this tool, ultimately enhancing the practice of evidence-based plastic surgery.

**Methods:** A subset of the National Inpatient Sample was selected for the assessments. Data analysis tasks were divided into descriptive statistics and inferential statistics. Descriptive statistics included mean, standard deviation, median, and interquartile range calculations. These were evaluated based on the accuracy of the outputted values. Inferential statistics included Chi square, Pearson correlation, Independent two-sample t-test, One-way ANOVA, Fisher's exact, Spearman correlation, Mann-Whitney U test, and Kruskal-Wallis H test. Inferential statistics tasks were evaluated based on method selection, statistical assumptions, and outputted values. For both descriptive and inferential statistics, a series of prompts were developed to instruct ChatGPT on how to perform the task. Each prompt was inputted into ChatGPT ten times to ensure reliability. Verification analyses were then conducted using SAS.

**Results:** Code Interpreter demonstrated proficiency throughout the descriptive statistics assessments, correctly outputting the requested values across all attempts. Inferential statistics testing also exceeded expectations. ChatGPT selected the correct method in 75 of 80 attempts at inferential statistics. In those 75 correct attempts, ChatGPT also provided the correct assumptions, test statistics, and p-values.

**Conclusion:** For plastic surgeons with statistical knowledge but limited programming skills, Code Interpreter represents a valuable research tool, capable of assisting with exploratory data analysis. While its high accuracy and efficiency underscore its potential as an analytical tool, the occasional incorrect outputs highlight the need for confirmatory analysis through traditional statistical methods. Hence, we do not recommend this be used in published research without the input of a biostatistician. This tool also offers an invaluable learning opportunity for surgeons with minimal statistical background, encouraging hands-on experimentation to foster a deeper understanding of biostatistics. Through interactive engagement, plastic surgeons can enhance their comprehension of when and how to apply statistical tests, and grasp the implications of these tests in their research and clinical practice. Ultimately, we believe ChatGPT has the potential to increase statistical literacy among plastic surgeons, enabling them to better understand and practice evidence-based medicine.

## **Chimeric Multiple Perforator Fibula Flap (CMPF): Expanding Single Flap Reconstruction and Optimizing Donor Site Morbidity**

Abstract Presenter

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**Purpose:** The free osteocutaneous fibula is the flap of choice for complex composite mandibular and maxillary reconstruction. However, recipient defect size, flap volume, and donor site morbidity pose individual challenges. We present an anatomic study and clinical application of a perforator-preserving free fibula flap with multiple individual skin islands and a lateral hemisoleus. The chimeric multiple perforator free fibula (CMPF) design increases the versatility of the flap, obviates the need for secondary free tissue transfer, and improves donor site morbidity.

**Methods:** A perforator preserving technique was used in 38 cadaveric flap dissections. A total of 138 cutaneous perforators were isolated, averaging 3.64 perforators per leg, 78% of which were musculocutaneous. Twenty-six percent were located in the proximal third, with an average length of 6.8 cm. The tibioperoneal trunk gave rise to the proximal peroneal perforator in 15.2% of cases and was not included in the single-pedicle free fibula flap dissection. From April 2011 to May 2017, the CMPF flap was utilized in 117 composite mandibular and maxillary reconstructions. Age ranged from 7 to 74 years. Flap design was based on defect size and isolated cutaneous and muscular perforators.

**Results:** All patients were reconstructed using the CMPF flap technique. The flap contained multiple skin islands in 87 cases (74.4%) and a single proximal skin island in 25 cases (21.3 %). In 86.3% of patients, the proximal perforator was a direct branch of the peroneal artery. It followed a musculocutaneous course in 88% of cases, with an average length of 7.4 cm. In 13.7% of patients, the proximal perforator was a direct branch of the tibioperoneal trunk, leading to a distal flap design. The lateral hemisoleus was harvested in 61.5% of cases. The proximal leg defect was primarily closed in 76.8% patients and skin grafted in 23.2%; distal leg donor site was grafted in 87%.

There were no proximal donor site dehiscences and all skin grafts healed well. The distal donor site dehiscence rate was 72.8% and required local wound care or regrafting. Nine flaps (7.7%) were lost due to salivary fistula or infection, all of which occurred in complex tertiary cases.

**Conclusion:** The CMPF flap is based on a single peroneal vascular pedicle and provides independent skin and muscle components for large volume complex head and neck reconstructions. Utilizing the proximal perforator and associated skin island improves donor site morbidity.

### **Comparison of Clinical Characteristics and Outcomes between Idiopathic and Secondary Necrotizing fasciitis in Streptococcal Infections: A Single-center Retrospective Study**

Abstract Presenter  
Chun-Yang Kuo MD

**Background:** The prognosis of necrotizing fasciitis (NF) depends on early recognition and management. Idiopathic NF may be more challenging, due to the lack of a known causative factor. 1, 2 Necrotizing fasciitis caused by streptococcal infection can occur on the healthy young patients and often spreads rapidly, leading to widespread necrosis of the subcutaneous tissues and even fatal sepsis. 3-5 Early diagnosis and treatment of idiopathic streptococcal NF remained as a clinician difficulty.

**Aim and Objectives:** The patients with necrotizing fasciitis caused by streptococcal infection were classified in to two groups, based on their routes of infection. Our purpose in this study was to identify the specific features of idiopathic streptococcal NF that are important in early recognition and to assess the factors associated with prognosis.

**Materials and Methods:** This is a single-center retrospective study between J January 1st 2013 and December 31st 2019. The patients were enrolled based on the tissue or wound culture reports of Streptococci. The records of 49 patients with pathologically confirmed necrotizing fasciitis were retrospectively reviewed. We collected the data of route of infection, patients' demographics, predisposing factors, microbiology, hematology, frequency of surgery, the duration between the onset of symptoms and surgery, and outcomes, and then compared these data in to the two groups by performing a statistical analysis. Univariate analysis and multivariate analysis, and

receiver operating characteristic curve analyses were performed.

**Results:** Idiopathic NF occurred in 25 of 47 patients (53%). Of the 49 patients, there were 2 cases excluded due to short of strong evidence of NF. The incidence of the idiopathic groups was slightly higher. Patients in idiopathic NF group were more like than those with secondary NF to have younger population and higher qSOFA score ( $0.84 \pm 0.9$  vs.  $0.32 \pm 0.6$ ,  $p=0.031$ ). Even white blood counts(WBC) were not significantly different between idiopathic and secondary NF, the significant higher C-reactive protein levels and blood lactate levels were found in patients of idiopathic group ( $25.99\text{mg/dL}$  vs.  $19.59\text{mg/dL}$ ,  $p=0.046$ ;  $3.47\text{mg/dL}$  vs.  $1.71\text{mg/dL}$ ,  $p=0.007$ , respectively). There was no significant difference in predisposing factors and mortality rate between the two groups. More patients needed ICU admission and longer hospital stay in the idiopathic streptococcal NF group than the secondary group (52% vs 13.6%,  $p$  value= 0.012; 35.4 days vs. 23.59 days,  $p$  value=0.045). Multivariate analysis revealed that the serum lactate levels and qSOFA score independently predicted the idiopathic streptococcal NF group (Odds ratio: 3.058,  $p$  value= 0.031; Odds ratio: 2.306,  $p$  value=0.044).

**Conclusion:** Patients with idiopathic NF present among relatively young and healthy populations, without skin lesions or traumatic history. We should stay vigilant in such patients with extremely high CRP level and serum lactate level. By elucidating the differences in clinical presentation, we can enhance the clinical approach to idiopathic NF and provide effective management promptly.

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# **Comparison of Complication Rates of Horizontal and Vertical Medial Thighplasty Following Massive Weight Loss: A Systematic Review and Meta-Analysis**

Abstract Presenter

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**Purpose:** Massive weight loss patients often desire thighplasty to address their excess thigh skin, but they are at risk for increased complications due to diminished skin quality. This study sought to compare the complication rates between two common thighplasty techniques: horizontal and vertical incision.

**Methods:** A systematic review following PRISMA guidelines was performed to assess complication rates from different thighplasty techniques. Five papers met inclusion criteria and were used to compare horizontal and vertical incision thighplasty complication rates. Complications included seroma, hematoma, wound dehiscence, skin necrosis, deep vein thrombosis, infection, scar migration, wound healing problems, lymphedema, and re-operation.

**Results:** 285 patients (mean age 44 years, 91% female) were treated with horizontal (N = 80) or vertical (N = 205) incision medial thighplasty. Common complications in both groups included wound dehiscence, wound infection, and seroma. Wound dehiscence was the only complication that showed a statistically significant difference between the horizontal (16.3%) and vertical (28.8%) thighplasty cohorts ( $p=0.029$ ). Although not statistically significant, the vertical incision group also had a greater percentage of reoperation (4.9%) compared to the horizontal incision group (1.25%). The correlation of complication rates and patient comorbidities and demographics was not possible to calculate due to inconsistent reporting of data across the studies.

**Conclusion:** Complications are common after medial thighplasty. Wound dehiscence was found to be less likely to occur with the horizontal thighplasty technique, which may indicate its superiority in certain patient populations. Horizontal incisions may also provide an additional aesthetic benefit due to the hidden nature of the scar. The

reoperation rate should also be considered, particularly among elective surgery patients. The choice to perform horizontal or vertical incision medial thighplasty may be influenced by patient demographics and history, which could also impact complication rates. The current study demonstrated that published research is lacking in the standardized reporting of factors that likely impact complication rates of thighplasty beyond the technique itself. Future research should aim to assess the impact of variables such as patient comorbidities, concomitant liposuction, average weight loss prior to surgery, resection weights, and drain use in order to determine optimal thighplasty practices.

## **Complication Profile Of Male To Female Gender Affirming Surgery - An ACS NSQIP Analysis**

Abstract Presenter  
Hanna Pfershy

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Ronald Ford MD

**Objective:** The frequency of performing male to female gender affirming surgery has increased over the past decade, indicating the importance of characterizing the complication profile. Therefore, we performed a multi-institutional analysis to present the postoperative outcomes and risk factors for adverse events after male to female gender affirming surgery.

**Methods:** Data was collected from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database (2005-2021). Patients were identified by those that underwent procedure CPT 55970; intersex-male to female surgery. The postoperative outcomes included 30-day reoperation, readmission, and surgical and medical complications. Demographic factors, medical comorbidities, and preoperative laboratory values were analyzed using univariate and multiple logistic regression to determine risk factors for complication occurrence.

**Results:** We identified 376 patients who underwent surgery from 2011-2021. The average patient age was  $35.9 \pm 12$  years, with most patients being white ( $n=266$ ; 71%) and documented as female ( $n=273$ , 73%). The average number of concurrent



procedures was  $3.5 \pm 3.6$  and operation time was  $250 \pm 93$  minutes. Complication rate was 15% (n=56), with wound disruption (n=30, 8%), readmission (n=13, 3.5%) and return to OR (n=10; 2.7%) accounting for the most common adverse events. For every minute increase in operation time, the odds of a surgical complication were 1.004 ( $p < 0.0001$ ) higher and the odds of any complication were 1.006 ( $p < 0.0001$ ) higher. The odds of a surgical complication were 2.5 ( $p = 0.015$ ) times higher in smoking patients.

**Conclusion:** Wound disruption made up the majority of complications for male to female gender affirming surgery, indicating an important outcome to assess for postoperatively. There are no preoperative factors that can be optimized to improve outcomes except for smoking cessation, which is well-established and supported by this analysis. In addition, when operative planning physicians should expect that any additional time in the OR increases chances of complications.

## **Complications Following Open Treatment of Frontal Sinus Fracture: A Nationwide Analysis of 1,492 Patients**

Abstract Presenter  
Alexander Kammien

Abstract Co-Author(s)  
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James Clune MD

**Background/Purpose:** Prior studies characterizing surgically managed frontal sinus fractures are small, institutional studies from major trauma centers (1-5). The current study characterizes the concomitant injuries and complications following open treatment of frontal sinus fractures across the United States.

**Methods:** Patients who underwent open treatment for a frontal sinus fracture between 2010 and 2022 were identified in a national administrative database. Patients  $< 18$  years old and with  $< 90$  days of follow-up were excluded. Type of fracture (simple or complex), frontal sinus obliteration and concomitant fractures (facial, vertebral, extremity) were identified. 90-day surgical site infection, sinusitis, meningitis, brain abscess and cerebrospinal fluid leak were identified, as well as mucocele any time after surgery.

**Results:** There were 1,492 adult patients with open treatment of frontal sinus fractures:

654 (44%) with simple fractures and 838 (56%) with complex fractures. There were 157 (11%) patients with frontal sinus obliteration. Concomitant fractures included facial (715 patients, 48%), vertebral (55, 4%), upper extremity (40, 3%) and lower extremity (53, 4%). Within 90 days of surgery, 155 (10%) patients had a complication: surgical site infection (42, 2.8%), sinusitis (29, 1.9%), meningitis (25, 1.7%), brain abscess (23, 1.5%), and cerebrospinal fluid leak (63, 4.2%). There were 11 (0.7%) patients who developed a mucocele, and <11 (<0.7%) underwent reduction of contour deformity. On multivariate analysis, complex frontal sinus fracture and concomitant vertebral/extremity fracture were associated with increased likelihood of a complication.

**Conclusion:** Over the last thirteen years, complication rates are low following surgically managed frontal sinus fractures. Comminuted fractures and those involving the posterior table increase the likelihood of a complication, likely due to increased injury severity. The results of the current study generally align with the published single-institution studies on complications of frontal sinus fractures treated with surgery. These findings from a large, nationwide cohort strengthen prior conclusions and increase the generalizability of reported complication rates.

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## Contemporary Surgical Approaches to Lip Lifts: A Comprehensive Overview of Current Lip Lift Operation Techniques

Abstract Presenter  
Marah Miller

Abstract Co-Author  
Rahul Varman MD

**Purpose:** This poster aims to assist surgeons and their patients with decisions regarding the optimal surgical lip lift technique suited to each individual patient and situation by providing a resource that succinctly describes and compares contemporary surgical lift lip approaches. The poster includes descriptions of the Bullhorn, Corner, Gullwing, Italian, Upper Lip Advancement, Cupid, and Scarless techniques. It covers the focus, surgical equipment, contraindications, and acknowledged difficulty of each approach. Visual representations of each technique and its intended results are incorporated, providing a comprehensive review of the most relevant techniques that any facial plastic surgeon should be able to offer to their patients.

**Methods/Materials:** A review of articles describing the various surgical approaches to lip lifts was conducted via PubMed, Google Scholar, and Embase. Evidence-based approaches that have been utilized in the past five years (from January 2018 to December 2023) with at least 50% patient satisfaction or statistically significant improvement in procedure-specific outcomes (such as percentage improvement of lip measurements and percentage retention of the lift over time) were included. The information gathered from this review was then synthesized into a poster describing the technique, efficacy, utility, and described advantages and risks of each relevant technique.

**Experience:** For thoroughness, this poster is a review of surgical techniques and their outcomes as described in previous publications on online databases; final data comes from this review rather than cases conducted by the authors themselves.

**Results:** Plastic surgeons currently utilize numerous surgical approaches to lip lifts, each with unique result focuses, potential adversities, and reliability factors (Nagy et al. (2022), van der Sluis et al. (2022), Zhao et al. (2023)). This poster will outline the relevant approaches in a detailed yet succinct and accessible poster, broadening many surgeons' and patients' knowledge of the options available to them and streamlining the process of ensuring that the optimal technique for each individual is used.

**Conclusions:** The field of plastic surgery continues to advance at a rapid pace. It is difficult, but imperative, to stay up-to-date on the current techniques available for various operations. As a frequently performed aesthetic surgery, the multitude of approaches to lip lifts constitute a significant portion of the most relevant aspects of facial plastics. This poster provides easy access to thorough descriptions of each of the contemporary approaches, with which surgeons may guide future operational decisions

and patient education concerning lip lifts.

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### **Current Applications and Efficacy of ChatGPT in Diabetic Foot Ulcer Care**

Abstract Presenter

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**Background:** Diabetic foot ulcer (DFU) care and surgical management represent a significant challenge in plastic and reconstructive surgery. The rise of artificial intelligence (AI), notably ChatGPT, represents a resource for DFU patients to seek information regarding their care. In attempts to qualify its utility as a patient resource, we evaluated the accuracy, comprehensiveness, and safety of ChatGPT responses to frequently asked questions (FAQs) related to DFU care.

**Methods:** 11 DFU care FAQs were posed to ChatGPT Model 3.5 in December 2023. Questions were divided into topic categories of Wound Care, Concerning Symptoms,

and Surgical Management. 4 plastic surgeons in our wound care department evaluated responses for quality on a 10-point Likert scale for accuracy, comprehensiveness, and danger, defined by the extent to which closely following ChatGPT-3.5's advice could harm patients. Department attendings provided qualitative feedback. Response readability was assessed using 10 different readability indexes.

**Results:** Overall, ChatGPT answered patient questions with an mean accuracy of  $8.7 \pm 0.3$ , comprehensiveness of  $8 \pm 0.7$ , and danger of  $2.2 \pm 0.6$ . Averaged across all readability metrics, ChatGPT answered at mean grade level of  $11.9 \pm 1.8$ . Qualitatively, physician reviewers complimented the "comprehensiveness and simplicity" of the responses ( $n=11/11$ ) and the AI's ability to provide "generally good" information ( $n=4/11$ ). While only 3 responses were noted to present explicitly incorrect information, the majority of responses ( $n=10/11$ ) left out key information, such as DVT symptoms and comorbid conditions impacting salvage.

**Conclusion:** We observed that ChatGPT may provide misinformation, omit crucial details, and respond at nearly 4 grade levels higher than the American average, warranting caution for DFU patients and providers alike. However, ChatGPT was sufficient in its ability to provide general information, which may allow DFU patients to make more informed decisions, be more comfortable with their care, and learn how to prepare for their recovery. The utility of ChatGPT is likely to be further integrated into clinical practice and consultations. It is becoming increasingly synonymous with the future of healthcare and to keep pace with emerging trends, physicians should be prepared to talk about AI with their patients. Physicians must bridge the gap between potential benefits of ChatGPT and the current limitations, as seen in our study.

## **Does the Central Nasolabial Aesthetic Subunit Improve after Secondary Alveolar Bone Grafting? A Three-Dimensional Morphometric Study**

Abstract Presenter  
Peter Miller MD

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Anand Kumar MD

**Introduction:** Bone grafting is essential for management of residual alveolar cleft in patients with a cleft lip and palate. Previous studies have reported that alveolar bone

grafting can reduce nasal asymmetry, raise and support a collapsed alar base and nostril, and produce better esthetic and functional outcomes with respect to lip and nose (1). Secondary alveolar bone grafting affects the central nasolabial aesthetic subunit in unilateral complete cleft lip (2). Soft tissue changes after bone grafting in the overlying central face remains under characterized. The purpose of this study is to retrospectively utilize a three-dimensional stereophotogrammetry system (Vectra 3D) software to evaluate soft tissue volumetric changes after alveolar bone grafting. We hypothesized that soft tissue changes after bone grafting would induce favorable volumetric and linear outcomes in the study area.

**Materials and methods:** After obtaining the IRB approval, this pilot study was conducted. Patients with unilateral cleft lip and palate, age range between 7-20 years, underwent secondary bone graft and had 3D stereophotogrammetry (Vectra 3D) images taken before and at least 3 months after alveolar bone grafting. Pre-existing pre-surgical (T1) and post-surgical (T2) 3D-stereophotogrammetry images from patients with a unilateral cleft lip and palate were analyzed on the Vectra3D software. Pre and post-surgical images were superimposed and the same software and volumetric analysis of the soft tissue changes before and after alveolar bone grafting was performed. The differences in various regions of the face (alar base, upper lip, lower lip) and the amount of symmetry were assessed. The primary predictor variables were Enemark's marginal bone status and time between images. The primary outcome variables were upper lip volume (ULV), columellar length (CL), alar width (AW), and nasolabial angle (NLA). Standard statistical analysis was performed using (SPSS 27).

**Results:** Six patients met the inclusion criteria; mean age at SABG (n=10.4 years), mean imaging time (N=111 days). All SABGs procedures were Enemark's grade 3 or greater. Upper lip volume (ULV) in cubic centimeter (cc) increased from 112 vs.122, nasolabial angle (NLA) 114° vs. 129° whereas columellar length (CL) decreased from 9.3 mm vs 8.7 mm and alar width (AW) from 9.6 mm vs 9.3 mm (p=.008, .018, .004, .007 respectively). When comparing the affected to non-affected side to control for growth ULV increase 0.89 cc vs. 0.53 cc, NL angle 10.7° vs. 8.1° and CL decreased from -0.62 mm vs -0.06 mm, AW -0.35 mm vs. +0.87 mm (p=.018, .008, .004, .008 respectively)

**Conclusion:** Our findings demonstrate reliable volumetric expansion of the lip at the cost of worsening alar shape. The central nasolabial aesthetic subunit is favorably affected by expansion of the upper lip volume and nasolabial angle whereas alar length and alar width are significantly decreased after SABG. This study represents an ongoing effort to comprehensively evaluate soft tissue changes after secondary alveolar

bone grafting in CLP patients. By utilizing 3D-stereophotogrammetry (Vectra 3D) software analysis, we aim to enhance the current understanding in the facial morphology of CLP patients and offer valuable insights that may influence future treatment decisions.

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## **Effect of Immediate Application of Topical Anti-Inflammatory Agents on Healing of Burn Wounds**

Abstract Presenter  
Jamie Neelon MD

Abstract Co-Author(s)  
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Irene Yau DO

**Introduction:** Though recent advances in the treatment of burns have considerably improved overall survival rates, they have also highlighted several long-term sequelae related to the injury. Hypertrophic scars, for example, can impair function, reduce quality of life, and require multiple procedures as well as physical therapy. The purpose of this study was to investigate the effects of topical application of anti-inflammatory drugs on burn wound progression, overall wound healing, and quality of healing.

**Materials and Methods:** 15 deep-partial thickness burns were created on the dorsum of four anesthetized swine using a custom burn device at 100°C. Analgesia was provided prior to all surgical procedures with buprenorphine and the animals were monitored for pain twice every 24 hours for the first 72 hours. The burn wounds were randomized to receive amiloride, celecoxib, dexamethasone or minocycline formulated in a hydrogel. Silver sulfadiazine cream and blank hydrogel acted as controls. The animals were followed for 90 days and the wounds were assessed on days 3, 14, 28 and 90 post-burn. Assessments were performed using digital photographs (macroscopic healing, contraction), laser-Speckle imagery (blood perfusion), 3D camera (scarring,

pigmentation), and histology (burn wound depth, epidermal thickness, rete ridges).

**Results:** 15 deep-partial thickness burns were evaluated. It was shown that on day 3, burn depth varied from 155  $\mu\text{m}$  (celecoxib) to 222  $\mu\text{m}$  (blank hydrogel) but no statistically significant differences were observed. In terms of wound healing, the results showed that by day 14 post-burn, percent wound closure ranged from 45% (dexamethasone) to 84% (celecoxib) but no significant differences were observed. By day 28 post-burn all the wounds were fully healed. Quality of healing was studied on day 90 post-burn. Wound contraction varied from 28% (celecoxib) to 43% (minocycline) but no significant differences were seen. No differences were observed in the thickness of epidermis or number of rete ridges.

**Conclusions:** This study concluded that topical application of amiloride, celecoxib, dexamethasone or minocycline formulated in a hydrogel did not mitigate burn wound progression, promote wound healing or increase quality of healing when compared to controls.

## **Evaluating the Effect of Patient Factors on Post-Operative Outcomes in Gender-Affirming Transmasculine Top Surgery: A Single-Institution Retrospective Analysis**

Abstract Presenter

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**Introduction:** Gender-affirming bilateral mastectomy, also known as transmasculine top surgery (TMTS), is a vital step in the transition process for transgender male or



nonbinary individuals due to its proven role in alleviating gender dysphoria. Despite increasing access and performance of TMTS, the impact of patient factors on postoperative outcomes remains underexplored. With this large retrospective study, we aimed to evaluate the impact of age, BMI, and comorbidities on complication and re-intervention rates in TMTS patients in hopes of strengthening current surgical recommendations for optimized patient outcomes.

**Methods:** An IRB-exempt retrospective chart review was conducted for 228 patients who underwent TMTS at a single academic institution from March 2018 to September 2023. All patients had confirmed diagnoses of persistent gender dysphoria and were >16 years old at the time of surgery. Age, BMI, smoking history, comorbidity history (e.g. diabetes, hypertension, hyperlipidemia, coagulopathy, cancer, venous thrombosis), operative details, and post-operative outcomes were evaluated. Logistic regression analysis was performed to assess the relationship between various patient factors and rates of short-term complications and re-intervention up to 6 months following surgery.

**Results:** Of the 228 patients, 11.0% had a history of  $\geq 1$  systemic comorbidity, 15.4% were former smokers, and 11.8% were current smokers. Average age at surgery was 28.4 years and average BMI was 29.1. Postoperatively, 31.6% of patients were noted to have any degree of contour irregularity or asymmetry, 16.2% widened or hypertrophic scarring, 11.0% seroma formation, and 5.7% hematoma formation. In all, 16.7% of patients required re-intervention. The reasons for re-intervention were seroma aspiration (36.8%), scar revision (28.9%), hematoma evacuation (18.4%), contour revision (7.9%), nipple-areolar complex revision (5.3%), or other (2.6%). Patients with a history of  $\geq 1$  systemic comorbidity had a significantly increased likelihood of re-intervention ( $p < 0.012$ ). Both current and former smokers had a significantly increased risk of hematoma formation ( $p < 0.010$ ;  $p < 0.024$  respectively). With every one-year increase in age, patients had a 7% increased likelihood of seroma formation ( $p < 0.015$ ) and 8% increased likelihood of any contour irregularity or asymmetry ( $p < 0.001$ ). Increasing BMI did not significantly impact the likelihood of hematoma formation ( $p < 0.106$ ) or re-intervention ( $p < 0.095$ ).

### **Conclusion:**

History of systemic comorbidity, older age, and history of smoking were all found to be associated with a significantly increased risk of developing a major complication or needing re-intervention following TMTS. These findings support the importance of conducting more robust preoperative evaluations and risk assessments in order to provide more individualized recommendations for TMTS patients regarding their personal risk factors for specific adverse surgical outcomes. Furthermore, an improved understanding of how patient comorbidities influence surgical outcomes can better

guide surgeons in their preoperative and postoperative planning, including taking extra precautions to reduce rates of complications and reoperation in higher-risk patients. Altogether, these practices have the potential to improve TMTS patient trust, satisfaction, and quality of life. Future studies should assess the utility of refining preoperative risk criteria to allow for the reduction of modifiable risk factors.

## **Evolving Trends in Facial Reanimation Procedures: A Medicare Population Analysis from 2000 to 2022**

Abstract Presenter

Pooja Dhupati

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**Purpose:** Facial reanimation procedures mitigate functional and psychosocial impairments associated with facial paralysis. While sling-type procedures offer static solutions for achieving resting facial symmetry in adult facial paralysis, nerve repair or transfer procedures aim to restore dynamic movement and natural facial expression by reestablishing nerve function and connectivity to facial musculature. Though the choice between these approaches depends on several patient factors, literature suggests many surgeons have a preferred reanimation technique (1). Our analysis examines trends in nerve-type versus sling-type reanimation procedures in the Medicare population from 2000 through 2022.

**Methods:** We conducted an analysis of Medicare Part B National Summary Data files from 2000 to 2022, identifying the annual frequency of each service by its associated Current Procedural Terminology (CPT) code. Procedure categories included CPT codes for facial reanimation (64716, 64864, 64865, 64868, 64886, 15840, 15841, 15842, and 15845), with separate analysis for codes associated with definitive facial nerve transection (42425 and 64742). Other commonly used codes (64885, 64910, 65727, 67917, 67912, 61590, 67900) were excluded from primary analysis due to redundancy with other nerve repair or ophthalmic procedures. Repair codes were classified into nerve-type repairs and non-nerve or sling-type repairs, consistent with previously published literature (2,3). Trends in total services performed by physicians were longitudinally analyzed from 2000 to 2022. Utilization rates for each procedure type

category were compared and used to estimate trends in dynamic reanimation procedures versus static, sling-type procedures.

**Results:** Sling-type procedures saw a 37% increase in utilization from 2000 to 2011, followed by a 34% decrease from 2011 to 2022, resulting in a net 10% decrease over 22 years. Conversely, nerve repair procedures experienced a 118% increase from 2000 to 2011 and a 72% increase from 2011 to 2022, totaling a near 280% rise from 2000 to 2022, with 1,779 procedures billed in 2022 compared to 472 in 2000. Notably, CPT code 15842, representing free muscle flap with microsurgical technique for facial nerve paralysis, saw a 90% increase in allowed service from 2000 to 2022. In 2000, sling type repairs and nerve type repairs were evenly distributed, with each constituting approximately 50% of facial reanimation procedures. However, by 2011, the proportion of sling repair procedures relative to nerve repairs decreased to 37%. This trend continued, with sling repairs comprising only 19% of procedures by 2022, indicating a significant decline in comparison to nerve type facial reanimation procedure trends.

**Conclusion:** Our analysis underscores a notable shift towards nerve-based procedures in facial reanimation, highlighting evolving trends in the surgical management of facial nerve injuries over the last twenty-two years. Further research is warranted to clarify differences between specialties in management preferences, as well as geographical trends in the adoption of these techniques.

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## **Exploring Independent Medical Reviews: Insights into Gender-Affirming Procedure Denials in California**

Abstract Presenter  
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**Background:** Addressing gender dysphoria requires consideration of diverse individual factors, surpassing a simplistic approach. Our study delves into insurance denial claims for gender-affirming procedures in California, specifically those subjected to Independent Medical Review (IMR). We analyzed both upheld and overturned cases, categorizing decisions based on the reviewer's rationale, specialty, and the utilization of national guidelines and peer-reviewed literature.

**Methodology:** We conducted a qualitative review of 230 publicly available records provided by California's Department of Managed Health Care Independent Medical Review on insurance denials for gender-affirming procedures between 2016 and 2023. Variables collected included claim year, treatment subcategory, patient demographics, reviewer specialty, and citation of national guidelines and peer-reviewed evidence. Overturned decisions were categorized as medically necessary, reconstructive, case-by-case, or other. Upheld decisions were broken down into insufficient medical necessity documentation, gender-neutral appearance, aesthetic vs. reconstructive, prerequisites not met, misalignment with medical literature, and other.

**Results:** Preliminary findings expose inconsistencies in applying national guidelines and peer-reviewed literature when reviewing claims, with claims only citing at rates of 64% and 45%, respectively. Overturned claims predominantly hinge on being medically necessary (60%), while upheld claims are often attributed to insufficient documentation (26%), gender-neutral appearance (22%), and ambiguity in aesthetic versus reconstructive intent (22%).

**Discussion and Conclusion:** Our research underscores the distinctive nature of gender-affirming care, advocating for a withdrawal from generic denial approaches and a shift to case-specific care. To create a more inclusive healthcare system, the study emphasizes the crucial need for transparency and consistency in decision-making for gender-affirming care claims.

## **Exploring the Nexus: Socioeconomic Indices and Their Influence on Patient-Reported Outcomes in Oncologic Reconstructive Surgery at a Quaternary Care Center**

Abstract Presenter

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**Introduction:** The role of socio-environmental determinants in shaping postoperative outcomes, especially in the context of oncologic surgeries like lower extremity soft tissue sarcoma (STS) reconstructions, warrants deeper exploration given their noted impact across various surgical disciplines (1). This research aims to dissect the connection between socioeconomic factors, as gauged by the Area Deprivation Index (ADI) and the Social Vulnerability Index (SVI), and the outcomes reported by patients following their surgeries.

**Methods:** Our study was a single-institution, IRB-approved retrospective analysis of patients treated for lower extremity soft tissue sarcoma from 2016 to 2021. Data from 302 STS patients were analyzed for complications and patient-reported outcomes using PROMIS-29 (Patient-Reported Outcomes Measurement Information System) and TESS (Toronto Extremity Salvage Scale) surveys calibrated to 6 months postoperatively. Socioeconomic status (SES) was assessed through ADI and SVI scores, categorized into tertiles. Statistical analysis involved Chi-square, Fisher exact tests, and logistic regression using SPSS V26.0.

**Results:** Within the SVI categories for 302 patients, complication percentages were observed as follows: 33.3% in the high vulnerability group, 36.2% in the intermediate vulnerability group, and 42.6% in the low vulnerability group. Similarly, for ADI categories, the rates were 30.7% for the high deprivation group, 48.1% for the

intermediate deprivation group, and 40.2% for the low deprivation group.

The response rate for the TESS survey was recorded at 17.96%, with 46 out of 256 patients providing feedback. Similarly, the PROMIS-29 survey yielded a participation rate of 17.19%, with 44 out of 256 patients responding. The physical function domain in the PROMIS-29 survey revealed significant differences across ADI tertiles ( $p=0.035$ ), with higher ADI associated with lower physical function scores, indicating a poorer quality of life. No significant differences were observed in other domains or across SVI tertiles. TESS scores did not vary significantly by SES, indicating uniform functional recovery irrespective of socioeconomic background.

**Discussion:** The minimal differences in patient-reported outcomes highlights the complex interplay of factors influencing postoperative recovery. The significant finding in the physical function domain among higher ADI tertiles suggests potential underreporting of difficulties by lower SES groups, possibly due to cognitive biases shaped by lifelong socioeconomic challenges (2). This underlines the necessity of incorporating socioeconomic awareness into surgical care to identify and address potential barriers to recovery, ensuring equitable patient outcomes.

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### **Exploring the Vascular Risk in Facial Procedures through Thermal Scanning Imaging and Doppler Ultrasonography**

Abstract Presenter

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**Introduction:** The increasing popularity of facial procedures, both surgical and non-surgical, is attributed to their aesthetic advantages. To ensure patient safety and optimal outcomes, a thorough understanding of facial vascularization and risk assessment is essential [1,2]. This study investigates the effectiveness of thermal scanning and Doppler ultrasonography in evaluating vascular risks associated with facial procedures.

**Material and Methods:** A prospective study included 80 patients, undergoing preoperative thermal scanning and Doppler ultrasonography to visualize facial vasculature and identify potential risk areas. We observed and documented vascular injuries in all patients, while also noting the presence of any prior aesthetic procedures.

**Results:** Among the subgroup where we utilized Doppler scanning imaging and thermal scanning before and during the procedure, 5% (2 patients) experienced complications (ecchymoses). In contrast, among the 40 subjects who did not undergo ultrasound and thermoscaning 15% (6 patients) experienced vascular injuries, including 3 ecchymoses, 2 hematomas, and 1 vascular occlusion (of the inferior labial artery). The preprocedural evaluation revealed a significant difference in postinterventional complication rates. The combined use of thermal scanning and Doppler ultrasonography proved to be valuable in assessing vascular risk for facial procedures, emphasizing the importance of preoperative assessments in identifying patients prone to vascular complications.

**Conclusions:** Thermal scanning and Doppler ultrasonography provide a comprehensive approach to evaluating vascular risk in facial procedures. By identifying abnormal vascular patterns and altered blood flow dynamics, these techniques enhance patient safety and contribute to effective procedure planning.

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# **Factors Influencing Patient-Initiated Communication in Below-Knee Amputation for Diabetic Chronic Lower Extremity Wounds: A Preliminary Analysis of 88 Cases**

Abstract Presenter

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Richard Youn MD

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**Background:** Patients undergoing below-knee amputation (BKA) for diabetic complications often experience heightened anxiety and poor psychosocial outcomes perioperatively. Patient-initiated-communication (PIC) has been utilized to address unclear information, but may also lead to burnout among surgeons and office staff. Our study aims to characterize patient factors associated with increased PIC in this patient population.

**Methods:** We retrospectively reviewed patients receiving BKA from December 2021 to August 2023. PIC in the form of phone calls and portal messages documented in the perioperative period (defined as  $\pm 90$  days of surgery) were reviewed. PIC patients were compared to patients that did not initiate PIC (non-PIC). We further conducted a subgroup analysis of patients who initiated preoperative PIC (pre-PIC) and postoperative PIC (post-PIC). Primary outcomes were 1) incidence of PIC within the perioperative period, 2) rationale for PIC, and 3) characteristics associated with PIC patients.

**Results:** A total of 88 patients underwent BKA, 65 (73.9%) of whom initiated communication during the perioperative period, for a total of 206 communication encounters in the perioperative period. The cohort was primarily male ( $n=59$ , 67.1%) and the mean age was  $57.9 \pm 13.3$  years with a mean Charlson Comorbidity Index (CCI) of  $5.0 \pm 2.8$ . Pre-PIC ( $n=111$ , 53.9%) was more common than post-PIC ( $n=95$ , 46.1%). Collectively, the majority of PICs were administrative ( $n=73$ , 35.4%). Pre-PIC was related to medication, ( $n=20$ , 18.0%), wound care ( $n=18$ , 16.2%), wound symptoms ( $n=13$ , 11.7%) and procedural details ( $n=7$ , 6.3%), and post-PIC concerned medication



(n=25, 26.3%) and wound care (n=14, 14.7%). There were no differences in age (p=0.464), gender (p=0.345), or CCI (p=0.382) between patients that engaged in PIC and those that did not. Overall, PIC patients demonstrated a higher rate of psychiatric history other than major depressive and generalized anxiety disorders (38.7% vs. 0.0%, p=0.011) compared to non-PIC patients. Subgroup analysis revealed that pre-PIC patients were more likely to be married (61.3% vs. 38.6%, p=0.033) than non-pre-PIC patients. Post-PIC patients were more commonly discharged to home rather than a rehabilitation facility (28.6% vs. 10.3%, p=0.047) and experienced less complications requiring a return to the OR 30 days postoperatively (6.1% vs. 24.3%, 0.026).

**Conclusions:** Perioperative PIC is prevalent among BKA patients at our institution. Identifying reasons for PIC and high-incident patient groups can guide quality improvement efforts to proactively address patient concerns and reinforce resources already established by our institution, such as amputee support groups and prosthetist consultations.

## **Fluidic Preparation Device Enables Washing and Mechanical Processing of Lipoaspirate**

Abstract Presenter

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**Background:** The washing of lipoaspirate (LA) is imperative to any reconstructive or aesthetic procedure requiring autologous fat grafting. Many approaches exist, ranging from manual (i.e., Cotton gauze rolling, decantation) to commercialized processing devices (i.e., REVOLVE, Puregraft). However, given the lack of standardization between methodologies, there is a prevalent degree of variability resulting in graft take ranging from 20-80%. We hypothesize that a new closed-loop, peristaltic pump-driven fluidic device could enhance the washing process, resulting in minimal adipose tissue manipulation and comparable tissue purity.

**Methods:** We designed and fabricated the Preparation Device (PD) to improve the

washing of LA within a closed-loop system. Using human LA samples, the PD was optimized for use in a batch and dynamic wash protocol and was compared to a traditional washing approach. Resultant adipose tissue samples underwent a visual colorimetric comparison and were enzymatically digested for ex vivo measurement of cell counts, cell viability, and Mesenchymal Stem Cells (MSCs) and Endothelial Progenitor Cells (EPCs). LA samples were mechanically processed using our lab's Emulsification and Micronization Device (EMD) for downstream stem/progenitor cell analysis.

**Results:** The PD produced similar results to traditional manual washing using both batch and dynamic washing protocols. Internal baffles within the PD helped increase agitation and facilitate mixing within the PD's internal cavity. No significant changes in cell counts or viability were noted and both MSC and EPC populations arose from using the PD and peristaltic pumps. Combining the EMD within the PD platform enabled closed-loop mechanical processing and significantly improved EPC numbers (5-fold) compared to manual washed/syringe pump-driven EMD processing.

**Conclusions:** Our new PD platform demonstrates effective washing of LA within a closed-loop system and demonstrates minimal manipulation and purity of final adipose tissue. Additionally, this platform enables the simple integration of LA mechanical processing in a minimal footprint while enriching for EPCs. Future directions will explore fat graft retention within an in vivo murine model and full automation for improved reproducibility within clinical settings.

## **From Selfies to Surgery: Unveiling Trends and Ethical Considerations in Facial Feminization on Instagram**

Abstract Presenter  
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**Background:** Facial Feminization Surgery (FFS) is a critical gender-affirming intervention, and its significance in alleviating gender dysphoria is increasingly

acknowledged (1). Public interest in FFS and other surgical subtopics can be analyzed through the lens of social media (2). This study aims to analyze the role of Instagram in shaping public perceptions and disseminating information about FFS by tracking trends and content, highlighting the significance of patient education, ethical implications, and global interest in this procedure.

**Methods:** Between June and October 2023, 500 Instagram posts tagged with "#facialfeminizationsurgery" were collected using a non-biased web scraping platform. Authors manually screened, categorized, and analyzed posts for tone, whether they included patient-reported or physician-reported outcomes, creator information, hospital associations, content type, and geographical distribution. Statistical analysis was performed using SPSS.

**Results:** Our study indicated that 85.8% of posts conveyed a positive tone. Notably, healthcare providers and organizations contributed 65.4% of the content. Demographic analysis revealed a global interest in FFS. Notably, 55% of the healthcare providers mentioned were in the United States (U.S.). Outside the U.S., South Korea (16.0%), India (25.2%), and England (19.1%) were the most frequently cited locations. Ethical considerations, including the posting of patient images, the perception of FFS (cosmetic or reconstructive), and funding challenges, were prevalent themes according to manual and keyword analysis. Intriguingly, 36.0% of posts served as direct advertisements, and 20% included educational content, emphasizing the role of social media in disseminating information about FFS.

**Key Takeaways and Conclusion:** Social media platforms play a significant role in shaping perceptions and disseminating information about FFS. Most posts had a positive tone and there was a notable emphasis on postoperative outcomes, highlighting Instagram as a platform for surgeons to showcase their successes and for patients to share satisfaction with their results. Due to the significant proportion of positive posts, Instagram users learning about FFS should use other resources to be fully informed about potential adverse experiences as well (3). Patient education related to FFS is an important discourse on Instagram, which is why we recommend surgeons work on spreading accurate and reliable information to empower patients (4). When doing so, surgeons are encouraged to adhere to published ethical guidelines regarding the posting of patient images by obtaining proper consent and protecting patient confidentiality (5). The global interest in FFS on Instagram reflects the increasing accessibility of FFS, and Instagram users can utilize this to facilitate outreach and foster physician-patient relationships from distant locations. Additionally, financial and insurance challenges are evident in a significant portion of Instagram posts, emphasizing the need for continued advocacy to improve access to gender-affirming

care and address barriers to insurance coverage. In conclusion, we encourage surgeons to utilize hashtags like #facialfeminizationsurgery to contribute to a more robust and accurate social media landscape, promoting education, connections with patients and fellow surgeons, and dispelling misinformation.

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## **Gender and Nationality Trends in the Plastic and Reconstructive Surgery Journal**

Abstract Presenter

Sarah Frommer MD, PhD

Abstract Co-Author(s)

Alexander Carruth

Karen Lu MD

Sher Isada

**Background:** Ethnic and female disparities still exist in plastic surgery despite the closing gap in the medical field. Women are continually underrepresented in primary and senior authorship positions in academic literature. There is limited information about the authorship trends for women in plastic surgery. This study examines the gender and country of origin trends of authorship in the Plastic and Reconstructive Surgery Journal.

**Methods:** The Web of Science database was used to collect bibliographic records of all peer-reviewed publications published in the Plastic and Reconstructive Surgery (PRS) journal between 2004 and 2023. All publication types were considered, and the search strategy had no exclusion criteria. A Python script was developed to determine the genders of all authors using Genderize.io, an Application Programming Interface (API). Articles that either had authors with initials as their first names or with mononyms were removed, leaving 11,312 articles. Logistic regression analysis was conducted to examine the relationship between the prevalence of female authorship in first and last positions across the 10 countries with the most articles. The USA was used as the reference for comparison. Odds ratios were computed to assess the likelihood of female authorship.

**Results:** P-values indicated statistical significance in the variation of female authorship across different countries compared to the United States. Canada, Japan, China, Germany, France, the Netherlands, and Turkey all had p-values less than 0.05 for the gender of their first author, suggesting meaningful deviations from trends observed in the United States. Notably, the Netherlands had the highest first author odds ratio (2.38), indicating that the odds of a female being the first author of an article in the Netherlands is 2.38 times higher than in the United States. Japan, which had the smallest first author odds ratio, has the likelihood of a female being the first author of an article at 50% that of the United States. Last author gender p-values contained less statistically significant data: Canada, England, China, Germany, and the Netherlands. The odds ratio for the last author position in the Netherlands, at 2.19, is the highest among the countries analyzed, indicating a significantly greater likelihood of female senior authorship compared to the United States. However, Germany, with the smallest odds ratio of 0.59, suggests a notably lower probability of female representation in senior academic roles within the field of plastic and reconstructive surgery.

**Conclusion:** This study highlights disparities in gender representation within the PRS journal authorship, with a focus on variations across countries. While nations like the Netherlands show a progressive stance towards female authorship, in both primary and senior positions, others, such as Japan or Germany, reveal a more conservative pattern. This study calls for a broader cultural shift within the academic community, encouraging a more inclusive representation of genders across all levels of authorship.

## **Hospital Price Transparency Legislation and Published Costs of Breast Reconstruction.**

Abstract Presenter  
Alexander Carruth

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**Background:** Health literacy allows patients to make more informed decisions about their healthcare. Surgical cost transparency is one important aspect of literacy; without an adequate understanding of pricing, a patient cannot make a fully autonomous choice, especially in elective procedures. To address obfuscated prices and resulting unexpected medical bills, the U.S. Centers for Medicare and Medicaid Services mandated in 2021 that government-funded hospitals clearly publish their pricing on their home web pages. One year after the rule went into effect, a study found that only 13% of hospitals were compliant in posting their standard charges for plastic surgery procedures (1). In this study we sought to expand upon this assessment, focusing on breast reconstruction with regard to the current state of hospital price transparency.

**Methods:** We evaluated Level 1 hospitals, which are mandated to publish pricing under the CMS ruling. Using the Texas Department of Health Database, the authors identified 19 adult CMS Level 1 hospitals in Texas. Two separate medically fluent investigators searched the website of each hospital system to find the price list or chargemaster. Charges related to general breast reconstruction (CPT codes 19357 and 19366), implant-based reconstruction (19340 and 19342), and free flap reconstruction (19364) were noted. Costs were analyzed to factor in if the patient had Cigna PPO, Humana PPO, or was uninsured. These companies were selected for their substantial market presence and diverse policy offerings, providing insights into varied coverage levels and patient financial impacts.

**Results:** Although all 19 Level 1 hospitals investigated had their pricing linked conspicuously as per the CMS ruling, only eleven (58%) had pricing available for breast reconstruction operations. For general breast reconstruction, eight hospitals had viewable uninsured charges, with an average cost of  $\$20,204 \pm \$14,069$ . When insured by Humana, the average charge decreased significantly to  $\$7,485 \pm \$6,065$  at 3

hospitals, while the average Cigna charge was  $\$7,283 \pm \$6,353$  at 2 hospitals. For implant-based breast reconstruction, seven hospitals had viewable uninsured charges (average of  $\$15,202 \pm \$11,813$ ). One hospital provided viewable charges for Humana-insured patients ( $\$8,806$ ). Charges for Cigna-insured patients were available at 3 hospitals, with an average of  $\$9,607 \pm \$8,949$ . For free flap reconstruction, only 2 hospitals had viewable uninsured charges with an average of  $\$12,824 \pm \$11,940$ . No hospitals had viewable charges for Humana-insured patients, and 2 hospitals had viewable charges for Cigna-insured patients, averaging  $\$9,861 \pm \$7,783$ .

**Conclusion:** The study highlights the lack of transparency in breast reconstruction charges in Level 1 Texas hospitals. Despite being mandated, access to cost information is limited, with wide cost variances across procedures and insurers. This greatly limits patient autonomy and the ability to make informed healthcare decisions.

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**Impact of Smoking on Preoperative Fitness in Patients Undergoing Flap-Based Pelvic Floor Reconstruction**

Abstract Presenter  
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Timothy King MD, PhD, MSBE, FAAP, FACS

**Background:** The use of local advancement myocutaneous flaps and free flaps has become a mainstay of pelvic reconstructive surgery requiring complex closure.(1) The link between tobacco smoking and vascular disease is well established, which has been shown by some studies to negatively affect wound healing in the postoperative period. Further, the success of complex flap-based reconstruction largely depends on oxygen

delivery to reconstructed tissue, which can be compromised in smokers.(2) Beyond the surgical success of reconstructive flaps, patient fitness and preoperative optimization are crucial components of postoperative recovery and desirable surgical outcomes.(3) There is a scarcity of literature exploring the comorbidities associated with smoking in the preoperative period, particularly for patients undergoing complex reconstructive procedures. The purpose of this study is to analyze trends in preoperative comorbidities in smoking vs. nonsmoking patients undergoing flap-based pelvic floor reconstruction.

**Methods:** In this single-center retrospective study, participants were identified using electronic medical records and CPT code data. Included patients were males and females over 18 who underwent flap-based pelvic floor reconstruction at Loyola University Medical Center between 2012 and 2022. Patients were excluded from analysis if they lacked postoperative follow-up. Patient information collected included age, sex, race, BMI, smoking status, insurance type, comorbidities, and hospital readmission data. Statistical analysis was performed using the Fisher's Exact Test and the Wilcoxon Rank Sum Test for categorical and continuous variables, respectively, comparing relevant demographic and preoperative clinical factors among non-smokers vs. former and current smokers. Univariate and multivariate logistic regression models were used to analyze the relationship between key patient data and smoker status, with the p-value set to <0.05 for significance.

**Results:** Retrospective data collection yielded 608 patients that met study criteria. History of smoking was more prevalent among Whites/Caucasians (OR 1.15, 95% CI: 1.00, 1.31,  $p=0.044$ ) and less common in females (OR 0.80, 95% CI: 0.74, 0.87,  $p<0.001$ ). Mean BMI was lower in smokers than in nonsmokers ( $\mu = 27$  vs. 29;  $p=0.011$ ). Smokers were more likely than nonsmokers to have chronic pulmonary disease (OR 1.14, 95% CI: 1.02, 1.27,  $p=0.026$ ) and connective tissue disease (OR 1.29, 95% CI: 1.01, 1.65,  $p=0.044$ ) in both univariable and multivariable logistic models. Smokers were more likely than nonsmokers to have peripheral vascular disease in univariable logistic models (OR 1.17, 95% CI: 1.06, 1.29,  $p<0.001$ ) but not in multivariable models. Smoking was positively correlated with a designation of ASA class III (OR 1.54, 95% CI: 1.11, 2.12,  $p=0.009$ ). Length of hospital stay following surgery was lower in nonsmokers than in smokers and former smokers (7 vs. 8 days,  $p=0.007$ ). There was no significant difference in ER visits or hospital readmission at any amount of time following discharge between the groups. Finally, our study found no significant difference between smokers and nonsmokers with regard to rates of postoperative complications, including hematoma, seroma, wound dehiscence, and infection.

**Conclusions:** This study reveals key preoperative morbidity associations among smokers undergoing pelvic floor reconstruction. White/Caucasians and men were more



likely to be smokers in this patient population, found to be a predictor of a preoperative diagnosis of chronic pulmonary disease and connective tissue disease in our cohort. Smokers undergoing pelvic floor reconstruction were also more likely to be designated as ASA class III and experienced longer hospital stays when compared to nonsmokers. Our analysis found no significant difference in postoperative complications between smokers and nonsmokers. Understanding the relationships between patient behaviors and preoperative fitness can help to optimize patient counseling and can be applied more broadly to guide the clinical decision-making of plastic and reconstructive surgeons employing local advancement flaps for pelvic reconstruction.

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### **Implications of immediate breast reconstruction on wait times to adjunctive therapies: A Regional Canadian Cross-Sectional Study**

Abstract Presenter

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**Introduction:** Breast cancer therapy requires complex coordination of multidisciplinary care, and the addition of immediate breast reconstruction (IBR) further complicates this.

This study evaluates the impact of IBR on wait times to adjunctive therapies in breast cancer treatment.

**Methods:** A retrospective chart review identified 337 patients who underwent IBR following total mastectomy for therapeutic breast cancer treatment. Patients were divided into groups: Surgery First (SF) and Neoadjuvant Chemotherapy (NC). Wait times were compared against Canadian and global benchmarks. Further subgroup analysis evaluated the impact of reconstructive modality (alloplastic vs. autologous) on wait-times.

**Results:** Surgery First experienced longer wait times compared to Neoadjuvant Chemotherapy with delays of 24 days in biopsy to treatment initiation ( $62 \pm 51$  vs  $38 \pm 28$ ,  $p < .001$ ), 25 days in first consultation to treatment initiation ( $47 \pm 51.5$  vs  $22 \pm 22$ ,  $p < .001$ ), and 23 days in transitioning from first to second treatment modality ( $62 \pm 35$  vs  $39 \pm 17$ ,  $p < .001$ ). Furthermore, 74% of Surgery First did not meet the benchmark of receiving surgery within 6 weeks of diagnosis ( $p < .001$ ), compared to 43% of Neoadjuvant Chemotherapy. Additionally, 61% of Surgery First and 44% of Neoadjuvant Chemotherapy waited longer than 8 weeks for radiotherapy ( $p = .048$ ). Within subgroups, Surgery First alloplastic had shorter wait times compared to Surgery First autologous for biopsy to treatment by 14 days ( $60 \pm 49.5$  vs  $74 \pm 49$ ,  $p = .007$ ) and first consultation to treatment by 10 days ( $43 \pm 51.5$  vs  $53 \pm 59$ ,  $p = .030$ ). For Surgery First alloplastic only 69% did not initiate treatment within 6 weeks of diagnosis compared to 84% of Surgery First autologous patients ( $p = .014$ ).

**Conclusion:** IBR patients receiving surgery first, particularly those undergoing autologous reconstruction, experienced the most prolonged wait times. By identifying this vulnerable patient group, care providers can make informed decisions around prioritization of care and attempt to reduce discrepancies in wait times between treatment orders and reconstructive modalities. However, an important consideration is that our data was limited to was restricted to IBR patients only. Future work should aim to include both IBR and delayed reconstruction patients to capture a broader population of breast cancer patients.

## **In House 3D Printing for Craniofacial Trauma, a 7 year Review**

Abstract Presenter  
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**Introduction:** Complex facial trauma presents a challenge to the reconstructive surgeon as the loss of facial buttresses makes accurate reduction of fractures more and more difficult. Accurate 3D printed models and virtual surgical planning have become a mainstay in many other aspects of craniomaxillofacial surgery. However, turnaround times from industry produced models frequently preclude their use in the unplanned acute surgical setting.

**Purpose:** We seek to evaluate the use of in-house printed 3D models for facial trauma and the efficacy and safety of the procedures performed with the aid of these models.

**Methods:** All patients from January 2017 to August 2023 that received an in-house 3D printed model to help treat facial fractures were analyzed. Chart review was performed to extract demographic data, fracture type, mechanism, complications, comorbidities, and operative time. Analysis was performed in Microsoft Excel.

**Results:** A total of 24 patients had 3D models created for facial fractures. The average age was 24.5 years. Motorized vehicles were involved in 15 cases (62.5%). The most commonly injured region was the midface (19 patients; 79.2%) and 8 patients had true panfacial fractures (33.3%). 17 patients (71%) had complex fractures involving multiple buttresses. For acute treatments, average time from presentation to operative treatment was 9 days. Average operative time was 282 minutes. 3 patients (12.5%) had minor complications, including localized infection treated with antibiotics and a small wound dehiscence. 2 patients (6.25%) had major complications: a draining sinus tract that required excision and a cicatricial lagophthalmos due to a laceration near the eyelid margin. 96% of patients had satisfactory facial contour.

**Conclusion:** 3D printing anatomical models can be helpful in assisting surgical decision making for patients with facial fractures as well as the process of surgery itself by allowing for pre-bending of plates. In the acute setting, when turnaround times are short, in-house 3D printing can produce models in a timely fashion to help surgeons operate safely and efficaciously.

## Increased Burn Admissions on Independence Day: An 9-Year Analysis of Burns on Major U.S. Holidays

Abstract Presenter  
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**Purpose:** Temporal patterns of burn admissions have been demonstrated throughout the day, week, and year, while additional research shows trauma admission peaks in the summer, October, and December. The purpose of this study is to analyze adult and pediatric burn admissions surrounding major United States (US) holidays to identify periods of time that require increased resource allocation and targeted patient education.

**Methods:** A retrospective review of all patients admitted to a large urban burn center from January 2015 to December 2023 was conducted. Patients admitted within 48 hours of major holidays were included, and patients in the control cohort were identified as patients admitted at other time points. Demographics, burn injury data, and treatment course data were extracted. Independent sample t-tests were used to compare admissions across holidays and descriptive statistics were used to present Independence Day data.

**Results:** Of the major US holidays assessed (New Years, Memorial Day, Labor Day, Independence Day, Halloween, Thanksgiving, Christmas), only Independence Day showed a significantly higher burn admission rate ( $n = 1.55$  burns/day) when compared to the control group ( $n = 0.91$  burns/day) ( $p = 0.0001$ ). A total of 62 patients were admitted within 48 hours of Independence Day, of which 62.9% ( $n = 39$ ) were male. The mean patient age was 28.1 (SD = 20.8), which was younger than the mean age of the control population ( $p = 0.0001$ ). Most patients were hispanic or latino (58.1%,  $n = 36$ ), single (56.5%,  $n = 35$ ), housed (96.8%,  $n = 60$ ), and insured through the government (74.2%,  $n = 46$ ). On average, patients presented for care 2.43 days post injury (SD = 4.2). Burn etiology included firework (41.9%,  $n = 26$ ), flame (21.0%,  $n = 13$ ), scald (14.5%,  $n = 9$ ), contact (9.7%,  $n = 6$ ), chemical (4.8%,  $n = 3$ ), and other (8.1%,  $n = 5$ ). Of note, firework burns comprised 0.7% ( $n = 18$ ) of control group injury ( $p = 0.000$ ). Inhalational injury was rare (1.6%,  $n = 1$ ). The mean total body surface area burned was 9.5% (SD = 15.5). A total of 9.7% ( $n = 6$ ) and 27.4% ( $n = 17$ ) of patients screened

positive for alcohol and illicit drugs on admission, respectively. Surgical intervention was necessary for 29.0% (n = 18) of patients with 11.3% (n = 7) requiring multiple operations. Intensive care was required by 25.8% (n = 16) patients, of which 9.7% (n = 6) required mechanical ventilation. Mean hospital length of stay was 8.3 days (SD = 11.2) and the in-hospital mortality rate was 3.2% (n = 2).

**Conclusion:** Burn admissions at this large urban burn center significantly increased on Independence Day, with no significant variation across other US holidays. The characterization of patients and injuries should be used by burn units nationwide to allocate staff and material resources at this time of year. Additionally, risk of burn is associated with holiday specific activity and younger patient age. This calls for community level intervention, specifically burn education and prevention with special focus on Independence Day precautions.

## **Influence of End-Stage Renal Disease on the Success of Free Tissue Transfer Reconstruction for Limb Salvage**

Abstract Presenter  
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**Background:** Lower extremity (LE) free tissue transfer (FTT) remains a useful reconstructive solution for the highly comorbid patient population enduring chronic, non-healing wounds. Historically, microsurgery in the end stage renal disease (ESRD) patient has been considered high-risk, likely related to poor long-term survival and lower limb ischemia [1-2], but there remains insufficient literature with a focus on these patients. Our study aims to characterize the clinical outcomes of end-stage renal disease patients who received lower extremity free tissue transfer.

**Methods:** A retrospective review was conducted on all patients with ESRD on hemodialysis who underwent LE FTT performed between the years of 2011 to 2023.

Demographics, comorbidities, preoperative management, intraoperative details, surgical outcomes, and complications were recorded. Primary outcomes evaluated immediate flap success from postoperative day (POD) zero to 12 and rates of long-term limb salvage.

**Results:** A total of 14 patients with ESRD who received a LE FTT were included in this study, 10 (71.4%) of which were male and 4 (28.6%) female. Patients were on average  $51.8 \pm 8.0$  years old, with an average body mass index (BMI) of  $32.6 \text{ kg/m}^2 \pm 7.6$  and Charlson Comorbidity Index of  $5.8 \pm 0.89$ . All 14 patients had diabetes mellitus, and 10 (71.4%) had peripheral arterial disease. On preoperative lab testing, the median hemoglobin A1c was 6.7% (IQR:3), creatinine was  $5.01 \pm 2.82$ , and glomerular filtration rate (GFR) was a median of 11 mL/min/1.73 m<sup>3</sup>. Of note, 6 (42.9%) patients had undergone prior renal transplantation and were receiving anti-rejection immunosuppressive therapies. Preoperative limb angiogram studies of these patients found 1-vessel runoff (VRO) in 3 patients (21.4%), 2-VRO in 5 patients (35.7%), and 3-VRO in 6 patients (42.9%). Calcified vessels were found in 10 patients (71.4%) intraoperatively, and 4 patients (28.6%) required a saphenous vein interposition graft. The immediate flap success rate was 100 percent. Postoperative complications were identified in 6 patients (42.9%) throughout follow-up, including 1 hematoma (7.1%), 3 dehiscent wounds (20%), 4 infections (28.6%), and 3 donor site complications (21.4%). The median patient follow-up duration was 19.0 months (IQR: 32.4). Six patients (40%) eventually required major limb amputation during long-term follow-up at an average time of  $277.2 \pm 305.9$  days.

**Conclusion:** Renal disease has been associated with poor outcomes in microvascular surgery in the past, and some have even proposed amputation for chronic, nonhealing wounds in this population. However, our findings suggest that aggressive attempts at limb salvage with free flap reconstruction in these patients may be worthwhile in preserving limb length and function for a longer period of time.

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# Machine Learning to Predict the Risk of Postoperative Wound Complications In Open Spine Surgery: A Prediction Model for High-risk Patients

Abstract Presenter

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**Purpose:** Wound complications are a source of increased hospital costs and adverse patient outcomes, particularly in open spine procedures (1, 2). A growing body of literature suggests the use of prophylactic muscle flaps during primary closure can reduce the risk of wound complications (3). Risk stratification is critical in identifying patients at higher risk of developing postoperative complications. Current risk assessment tools that assess the overall likelihood of complication development have limited utility in risk-specific assessment of complications such as delayed wound healing or dehiscence. Artificial intelligence may help to increase the accuracy of current risk models. The aim of this study was to (1) use machine learning (ML) to create a novel algorithm to stratify risk of wound complications after open spine procedures and (2) to compare this ML model to commonly used general surgical risk scores in a national quality-improvement database.

**Methods & Materials:** Patients who underwent any open spine procedures with a posterior approach between 2012 and 2022 were identified using the Current Procedural Terminology (CPT) and included. A novel risk scoring algorithm for development of wound complications was created and validated using L1 Logistic regression, Naive Bayes, Random Forest, and XGBoost, using 10-fold cross validation on 85% of the patient cohort to predict the risk of wound complications. Potential predictors of wound complication included patient demographics, eighteen distinct comorbidities, procedural type, surgical specialty, and operative time. We also evaluated our models on the remaining 15% of the patient cohort to assess model calibration, and performed the same validation of the mFI-5.

**Results:** A total of 25,159 patients were included. The cohort was stratified by patients with any incidence of wound complications (n= 6,289) and patients without(n=18,870). The final logistic regression model included 11 predictors, with procedural type encoded into 3 distinct procedural risk categories. The L1 Logistic Regression, Naive Bayes, Random Forest, and XGBoost models scored mean area under the receiver operator characteristic curve (AUROC) of 0.69, 0.69, 0.70, and 0.70, respectively and mean average precision (AP) of 0.45, 0.43, 0.47, and 0.47, respectively. In comparison, the mFI-5 scored AUROC and AP of 0.56 and 0.32, respectively.

**Conclusions:** A machine learning based risk stratification model demonstrates promising results for estimating the risk of spine wound complications. This novel assessment tool can potentially help plastic and reconstructive surgeons determine which patients may benefit from prophylactic intervention when undergoing open spine surgery.

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## **Management of Full-thickness Eyelid Burns: An 8-Year Retrospective Review**

Abstract Presenter

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**Purpose:** Full-thickness burns to the eyelids are associated with high rates of contracture, corneal injury, and infection, posing a significant threat to vision. Early



excision and grafting are recommended to reduce the risk of these complications. Our center utilizes split-thickness skin grafts for early coverage to avoid sacrificing full-thickness donor sites prior to stabilization of all burn wounds. Here we report the incidence, management, and outcomes of full-thickness eyelid burns at a single institution.

**Methods:** A retrospective review of all patients admitted to a large, urban burn center from January 2015 to December 2023 was performed. Admission documentation was screened to identify patients with eyelid involvement. Data was collected on patient demographics, hospital course, and outcomes, and reported with descriptive statistics.

**Results:** Of the 3,247 patients admitted for burns during the study period, 137 (4.2%) had involvement of the eyelids. Depths of eyelid burns were inconsistently documented; however, at least 11 (0.34%) patients had confirmed full-thickness injuries. The median age of these patients was 36 (IQR: 29-51.5), and all were male. Notably, four (36%) patients were homeless, and the eight that received admission urine toxicology screens all tested positive for at least one substance, including stimulants (n=5, 62.5%), benzodiazepines (n=4, 50%), cannabis (n=3, 37.5%), opioids (n=2, 25%), and dissociative agents (n=1, 12.5%). Burns were caused by flame (n= 9, 82%) and chemicals (n=2, 18%), with a median total body surface area burned of 70.3% (IQR: 43.6-86.5%). Only five of 11 (45.5%) patients had full-thickness eyelid burns in the context of survivable burn injuries, meaning they were not placed on comfort care and did not die within 72 hours of admission. All five received artificial tears and ophthalmic antibiotics, while two (40%) received amniotic membrane insertion and one (20%) underwent temporary tarsorrhaphy. Exposure keratopathy developed in three patients (60%) prior to skin grafting. The median time to skin grafting was 14 days (IQR 9-21 days). Initial skin grafts were split-thickness (12-14/1000") and harvested from the thigh (n = 3), medial arm (n = 2), and abdomen (n = 1). Cicatricial ectropion developed in three patients (60%), necessitating contracture release and regrafting following discharge. One patient (20%) experienced partial graft loss that was successfully left to heal by secondary intention. Another patient (20%) developed infection, a perforated globe, and blindness, ultimately requiring enucleation. Preservation of pre-burn visual acuity was achieved in all other patients (80%).

**Conclusions:** Full-thickness eyelid burns are relatively uncommon, especially in patients with survivable injuries. Adult male patients under the influence of substances seem to be at higher risk. Despite early protective measures, exposure keratopathy was common. Split-thickness skin grafting performed at 1-3 weeks had high rates of cicatricial ectropion necessitating later revision. However, this approach was successful

in preserving vision and full-thickness donor sites for delayed reconstruction. Additional research is needed to elucidate optimal management strategies for these patients.

## **Minimally Invasive Cubital Tunnel Decompression Using Real-Time Sonography-Guided Surgical Intervention**

Abstract Presenter

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**Hypothesis:** Neuromuscular ultrasound has emerged as a useful tool in both the diagnosis and management of cubital tunnel syndrome (1). Ultrasonographic indicators of neuropathy and edema of the ulnar nerve include hypo-echogenicity, intra-neural vascularity, and visual swelling of the nerve proximal to the compression site (2). Sonography is utilized currently for minimally invasive approaches to carpal tunnel syndrome and thus is of interest for application in minimally invasive cubital tunnel decompressions. This study explores an in-office alternative to an open surgical procedure through employing the Sonex UltraGuideCTR™ carpal tunnel release system bidirectionally at a single incision site at the level of the cubital tunnel.

**Methods:** We postulate an alternative approach for cubital tunnel decompression via a minimally invasive surgical intervention. Utilizing the Sonex UltraGuideCTR™ as the incising instrument, dissections were performed on three cadaveric arms under live ultrasonographics. The Sonex UltraGuideCTR™ was chosen due to its inherent ability to avoid unintentional soft tissue damage and iatrogenic nerve injury via a retractable blade and inflatable balloons respectively. The cadaveric operations rigidly simulated a surgical operation in regards to time, technique, and care of dissection. Confirmation of fascial release was achieved post-operatively via an open dissection.

**Results:** Use of real-time sonography offered the surgeon a unique vantage point to

establish proper alignment of the device and to provide confidence throughout the release. In all three specimens, complete release of the deep and superficial fascia of the flexor carpi ulnaris was observed. Fascial split was associated with longitudinal split of the muscle fibers on either side of the release. There was no identified injury to any motor branches supplying the flexor carpi ulnaris muscle. Proximally, the nerve was noted to be completely decompressed in its course as well. There was no identifiable subluxation of the nerve with ranging of the elbow. The first release was completed in 14 minutes; the second release in 10 minutes; and the final release was completed in 7 minutes.

**Summary Points:** Access to operating theaters is increasingly limited, and the ensuing exigencies of the patient population for in-office procedures has become a driver for novel interventions (3). Modeled from currently accepted minimally invasive management of carpal tunnel syndrome, the Sonex UltraGuideCTR™ device was utilized in similar fashion at the level of the cubital tunnel to successfully decompress the ulnar nerve. In response to meeting the rising need for patient access to surgical intervention outside of the operating room, such novel approaches are becoming increasingly necessary and embolden surgeons and device developers alike to expand their horizons.

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#### **Mix and Match: Enhancing Microsurgical Breast Reconstruction Outcomes with Hybrid Techniques**

Abstract Presenter  
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**INTRODUCTION:** As abdominal-based microsurgical breast reconstruction continues to gain momentum, new avenues exist to expand its reach to a broader population. Hybrid breast reconstruction can alleviate the discordance between donor flap and desired breast volume in patients previously excluded from flap-based modalities. The authors review their consecutive experiences with two novel hybrid microsurgical breast reconstruction techniques.

**METHODS:** A retrospective review of all consecutive patients who received microsurgical flap reconstruction was performed over a five-year period, both with and without hybrid techniques. The HyPAD® technique combines flap reconstruction with stacked pre-pectoral acellular dermal matrix (ADM), while the HyFIL® technique combines a flap, pre-pectoral implant, and fat transfer (lipofilling). Demographic, health-related, surgical, and outcome indicators were measured for comprehensive qualitative and quantitative analysis.

**RESULTS:** During the study period (September 2018 to November 2023), 101 patients with hybrid breast reconstruction (HyPAD® n=40, HyFIL® n=61) were compared to 208 patients who received DIEP flap reconstruction alone. Hybrid patients were significantly younger (47.3 versus 52.9 years,  $p < 0.01$ ) had lower BMIs (24.9 versus 30.3 kg/cm<sup>2</sup>,  $p < 0.01$ ), and had reduced flap weights (348.7 versus 683.5 grams,  $p < 0.01$ ). Hybrid patients had fewer clinically significant breast infections (1 versus 14,  $p = 0.03$ ). No significant differences were found for length of stay ( $p = 0.56$ ) or readmission ( $p = 0.84$ ). No implant or ADM extrusions occurred in the hybrid cohort.

**CONCLUSIONS:** Hybrid breast reconstruction is a safe and reliable method to enhance core projection in microsurgical breast reconstruction and is valuable in correcting volume imbalance.

## **Novel Use of Intraoperative MRI to Objectively Assess Immediate Palatoplasty Results**

Abstract Presenter  
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**Background:** Cleft palate is a common congenital anomaly characterized by the failure of palatal shelf fusion during embryonic development. Palatoplasty techniques aim to reconstruct the levator veli palatini (LVP) muscle to establish proper velopharyngeal closure. Although morphology and function of the LVP have been studied in both normal and cleft palate patients,(1)(2) there is no consensus on the quantitative characterization of successful cleft palate repair procedures and further, to date, no studies have directly evaluated or measured the cleft morphology and defect immediately pre- and post-palatoplasty via intraoperative magnetic resonance imaging (MRI).

**Methods:** In this study, we compare the immediate pre- and post-palatoplasty anatomy of the LVP in six patients between the ages of 11 and 51 months via intraoperative MRI. Measurements of LVP length and thickness were obtained using the oblique coronal plane and measurements of velar length, velar thickness, and velopharyngeal gap were obtained using the sagittal plane. Paired sample T-test was used to assess for statistical significance between immediate pre- and post-palatoplasty.

**Results:** The mean LVP length increased from 47.8mm to 61.2mm ( $p=0.010$ ) while the mean LVP thickness at the central palate was reconstructed to 7.8mm ( $p<0.001$ ). The mean velar length increased from 8.9mm to 26.3mm ( $p=0.002$ ), and the mean velar width increased from 5.8mm to 11.9mm ( $p<0.001$ ). The mean velopharyngeal gap decreased from 6.9mm to 1.7mm ( $p=0.013$ ).

**Discussion:** Results indicate that MRI quantification provides a valuable evaluation of the pre-operative LVP anatomy. This study reports the first use of intraoperative MRI measurements in a cohort of patients to objectively assess cleft palate pre-operative anatomy and surgical repair results. Early post-surgical results indicate no evidence of fistula formation or velopharyngeal insufficiency.

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## **Obesity as an Independent Risk Factor for Carpal Tunnel Syndrome and Relationships to Diabetes Mellitus**

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**PURPOSE:** Although the relationship between diabetes mellitus (DM) and carpal tunnel syndrome (CTS) is well-documented due to neuropathic complications (1), a relationship specific to CTS and obesity has not yet been identified on a population level. Given the direct relationship between obesity and DM (2), the current study seeks to compare CTS prevalence among obese and non-obese patients, examine various associations between obesity, DM, and CTS, and evaluate the role of BMI in CTS risk.

**METHODS & MATERIALS:** Data used in this study came from Epic Cosmos, a community collaboration of health systems representing over 227,000,000 patient records from over 1,301 hospitals and 28,600 clinics. All patients at least 18 years of age with an encounter between December 2013 and December 2023 were included and assorted based on presence or absence of ICD-10 codes for CTS, obesity, DM, and BMI values. Other than <19.9 and >70.0, BMI values were grouped in intervals of 10.0 for comparison. 99% confidence intervals were recorded, and odds ratios were calculated for group comparison. Significance was determined by  $p < 0.01$ .

**RESULTS:** All adult patients with a documented obesity diagnosis ( $n=26,702,609$ ) showed a significant, near 6-fold increase in CTS prevalence ( $5.9\% \pm 0.012\%$ ) compared with non-obese adult patients ( $n=161,410,353$ ;  $1.1\% \pm 0.002\%$ ;  $OR=5.41$ ,  $p < 0.0001$ ).

When only including adults with a documented DM diagnosis, obesity was also associated with a significantly increased CTS prevalence ( $n=7,981,900$ ;  $7.9\% \pm 0.025\%$ ) compared with both non-obese, diabetic patients ( $OR=2.67$ ,  $p<0.0001$ ) and non-diabetic obese patients ( $n=18,720,709$ ;  $5.0\% \pm 0.013\%$ ;  $OR=1.62$ ,  $p<0.0001$ ). When excluding those with a documented DM diagnosis, this relationship was largely maintained with a significant, 5-fold increased prevalence in obese adults without DM ( $n=18,720,709$ ;  $5.0\% \pm 0.013\%$ ) compared with non-obese adults without DM ( $n=150,929,553$ ;  $1.0\% \pm 0.002\%$ ;  $OR=5.21$ ,  $p<0.0001$ ). Additionally, obese adults without DM had a higher rate of CTS compared to non-obese, diabetic adults ( $n=10,480,800$ ;  $3.1\% \pm 0.014\%$ ;  $OR=1.65$ ,  $p<0.0001$ ).

Stratifying by BMI, the 30.0-39.9 group ( $n=13,452,382$ ) had significantly higher CTS comorbidity ( $6.0\% \pm 0.017\%$ ) than the  $<19.9$  group ( $n=1,937,281$ ;  $2.7\% \pm 0.030\%$ ;  $OR=2.26$ ,  $p<0.0001$ ) and the 20.0-29.9 group ( $n=165,403,966$ ;  $1.2\% \pm 0.002\%$ ;  $OR=5.06$ ,  $p<0.0001$ ). However, the 40.0-49.9 group ( $n=3,316,957$ ;  $5.5\% \pm 0.032\%$ ;  $OR=0.91$ ,  $p<0.0001$ ), 50.0-59.9 group ( $n=563,017$ ;  $4.6\% \pm 0.072\%$ ;  $OR=0.77$ ,  $p<0.0001$ ), 60.0-69.9 group ( $n=99,203$ ;  $3.6\% \pm 0.152\%$ ;  $OR=0.59$ ,  $p<0.0001$ ), and  $>70.0$  group ( $n=38,837$ ;  $3.4\% \pm 0.236\%$ ;  $OR=0.55$ ,  $p<0.0001$ ) each had significantly lower rates of CTS than the 30.0-39.9 group.

**CONCLUSIONS:** While DM patients are classically associated with CTS presentation, obesity, even without DM, possesses a similar and more powerful relationship. Additionally, comorbidity of obesity and DM suggests an additive effect between the two diagnoses on increased CTS prevalence. Although CTS prevalence initially increases with increased BMI, this relationship is far from linear. Further research must be undergone to evaluate the anatomic and pathologic mechanism of this relationship.

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# **Patient Experiences with Breast Implant Illness: An Analysis of Online Support Groups Reveals Patient Concerns and Needs**

Abstract Presenter

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**Introduction:** Breast implant illness (BII), also known as autoimmune/inflammatory syndrome induced by adjuvants (ASIA), describes a cluster of patient-reported autoimmune-like symptoms following silicone breast implant surgery. The most agreed upon hypothesis is that BII is a result of an autoimmune or inflammatory reaction, though the exact etiology of this condition remains unknown and its existence remains controversial. Despite this, the patient experience with BII cannot be ignored, as devastating, life altering effects have been described. Here, we analyze the online support groups for BII patients to understand the needs of this unique population.

**Methods:** A systematic search for BII support groups on FaceBook was conducted and all English-language groups active in the last six years were included. Posts were read by two independent reviewers to understand the needs, goals, and forms of support provided by the users in the group. Data analysis included group metrics and post contents.

**Results:** A total of 24 support groups were identified, of which 29% (n = 7) were public and 71% (n = 17) were private. Most groups were established between 2015 to 2019 (88%, n = 21), with only an additional 12% (n = 3) formed more recently. The median group size is 1,950 members (interquartile range = 5,078.8). Common post-themes across groups was as follows: reporting symptoms (n = 23), helping others navigate care (n = 22), sharing feelings (n = 21), seeking recommendation for symptom relief (n = 20), seeking recommendation for providers (n = 18), and reporting on interactions with providers (n = 12). Education in the form of sharing articles and videos was common, with one group dedicated to posting peer-reviewed articles. Furthermore, patient frustration was frequently expressed, with regards to lack of diagnosis, conflicting information, and difficulty finding physicians. No individual shared that they were diagnosed with BII, though other diagnoses related to their BII symptoms included a spectrum of autoimmune disorders, chronic pain/fatigue, anaplastic large cell



lymphoma, anxiety, depression, fibromyalgia, postural orthostatic tachycardia syndrome, and monoclonal gammopathy of unknown significance. Many patients reported symptom relief after explant in 63% (n = 15) of groups.

**Conclusion:** Patients reporting BII symptoms are actively using online support groups to share experiences, recommend providers, offer emotional support, and educate others. Frustration with lack of diagnosis is clear among users, which helps to understand the high level of activity on these platforms. Patients are seeking empathy and understanding from both peers and providers, as well as advocating for increased attention to BII symptomatology. Providers can use this information to best address patient concerns within limited time during encounters.

## **Peer Relationship Problems in Children with a Craniofacial Anomaly**

Abstract Presenter

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**Background:** Children with visible medical conditions, such as craniofacial anomalies (CFAs), may be vulnerable to peer relationship problems. The current literature exploring peer relationships in children with CFAs is limited and mixed, making it difficult to guide informed psychosocial interventions. This study aims to characterize peer problems in children with CFAs and examine potential risk factors for peer problems. We examined physician-rated severity of CFAs as one risk factor as well as two cognitive risk factors: perceived stigmatization (e.g., the extent to which children perceive others are stigmatizing them due to their CFA) and hostile attributions (e.g., the extent to which children ascribe negative intent to others' ambiguous actions). We hypothesized that children with CFAs would have increased experiences of withdrawal/depression and social problems compared to norms. Second, we hypothesized that previously identified risk factors, including greater CFA severity rating, perceived stigmatization, and hostile attributions of peers would be associated

with increased peer difficulties.

**Methods:** Participants included N = 43 children (39.53% girls; M age = 9.27 years, SD age = 1.88, 32.56% Black/African American, 44.19% White, 4.65% Hispanic/Latino/a, 2.33% Asian/Asian American, 2.33% bi/multiracial, and 13.95% not reported/missing) and their caregiver(s) (76.74% female) who were patients seen in a multidisciplinary craniofacial clinic at an academic medical center located in the southern United States. Caregivers and their children completed questionnaires about children's psychosocial functioning and behaviors. Medical providers reported on CFA severity for participating children. All questionnaires utilized in the current study have been previously used with school-aged populations and demonstrate good psychometric properties.

**Results:** Data analyses included descriptive statistics of various peer problems (i.e., withdrawal/depression, aggression, and victimization) in children with CFAs. Mean scores for withdrawal/depression ( $t(37) = 4.92, p < .0001$ ), social problems ( $t(37) = 5.34, p < .0001$ ), and aggressive behavior ( $t(37) = 2.81, p = 0.008$ ) were significantly higher for children with a CFA compared to norms. Spearman Correlations revealed that children who perceived their peers to be staring at them were shyer ( $r = 0.51, p < .001$ ) and had more symptoms of withdrawal/depression ( $r = 0.49, p < .01$ ). Children who perceived their peers to be hostile engaged in more physical and relational aggression ( $r = 0.33, p < .05$ ). Lower physician rated CFA severity was associated with increased relational aggression ( $r = -0.32, p < .05$ ). Hostile attributions were not significantly associated with increased peer problems.

**Conclusion:** In the current study, children with CFAs experienced increased peer problems including withdrawal/depression, social problems, and aggressive behaviors compared to their peers. As hypothesized, perceived stigmatization was associated with increased peer problems, including increased shyness, withdrawal/depression, and physical and relational aggression. Additionally, children's perceived experiences of peer hostility and staring were associated with increased peer problems. Lower physician-rated CFA severity was associated with increased relational aggression, which is often associated with increased social dominance among peers. Increased knowledge of peer difficulties in this population can guide clinical intervention efforts, including interventions focusing on improving the self-image of children with CFAs.

## **Pre-Operative Mammography as a Predictor of Mastectomy Skin Flap Necrosis**

Abstract Presenter

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Abstract Co-Author

Arash Momeni MD

**Purpose:** Breast cancer is a common diagnosis with mastectomy a common treatment modality. Mastectomy skin flap necrosis (MSFN) occurs when the blood supply to the skin flaps is insufficient to meet metabolic demands. We sought to determine whether mammography would aid in preoperative risk stratification of patients hypothesizing that a thicker subcutaneous adipose tissue layer would be associated with a lower rate of postoperative MSFN.

**Methods:** A prospectively maintained database was retrospectively analyzed to identify 50 consecutive patients who underwent nipple sparing mastectomy (NSM) and subsequent implant based or autologous breast reconstruction. Using each patient's preoperative mammography, measurements were made to determine the thickness of the subcutaneous tissue. This was performed by taking an average of six measurement points. Three points were obtained on the craniocaudal view and three on the medial lateral oblique view.

**Results:** Forty-four patients and 73 breasts were included in final data analysis. Forty-three (58.9%) patients experienced mastectomy flap necrosis. On multivariable regression, subcutaneous thickness ( $p = 0.04$ ) was found to be predictive of mastectomy skin flap necrosis along with BMI ( $p = 0.02$ ) and smoking status ( $p=0.02$ ).

**Conclusions:** A significant association between subcutaneous tissue thickness and MSFN was identified. Two hypotheses are proposed; 1) the subdermal plexus in patients with thinner subcutaneous tissues is less robust, and 2) the subdermal plexus is more easily disrupted mechanically intraoperatively in patients with thinner subcutaneous tissues. Further studies may be aimed at determining if there is a specific value beyond which mastectomy skin flap necrosis can be expected.

# **Quantifying Plastic Surgeon Engagement in the Evolution of ICD-10 Codes**

Abstract Presenter

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## **Introduction:**

The precision of ICD-10 codes remains pivotal in modern medical practice and research, ensuring detailed diagnosis documentation for patient care and population-level data aggregation. Despite ongoing enhancements to the ICD coding system, significant gaps persist, particularly in plastic surgery. These gaps hinder plastic surgeons' ability to document clinical encounters accurately, impacting education, research, and patient care. This study examines the advocacy efforts by plastic surgeons for ICD code modifications over the past decade, aiming to quantify their engagement and highlight areas for potential improvement. It underscores the imperative of augmenting ICD-10 code specificity in plastic surgery to mirror the field's intricacies, thereby advancing practice, research, and education efforts.

## **Methods:**

A retrospective analysis of ICD code modification proposals submitted to the ICD Coordination and Maintenance Committee from March 2013 to March 2023 was executed using publicly accessible records from the CDC National Center for Health Statistics. Duplicate proposals were identified and excluded, and the remaining proposals were categorized by source, including surgical specialty organizations, independent surgeons, and other stakeholders. Proposals were further classified by surgical specialty, with a specific focus on contributions from plastic surgery. This process aimed to gauge the level of engagement and advocacy within the plastic surgery field towards ICD code modifications.

## **Results:**

Between March 2013 and March 2023, a total of 21 ICD Coordination and Maintenance

Committee Meetings were conducted, reviewing a total of 619 proposals. After the exclusion of 126 duplicate proposals, a total of 493 novel proposals were reviewed. Of these, 114 (23.1%) were submitted by surgical organizations or independent surgeons. A total of 16 surgical organizations were represented, collectively contributing to 72 (14.6%) novel proposals. The American Urological Association and the American Congress of Obstetricians and Gynecologists were responsible for the highest number of proposal submissions during the study period, promoting 25 and 24 novel proposals, respectively. Additionally, the American Academy of Ophthalmology had 7 proposals, followed by the American Association of Oral and Maxillofacial Surgeons with 4 proposals. The remaining organizations, including plastic surgery-related organizations, each submitted 1-2 proposals. A total of 8 surgical specialties were represented in surgical-related submissions by independent surgeons collectively contributing to 42 (8.5%) novel proposals. Plastic surgery was represented by 2 proposals, making up only 1.8% of all surgical-related proposals and 0.4% of all novel proposals.

### **Conclusion:**

The involvement of plastic surgeons in the ICD code modification process over the last decade has been significantly limited, highlighting an opportunity for the specialty to enhance coding precision for plastic surgery-related diagnoses. This gap underscores the imperative for codes that accurately capture the specialty's complexity. The study emphasizes the critical need for increased coding advocacy within the plastic surgery community, asserting that such engagement is pivotal for improving clinical documentation, enhancing research quality, and ultimately optimizing patient outcomes. Augmented coding specificity will empower better data collection and outcome assessment, fostering evidence-based practices and propelling advancements in the field of plastic surgery.

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## **Racial Disparities in Implant-Based Breast Reconstruction Across the United States**

Abstract Presenter

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In 2021, Susan G. Komen (SGK) published landscape analyses of breast cancer disparities across ten metropolitan areas (MTAs) with the most significant health inequities in breast cancer outcomes for Black women.(1) While SGK reported racial disparities along many aspects of the care continuum, it did not investigate disparities in breast reconstruction (BR) in women who undergo mastectomy. BR has become standard of care in the continuum of comprehensive breast cancer treatment and can dramatically improve quality of life.(2) The purpose of this study was to expand upon the results from SGK and investigate racial disparities in implant-based BR utilization across the United States (US).

This descriptive study was performed using data from the Centers for Medicare & Medicaid Services. Black and White women with Medicare Part A insurance and a breast cancer diagnosis who underwent at least one mastectomy between January 2016 and December 2022 were included. Racial disparities were investigated through three primary outcomes: overall BR utilization (%), immediate BR utilization (%), and mean days to delayed BR. Summary statistics were generated for all outcomes at the national level, and across all core-based statistical areas (CBSAs). A disparity index (DI) was calculated for each outcome per CBSA; DIs were sorted into DI deciles (DIDs) indicating low (1-3), moderate (4-7), and high (8-10) disparity. Qualitative analyses were conducted for ten key CBSAs, anchored in the MTAs explored by SGK, to contrast with disparity patterns previously reported.

A total of 487,577 women (44,337 Black [9.1%], 443,240 White [90.9%]) across the US met eligibility criteria. At the national level, Black women underwent BR at a slightly lower rate than White women (5.6% vs. 6.4%); the greatest DI was in Washington-Arlington-Alexandria (Black: 5.4%, White: 11.3%, DID=9). Black women also had a slightly lower rate of immediate BR across the US compared to White women (75.5% vs. 76.7%). The greatest DI for immediate BR was in Houston-The-Woodlands-Sugar-Land (Black: 47.7%, White: 63.6%, DID=8). Further, there was a disparity in days to delayed BR at the national level, with Black women having a longer wait time compared to White women (306 vs. 287 days). The greatest DIs were in St. Louis and Dallas-Fort-Worth-Arlington (385 vs. 259 days; DID=9, and 413 vs. 291 days; DID=8, respectively).

Disparities for Black women were observed across the US in overall BR utilization, immediate BR utilization, and mean days to delayed BR. Such disparities may result from several factors, including access to and quality of care, socioeconomic status, and health literacy-which were not controlled for in our descriptive investigation. Our analysis is cursory; hence, further research is needed to investigate underlying mechanisms that foster disparities, especially in those MTAs identified in our study as having a high DI.

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## **Resident and Faculty Perspectives Toward Plastic Surgery Skills Lab: A Targeted Needs Assessment for Curriculum Development**

Abstract Presenter

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**Introduction:** Currently there are no standard guidelines for surgical skills lab curricula in plastic surgery, leaving educators with the significant challenge of determining how to optimize learning in the lab. Though skills labs are becoming increasingly common in plastic surgery programs, we do not fully understand how to maximize resource utilization and how to align skills lab curricula with the specific needs of resident learners. As part of the process of refining our curriculum, we aimed to perform a targeted needs assessment to investigate attitudes toward our current plastic surgery skills lab at UCSF.

**Methods:** Plastic Surgery residents at UCSF participate in a recurring 2-year longitudinal skills lab curriculum, held once a month with a combination of cadaver labs and other hands-on workshops. We conducted semi-structured interviews with plastic surgery resident learners and faculty facilitators to explore the perceived value of skills lab in resident education, the utility of its content, and the strengths and limitations of the current skills lab curriculum. Two residents involved with this project were excluded. All interviews were de-identified, transcribed verbatim, and then analyzed using a constructivist grounded theory approach. A sub-analysis was performed comparing junior resident (PGY1-3) to senior resident (PGY4-7) responses.

**Results:** 15 of 19 eligible integrated plastic surgery residents and 4 frequent skills lab facilitators among the surgical faculty were interviewed. Regardless of PGY level, all residents cited the skills lab as one of the most valuable educational settings in residency, providing opportunity for 1) low stress, low stakes deliberate practice, 2) detailed anatomical dissection, and 3) practice with "unique procedures," including: procedures for rare pathologies, procedures for urgent indications, and procedures less frequently seen at UCSF specifically (i.e. cosmetic and brachial plexus). All residents experienced a change in the educational environment when learning in mixed-level groups compared to near-peer groups; While both juniors and seniors acknowledged the benefit of practicing teaching skills when in mixed groups, juniors appreciated more hands-on practice and focus on fundamental skills (i.e. preoperative marking, dissection) when in junior resident groups, while senior residents appreciated "struggling together" to troubleshoot more complex dissections in senior resident groups. Both residents and attendings cited instrument, implant and hardware selection as particularly valuable skills to practice in the lab, and an area that could be more represented in future curricular iterations. Attendings strongly believed learners in the



lab should focus on practicing fundamental technical skills and improving their understanding of anatomy rather than focusing on specific procedures.

**Conclusions:** Despite the wide variability in training and exposure to different aspects of plastic surgery across residency programs, our analysis revealed important insights into broad skill categories such as instrument selection and anatomical dissection that are valued by residents and educators alike in the skills lab setting. Additionally, factors that influence the educational climate such as near-peer interactions are critical to consider when designing skills lab curricula.

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### Reverse Sural Flaps in Pediatric Patients: A Systematic Review

Abstract Presenter

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**Introduction:** The reverse sural flap (RSF), otherwise referred to as distally-based sural flap, reverse-flow island flap, and the sural fasciocutaneous flap, is a random-type, pedicled flap based on sural artery perforators indicated for traumatic wounds of the lower extremity. The RSF has demonstrated comparable results to free flap placement in the adult population for reconstruction of distal third defect. While many publications on RSF use in adult populations exist, few reports describe its application and outcomes in the pediatric population. To best investigate the RSF's use in the pediatric population, we examined the post-surgical sequelae of RSF use exclusively in pediatric patients.

**Methods:** We investigated RSF application in pediatric patients (<18 years of age) by way of systematic review and meta-analysis. Pubmed, Scopus, CINAHL, and ProQuest databases were utilized. Literature search was conducted on articles pertaining to "reverse sural flap", and results were limited to original research published after 2000 and in English-language. Two reviewers independently screened titles and abstracts from 244 articles, while a third reviewer settled any discrepancies. Inclusion criteria included case series and chart studies reporting on pediatric patients. The selected primary outcomes included overall flap survival rate, venous congestion, and necrosis. After duplicates and unrelated studies were removed, 16 studies were selected for further review and statistical analysis. Effect size was calculated for each of the primary outcomes.

**Results:** Through our methods this resulted in the inclusion of 207 patients treated with a mean age of 9.51 +/- 2.27 years, (range 3-17). 71.1 percent of patients were male and 28.9 percent were female. The majority of studies focus on the distal third as the primary site for RSF reconstruction, with fasciocutaneous being the most commonly-used flap type, followed by neurocutaneous and adipofascial, respectively. Trauma was the primary etiology responsible for soft tissue defect (91.0%) and average flap dimensions measured 53 cm<sup>2</sup>. Mean postoperative follow-up period was 20.07 months. Analysis of selected outcome measures shows a survival rate of 91.0% for reverse sural flaps. Approximately 13% of patients experienced venous congestion. Flap necrosis occurred in 15% of cases, although the vast majority of these cases were sub-total necrosis (93.1%) and successfully managed through excision and additional skin grafting. Six patients (2.9%) reported moderately impaired ambulatory function.

**Conclusions:** Thus, through our analysis, the RSF and its multiple variates demonstrate reproducible promising results in the pediatric population for distal third defects. With a comparable efficacy to free flaps for small and mid-sized defects in the

pediatric population as well as similar success rates to adult RSF patients, the RSF should be considered first line therapy for soft tissue reconstruction for lower extremity wounds.

## **ROBOTICSCOPE (ROBOTIC MICROSCOPE) ASSISTED PRIMARY CLEFT PALATE SURGERY; A PILOT RETROSPECTIVE COHORT STUDY**

Abstract Presenter  
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**Introduction:** Conventional cleft palate surgery usually involves operating in a narrow oral cavity space with surgical loupe visualization. Today, some surgeons resort to surgical microscopes to improve visualization and obtain more precise muscle dissection. The RoboticScope is a head movement controlled system which moves the Robotic arm loaded with 3D visualization technology, allowing surgeons complete freedom to use their hands for surgery.

**Aims and Objectives:** This pilot case-control study compares conventional palatoplasty with RoboticScope-assisted palatoplasty, aiming to evaluate its impact on surgical outcomes. Operation duration, pain management, in-patient recovery, and finally ergonomic benefits for surgeons will be assessed. We aim to shed light on new-generation surgical technologies that may result in increased patient and surgeon's comfort and improvement in surgical performance.

**Methods:** This was a retrospective analysis of eight pediatric patients, split into two cohorts of four, comparing conventional palatoplasty to RoboticScope-assisted palatoplasty performed in 2023. Patient's demographics were collected: age in months, gender, and type of cleft palate. The study employed both quantitative and qualitative variables. Variables measured included operative time, post-operative analgesia, oral intake, hospital stay and complication rates. Ergonomic evaluations were performed through surgeons documenting their feedback on comfort and surgical efficiency, including dissection and repair.

**Results:** Results revealed that RoboticScope-assisted palatoplasty averaged 28 minutes longer than the conventional method, attributable to the time needed for equipment setup. The average duration of surgeries that were RoboticScope-assisted averaged 121 minutes (ranged 81-180 minutes), whereas duration of surgery without the RoboticScope averaged 93 minutes (ranged 84-107 minutes). Postoperative analgesic requirements differed as well. The entirety of the non-Robotic Scope group required morphine (all four patients) and half required nalbuphine. When compared to the RoboticScope group, only 2 out of four patients required morphine and none required nalbuphine. Furthermore, three out of four of the Robotic Scope group were reported to have good oral intake post-operatively on day 1 and quicker discharge in two cases, whereas poor oral intake was reported in three out of four of the non-RoboticScope group. However, there were no notable discrepancies in complication rates. Long-term outcomes such as speech development remain under review due to need for follow-up data. Finally, ergonomic assessments for surgeons operating with the RoboticScope revealed improved posture, less physical strain, and overall better ergonomics during procedures; compared to the significant neck/back strain reported during conventional palatoplasty. In terms of statistical analysis, to yield any statistical significance we will need more study participants and data.

**Conclusion:** This study concludes that RoboticScope assisted cleft palatoplasty is safe, feasible, associated with less analgesic needs, better oral intake and ergonomic benefits for surgeons when compared to conventional palatoplasty.

## **Rx for Research: Prescribing Strategies to Boost Productivity in Plastic Surgery Research**

Abstract Presenter  
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Hannah Jones  
Paul Ghareeb MD

**Introduction:** Understanding barriers to research is crucial to optimize the productivity and impact of busy physician-scientists. Research achievement is an increasingly important metric for medical students seeking to match into competitive specialties and

elite residency programs.(1,2) Surgical residency programs often require research to graduate, and research is a key component for career advancement in academia.(3) The purpose of this study was to identify common barriers to research productivity that are specific to medical students, residents, and attending surgeons in plastic surgery.

**Methods:** A survey was distributed to members of the American Counsel of Educators in Plastic Surgery to investigate factors influencing research productivity. The users were de-identified and maintained anonymity. Users who elected to participate in the survey answered a total of 43 questions. Questions focused on demographics, level of career, details of research productivity, and factors that may have affected completion. Univariate analysis was performed with student's t test, and multivariate analysis was performed with logistic regression. Statistical significance was determined to be  $p < 0.05$ .

**Results:** A total of 109 people responded to the survey; 42 were medical students, 19 were plastic surgery residents or fellows, 7 were junior attendings, and 41 were senior attendings. Of the 19 residents and fellows, 14 had research as a requirement for their program. Among the 48 attendings, 42 worked at academic institutions. The most common stage at which a project failed was during writing of the manuscript ( $n = 43$ ), followed by awaiting IRB approval ( $n = 33$ ). 30 people spent 16-40 hours and 22 people spent 8-16 hours on projects that did not reach completion in the last five years. Overall, 39 people had  $>10$  completed projects and 31 had  $>5$  incomplete projects, with the senior attendings being responsible for most successes and failures. In the group of people who had  $>10$  completed projects, 53.8% also had  $>5$  incomplete projects.

When comparing high productivity individuals to the remainder of the cohort, there was a statistically significant difference in the percentage of people whose programs had dedicated research staff (59 vs 31%,  $p = 0.0061$ ), institutional support for research (77 vs 57%,  $p = 0.0389$ ), and offered travel reimbursement (59 vs 33%,  $p = 0.0081$ ). Predictive factors for having  $>10$  research projects included being a PGY1-3 (OR 13.3,  $p = 0.006$ ), junior (OR 10.5,  $p = 0.026$ ) and senior (OR 7.8,  $p = 0.001$ ) attending status, having dedicated research staff (OR = 6.1,  $p = 0.0019$ ), and getting travel reimbursement (OR 3.1,  $p = 0.032$ ).

**Conclusion:** Research remains an integral part of scientific discovery and career advancement in plastic surgery. This study identifies several factors that may help future physician scientists increase research productivity while reducing inefficiency. Furthermore, we found that individuals with high academic productivity are more likely to also have the highest number of unsuccessful projects. Programs that support research productivity with dedicated research staff and adequate travel reimbursement are likely to have more research success.

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## **Sexual Satisfaction Post-Gender-Affirming Chest Masculinization: A Narrative Review**

Abstract Presenter  
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**Introduction:** The number of patients undergoing gender-affirming surgery (GAS) has continued to rise in recent years (Chaya 2022). There has been an increase in literature regarding the medical and surgical outcomes associated with GAS, but findings on sexual health outcomes have been slow to follow. In particular, gender-affirming chest masculinization has not been extensively studied in its role in sexual health. This study aims to conduct a literature review into the outcomes of gender-affirming chest masculinization associated with sexual satisfaction and wellbeing.

**Methods:** Studies were identified through PubMed, Google Scholar, and Cochrane Libraries. We considered all studies published through December of 2023.

**Results:** Forty-five studies were identified and evaluated. Many studies suggested that there was a significant increase in several sexual health-related outcomes including but not limited to sexual confidence, feeling sexually attractive when unclothed, and increase in sex drive. Post-surgical improvements in the number of patients were reported of up to 77%, 94%, and 54%, respectively (Poudrier 2019, Davis 2014). Several studies found there to be a lack of sufficient existing evaluation tools explicitly

tailored to the transgender and gender-diverse population (Barone 2017).

**Discussion:** To the best of our knowledge, this is one of few literature reviews to consolidate findings regarding sexual health and wellbeing of individuals who underwent gender-affirming chest masculinization procedures. There are few studies that focus exclusively on these types of procedures and even fewer that further separate out the various approaches to chest masculinization and their respective outcomes. A lack of existing validated evaluation tools that are catered to transmasculine and non-binary individuals assigned female at birth is a possible reason for this dearth in knowledge. We recommend that future evaluation tools be created to be inclusive of the breadth of chest masculinization surgery and its various approaches, unique gender identities, and sexual outcomes as related to the transgender and gender-diverse community.

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## **Split-Thickness Skin Graft Outcomes in Non-traumatic Lower Extremity Wounds: Does Location Matter?**

Abstract Presenter  
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**Background:** The use of a split-thickness skin graft (STSG) is a mainstay for managing chronic, non-traumatic lower extremity (LE) wounds. However, the biomechanics of LE anatomy introduces shearing forces and natural pressure points that can lead to STSG failure (1, 2). Such challenges may deter surgeons from considering STSG in regions such as the heel and ankle when such efforts could lead to successful limb salvage. This study aims to determine if wound location and surface impacts STSG outcomes.

**Methods:** A retrospective review of patients who underwent STSG from December 2014 to December 2022 was conducted. Wounds pre-treated with synthetic dermal matrix (SDS) prior to STSG placement were excluded. Patient demographics, wound characteristics, and post-operative outcomes were collected. Wound location was classified into seven categories: forefoot, midfoot, hindfoot, transmetatarsal amputation (TMA) site, ankle, leg, and knee. Foot wounds were further classified as plantar or dorsal. Graft failure, defined as complete necrosis or removal of the STSG, was compared among groups. An additional sub-analysis of plantar wounds treated with and without SDS was performed.

**Results:** A total of 168 patients with 245 wounds underwent STSG during the study period. Overall, the cohort was 61.3% male with a median age of 61.9 (IQR: 15.1) years and BMI of 28.5 (IQR: 8.9) kg/m<sup>2</sup>. The median Charlson Comorbidity Index (CCI) score was 4 (IQR: 3), reflecting prevalent rates of diabetes mellitus (DM) (57.1%), chronic kidney disease (CKD) (22.6%) and peripheral artery disease (PAD) (36.9%). Median wound size was 29 (IQR: 71) cm<sup>2</sup>. Wounds were located on the forefoot (n=48/245, 19.6%), midfoot (n=20/245, 8.2%), hindfoot (n=36/245, 14.8%), ankle (n=45/245, 18.4%), lower leg (n=78/245, 31.8%), knee (n=15/245, 6.1%), and TMA (n=5/245, 2.0%). Overall, rate of graft failure was 18.0% (n=44/245), with no differences between location groups (p=0.601). In the foot, wounds on plantar surfaces exhibited significantly higher rates of graft failure compared to dorsal defects (n=11/37, 29.7% vs. n=8/70, 11.4%, p=0.018). Furthermore, in a univariate regression, plantar foot wounds were associated with a 3.3-fold increase in the odds of graft failure (OR: 3.3, CI: [1.1, 9.1], p=0.022). Subanalysis of plantar defects treated with and without SDS prior to STSG demonstrated that pre-treatment with SDS decreases graft failure rates significantly by



23.6% (7.1% vs. 30.8%,  $p=0.019$ ).

**Conclusions:** Our results suggest that STSG is a viable method for LE wound coverage across multiple locations. However, wounds on plantar surfaces are more susceptible to graft failure. In these cases, the use of SDS prior to STSG may increase chances of graft success. Our institution's rigorous approach to postoperative immobilization and ambulation restrictions may have contributed to the overall success of STSG in our highly comorbid cohort. Emphasizing off-loading protocols is critical to improve graft outcomes in high-risk areas in a comorbid patient population.

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### **Testing ChatGPT's Knowledge of Hand Surgery: Performance of GPT-3.5 on the Hand Surgery Annual Self-Assessment Examination**

Abstract Presenter

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**Introduction:** Large Language Models like ChatGPT have become increasingly used to generate fluent content in a variety of different styles. Developers have trained the algorithm on internet-based sources of written human speech and encyclopedic knowledge. Studies have investigated the software's knowledge base including performance on exams like the Plastic Surgery In-Training Exam<sup>1</sup> and European Hand Certification Exam<sup>2</sup>, generation of readable and accurate patient content<sup>3</sup>, and advanced educational content for students. The purpose of this study is to assess ChatGPT-3.5's performance on the Annual Hand Surgery Self-Assessment Examination, examine trends in accuracy over time, and determine any particular gaps

in knowledge or patterns of interest.

**Methods:** Annual Hand Surgery Self-Assessment Examinations from years 2015 to 2021 were obtained as a question bank source. Each examination contained 200 multiple choice questions categorized under one of the following sections: basic science, bone and joint, neuromuscular, skin, vascular, ancillary, miscellaneous. Questions were formatted similarly on all years of examinations; an initial question stem followed by a single blank line and five response options labeled A through E. Each response option was entered on a separate line. In total, 1,400 questions spanning a seven-year period were collected. All 1,400 questions were entered as queries to ChatGPT using the Google Sheets ChatGPT-3.5 extension. Questions were formatted identical to how they appeared on the self-assessment examinations, minus any associated tables or media. Due to ChatGPT's adaptive learning ability within a conversation box, questions were queried in individual chat sessions. This was accomplished through use of the Google Sheets ChatGPT-3.5 extension. Analysis was performed in Microsoft Excel with an ANOVA and Student's t-test. Questions containing media necessary for answer selection were excluded.

**Results:** ChatGPT-3.5 only passed two of the seven examinations, which were the more recent examinations with newer information available. Overall percentage was 47.9%, less than passing score. Results possibly due to reference lag of five to seven years, as ChatGPT-3.5 was trained on data from 2013 to 2020. No statistically significant difference in word count between correct and incorrect responses. No significant difference in ChatGPT's selection of letter answers, however, a slight nominal bias toward "C" was present. ChatGPT scored higher on "ancillary" and "miscellaneous" sections ( $p=0.25^{-4}$ ), which include hand therapy, splints, ethics, infections, tumors, and congenital hand.

**Conclusions:** ChatGPT-3.5 does not reliably perform to passing standards on the self-assessment exam, making falsification for CME credit non-viable. Chat-GPT "hallucinates" answers consistently even in the deliberate setting of incomplete information and does not cite sources. It is not recommended as a study resource for hand surgery. Overall, ChatGPT-3.5 performed better on categories with broader range and less depth.

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# The Evolution of a Paradigm Shift: Analyzing Trends in Nerve Transfer Utilization from 2000 to 2022

Abstract Presenter

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**Purpose:** The introduction and refinement of nerve transfers is said to have contributed to a "quantum leap" and paradigm shift in peripheral nerve surgery over the last two decades (1,2). While studies analyzing case logs of plastic and orthopedic surgeons suggest an increasing familiarity with nerve transfer techniques, the impact of trends in the utilization of nerve graft vs. nerve transfer procedures on Medicare beneficiaries remains unclear (3,4). By examining data from one of the largest single payers in the United States, this analysis aims to clarify how a predicted paradigm shift in the use of nerve grafts versus nerve transfers progressed.

**Methods:** Data on services billed to Medicare from 2000-2022 were analyzed using Medicare Part B National Summary Data files. Each service is identified by a Current Procedural Terminology (CPT) code, with the total number of services performed annually associated with each code published. Twelve CPT codes associated with nerve graft procedures (64890, 64891, 64892, 64893, 64895, 64896, 64897, 64898, 64901 and 64902) and one CPT code representing nerve transfer procedures (64905) were queried. Trends were longitudinally analyzed from 2000 to 2022 by tracking the total allowed services performed by physicians each year. Utilization rates for each procedure were used to assess changes in the proportion of nerve graft and nerve transfer procedures over twenty-two years.

**Results:** In 2000, nerve transfer procedures represented less than 1% of the sum of nerve graft and nerve transfer CPT code services billed to Medicare. By 2011, this proportion increased to less than 7%. Remarkably, by 2022, nerve transfers represented nearly 78% of all graft and transfer services performed by physicians paid by Medicare. Graft codes encompassed services performed for nerve grafts in the hand, foot, arm, and leg as well as the head and neck. Between 2000 and 2011, utilization of nerve graft procedures decreased by 6.56%. However, between 2011 and 2022, nerve

graft procedures increased by 13.38%, representing an overall increase of 5.94% between 2000 and 2022. Nerve transfer procedures exhibited a dramatic increase in percentage, with a 1000% increase from 2000-2011, and a 5322% increase from 2011-2022. This cumulative increase amounted to nearly 60,000% increase across 2000-2022, skyrocketing from only 2 procedures billed in 2000 to 1,292 in 2022. When analyzing trends in the ratio of nerve graft to nerve transfer procedures, the proportion of transfer procedures steadily increased from 2000-2016, albeit remaining a minority (38.98%) compared to graft procedures. By 2017, nerve transfer procedures surpassed the utilization rate of graft procedures, comprising 57.19% of total graft and transfer procedures performed.

**Conclusion:** Our analysis reveals a substantial increase in nerve transfer procedures across 2000-2022, indicating a notable shift in practice models of peripheral nerve surgical intervention. These findings highlight the impact of a paradigm shift in peripheral nerve surgical techniques and underscore the evolving landscape of overall reconstructive techniques. Further research is warranted to elucidate differences between specialties and geographical trends in adoption of nerve transfers.

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## **The Impact of Diabetes and Weight Loss Medications on Wound Healing: A Systematic Review**

Abstract Presenter  
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**OBJECTIVE:** To conduct a systematic review examining how different medications for diabetes and weight loss management affect wound healing and the incidence of wound development.

**METHODS:** Using systematic review methodology, we searched multiple databases, including PubMed/Medline, Cochrane Central, and Embase. The search was conducted in February 2024 with no limit on publication date. Inclusion criteria focused on studies regarding wound healing. Specifically, our primary search terms included wound, wound healing, diabetes, diabetes medications, GLP, DPP, and topiramate. We excluded studies that noted chemotherapy, neoadjuvant, and radiation. Abstracts were independently reviewed for inclusion or exclusion. The 2020 PRISMA guidelines were followed.

**RESULTS:** A preliminary systematic review yielded 146 records that addressed the first aim of our study, of which 19.8% (29/146) met the inclusion criteria. Outcome measures of glucagon-like peptide-1 (GLP-1) in 44.8% (13/29), dipeptidyl peptidase-4 (DPP-1) in 48.3% (14/29) and topiramate 10.3% (3/29) of studies. Of those studies with an outcome of DPP-4, 35.7 % (5/14) noted an improvement in angiogenesis and wound healing. Similarly, GLP-1 enhanced angiogenesis and attenuated the inflammatory response in 23.0% (3/13) of studies. Topiramate was found to improve the quality of wound healing through signaling pathways involved with inflammation and growth factors in 66.6% (2/3) of studies.

**CONCLUSION:** This systematic review highlights the possible wound-healing benefits of GLP-1, DPP-4, and topiramate. Although promising, most study data has been generated using animal models, with few studies assessing systemic medications in humans. Given the increased use of GLP-1 medications in both the general and diabetic populations, further studies are necessary to investigate their clinical significance as they relate to wound healing. Furthermore, there remains a need for systematic evidence from randomized trials on these classes of medications in the chronic wound care setting.

## **The Incidence and Predictive Factors of Post-Traumatic Stress Disorder in Burn Injury Survivors**

Abstract Presenter  
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**Background:** Burn injuries represent a traumatic and life-altering event with profound physical and psychological consequences. Among these, Post-Traumatic Stress Disorder (PTSD) emerges as a critical psychological aftermath affecting a considerable number of survivors. Understanding the prevalence and risk factors associated with PTSD following burn injuries is essential for developing targeted mental health interventions. This study aims to explore the incidence of PTSD among burn injury survivors and to identify demographic, clinical, and injury-related factors that may predict its development.

**Methods:** Utilizing a retrospective chart review design, this study analyzed medical records of 95 patients pulled from a pre-existing database with a documented mental illness pre-or post-burn injury who were treated at an ABA verified burn center over a three-year period between January 2017 and December 2020. Data extracted included demographics, burn injury characteristics (total body surface area affected, degree of burns, location of burns), and documented comorbidities. PTSD incidence was determined through diagnoses noted in medical records, based on DSM-5 criteria. Statistical analyses, including t-tests and logistic regression models, were used to identify predictors of PTSD among the study population.

**Results:** Preliminary analyses revealed that 20% of the burn injury survivors obtained a diagnosis of PTSD related to their burn injury. Key predictors for the development of PTSD included total body surface area burns of greater than 10% ( $P < 0.05$ ), burns involving the head ( $P < 0.05$ ), and increased length of stay in the hospital ( $P < 0.05$ ). Furthermore, the presence of prior psychiatric conditions pre-burn ( $P < 0.05$ ) had a significant relationship with PTSD incidence post-burn, with the most common pre-burn conditions being anxiety and depression. There was no significant correlation with PTSD incidence and number of OR visits ( $P = 0.35$ ). Interestingly, age less than 35 years at time of burn injury also correlated with increased PTSD incidence ( $P < 0.05$ ).

**Conclusions:** The high incidence of PTSD observed in this study highlights the significant psychological impact of burn injuries. The identification of predictive factors for PTSD underscores the importance of integrating psychological assessments into the standard care protocol for burn survivors, particularly for those with identified risk factors. The data suggest a strong association between the severity and location of burn

injuries and the likelihood of developing PTSD, underscoring the need for early psychological assessment and support for patients with these risk factors. These findings advocate for a comprehensive approach to burn care that includes mental health support to mitigate the development of PTSD. Given the retrospective nature of the study, further prospective research is needed to validate these findings and explore the efficacy of early psychological interventions in reducing PTSD prevalence among burn injury survivors.

## **The Incidence of Paramuscular Perforators in Deep Inferior Epigastric Perforator Flap Surgical Planning**

Abstract Presenter

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**Background:** Perforating vessels from the deep inferior epigastric pedicle can in some instances travel around the medial edge of the rectus abdominis muscle without passing through any portion of the muscle itself. Such "paramuscular" perforators do not require any muscular dissection and allow for a longer pedicle length, and thus are highly favorable for use in deep inferior epigastric perforator (DIEP) flap breast reconstruction procedures. Recently developed advanced imaging modalities now allow for enhanced identification and greater quantitative description than previously possible. Therefore, the purpose of this study was to utilize high-resolution magnetic resonance angiography (MRA) to quantify the presence and anatomic characteristics of paramuscular perforators.

**Methods:** A retrospective institutional review was conducted of patients who underwent DIEP flap breast reconstruction between 2016 and 2023. Patients who had a preoperative MRA of their abdominal vascularization were included. Patient demographics and anatomic variables of any paramuscular perforators were collected. Descriptive statistics was performed to analyze the incidence of the perforator and the average infraumbilical distance among the cohort. The p-value was set to 0.05 for

relative variables.

**Results:** MRA series from 517 patients met the criteria and were analyzed. A total of 72 paramuscular perforators were identified in 64 patients. Paramuscular perforators were unilaterally present in 10.8% (n=56) of patients and bilaterally present in 1.5% (n=8) of patients. When unilaterally present, paramuscular perforators were found on the right side in 38 patients and on the left side in 18 patients ( $p<0.001$ ). The mean infraumbilical distance of the right-sided paramuscular perforators was  $4.6 \pm 2.5$  cm, and left-sided paramuscular perforators was  $4.1 \pm 1.8$  cm.

**Conclusions:** By utilizing high-resolution MRA imaging the present study found that paramuscular perforators were unilaterally present in 10.8% of patients and bilaterally present in 1.5% of patients. Furthermore, when unilaterally present, paramuscular perforators were more than twice as likely to be present on the right side as on the left side.

### **The Makings of a Successful Integrated Plastic Surgery Residency Applicant: Insights from the Texas STAR and 2020 NRMP Program Director Survey**

Abstract Presenter  
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**Background:** The competitiveness of Integrated Plastic Surgery Residency (IPSR) makes the application process unpredictable and costly. With the return of away rotations post-COVID-19 and USMLE Step 1 now pass/fail, future applicants can benefit from recent match data. The Texas Seeking Transparency in Application to Residency (STAR) survey promotes transparency in residency matching by sharing application data, and the National Residency Matching Program (NRMP) provides insights from program directors (PDs) on important factors for applicant ranking. Though similar analyses have been conducted for other competitive surgical subspecialties, these trends in the application to IPSR have yet to be clarified. This study seeks to examine the characteristics of recently matched versus unmatched IPSR applicants through



analysis of the Texas STAR database and compare these findings to attitudes expressed in the 2020 NRMP PD survey.

**Methods:** We retrospectively reviewed the Texas STAR database for IPSR cycles 2020-2023. Information collected included academic, standardized test performance, extracurricular, and match cycle outcome data. Descriptive statistics were calculated, and univariate analyses were used to compare matched and unmatched applicants. Percent of PDs citing factors and the average score of the factor were multiplied to give a standardized score.

**Results:** A total of 209 IPSR applicants participated in the Texas STAR survey from 2020-2023, with a match rate of 70.3% (147). There were no significant differences between matched versus unmatched applicants in Step 1 scores  $\geq 240$  ( $p = 0.708$ ) and Step 2 scores  $\geq 250$  ( $p = 0.465$ ), class quartile ( $p = 0.198$ ), number of honored clerkships (0.351), honors/A in surgery ( $p = 0.286$ ), Alpha Omega Alpha (AOA) membership ( $p = 0.307$ ), Gold Humanism Honor Society membership ( $p = 0.108$ ), number of volunteer experiences ( $p = 0.779$ ), number of leadership positions ( $p = 0.709$ ), or number of programs applied to ( $p = 0.923$ ). However, matched applicants reported a significantly greater median number of peer-reviewed publications (8 [4, 11] vs 5 [3, 9],  $p = 0.023$ ) and a greater median aggregate research output (18 [12, 22] vs 14.5 [9, 19],  $p = 0.013$ ) than unmatched applicants. Matched applicants attended significantly more interviews (13 [9, 18] vs 9.5 [4, 14],  $p < 0.001$ ). PDs rated letters of recommendation, USMLE Step 1 score, and AOA membership as the three most important factors for interview selection. 100% of PDs who responded ranked interpersonal skills, as well as interactions with faculty and staff during the interview as factors included in ranking to match.

**Conclusions:** Application to IPSR is competitive. Although exam scores, grades, and honor society memberships in both matched and unmatched applicants were high, there were no significant differences among these factors between the two groups. This stresses that most applicants will be academically excellent, but they must stand out with research and interpersonal skills to successfully match as well. This is perhaps why research output was found to be greater in matched applications and was the fourth most important factor for interview selection. This is further supported by the findings from the PD survey, which lists interpersonal traits as imperative to match.

# **The Role of Circulating Metabolites and the Gut Microbiome in Hypertrophic Scar Formation: a Two-sample Mendelian Randomization Study**

Abstract Presenter

Haisong Xu

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**Background:** Hypertrophic scarring is a fibro-proliferative disorder caused by abnormal cutaneous wound healing. Circulating metabolites and the gut microbiome may be involved in the formation of these scars, but high-quality evidence of causality is lacking.

**Objective:** To assess whether circulating metabolites and the gut microbiome contain genetically predicted modifiable risk factors for hypertrophic scar formation.

**Methods:** Two-sample Mendelian randomization (MR) was performed using MR-Egger, inverse-variance weighting (IVW), Mendelian Randomization Pleiotropy RESidual Sum and Outlier, maximum likelihood, and weighted median methods.

**Results:** Based on the genome-wide significance level, genetically predicted uridine ( $P=0.015$ , odds ratio [OR]=1903.514, 95% confidence interval [CI] 4.280–846,616.433) and isovalerylcarnitine ( $P=0.039$ , OR=7.765, 95% CI 1.106–54.512) were positively correlated with hypertrophic scar risk, while N-acetylalanine ( $P=0.013$ , OR=7.98E-10, 95% CI 5.19E-17–0.012) and glycochenodeoxycholate ( $P=0.021$ , OR=0.021 95% CI 0.003–0.628) were negatively correlated. Gastranaerophilales and two unknown gut microbe species ( $P=0.031$ , OR=0.378, 95% CI 0.156–0.914) were associated with an increased risk of hypertrophic scarring.

**Conclusion:** Circulating metabolites and gut microbiome components may have either positive or negative causal effects on hypertrophic scar formation. The study provides new insights into strategies for diagnosing and limiting hypertrophic scarring.

## **The Timing of a Multidisciplinary Approach to the Management of Deep Sternal Wound Infection after Cardiac Surgery**

Abstract Presenter

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**Objective:** Deep sternal wound infection (DSWI) remains a life-threatening complication of median sternotomy after cardiac surgery. Evidence suggests the superiority of a stepwise, staged approach to management including radial debridement, removal of sternal wires, negative pressure wound therapy (NPWT) and myocutaneous flap reconstruction. Additionally, the timing of intervention and collaboration between cardiac, infectious disease (ID) and plastic and reconstructive surgery (PRS) providers, has demonstrated importance in improving of patient outcomes. Here we evaluate the utility and timing of a multidisciplinary stepwise approach in the management of DSWI.

**Methods:** We performed a retrospective analysis of 65 patients with DSWI undergoing wound debridement from January 2011 to September 2022. Patients were separated into early (0-7 days) or delayed multidisciplinary consultation (>7 days), from the time of diagnosis of DSWI, to consultation of both PRS and ID teams together. Primary outcome variables included post-operative systemic complications and mortality during admission and 1-year after discharge.

**Results:** 67.12% of patients were male, with a mean age of 67.12, and had a BMI >30 (67.69%). Most were current or past smokers (67.69%), and had hypertension (95.38%), hyperlipidemia (70.77%), diabetes mellitus (61.54%), coronary artery disease (89.23%), and/or a history of myocardial infarction (56.92%). 47.69% of patients were entirely functionally dependent at their index procedure, with an ASA score of 4 (80%). Most patients were presented with sternal wound discharge and polymicrobial infection (24.62%) within one month after coronary artery bypass graft (73.85%).

Almost all patients underwent our standard stepwise approach of early antibiotic administration (87.69%) and wound debridement within 7 days (83.08%), use of NPWT

(75.38%), and myocutaneous flap reconstruction within 30 days of debridement (66.15%). IV antibiotics were administered at discharge in 98.5% of patients.

Early multidisciplinary consultation (n=40), was associated with reduced post-operative complications such as bacteremia (20% vs 45%), wound reoperation (31% vs 45%), sepsis (\*p=0.0073), dehiscence, (11.11% vs 30%), and reduced time to reconstructive closure (median of 8 days vs 141 days)(\*p=0.0049), when compared to delayed consultation (n=20).

Mortality occurred in 3 patients during admission, 2 of which had delayed multidisciplinary consultation. There were no mortalities within 1-year of discharge.

### **Conclusion and Implications:**

Our data suggest that a stepwise approach is safe and effective when applied to the management of DSWI in a heavily comorbid population. Timely multidisciplinary involvement of both PRS and ID teams together, may contribute to reduced time to reconstructive closure and improved outcomes for patients.

## **The Untapped Potential of Machine Learning in Plastic Surgery Research: Data-Driven Recommendations from a 5-year Scoping Review**

Abstract Presenter

Alisha Dua

Abstract Co-Author

Jason Spector MD

**PURPOSE:** Machine learning (ML) methods, which are uniquely powered to identify patterns in complex data, are being increasingly incorporated into plastic surgery research. In particular, the 2017 introduction of transformers in deep learning architecture represented a critical transition in the usability of advanced ML for answering clinical research questions. We conducted a scoping review to characterize and critically assess the use of ML techniques in plastic surgery research over the last five years. We detail the use of ML methods by level of supervision, model class, plastic surgery subfield, and primary research question to provide a comprehensive understanding of current trends. We then develop data-informed recommendations for improving and expanding machine learning use in plastic surgery research.

**METHODS:** Primary research articles at the intersection of plastic surgery and machine

learning were compiled through PubMed and Embase queries. Clinical inclusion criteria were defined by the procedure list in the ACGME's minimum operative requirements for plastic surgery residency. Articles published before January 1st 2018 were excluded to restrict our review to the post-transformer era of ML. Of 624 articles reviewed to date, 157 articles have met inclusion criteria.

**RESULTS:** Supervised machine learning, which uses known outcome labels to train models, is the most common ML approach used in plastic surgery research. Within supervised ML, linear and logistic regression models – the simplest methods for answering regression and classification questions – were most frequently used. Conversely, unsupervised machine learning methods, which look to identify latent patterns in high-dimensional data without the bias of labels, were used in few publications. While publications with clinically-focused research questions were the most likely to incorporate ML techniques, a small subset of publications utilized ML methods for patient- and training-focused investigations. A preference for univariate and multivariate techniques over deep learning methods was also evident. A large majority of the publications did not use standard approaches to ensure model generalizability such as splitting data into training and testing sets or using internal cross-validation. Access to the code used to develop published models was also infrequently available.

**CONCLUSION:** Unsupervised ML approaches such as clustering and dimensionality reduction were seldom utilized in publications from the last five years. These techniques are particularly relevant for clinical research as they allow for meaningful and unbiased conclusions to be drawn from highly complex data such as electronic medical records or clinical imaging. Clustering techniques can additionally provide unbiased identification of clinically meaningful subclasses of patients. Such subtyping approaches can be used to develop more personalized care models-a prominent goal in many clinical fields. We also find that non-clinical studies in patient and education research spaces represent an area of investigation with ample opportunity for growth through the incorporation of ML modeling. Finally, while univariate and multivariate techniques are employed by many researchers, common mistakes in model design and limited utilization of deep learning algorithms suggest a need for more training and/or collaboration to facilitate the use of more advanced ML methods in plastic surgery research.

# **The Utility of Negative Preoperative Cultures in Lower Extremity Split-Thickness Skin Graft Outcomes**

Abstract Presenter

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**BACKGROUND:** Serial debridement to achieve a negative culture has become a standard protocol before closure of chronic, lower extremity (LE) wounds. However, in this population, achieving sterility is often not feasible. The current study aims to evaluate the impact of the qualitative debridement cultures obtained immediately before STSG placement on STSG outcomes.

**METHODS:** We performed a retrospective review of all patients receiving an STSG for chronic LE wounds from December 2014 to December 2022. Patient demographics, wound characteristics, and post-operative outcomes were collected. Microbiological data included pathogen type and bacterial load. Wounds that had a preoperative positive culture (PC) on the day of STSG were compared to those that had a negative culture (NC). Primary outcomes were STSG failure, defined as complete necrosis or removal of the STSG, infection, and reintervention, defined further surgery performed at the original wound site. A subanalysis of graft failure was conducted on PC wounds only.

**RESULTS:** A total of 114 patients underwent STSG for 164 chronic LE wounds. The majority of wounds had PC (n=128, 78.1%) while only 36 wounds (22.0%) had NC. Overall, the cohort had a median age of 63 (IQR: 19.5) and BMI of 29.4 (IQR: 9.3), with no differences between groups (p=0.617 and p=0.430, respectively). Charlson Comorbidity Index (CCI) for the PC group was 5 (IQR: 3) and 4 (IQR: 3.5) for the NC group (p=0.212). On the date of STSG, median wound sizes for the PC wounds were larger than NC groups (23.3, IQR: 48.3 cm<sup>2</sup> vs. 38, IQR: 109.5 cm<sup>2</sup>, p=0.204). Of the PC wounds, 63.3% (n=81/128) were polymicrobial, 74.2% (n=95/128) contained gram

positive organisms, and the majority (51.2%) were quantified as "light" volume of growth. There were no differences in graft failure (18.8% vs. 19.4%,  $p=0.925$ ) or reintervention (38.4% vs. 22.2%,  $p=0.073$ ) between the PC and NC groups. However, PC wounds demonstrated a significantly higher rate of infection (17.2% vs. 2.8%,  $p=0.028$ ) compared to NC wounds. Subanalysis of PDC wounds demonstrated that wounds that had heavy bacterial loads ( $p=0.035$ ) and were polymicrobial ( $p=0.024$ ) had significantly higher rates of graft failure.

**CONCLUSIONS:** Our findings suggest that the presence of a PC prior to STSG placement for chronic LE wounds does not adversely affect postoperative outcomes when compared to NC. Rather, it is the quality of the PC, specifically polymicrobial presence and heavy growth, that significantly influences the outcome of the graft. This challenges the conventional emphasis on achieving negative cultures before proceeding with STSG. We show that a positive culture result alone does not necessarily impact outcomes.

## **The Utility of Robotic-Assisted Latissimus Dorsi Flaps for Revision of Post-Radiation Breast Reconstruction: A Case Series**

Abstract Presenter  
Carol Wang BA

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**Purpose:** Robotic-assisted harvest of the latissimus dorsi (LD) flap is a minimally invasive alternative to traditional techniques. The smaller incision required for muscle harvest has been shown to reduce postoperative pain and improve cosmetic outcomes (1). The present study demonstrates the utility of robotic LD flaps for revision surgeries following breast reconstruction compromised by radiation damage.

**Methods:** Patients who received robotic-assisted pedicled LD flap breast reconstruction procedures from 2016-2022 were identified. Patients who received robotic-assisted LD flap for other indications were excluded. All cases were performed by the senior author (A.Y). The LD flap was harvested using the da Vinci operating system as previously described in the literature (2). Demographics, operative details, and postoperative

outcomes were collected.

**Results:** Six patients met inclusion criteria, with an average age of  $47 \pm 11.2$  years and body mass index (BMI) of  $24 \pm 2.8$  kg/m<sup>2</sup>. All patients presented requiring revision surgery after their initial breast reconstruction with associated tissue damage and complications from adjuvant radiation therapy. Four (67%) patients had received implant-based reconstruction. Of these patients, one additionally had implant failure and another was not suitable for abdominal-based reconstruction due to prior abdominoplasty. Two (33%) patients had received abdominal-based autologous free flaps with subsequent complications including flap loss and tissue expander placement with capsular contracture, and flap atrophy after excessive liposuction at another institution, respectively. All procedures were successfully completed without converting to an open approach. The mean axillary incision measured  $6.2 \pm 1.1$  cm and the mean procedure time was  $489 \pm 62$  minutes. Five patients underwent simultaneous implant placement, while one patient opted for simultaneous fat grafting. The average follow-up time was 964 days (range 79-2907 days), or 2.6 years, following their robotic procedure. None of the patients experienced flap loss. Most postoperative complications were resolved on an outpatient basis, consisting of two seromas and one instance of breast erythema treated empirically with oral antibiotics. One patient received intravenous antibiotics for diffuse cellulitis after failing to pick up postoperative antibiotics. Overall, patients were satisfied with post-operative arm mobility and cosmesis.

**Conclusions:** Robotic LD muscle flaps provide vascularized healthy tissue to areas with radiation damage using markedly smaller axillary incisions than the open technique (6 cm vs 20-45 cm). The mean procedure time was longer than previously reported due to the challenging dissection of radiation-damaged tissue in this population. Nonetheless, patients had promising clinical, cosmetic, and functional outcomes. These findings demonstrate the utility of robotic LD muscle harvest flaps for patients who have suffered significant radiation damage, are not suitable abdominal-based flap candidates, or have failed other types of breast reconstruction.

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# Three-Dimensional Printing in Plastic Surgery: An Era of Innovation, Analysis, and Anticipation

Abstract Presenter  
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**Purpose:** There is a paucity of literature that thoroughly examines the utility of 3D printing in plastic surgery. To address this gap, we conducted a comprehensive review of the evolution, applications, and emerging trends of 3D printing in plastic surgery.

**Methods:** We utilized Lingo3G, a cluster analysis software, to analyze 5,924 publications sourced from PubMed from 2015 to 2022. Included papers were selected utilizing 65 MeSH terms related to technological innovations, materials, techniques, challenges, and clinical applications of 3D printing within plastic surgery. Utilizing ChatGPT-4 Advanced Data Analytics, we conducted thematic and temporal analyses of common and topic-focused keywords to identify prevalent trends and evolution in the field. Findings were corroborated with manual review.

**Results:** An increase in the volume of publications in plastic surgery related to 3D printing was observed over the years 2015 (58 articles) to 2022 (2,114 articles). Keyword analysis revealed frequent association of 3D printing with tissue engineering, additive manufacturing, scaffold creation, and bioprinting purposes. Notably, the fields of tissue engineering and bioprinting exhibited significant growth in research focus. The application of 3D printing technology was found to be extensive across various anatomical areas, including hand, breast, and craniofacial regions, with predominant uses in maxillary, orbital, and mandibular regions. In terms of the materials used for 3D printing, there was a marked preference for polymer and ceramic filaments compared to metal and resin materials. Clinically, the data revealed a significant increase in the use of 3D printing, particularly for the development of patient-tailored implants and intraoperative planning.

**Conclusions:** Our review highlights the evolving role of 3D printing in plastic surgery.

The integration of 3D printing in plastic surgery has contributed to the push for precision medicine through innovation allowing for advances in implant and reconstruction customization.<sup>1</sup> Over the span from 2015 to 2022, the integration of 3D printing technology into plastic surgery has led to transformative innovations characterized by enhanced precision, customization, and patient outcomes.<sup>1</sup> The advancements in the field, particularly in the development of patient-tailored implants, surgical guides, and tissue scaffolds, demonstrate potential to streamline surgical procedures, introduce longer-term cost efficiencies, and possibly enhance outcomes.<sup>1,2,3</sup> Our temporal analysis showed notable shifts in focus on themes such as implant technology, anatomical applications, and clinical utilization. As technology continues to evolve and mature, it appears increasingly likely that areas currently viewed as experimental, such as bioprinting and tissue engineering, may soon become integral and standard components of clinical practice in plastic surgery.

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### **Trends in Nipple Reconstruction for Gender-Affirming Mastectomies**

Abstract Presenter  
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**Introduction:** Gender-affirming surgeries have been shown to improve the psychosocial functioning, mental and physical health of transgender and non-binary people. Many transmasculine and non-binary patients who experience chest dysphoria that impacts their daily functioning choose to pursue masculinizing top surgery, also known as gender-affirming mastectomy. One aesthetic option available to patients is to forgo nipple preservation with nipple grafting during surgery to create a smooth flat chest with no nipples. We hypothesize that in the last few years, more non-binary compared to transmasculine patients have chosen to forgo nipple-areola complex (NAC) preservation with nipple grafts in gender-affirming mastectomy surgery and testosterone use is associated with preservation of a NAC for a more traditionally masculine chest.

**Methods:** A chart review of 443 transgender patients who underwent gender-affirming mastectomies at UW Health between the years 2017-2023 was completed. A Pearson Chi-Square test was run on categorical data while an independent sample t-test was run on continuous data.

**Results:** In recent years, patients who chose to have nipple grafts declined steadily from 100% in 2017 to 77.8% in 2022. Patients who identified with genders outside the binary (e.g. nonbinary, agender, gender expansive) comprised the majority of those that opted out of receiving nipple grafts. In contrast, most of the patients who chose to receive nipple grafts identified as transmasculine. We found that the statistically significant factors in deciding to forego nipple grafts were a patient's gender identity, pronouns, and absence of prior testosterone therapy. Factors that were not associated with nipple preservation were race, age, BMI, time from social transition to surgery, time from medical transition to surgery, chest binding history, marital status, and employment history.

**Conclusions:** As predicted, the recent yearly trend shows a steadily increasing proportion of patients opting out of nipple grafts when undergoing gender-affirming mastectomies. Patients who identified outside the gender binary and did not pursue testosterone therapy were more likely to choose a flat chest with no nipples. These findings establish an evolving need for different surgical outcomes compared to the past that directly correlates to gender. We can safely assume this no-nipple trend will only increase in the coming future and hope to use our findings to advocate for physicians to readily present and accept this aesthetic option for their transgender patients.

# Ultrasound-guided BBL: A Systematic Review and Single Arm Meta-Analysis of complications

Abstract Presenter

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**Purpose:** There are several published guidelines from different plastic surgery societies (ASAPS, ASPS, ISAPS, ISPRES, and IFATS) that emphasize that the fat graft in Brazilian Butt Lift (BBL) surgery must only be injected above the muscle in the subcutaneous layer. However, there is no consensus on the most effective and safe method to precisely inject fat into the subcutaneous space. We aimed to perform a proportions meta-analysis to assess whether using real-time intraoperative ultrasound for gluteal fat grafting can help achieve this goal.

**Methods:** We conducted a systematic literature search in PubMed, Cochrane Library, and Embase databases up to February 2024 looking for articles that performed BBL surgery with ultrasound guidance and reported the following outcomes: mortality, fat embolism, fat necrosis, infection, and seroma. A random-effects model was used. The proportions meta-analyses used the Freeman-Tukey Double arcsine transformation. Statistical analyses were performed using R version 4.1.2.

**Results:** Two retrospective studies comprising 6,015 patients were included. The patients' average age and BMI were 34 years and 30.4 kg/m<sup>2</sup>. In the pooled analysis, the mortality rate was 0.00 per 100 (95% CI: 0.00–0.03%), the prevalence of fat embolism was 0.00 per 100 (95% CI: 0.00–0.03%), the prevalence of fat necrosis was 0.40 per 100 (95% CI: 0.25–0.57%;  $I^2 = 0\%$ ), the prevalence of infection was 0.37 per 100 (95% CI: 0.00–1.28%) and the prevalence of seroma was 2.50 per 100 (95% CI: 0.36–6.45%)

**Conclusion:** Our meta-analysis suggests that utilizing ultrasound guidance during the BBL procedure could eliminate adverse serious events such as death and fat embolism. It might also decrease the incidence of other complications like infection, fat necrosis, and seroma.

## Understanding Syndrome of the Trephined: Development of a Novel Mouse Model

Abstract Presenter

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**Introduction:** Syndrome of the Trephined (SoT) is a rare complication in the field of neuroplastic surgery characterized by neurological deterioration after a segment of the skull is removed. Patients with a traumatic brain injury (TBI) may be prone to developing SoT after decompressive craniectomy (1). SoT lacks well-defined diagnostic criteria, with the main feature being neurologic improvement after the skull is repaired in a cranioplasty surgery. As such, SoT remains underdiagnosed and possibly undertreated. Our aim is to elucidate the underlying pathophysiology of SoT by evaluating neurologic dysfunction in a novel mouse model of decompressive craniectomy and cranioplasty after TBI using a previously established behavioral analysis tool (2).

**Methods:** Four groups of 6 adult C57BL/6 mice were evaluated: 1) craniectomy with immediate replacement of the calvarial bone, 2) craniectomy without replacement of the calvarial bone, 3) craniectomy + TBI with immediate replacement of the calvarial bone, and 4) craniectomy + TBI without replacement of the calvarial bone. This study utilized a controlled cortical impact model of TBI, with an impact depth of 2mm. Behavioral analysis, via open field testing, was performed at 4 weekly timepoints after the respective surgery to evaluate anxiety, gross motor ability, and neurological function.

**Results:** In the first week after their respective surgeries there were significant decreases in total distance travelled, inner zone entries, inner zone distance, and inner zone time between mice who received a TBI and mice who did not ( $p=0.0032$ ,  $p=0.0110$ ,  $p=0.0358$ ,  $p=>0.001$  respectively). There were also significant decreases in inner zone distance between the craniectomy with skull replacement group compared to the craniectomy + TBI with and without skull replacement groups ( $p=0.0188$  and  $p=0.0193$ , respectively). In weeks 2 through 4, no significant differences were seen between any of the 4 groups for any behavioral measurements studied. There were also

no significant differences in behavior based on replacement of the skull or not.

**Conclusion:** Mice who received a TBI initially experienced worsened neurologic functioning. However, mice seemed to adapt to the injury by week 2. Additionally, the presence or lack of skull replacement did not have any significant impact on behavioral testing. This indicates that the neurologic differences seen were likely due to brain injury and not from removal of the skull, as would be expected with SoT. As such, further work is needed to evaluate this novel mouse model. It's our hope that this model will ultimately allow for in-depth study of the factors associated with SoT and a better understanding of its symptomatic sequelae.

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## **Unmasking Deception: A Comprehensive Study of Fraudulent Activities in Plastic Surgery Practice**

Abstract Presenter  
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**Introduction:** Plastic surgeons may be involved in lawsuits claiming fraudulent practices. Research on the prevalence and nature of these incidents in plastic surgery is limited. In this study, we utilized an academic legal database to analyze the characteristics of these lawsuits in plastic surgery. To our knowledge, this is the only study in the literature to investigate fraud lawsuits involving plastic surgeons.

**Methods:** A retrospective review of all jury verdicts and settlements from appellate state

and federal cases that involved a fraud claim from 1990 through 2020 was queried using the LexisNexis legal database. A total non-representative sample of 148 cases was collected. Of these, 44 met criteria for lawsuits involving fraud filed by or against a plastic surgeon(s). Cases were analyzed for demographics of plaintiffs and defendants, type of fraud claim, location, verdict or settlement results, and compensation.

**Results:** Of the 44 cases analyzed, 40 involved male surgeons. Majority of cases involved aesthetic surgery, with only 6 (15%) of the lawsuits involving cases of reconstruction. All cases involved plastic surgeons operating in a private practice setting, with Texas being the most commonly involved state (15). The most common fraud type was malpractice fraud (26), followed by deceptive trade practice (7) and business fraud (5). There were 4 cases of contract fraud and 3 cases of billing/insurance fraud. Amongst all cases, 15 were ruled in favor of the plastic surgeon and 12 were settled; of the cases ruled in favor of the opposite party, almost all involved fraud claims related to malpractice.

**Conclusion:** Lawsuits related to plastic surgery that involve allegations of fraud have arisen in multiple contexts such as malpractice, deceptive trade practices, contracts, and billing disputes. All cases identified occurred in private practice, with claims involving malpractice in the setting of aesthetic surgery being the most common.

## **Unveiling Trends and Predictive Factors of Acute Postoperative Pain and Opioid Requirements after DIEP Flap Reconstruction**

Abstract Presenter

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**Purpose:** Greater pain and opioid consumption in the acute postoperative period have been associated with chronic pain following breast cancer surgery (1,2). However, factors affecting acute postoperative pain following breast reconstruction are not well studied (3,4). The present study investigated the characteristics and predictive factors of acute postoperative pain and opioid requirements following deep inferior epigastric perforator (DIEP) flap breast reconstruction.

**Methods:** A retrospective chart review was conducted of patients receiving DIEP flap breast reconstruction between 2019 and 2023. Patient-reported pain (0-10 Numerical Rating Scale [NRS]) scores and postoperative inpatient opioid requirements (morphine milli-equivalents [MMEs]) were collected and stratified based on patient variables. Predictive factors for postoperative pain and opioid requirements were investigated using linear regression analyses.

**Results:** A total of 209 patients (306 breasts) were included in the study. Overall, patients reported average and maximal pain scores of 1.6 and 5.6 within 24 hours of admission, and 2.0 and 8.0 over the entire hospital stay (mean 88.2 hours), respectively. Mean postoperative opioid requirements totaled 101 MMEs. White patients experienced greater average pain than their Black and Asian counterparts ( $P = 0.046$ ), though they were only given significantly more opioids than Asian patients ( $P = 0.040$ ). Patients identifying as Hispanic received more opioids than non-Hispanic patients ( $P < 0.01$ ) though pain scores were similar ( $P = 0.21$ ). Patients receiving abdominal nerve blocks had less pain ( $P < 0.01$ ) and opioid requirements ( $P = 0.014$ ); the addition of a chest nerve block did not affect either outcome. Patients with history of smoking ( $P < 0.01$ ) or psychiatric diagnoses ( $P < 0.01$ ) also experienced more pain, though only the latter had greater opioid requirements ( $P = 0.015$ ). A multivariable linear regression model revealed that higher average pain scores throughout the hospital stay was predicted by younger age, greater pain within the first 24 hours, and greater maximal pain overall (adjusted  $R^2 = 0.657$ ,  $P < 0.01$ ). Higher opioid consumption was predicted by higher average pain scores, longer hospital stays, current marijuana use, and identifying as Hispanic (adjusted  $R^2 = 0.555$ ,  $P < 0.01$ ). Prior opioid prescriptions, insurance type, BMI, laterality, timing of reconstruction (delayed vs immediate), procedure time, intraoperative opioid requirements, and intraoperative temperatures were not independent predictors of pain or opioid requirements.

**Conclusion:** These results offer valuable insights into the complex interplay of demographic and historical variables as predictors of acute postoperative pain and opioid use. Interestingly, factors like race, ethnicity, smoking, and marijuana use exhibited varying impact on pain scores and opioid requirements, highlighting the need for further investigation in future studies. These findings will inform patient discussions



and targeted interventions to mitigate chronic pain and opioid misuse following breast reconstruction.

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## Practice Management

### Ready to Launch: Making the Jump to Department Status

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**Background:** The transition of plastic surgery divisions to departments has been a gradual process compared to peer surgical specialties. We hypothesize that intra-institution metrics between plastic surgery units and other peer surgical subspecialties

at that same academic medical institution are a major determinant of division or department status. Here we examine characteristics that define plastic surgery departments and identify the predictors of departmental status.

**Methods:** Data were collected from institutional websites of academic plastic surgery units with integrated and/or independent residency programs as well the units of cardiothoracic surgery, urology, and otolaryngology at the same institution. Multivariable logistic regression was performed to determine program characteristics that were most associated with departmental status.

**Results:** Plastic surgery departments tended to have older integrated residency programs ( $p<0.01$ ) and more full-time faculty ( $p=0.026$ ), research faculty ( $p=0.026$ ), and residents ( $p=0.010$ ). Through multivariable analysis, the presence of a department of cardiothoracic surgery (OR 1.30,  $p<0.01$ ), the ratio of plastic surgery to otolaryngology faculty (OR 1.26,  $p<0.01$ ), the number of years a unit has had an integrated residency program (OR 1.01,  $p<0.01$ ), and the number of research faculty (OR 1.07,  $p=0.029$ ) were independently associated with departmental status.

**Conclusions:** Attaining departmental status at an academic institution allows a specialty to chart its own course with greater financial and administrative autonomy. Identifying the characteristics of plastic surgery departments can help divisions recognize their relative strengths and weaknesses when considering a possible transition to departmental status.

## **Training The Next Generation: Insights From Plastic Surgery Educators In Nigeria**

Abstract Presenter

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**Introduction:** The landscape of plastic surgery residency training in Nigeria, in comparison with other countries, presents a unique mix of challenges and advancements. This study aims to assess the current state of plastic surgery training from the perspective of educators, identifying critical areas for improvement and offering recommendations for future development.

**Methods:** A 25-question survey was distributed on the online plastic surgery resident/educator's forum in Nigeria using Google Forms. The survey collected detailed responses on demographics, institutional affiliations, training scope, surgical volume, training experience, satisfaction levels, challenges faced, and recommendations for improvement.

**Results:** Out of 171, 37 educators responded to the survey (response rate = 21.6%). The educators were between 38 and 60 years old, predominantly male (82.9%), and were chiefly affiliated with tertiary institutions (91.4%). Most educators focused their practice on reconstructive surgery (75%) compared to aesthetic surgery (25%). The duration of experience in training residents ranged widely from 1 to 26 years. When discussing work conditions, most were neutral (54.3%) or happy (25.7%). Only 31.4% of educators found time spent with residents in operation theatre adequate. However, for time spent in the clinic, 51.4% found it adequate. 77.1% of educators believed residents lacked core competencies, specifically aesthetic surgery and microsurgery. Challenges identified included lack of essential surgical equipment, insufficient theatre space, high cost of medical bills affecting patient turnout, and inadequate exposure of residents to advanced surgical techniques. Educators highlight the need for increased collaboration with established centers globally, enhanced governmental support for resources, and the establishment of exchange programs, hands-on workshops, and simulations.

**Conclusions:** The findings underscore the critical need for systemic improvements in plastic surgery training in Nigeria. Educators emphasize the importance of substantial investment in surgical equipment and integrating aesthetic surgery and microsurgery into educational curricula. Additionally, they recommend enhancing global collaboration with initiatives like Surgeons in Humanitarian Alliance for Reconstructive, Research and Education (SHARE) to bridge existing deficiencies and meet future demands in plastic surgery education.

# Misconceptions in Plastic Surgery: Crowdsourcing Public Perceptions of Plastic Surgery Urban Myths

Abstract Presenter

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**Purpose:** Understanding public misconceptions about plastic surgery can inform plastic surgeons of their patients' and non-plastic surgeon colleagues' knowledge gaps about the field. This deepened understanding can help lay the framework for better education, communication, and patient care and represents an essential step in optimizing patient satisfaction and health outcomes. The objective of this study was to leverage crowdsourcing methods to investigate the extent to which laypersons agree with common plastic surgery "urban myths."

**Methods:** A Likert scale-based survey of ten popular plastic surgery myths was distributed via Amazon Mechanical Turk between November and December 2023. Descriptive analyses and multinomial logistical regressions were performed to assess the strength of the associations between gender, age group, prior plastic surgery experience, and role as a health care professional and responses to the statements in the survey.

**Results:** Two thousand survey responses were included. The average age of respondents was  $37.4 \pm 10.5$  years (range: 18–79 years). Nine hundred forty-nine (47%) and 1031 (52%) respondents identified as female and male, respectively; 20 (1%) respondents identified as non-binary or other. Most respondents did not have a prior plastic surgery procedure ( $n = 1449$ , 72%) or a prior plastic surgery consultation ( $n = 1361$ , 68%). There were 617 respondents (31%) who reported working or training in health care. Over half of respondents (52.7%) believed that plastic surgery is almost always cosmetic. Over a quarter of respondents were unsure (25.8%) or disagreed (12.6%) that plastic surgeons perform emergency and trauma surgeries. Many respondents (40.0%) believed that wearing underwire bras causes breast cancer, and

40.7% of respondents believe that hand dominance is associated with an ipsilateral larger breast. Respondents who were male or younger than 35 were significantly more likely to believe in inaccurate myths. Health care workers had higher odds of agreeing that plastic surgery uses plastic (OR=2.49 [95% CI: 1.82–3.41];  $p<0.001$ ) and that plastic surgery is almost always cosmetic (OR=1.85 [1.32–2.61];  $p<0.001$ ). Participants who underwent a plastic surgery procedure or consultation were generally more likely to agree with the listed myths.

**Conclusion:** This study suggests that the public and non-plastic surgeon healthcare workers have a limited understanding of the scope and practice of plastic surgeons. A multi-pronged approach to increase awareness about the field and dispel certain myths will be an instrumental step in bettering patient care. For example, it will be important to educate health-care staff and doctors in different specialties about the field. Providing compassionate patient-physician communication and creating patient-centered educational resources can also help dispel misconceptions about the field and conditions treated by plastic surgeons, thereby optimizing patient health outcomes and satisfaction.

### **Impact of Interview Modality on Gender Disparities in Plastic and Reconstructive Surgery Residency Match Success**

Abstract Presenter

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**Introduction:** The transition from in-person to virtual interviews during the COVID-19 pandemic transformed the residency application process. Recognizing the gradual return to in-person interviews and the historical presence of gender disparities within medical fields, the present study sought to evaluate how interview modality influences the success rates of applicants to Plastic and Reconstructive Surgery (PRS) residency

programs, with a focus on gender and applicant characteristics.

**Methods:** Data on PRS residency applicants to a single integrated Plastic and Reconstructive Surgery program from 2017 to 2021 (four application cycles) were obtained from the Electronic Residency Application Service (ERAS), National Residency Matching Program databases, and public online sources. The dataset included demographics (gender, race, orphan status), academic and professional qualifications (research year participation, Alpha Omega Alpha [AOA] and Gold Humanism Honor Society [GHHS] memberships, USMLE Step 1 and 2 scores, reapplicant status, type of medical graduate, additional degrees), interview modality (virtual or in-person), and match results. Specifically, interviews in the 2017/18, 2018/19, and 2019/20 cycles were in-person and those that took place in the 2020/21 application cycle were virtual. Data analysis included univariate regression with chi-squared test and multivariate logistic regression to assess the impact of virtual interviews on match success across genders and other factors.

**Results:** A total of 1298 applicants (573 females, 724 males, 1 uncategorized) were included in the analysis; 985 (75.9%) underwent in-person interviews, and 313 (24.1%) had virtual interviews. There was a predominance of males with in-person interviews (58.2%) and females with virtual interviews (51.6%) ( $p = 0.002$ ). The overall match success rate was 63.5%, with virtual interviews having a lower match rate (56.9%) compared to in-person (65.5%) ( $p = 0.004$ ). Gender analysis revealed that female applicants had a higher overall match rate (67.2%) than males (60.5%) ( $p = 0.008$ ). Notably, females had 1.38 times higher odds of matching with virtual interviews ( $p = 0.006$ ). Specifically, the majority of successful matches with in-person interviews were male (56.3%), and with virtual interviews were female (57.9%) ( $p = 0.001$ ). Gender was not a significant determinant in match rates when considering other characteristics ( $p = 0.213$ ). Race played a crucial role ( $p = 0.011$ ), with Asian, Hispanic, and other race categories associated with lower match success ( $p = 0.004$ ,  $p = 0.049$ ,  $p = 0.045$ ). Participation in a research year was positively correlated with match success ( $p < 0.001$ ). Being a previous graduate at the time of application (as opposed to being a senior medical student at the time of application) had a negative correlation ( $p < 0.001$ ). Reapplicant status had no significant impact ( $p = 0.213$ ,  $p = 0.650$ ).

**Conclusion:** Virtual interviews for PRS residencies led to lower overall match rates compared to in-person interviews, although female applicants experienced a relative benefit. Applicant success was additionally influenced by personal and career-related factors, such as race and research activity. These findings underscore the need for comprehensive and equitable residency selection processes.

## **Reducing Plastic Surgery's Silicone Footprint: Modeling Shipping Costs for Breast Implants and Tissue Expanders**

Abstract Presenter

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**Background:** Implants and tissue expanders (TEs) are used in all types of breast procedures. In the traditional ordering model, plastic surgeons will typically request 3-4 different implant and TE sizes per procedure with accompanying sizers and extras - yielding a range of 15-32 items - after which unused stock is sent back to the manufacturer. To date, no study has investigated the costs of transporting materials in any surgical field. This study aims to quantify the economic impact of shipping implants and TEs for use in breast augmentations and reconstructions.

**Methods:** Shipping courier websites were queried to establish average weight-based charges for overnight, two-day, and ground shipping. Four implant models - unilateral/bilateral lightweight and unilateral/bilateral heavyweight - as well as a TE model were created to determine forward and return shipping rates per case when 3 or 4 sizes were ordered. The 2020 ASPS statistics data were then used to calculate total costs in scenarios where multiple implant and TE sizes were ordered with various shipping options (1).

**Results:** In the most expensive scenario where 4 sizes were ordered with overnight shipping for all cases, the maximum possible total for implant and TE shipping in 2020 was \$200,691,882.37. Conversely, ordering 3 sizes using ground shipping yielded a minimum possible total of \$25,369,050.97, saving \$175,322,831.40 (87.4%). Compared to the maximum, choosing ground shipping for 4 sizes saved \$164,761,561.49 (82.1%), while ordering 3 sizes using overnight shipping saved \$58,990,876.94 (29.4%).

**Conclusion:** Implant and TE shipping costs are extremely significant, totaling tens or hundreds of millions of dollars depending on the type of shipping and the number of sizes ordered. These excessive costs are handed down to the healthcare system, physician practices, and ultimately, the patient, which can increase financial toxicity. While this study has its limitations as a model, it may encourage the use of more cost-

efficient methods, such as opting for ground shipping, ordering less sizes, or using a consignment system, to decrease overall waste.

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## **Osteopathic Medical Students' Perception of Plastic Surgery**

Abstract Presenter

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**Background:** Integrated plastic surgery residency is one of the most competitive specialties for medical students to match into. Osteopathic graduates account for only 1.02% of current integrated plastic surgery trainees. This study was performed to explore osteopathic medical students' perception of plastic surgery and identify methods that our national societies can utilize to foster interest and exposure to the specialty.

**Methods:** An anonymous survey was distributed to Student Affairs directors of all 43 osteopathic medical schools. Student Affairs directors were asked to forward the survey to their respective student bodies. The survey consisted of 35 questions, inquiring about student demographics, exposure and barriers to surgical education opportunities, and overall perception of plastic surgery.

**Results:** We received 252 responses from seven osteopathic medical schools. 25.4% of respondents reported exposure to plastic surgery prior to medical school and 29.6% reported exposure to plastic surgery during medical school. 87.4% of students believe that exposure is lacking at their medical school. 82.5% of respondents identified a surgery interest group at their medical school, but only 5.9% were able to identify a



plastic surgery interest group at their school. 74.2% of students interested in pursuing away rotations or sub-internships for surgical specialties experienced barriers arranging these experiences, and 92.6% of students interested in away rotations or sub-internships specifically for plastic surgery experienced barriers.

**Conclusion:** Osteopathic students encounter barriers when seeking exposure to plastic surgery during their medical education. Osteopathic students may benefit from mentorship opportunities directed to improve medical student exposure to plastic surgery. These programs include the mentorship programs of the American Council of Educators in Plastic Surgery (ACEPS) and attendance at the virtual Medical Students Day hosted by the American Society of Plastic Surgeons (ASPS). Early exposure and increased opportunities for away rotations may encourage more osteopathic medical students to pursue plastic surgery.

## **Reading Between the Tabloids: An Objective Analysis of the Quality and Readability of Patient Encountered Online Material for Face Transplantation**

Abstract Presenter  
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**Purpose:** Face transplantation is a relatively novel procedure that is highly sensationalized in the media, drawing significant public attention and fascination. As a result, alongside informational sources, much of the online material on face transplantation is encompassed by news stories and tabloids on patients who have undergone the procedure. Thus, the purpose of this study, is to provide a quantitative assessment of the content and readability of online materials that prospective patients or the public encounter regarding face transplantation.

**Methods:** In February 2024, an exhaustive search of "face transplantation" and related

terms was performed on Google, reviewing over 180 search results. Sites were categorized under three groups: informational sites from established face transplant centers, informational sites from third party sources (e.g. Wikipedia), and news article/tabloid sites. Each site was assessed for readability using 15 different standardized readability assessment scales including the Flesche Reading Ease (FRE), Coleman Liau Index (CLI), Automated Readability Index (ARI), and Dale-Chall Readability Score (DCRS) among others. The quality of each site was assessed utilizing the JAMA Benchmark Criteria.<sup>1</sup> One-way ANOVA with post-hoc Tukey's multiple comparisons test was used to compare average scores of each metric.

**Results:** From the search results 20 sites from face transplant programs were identified, 22 sites from third-party informational sources, and 36 news articles/tabloids. While face transplant program sites and third-party informative sites had overall similar readability scores across all scales, news sources had significantly greater FRE scores (57.11 vs 44.96;  $p=0.017$ ), lower CLI (10.80 vs 13.85;  $p<0.001$ ), lower ARI (9.718 vs 11.66;  $p=0.032$ ), and lower DCRS (5.746 vs 6.975;  $p=0.007$ ) relative to face transplant program cites- all reflecting easier/lower grade level of reading in news sources. There was a significant difference between all categories for the JAMA Benchmark Criteria with face transplant programs demonstrating the lowest average score, followed by third-party sites, and news sources encompassing the highest score (2.05 vs 2.91 vs 3.67;  $p<0.001$ ).

**Conclusion:** Our analysis ultimately revealed that news source sites about face transplantation not only provide their content at a significantly lower grade/reading level, making it much more accessible and understandable to the general public, but also are overall more reliable and transparent in their authorship, sources, disclosures, and publishing dates (four criteria of JAMA Benchmark). This is a potential concerning finding because prospective patients and the public will seek out these readily accessible, understandable, and more abundant news sites as their primary sources of information when often they are authored by non-clinicians that lack the depth of face transplantation knowledge a face transplant program or reputable third-party resource sites possess. Thus, face transplant programs should update their websites to ensure greater transparency and accessibility of the information provided to the public.

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# The Effects of Language Discordance on Breast Reconstruction

Abstract Presenter

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**PURPOSE:** The complexities in approaching breast reconstruction necessitates shared decision-making in order to balance patient preferences, needs, and medical limitations. The quality of patient-centered care can account for significant differences in immediate breast reconstruction rates (1, 2). Language discordance may impede this process.

Literature on translation validation and content readability have demonstrated the importance of resource accessibility for informed patient decisions (3). However, the influence of language barriers during patient-provider communication lacks research. This study systematically examines the influence of language discordance on breast reconstruction surgical decision-making and outcomes.

**METHODS:** A systematic review was performed using PubMed, Scopus, CINAHL, and Medline - Ovid within 10 years of the search date of June 2023. Original studies on patient-provider language differences and breast reconstruction decisions or outcomes were included. Non-English studies, case reports, and articles validating translated materials or content readability were excluded.

Articles that met the inclusion criteria were evaluated for risk of bias. Patient data was dichotomized into English and Non-English speaking groups, representing the absence and presence of language discordance respectively. Further statistical analysis was conducted through the Cochrane RevMan Web program with a Cochrane-Mantel-Haenszel Estimate forest plot. Included studies were also qualitatively analyzed.

**RESULTS:** Six of the final 8 included studies found that fewer Non-English speaking mastectomy patients underwent breast reconstruction. Of which, 3 of the studies were statistically significant ( $P < 0.05$ ). However, the significance did not remain following odds ratio analysis of breast reconstruction rates between English and Non-English speaking patients in the pooled data.

Overall, Non-English speakers were 43% (odds ratio: 0.57) less likely to undergo breast reconstruction than English speakers (95% CI, 0.55 - 0.65). The lack of statistical significance may be attributed to high heterogeneity ( $I^2 = 91\%$ ) and limitations in quality of data.

**CONCLUSION:** Non-English speaking patients were less likely to undergo breast reconstruction than English patients, suggesting that language discordance acts as a disparity in elective surgical experiences. However, a qualitative review of articles that did not demonstrate a significant difference in reconstruction rates cited their robust translation services as a critical mitigating factor. Further studies on protective factors such as interpreters and culturally-competent approaches are warranted to address the potential for language discordance to impede shared decision-making.

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## A Deep Dive into Documentation: The Insurance Landscape of Hyperbaric Oxygen Therapy.

Abstract Presenter  
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**BACKGROUND:** Hyperbaric oxygen therapy (HBOT) can promote viability in ischemic tissue. It is considered medically necessary for acute graft and flap compromise by most insurance policies but, in practice, it is inconsistently covered. Physicians have reported challenges with denied claims for HBOT resulting in unexpected costs for patients.

**PURPOSE:** This cross-sectional analysis aimed to review HBOT insurance policies, highlight minimum documentation standards, and suggest practical approaches when submitting claims for HBOT reimbursement.

**METHODS:** Using previously described methods, we collected insurance policies on HBOT from 60 health insurers and conducted a dual, blind extraction of documentation policies, prior and continuing authorization requirements, and treatment guidelines.[1] We compiled these data into an insurance reimbursement algorithm to assist prescribing physicians.

**RESULTS:** Of the 60 insurance providers initially identified, 53 (88.3%) had policies on HBOT. While most (83.6%) covered HBOT to varying extents, three (5.7%) considered HBOT investigational, and one (1.9%) explicitly denied coverage. Only 15 insurers (28.3%) defined graft or flap "compromise" in their policies. Most definitions relied on clinical suspicion of hypoxia, ischemia, or necrosis. Four policies required quantitative evidence of hypoxia using transcutaneous oximetry testing (TcPO<sub>2</sub>). Of insurers with HBOT policies, 25 (47.2%) required prior authorization, and most required continuing authorization after a dedicated number of HBOT sessions (Median 20, Min 12, IQR 18). Minimum acceptable pressure thresholds ranged from 1 atmosphere absolute (ATA) (n=15, 35.7%) to 1.9 ATA (n=2, 4.8%), and seven policies mandated twice daily HBOT at 2.0 to 2.5 ATA for 90 to 120 minutes. Less than half of insurers (n=22, 41.5%) outlined documentation requirements for HBOT reimbursement. The most requested documentation items were medical records (n=19, 86.4%), signs of healing (n=12, 54.5%), images (n=10, 45.5%), treatment goals (n=8, 36.4%), and dive parameters (n=5, 22.7%). Detailed records required the patient's diagnosis, type of graft or flap, surgeon's name, exclusion of mechanical etiologies for flap compromise, and any attempted conservative therapies. Twelve policies (54.5%) required that progress notes include "measurable" signs of healing, three of which recommended serial TcPO<sub>2</sub> testing.

**CONCLUSIONS:** Most insured Americans are eligible for at least 12 sessions (6 days) of HBOT at 2.0 to 2.5 ATA for 90 to 120 min. Plastic surgeons wishing to refer patients for HBOT may improve the likelihood of claim coverage by seeking prior authorization, maintaining detailed patient records, and using objective measures of graft or flap viability. These details are outlined in our HBOT prescribing and documentation algorithm.

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## **A MEPS Analysis of Payer Trends for Ambulatory Plastic Surgery Visits from 2002 – 2021**

Abstract Presenter

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**Introduction:** Recent studies on plastic surgery expenditures have simultaneously revealed trends of both increasing charges to patients alongside decreasing reimbursements for providers (1,2). This is particularly true for government insurers like Medicare (3,4). However, there remains a lack of understanding related to the causes and implications of how expenditures, payer type distribution, and reimbursement rates in plastic surgery have changed. The purpose of this study is to investigate payer trends for ambulatory plastic surgery visits to better understand noted changes in spending patterns, payer type mix, and reimbursements rates over the past two decades.

**Methods:** We utilized the Medical Expenditure Panel Survey (MEPS), a dataset of national surveys of patients and providers on attendant healthcare usage and expenditures. During the study period (2002-2021), we calculated the yearly average amount of money charged and paid per visit, the distribution of payer type expenditures (i.e., government insurance, private insurance, out-of-pocket), and the mean percentage discount per visit. This refers to the percent of total charges not reimbursed. Dollar amounts were inflation-adjusted to 2021 estimates.

**Results:** 792 ambulatory visits were identified from 2002 – 2021. The mean dollar amount paid per visit increased generally over time, particularly in the second decade, ranging from \$2,021 (2013) to \$8,023 (2021) (Fig. 1). Approximately 5.2% of

expenditures were paid through Medicaid, 12.5% through Medicare, 56.0% through private insurance, 16.2% out-of-pocket, and 10.1% through other means. The proportion of expenditures paid through private insurance increased gradually to a high of 82.8% (2021), while the proportion of Medicaid, Medicare, and out-of-pocket expenditures remained relatively steady (Fig. 2). The mean percentage discount generally increased over the study period, ranging from 40.7% (2002, 2005) to 68.5% (2015) (Fig. 3).

**Conclusions:** Healthcare spending by patients and insurers for outpatient plastic surgery visits has increased since 2001. The majority of these expenditures were paid through private insurers. The data also shows that payer mix trends have fluctuated and reimbursements have decreased in the previous two decades. Further investigation is key to elucidating the causes of these changes and their potential implications for patients, providers, and health systems, particularly as it relates to access to equitable care.

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## Choosing A Second Line Groin Closure Strategy: A Retrospective Review

Abstract Presenter  
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**Introduction:** High risk patients undergoing vascular procedures often receive plastic surgery directed closure of surgical wounds. Although many different strategies exist for wound closure, sartorius flap closure remains a mainstay method, due to the versatility and reliability of the muscle flap for sufficient tissue support. Despite this, plastic surgeons may sometimes need to rely on alternative methods such as rectus flaps (rectus femoris, rectus abdominus) or complex closures due to the unsuitability or unavailability of sartorius flaps from prior operation. Here, we investigate the context for usage of alternative closure methods and compare the postoperative outcomes of these closure methods for groin incisions.

**Methods:** Data from the electronic health record was pulled for all procedures involving both vascular and plastic surgeons over a 7 year time period (2014-2020). Cases were manually reviewed for those describing groin closure. A variety of demographics and clinical characteristics were collected. The context and type of the closure (re-do vs. novel closure) was determined through chart review. Cases with more than 1 closure method detailed were excluded from further analysis. Postoperative complications and return to operating room (OR) rates were recorded. Data was compiled and logistic regression was used to derive correlations.

**Results:** Our complete cohort consisted of 283 unique patients and 419 procedures. This consisted of 345 sartorius flaps, 48 complex closures, 16 rectus femoris flaps, and 10 rectus abdominus flaps. Preoperative health was similar amongst all closure methods groups with a median ASA score of 3 (min=2; max=5). Rectus femoris and abdominus flaps were most commonly utilized in the context of a re-do procedure (70%; 75%) as opposed to complex closures (27.1%) and sartorius flaps (26.4%). Rectus abdominus flaps saw the highest overall complication rate (40.0%) followed by complex closure (39.1%), rectus femoris flaps (37.5%) and sartorius flaps (25.8%). A similar trend was present with return to OR rates (31.3% rectus femoris, 29.1% complex closure, 20.0% rectus abdominus, 12.8% sartorius). Of all postoperative complications included in review, wound breakdown, lymphocele, and hematomas were the only 3 significantly associated with return to OR ( $p < 0.01$ ). Rectus femoris and abdominus flaps saw comparable rates of wound breakdown (18.8%; 10.0%) to sartorius flaps (16.8%) and all three had lower breakdown rates than complex closure (29.1%). Hematoma and lymphocele rates were similar amongst all 3 groups (+/-5%).



**Conclusions:** This study suggests that rectus abdominus and femoris flap closure is superior to complex closure in cases where sartorius flaps have failed previously or cannot be used. Complication rates were similar to those in complex closures despite the majority of abdominus and femoris flaps being performed on re-do cases. These cases confer increased risk over novel closures due to the presence of scar tissue and previous vascular damage. Our results also reinforce current practice patterns that favor sartorius flaps for groin closure due to better performance endpoints (complication and return to OR rates).

## **Representation Matters: Authorship of Submissions to 2018-2023 ACEPS Meetings**

Abstract Presenter

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**Purpose:** The American Council of Educators in Plastic Surgery (ACEPS) is the leading organization invested in improving plastic surgery education and training, thereby influencing the future workforce of plastic surgery. With the formation of ACEPS' Diversity, Equity, and Inclusion (DEI) Committee in 2021, the landscape of abstracts submitted to ACEPS meetings may be changing, reflecting the social and professional shifts in inclusion. We sought to characterize differences in abstracts submitted versus accepted to the ACEPS meetings over a 6-year span in (1) author gender and (2) institutional affiliation.

**Methods:** We retrospectively reviewed abstracts submitted to the 2018-2023 ACEPS annual meetings. Data included: acceptance status, reviewer scores (1=lowest, 5=highest), author lists, and institutional affiliations. We cross-referenced last authors' affiliated institution with the top-40 National Institutes of Health(NIH)-funded institutions. We used Gender API to designate first and last author genders. Parametric tests were performed to analyze continuous variables. Significance was  $p < 0.05$ .

**Results:** We analyzed 489 abstracts and found no difference in mean reviewer scores for submissions with women versus men first (3.06 vs. 3.02; 95%CI=(2.97-3.15) vs. (2.92-3.13);  $p=0.56$ ) or last authors (3.13 vs. 3.02; 95%CI=(3.00-3.25 vs. 2.94-3.10);  $p=0.14$ ). Overall, 50.4% of submissions had women first author and 21.3% as last. Women first author submissions increased from 42.1% ( $n=8$ ) in 2018 to 53.9% ( $n=104$ ) in 2023; last author increased from 15.8% ( $n=3$ ) in 2018 to 23.3% ( $n=45$ ) in 2023. The smallest proportion of women last author submissions ( $n=7$ , 9.2%) and podium acceptances ( $n=3$ , 11.5%) was observed in 2020; the largest was in 2021 ( $n=27$ , 31.0%;  $n=11$ , 42.3%) and remained visibly higher since its 2020 nadir. Across all 6 years, there was a similar proportion of submitted versus accepted last authors from a top-40 NIH-funded institution (61.11% vs. 65.04%).

**Conclusions:** Representation of women first authors in abstract submissions/acceptances remained >50% in 2022 and 2023, suggesting ACEPS DEI Committee's successful efforts. However, representation of women last authors has yet to reach parity, a finding that may reflect the persistent landscape of fewer women as senior faculty. Last-author affiliation with a top-40 NIH-funded institution was not associated with greater acceptance rates. Achieving gender parity in senior authorship may take time as more women first authors enter academia, achieve senior faculty ranks, and become principal investigators. It is imperative to continue to support women academicians as they progress in their plastic surgery career.

## **The Effects of Pre-Visit Self-Directed Internet Research on Patient-Provider Initial Encounter**

Abstract Presenter  
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**Background:** Internet search engines like Google make health information accessible to patients. Although internet searches may help patients educate themselves, they may provide extraneous information resulting in patients misdiagnosing themselves. As a result, patients may seek care for nonexistent conditions, leading to unnecessary tests, procedures, and treatments, thereby straining healthcare resources. This study seeks to elucidate the frequency of self-directed patient research and how it affects their new

patient visit.

**Methods:** We prospectively administered an optional survey, via Epic, to all new patients two days before presenting to a hand surgeon at a single institution from July 2023 to December 2023. Survey questions included whether patients researched their condition, the search engine used, time spent researching, and search terms used. Following their new patient visit, billing and insurance data for the encounter were collected. Patients who did not complete the survey or had incomplete billing data were excluded. Patients who completed the survey and had a complete set of billing data were sorted into a correct or incorrect category based on the agreement between their self-researched key terms and billed diagnosis code (International Classification of Diseases-10 (ICD-10) code). Descriptive statistics were performed on demographic and survey data. Student's t-tests were performed to evaluate differences in means between the correct and incorrect agreement groups for the following variables: total visit time (determined by Current Procedural Terminology (CPT) code), total encounter charges, and physician work Relative Value Units (wRVUs).

**Results:** The survey was sent to 266 patients, and we received 76 responses (response rate 28.5%). 28 patients were excluded for the following reasons: three did not attend their visit, 22 did not completely fill out the survey, and three had incomplete billing data. 48 patients were included in the study. The average age of the included participants was 60.75 years (SD 15.8 years). Of the 48 patients who responded to the survey, 39 (81.3%) reported researching their condition before their appointment. Google was the most common search engine ( $n = 32$ , 82.1%). Most patients who performed research on their condition were incorrect about their diagnosis ( $n=22$ , 57%). The average time per appointment was significantly longer for incorrect patients (35.7 minutes) compared to correct patients (28.8 minutes) ( $p < .05$ ). Similarly, the average total charges for the encounter were higher for incorrect patients (\$450.86) than for correct patients (\$379.69); however, this difference was not statistically significant ( $p > .05$ ). Likewise, total physician work RVUs for the encounter were greater for incorrect patients (2.28) compared to correct patients (1.91); although, this difference also was not statistically significant ( $p > .05$ ).

**Discussion:** The majority of respondents (81.3%) engaged in self-directed research on their condition prior to their new patient visit. However, pre-appointment research does not typically result in accurate self-diagnosis, as 57% of patients who researched their condition had incorrect diagnoses. Patients with incorrect self-diagnoses experienced longer appointment durations. The added time may be due to additional provider discussion time explaining why the patient's pre-conceived diagnosis is not their actual diagnosis.

## **American Medical Association and Centers for Medicare and Medicaid Services: Role and Impact on Reimbursement for Plastic Surgery Procedures**

Abstract Presenter  
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**Purpose:** Plastic surgeons should be educated about market players that impact patient access and reimbursement of surgical services. Centers for Medicare and Medicaid Services (CMS) reimbursement for plastic surgery procedures have not kept pace with inflation. Furthermore, CMS reimbursement is often used as a lower bound for reimbursement from private payers. We quantitatively and qualitatively describe the American Medical Association Relative Value Scale Update Committee (RUC) process, which influences plastic surgery reimbursement rates through RUC recommendations to CMS. We also describe the CMS rulemaking process to understand how CMS considers RUC recommendations about plastic surgery services.

**Methods and Materials:** Between CPT years 2015 and 2024, RUC made recommendations to CMS for 38 plastic surgery procedure codes. We collected available RUC data for 33 CPT codes, including American Society of Plastic Surgeons (ASPS) recommendations, physician surveys, and final recommendations. We utilized the federal Physician Fee Schedule rules to track CMS's consideration of RUC recommendations, including proposed adjustments, public comments, and their final decision.

**Results:** RUC agreed with ASPS recommendations for 88% (29/33) of codes. While reviewing codes, RUC considered "compelling evidence" to include reorganization into new code families (9 codes), flawed/outdated methodology (7), change in patient population (4), and miscoding (6). RUC conducted surveys for 25 codes, resulting in an average response rate of  $4.4 \pm 2.0\%$ . Work Relative Value Units (wRVUs) were recommended at or below the 25th percentile for 88% (22/25) of codes and were

influenced by other code valuations for 56% (14/25) of codes. Regarding practice expenses, RUC's median recommended change in total cost of service per code was a \$9.63 decrease for facility payments (ranging from \$201 decrease to \$19.32 increase) and a \$28.09 increase for non-facility payments (ranging from \$168.24 decrease to \$134.90 increase).

In 87% (7/8) of codes where RUC recommended an increase in the wRVU, CMS decided to either lessen that increase, not change from the prior calendar year (CY), or issue a net decrease from the prior CY. In 100% (3/3) of codes where RUC recommended a decrease in wRVU, CMS decided to decrease reimbursement even further. On rare occasions, CMS considered methodologic concerns compelling enough to reverse their decisions. For new code proposals, CMS agreed with RUC recommendations 100% (8/8) of the time.

**Conclusion:** At the RUC level, we identified potential contributors to suboptimal valuation of codes including low survey response rates, recommending RVUs in the lowest quartile, and recommending decreases to service costs. Additionally, CMS frequently decreased RUC-recommended reimbursement values with the exception of new codes, which retained their recommended values. Fair reimbursement requires continuous strategic advocacy efforts by plastic surgery specialty societies and active participation from plastic surgeons in the RUC valuation and CMS rulemaking process.

## **Understanding Management of Emergency Department Lacerations Under the No Surprises Act: A Multi-Institutional Survey Study**

Abstract Presenter  
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**Introduction:** Laceration injuries are a common presenting complaint to emergency departments (EDs), comprising 5.2-8.2% of ED visits in the United States annually (1). However, guidelines on which wounds warrant consulting a specialized surgical service are not standardized. Moreover, these specialists are not always available. A nationwide survey of ED directors revealed the greatest difficulties in ensuring adequate plastic and reconstructive surgery on-call coverage (2). The No Surprises Act (NSA), implemented in January 2022 to prevent surprise medical billing, may exacerbate the gap between on-call specialist demand and coverage (3). In this study, we aim to understand criteria for plastic surgery consults and evaluate the effect of the NSA on institutional practices of emergent laceration repairs.

**Methods:** This was a cross-sectional survey study of Plastic & Reconstructive Surgery and Emergency Medicine residency and fellowship program leadership. Program directors of training programs at the 50 largest hospitals in the United States were invited via Qualtrics XM (Seattle, WA) to complete the survey.

**Results:** 25/46 (54.3%) of PRS programs and 24/45 (53.3%) EM programs responded. 60% of surveyed institutions have published guidelines on which service closes ED lacerations, based on factors such as location (77.3%), complexity (66.7%), size of the wound (53.3%), and age of the patient (20.0%). Eyelids are the most frequently consulted-on area (87.5%), followed by the lips (45.8%), ears (41.7%), and nose (41.7%). 88% of institutions honor patient requests for PRS repair, and 72% have PRS residents close by default. Of surveyed EM leadership, 39.1% reported lack of ED provider time as a factor in consulting PRS, although 91.7% disagreed that calling a PRS consult decreases the patient's overall length of stay. Three PRS programs (12%) reported difficulties with ED coverage since the implementation of the NSA.

**Conclusion:** Despite the absence of standardized guidelines, both clinical and situational factors contribute to the decision to consult a surgical specialist for repair of a laceration in the ED. Wounds that are complex or located in the head and neck region more often necessitate a PRS consult. Patient request and lack of ED provider time also contribute to an emergency physician's decision to consult PRS. The introduction of the NSA, although not significantly altering ED practices yet, poses future challenges for specialist coverage. These policy changes highlight a need to increase the number of providers who can provide laceration repair in the ED, thereby allowing emergency physicians to attend to other waiting patients and elevating the satisfaction, safety, and welfare of all patients in the ED.

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## **Just Say Yes: Changing Opioid Prescribing Algorithms in Plastic Surgery**

Abstract Presenter  
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**Introduction:** In recent years, there has been an encouraging amount of plastic surgery literature published regarding the benefits of reducing opioid use and the best strategies to responsibly treat patient's postoperative pain. However, there are still many plastic surgeons who hesitate to initiate this directive. While non-surgical fields have seen a significant decrease in opiate prescriptions, surgical specialties continue to provide a large excess of narcotics, increasing the risk for abuse. We present a practice modification designed to reduce the number of opiates prescribed and highlight the steps needed to implement a new prescribing algorithm.

**Methods:** In October of 2023 we implemented a new pain management algorithm for patients undergoing reconstructive, aesthetic, or revision breast surgery. In the pre-intervention group, patients received 30 pills of postoperative opiates and recorded their consumption using take-home logs. Following the intervention, patients were given a maximum of 10 pills. To guide our new prescribing practice, we relied on pill consumption analysis from our pre-intervention cohort. Data was prospectively collected on postoperative analgesic use per procedure. We compared the differences between pre-and post-intervention groups using Student's t-test to analyze the number of opiates

prescribed, amount consumed, and number of days used. The incidence of patients who used non-opioid analgesics and required refills were compared using Fisher's exact test. All statistical analysis were performed with SPSSv24.0 ( $p < 0.05$  considered statistically significant).

**Results:** 41 survey responses were included in our pre-intervention cohort and 10 in our post-intervention cohort. A median of 5.5 pills was consumed by patients who received implant and tissue expander procedures, 4.75 pills were consumed by patients who underwent pedicled flaps, 12 pills for fat grafting, 5 pills for breast reduction, and 12.5 pills for gender affirming mastectomies. Prior to the opioid intervention, patients received 30 pills of opiate analgesic postoperatively, and consumed a median of 6 pills. Following the intervention, patients received a median of 7 pills, which was a significant reduction ( $p < 0.000$ ) and consumed a similar number of opiates (5.5 pills,  $p = 0.398$ ). Patients in both cohorts would consume pills for a median of 4 days postoperatively. In the pre-intervention group, patients had a median of 24 unused pills. This was significantly reduced to 0.5 unused pills in the post-intervention cohort ( $p < 0.000$ ). Refill requirements and analgesic use by the two groups was not significantly different ( $p = 0.063$  &  $p = 0.545$ ).

**Conclusion:** We have shown it is possible to implement a new opioid prescribing algorithm in plastic surgery. Our opiate intervention significantly diminished opiate excess, reducing the risk for abuse, without significantly increasing patient's need for refills or non-opiate analgesics. With growing research demonstrating the benefits of regulating prescriptions and the best ways to implement change, surgeons can feel confident to just say yes to this meaningful reform.

## **Trends in Medicare Physician Fee and Facility Pricing Reimbursements for Craniofacial Trauma Procedures from 2007-2023**

Abstract Presenter  
Khoa Nguyen

Abstract Co-Author(s)  
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Brooke French MD  
David Khechoyan MD



Phuong Nguyen MD  
Jason Yu DMD, MD

**Introduction:** Understanding reimbursement trends is crucial to maintaining a sustainable practice, particularly in craniofacial trauma. However, there is limited literature on reimbursement trends for craniofacial trauma services. The purpose of this study is to evaluate trends in physician fees (PF) and facility pricing (FP) within the past two decades.

**Methods:** National reimbursement data from 2007 to 2023 was obtained through the Medicare Physician Fee Schedule Look-Up (MPFS) tool provided by the Center for Medicare & Medicaid Services (CMS). Craniofacial trauma surgeries of interest were identified through Current Procedural Terminology (CPT) codes.

The following values were queried from MPFS under the National Payment Amount which includes relative value units for work, practice expense, and malpractice. Geographic Practice Cost Indices were set at 1.000 to account for national payment values. Conversion factors were directly obtained by contacting CMS. PF calculations were conducted using the established physician fee reimbursement equation [2].

Medicare facility pricing set at the National Payment Amount for craniofacial trauma were also obtained. Both PF and RP were adjusted for inflation using the Bureau of Labor Statistics Consumer Price Index [3]. Subsequent percentage change (PC) and year-over-year (YOY) analyses were conducted.

**Results:** Fifty-eight CPT codes were identified. YOY illustrated a decreasing pattern in reimbursements from 2007-2023. Interestingly, YOY demonstrated fluctuations within facility pricing and physician fee reimbursement, in tandem with significant changes occurring during the Global Financial Crisis of 2007-2008 and the SARS-CoV-2 pandemic of 2019.

Overall, PF reimbursements decreased by an average of 9.3% by 2023 compared to 2007. 21 (36%) craniofacial CPT codes experienced an average net increase of 10.2% while 37 (64%) craniofacial CPT codes experienced an average net decrease of 20.3% in Medicare reimbursement in 2023 compared to 2007. CPT 21240 (Reconstruction of jaw joint) had the highest decrease (-43.78%). CPT 21480 (Reset dislocated jaw) had the highest increase (14.6%).

FP reimbursements decreased by an average of 14.6% by 2023 compared to 2007. Three (5%) craniofacial CPT codes experienced an average net increase of

approximately 11.5% while 55 (95%) craniofacial CPT codes experienced an average net decrease of 17.9% in Medicare reimbursement for facility pricing in 2023 compared to 2007. CPT 21490 (Open treatment of temporomandibular dislocation with interdental wire fixation) had the highest decrease (-32.2%) while CPT 21452 (Percutaneous treatment of mandibular fracture, with external fixation) had the highest increase (26.47%).

**Conclusion:** Overall, physician fee and facility pricing reimbursement demonstrated a down-trending pattern from 2007-2023, approximately 9.3% and 14.6%, respectively, with variable fluctuations at certain periods possibly due to significant economic changes.

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## Current State of Plastic Surgery Residency in Nigeria - A Resident Survey Analysis

Abstract Presenter  
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**Introduction:** Plastic surgery residency training in Nigeria has evolved considerably over the last decade but still faces unique challenges. These include limited awareness among the public and healthcare professionals about plastic surgery, a need for more specialized training, and a slow integration of aesthetic surgery into mainstream practice. This study aims to evaluate the perspectives of plastic surgery residents in Nigeria regarding the current state of their training programs, experiences, and overall satisfaction, with an emphasis on identifying areas for improvement.

**Methods:** A survey with 30 questions was distributed on the online plastic surgery resident/trainers forum in Nigeria using Google Forms. The questionnaire sought detailed information on demographics, training, confidence levels in performing various surgeries, academic involvement, satisfaction with the training environment, and suggestions for enhancing the training framework.

**Results:** Of 102 residents, 24 responded to our survey (response rate = 23.5%). 66.7% of residents were male, with an age range of 31-52. Most residents were in their third year of senior registrar training (41.7%). Confidence levels in performing specific surgeries varied, with a notable majority expressing confidence in tendon and nerve reconstructions (54.2%) and flaps for hand reconstruction (66.7%) but less so in microsurgery, with 29.2% of respondents having no experience and 45.8% having only 1-5 human cases. For aesthetic surgeries, a significant 41.7% deemed their training grossly inadequate or inadequate. Academic involvement was limited, with many residents never having authored a paper (41.7%) or presented at conferences (58.3%). Dissatisfaction was reported in workplace treatment (45.8%) and research exposure (50%). A higher satisfaction rate (54.2%) was reported regarding time spent with trainers in clinical settings. The suggestions for improvement focused on enhanced surgical participation, increased research motivation, and the need for structured training modules and adequate resources.

**Conclusions:** The study highlights the residents' perspective on plastic surgery training in Nigeria, with deficiencies in specific core competencies and research opportunities. Respondents advocated for a multifaceted reform approach, including providing more educational resources, opportunities for foreign training, and establishing specialized hospitals. Addressing these concerns is critical for enhancing the quality and effectiveness of plastic surgery training in Nigeria, ultimately leading to better patient care and surgical outcomes.

## **Clinical Impact of an Outpatient Minor Procedures Clinic at a Safety Net County Hospital**

Abstract Presenter

Daniel Soroudi

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**Introduction:** Overuse of the operating room (OR) leads to increased costs, potential exposure to nosocomial infections due to extended stays, resource constraints, and considerable psychological impacts on patients.(1) More simple procedures can be done safely in an outpatient setting, saving both time and resources.(2) The Minor Procedures Clinic at San Francisco's only public and safety-net county hospital serves a patient population who is uninsured, underinsured, or belongs to lower-income demographics. The purpose of this study is to describe our experience with the Minor Procedures Clinic, to report outcomes following these procedures, and to encourage other hospital centers to develop independent procedural clinics such as ours.

**Methods:** A retrospective review was conducted of all patients presenting to the Minor Procedures Clinic at San Francisco's safety-net hospital from May 2022 to June 2023. Demographic data, location of procedure, and outcomes were obtained. Means and standard deviations were reported.

**Results:** The Minor Procedures Clinic is open two days a week and specializes in the evaluation and management of soft tissue foreign bodies and masses, including lipomas and cysts. Patients can drop in during open hours or be referred by their provider to be evaluated. Multiple procedures are offered, including medically necessary foreign body and soft tissue removal. Plastic surgery residents assess the patient's suitability for clinic procedures under local anesthesia and the need for additional imaging for mass evaluation through an initial medical history and physical exam. Caution is exercised in the face, breast, and axilla due to complex anatomy and aesthetics. Once the necessary workup is complete, written consent is obtained and the procedure is

performed. The patient is provided with postoperative instructions and seen again by residents at a two-week postoperative appointment for wound check, suture removal if indicated, and pathology review.

67 patients were seen. The mean age was  $49.6 \pm 13.2$  years, 53.7% were males, and 46.3% were females. The mean Body Mass Index (BMI) was  $27.9 \pm 5.0$  kg/m<sup>2</sup>. The primary language spoken was English (53.7%), followed by Cantonese (17.9%) and Spanish (14.9%). 44.8% were employed and 83.6% were covered by Medi-Cal. Substance use included methamphetamine (7.5%), alcohol (6.0%), cocaine (4.5%), and fentanyl (1.5%). The most common locations for procedures were the back (19.4%), scalp (13.4%), chest (9.0%), and buttock (9.0%). There was a 1.5% (n=1, hematoma) complication rate.

**Conclusion:** The Minor Procedures Clinic model offers a refreshing departure from the norm in healthcare management. Its design presents benefits including reduced hospitalizations, fiscal efficiency, and a robust patient-centric focus. Such an innovative approach, when juxtaposed against the backdrop of more conventional inpatient care systems, underscores the transformative potential and value of this healthcare paradigm.

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### **Optimizing Billing Practices Using Artificial Intelligence**

Abstract Presenter  
Christina Zhu

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**Background:** In plastic surgery, artificial intelligence (AI) has been used for a variety of tasks: postoperative free flap monitoring, simulating surgical outcomes, understanding pre-operative risk for complications, and creating individualized treatment plans.<sup>1</sup> Many subdisciplines of AI exist, including machine learning, natural language processing (NLP), deep learning, and facial recognition.<sup>1</sup> Billing constitutes a majority of the healthcare administrative expenses in the U.S., with incorrect coding alone accounting for up to 50% of the improper payment rate in surgical fields, reported from the Centers for Medicare and Medicaid Services Comprehensive Error Rate Testing in 2022. Given these challenges, incorporation of AI presents an opportunity to streamline the billing process.<sup>2</sup> NLP and machine learning have garnered high interest due to their ability to generate current procedural terminology (CPT) codes from clinical documentation notes made of unstructured text in the electronic medical records (EMR).<sup>3-5</sup>

**Purpose:** This paper aims to explore the integration of artificial intelligence, specifically with natural language processing and machine learning, to enhance patient care and outcomes and improve administrative workflows within plastic surgery.

**Results:** AI has been used to interpret clinical documentation notes and assign ICD-10 and CPT codes with high accuracy compared to medical billing personnel, recognize instances of incorrect billing, and assist with prior authorization approvals. Automated medical billing companies such as Nym Health (New York, NY) and CodaMetrix (Boston, MA) as well as literature using machine learning and NLP models have demonstrated the ability to interpret CPT codes from clinical documentation. Insurance companies such as Blue Cross Blue Shield of Massachusetts have piloted prior authorization approvals using AI. AI implementation holds potential to enhance billing practices and maximize healthcare revenue as practicing physicians.

**Conclusion:** The broad capability of AI to develop accurate, efficient billing codes can improve revenue capture, reduce labor costs associated with manual coding, and increase the speed and efficiency of the billing workflow for all medical fields, and specifically in plastic surgery. Implementation of AI to improve billing as well as patient care can enhance a surgical practice.

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## **The Growth and Development of a Research Division in the Plastic Surgery Department of a Large Urban Academic Medical Center**

Abstract Presenter  
Andrew James

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**Background:** Research is a critical component of academic medicine that may not be prioritized in centers with high clinical volumes. The benefits of research expansion go beyond notoriety and industry partnerships, expanding into resident training and preparation of the next generation of physician-scientists. Improving a division or department's research portfolio requires a commitment to re-organizing structure, personnel, resources and a dedication to innovative funding models. To improve research productivity and quality, our group placed several initiatives into motion beginning in August 2017 that we have outlined and evaluated in the present study. Some of these initiatives included restructuring leadership, resourcing both bench and clinical outcomes research, providing initial funding directly from clinical profits and rewarding research fiscally.

**Methods:** Internal reviews of hiring records, research publications, grant allocations, and interviews with key personnel were carried out to generate a road map of the initiatives set in place to re-design and further develop our research department.

Student's t-tests were used to compare means from 2010-2017 to those from 2018-2022. Average impact factor was calculated by averaging journal impact factors for all publications from the department each year, excluding any publications with greater than five times the raw average, and creating a corrected average that most accurately represents the work carried out by the department that year. Impact factors were obtained using the Journal Citation Reports database from Clarivate. Rankings of top plastic surgery journals were pooled from Google Scholar.

**Results:** Overall publication output increased from 11 in 2010 to 63 in 2023. Prior to our restructuring initiatives (2010-2017) the department published an average of 9 articles annually which increased to an average of 42 articles since that time ( $p < 0.01$ ). Average impact increased from 0 in 2010 to 4.02 in 2022 with the number of publications in top 10 plastic surgery journals following a similar trajectory with 1 publication in 2010 and 31 in 2023. Following an initial one-million-dollar investment to create an institutionally directed fund in 2018, the department leveraged its research to earn \$3 million in endowments, \$1.25 million in private industry partnerships, and \$7.9 in Department of Defense and NIH funding. The diversity of research produced in the department significantly increased from a mean of 4.1 different study designs represented in publications from 2010-2017 to 9.2 between 2018 and 2022 ( $p < 0.001$ ).

**Conclusion:** Initiatives as noted above have led to remarkable growth in research output. This road map needs to be deliberate and prioritized. We believe these results are generalizable and that organizational structuring as carried out in our institution can reap benefits across the academic plastic surgery community.

## **The Facial Rejuvenation Ladder: A Shared Decision-Making Mixed Methods Evaluation of Treatment Plans**

### **Abstract Presenter**

Kylie McMath, NP, PhD Student

### **Abstract Co-Author(s)**

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Saira Gupta



**Purpose:**

Patients interested in facial rejuvenation may be treated with a variety of minimally invasive and surgical treatments. The extent to which patients participate in the shared decision-making process is highly variable in plastic surgery practices. Selecting a treatment is often complex and needs to account for variables such as physical characteristics, medical co-morbidities, patient expectations, downtime tolerance, and budget. Anecdotal reports suggest that patients find education from plastic surgeons is inadequate during the consultation process, leading them to search the internet. Web-based information is unable to replicate clinical judgment and may lead to incorrect conclusions. Investigation to evaluate the information reaching patients in a clinical setting is needed to aid in determining areas where shared decision-making can be improved.

**Methods:**

To facilitate shared decision-making, it is necessary to study the patients' point of view, determine which aspects of planning discussions are felt to be neglected, and identify opportunities to improve the therapeutic alliance between surgeon and patient. To fulfill these objectives, we performed a mixed methods study that employed validated clinical facial aging scales in conjunction with semi-structured interviews from a sample of patients who presented for facial rejuvenation consultation.

**Results:**

Forty participants [four men (10%) and thirty-six women (90%); mean age, 52 years (range, 37 to 84 years)] underwent facial rejuvenation procedures. Scores from the facial aging scales showed a high correlation to the level of invasiveness of the recommended procedure(s) with a Pearson coefficient of 0.79. When patient downtime was discussed in conjunction with the expected impact of procedures, the interviews revealed a high degree of shared decision-making and satisfaction. Patients who reported limited discussion of recovery time and expectations had the lowest perception of shared decision-making.

**Conclusions:**

Plastic surgeons must help patients select facial rejuvenation treatment plans that align with the patients' preferences for significant impact, recovery period, risks, and cost as they use this information to assist in their procedure choice. Areas of greatest impact for shared decision-making include details around physical and social downtime, and discussion around realistic expectations.

# **Predictors of Plastic Surgery Faculty Involvement in Institutional Diversity, Equity, and Inclusion Committees**

## **Abstract Presenter:**

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**Purpose:** This study aimed to analyze factors contributing to plastic surgery faculty involvement in diversity, equity, and inclusion (DEI) committees across the United States.

**Methods:** A retrospective review of ACGME plastic surgery residency program websites was conducted by three independent reviewers of different ethnicities and genders. Program size, program type (integrated vs. independent), perceptible representation in leadership, and plastic surgery faculty presence on an institutional diversity committee were collected from program websites. Perceptible representation in leadership was defined as a program director or assistant program director that the reviewers determined as representative of an expansion of plastic surgery diversity. Discrepancies between reviewer determination of perceptible representation were consolidated and inter-rater reliability was performed between the three reviewers. Statistical analysis was performed on R Studio 4.2.1.

**Results:** Upon review, 82 ACGME certified plastic surgery residency programs were identified, of which 59 (71.9%) programs were integrated and 23 (28.1%) programs were combined (independent and integrated). When comparing these integrated programs with the combined programs, there was a significant difference in plastic surgery participation in institutional DEI committees (30.5% vs. 69.6%;  $p=0.0003$ ). Additionally when comparing between programs with and without perceptible representation, there was a significant difference in plastic surgeon participation in institutional DEI committees (22.2% vs. 4.3%;  $p=0.034$ ). Univariate logistic regression further confirmed combined programs ( $p=0.005$ ,  $OR=8.17$ ) and the presence of perceptible representation ( $p=0.03$ ,  $OR=6.29$ ) as significant contributors to the presence of a plastic surgeon on the institutional DEI committee. When combined into a multivariate logistic regression, these variables remained statistically significant.

**Conclusions:** This study identified combined programs and the presence of perceptible representation as predictors of plastic surgeon participation in DEI committees. The methods by which this information was collected highlight the need for quantifiable and publicly accessible data enumerating program demographics.

## **Evaluating Surgical Care for Incarcerated Patients: A Systematic Review of a National Medical Malpractice Database and Lessons Learned for the Plastic Surgeon**

### **Abstract Presenter**

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### **Purpose:**

The incarcerated patient population is underserved and understudied. The primary objective of this systematic review examining a national medical malpractice database is to identify the deficits in surgical care from the perspective of incarcerated patients and the secondary objective is to propose interventions to improve their surgical care.

### **Methods and Materials:**

Our systematic review of the Thomson Reuters Westlaw legal database included all medical malpractice cases from January 2017 to January 2022 with a prisoner or prisoner representative as the plaintiff, a physician named as one of the defendant(s), and a surgical procedure. Cases that were still ongoing at the time of data collection or cases settled before litigation were excluded. We recorded plaintiff allegations against defendants, the timing of allegations in the surgical care spectrum (preoperative, intraoperative, and postoperative), legal and geographic data, and patient sex.

### **Results:**

A total of 634 malpractice cases were included. Most malpractice allegations involved

surgical care in the postoperative period (51.6%), followed by the preoperative (39.0%), and intraoperative (8.0%) periods. Chi-squared analysis revealed a significant difference in the timing of the surgical care allegation across different allegation types ( $P < 0.001$ ). The most common allegation was delays in evaluation (22.2%), followed by failure to manage complications appropriately (21.0%), incorrect treatment (17.4%), and procedural or technical error (7.6%). The least common allegations were abandonment (0.8%) and wrong site surgery (0.2%). California (18.0%), Pennsylvania (7.4%), and Illinois (6.2%) are the states with the highest number of malpractice lawsuits by incarcerated patients. The legal verdict favored physicians in 97.8% of cases. Ninety-seven percent of incarcerated patients were male.

### **Conclusion:**

Most malpractice allegations by incarcerated patients involve surgical care in the postoperative and preoperative periods. Patients often cited delays in evaluation or failure to manage complications appropriately as motivating factors for their lawsuits. Plastic surgeons may improve surgical care for incarcerated patients by working with local prisons to optimize channels of communication between the hospital and prison, improve the timeliness of preoperative evaluation, and establish follow-up protocols to ensure appropriate care during an incarcerated patient's postoperative course.

## **Plastic Surgeons' Perspective on the FDA Breast Implant Mandate**

### **Abstract Presenter:**

Nisha Gupta

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**Purpose:** In 2021, the United States Food and Drug Administration (FDA) took several actions to improve communication of the risks associated with breast implants and breast implant surgery to help patients make informed decision. New labeling, a checklist, and updated rupture screening recommendations for breast implants were issued. Prior studies have demonstrated its influence on public perception of breast implants. Plastic surgeons are important stakeholders in breast implant safety and utility; therefore, their perspectives on improving implant labeling and risk communication should be investigated. Our secondary aim was to review each of these components and their impact on current practice patterns.

**Methods:** An anonymous, voluntary survey was distributed to a cohort of 4,352 active American Society of Plastic Surgeons (ASPS) members in September 2023. The cross-sectional survey included 27 multiple-choice questions to evaluate respondents' attitudes on the black box warning, informed decision checklist, and updated rupture screening recommendations. Respondents were asked to provide their opinion of the statement based on a 5-point Likert scale (i.e. not applicable, neutral, disagree, agree, strongly disagree, and strongly agree). Respondent demographics, including age and years in practice were collected. Preferences for implant shell, shape, and fill type were also documented.

**Results:** A total of 591 respondents who were demographically representative of active ASPS members responded to the survey (13.6% response rate). 98% of respondents performed breast implant procedures. More than half were between the ages of 45 to 64 (58%) and had been in practice for more than 20 years (52%). 71% of respondents felt that the rupture screening recommendations were appropriate. However, the majority (57%) stated the informed decision checklist did not have a positive impact on workflow; 66% were also neutral or disagreed with the reported incidence rates related to complications and cancer risk. A greater number (47%) of respondents did not find the black box warning to improve their patients' understanding of the risks and benefits. 47% of respondents also believed these requirements, in combination, did not improve the overall patient experience with implants.

**Conclusions:** The recent changes to breast implant labeling and distribution have been a subject of discussion with research focused on understanding the patient's standpoint. Overall, respondents in our study believed patients should be provided risk information associated with implants and had positive opinions of many of the changes. Most surgeons felt the updated rupture screening recommendations to be appropriate and may increase compliance. However, respondents were not as optimistic toward the impact of the black box warning and patient decision checklist on clinical practice.

## **The Quality of Plastic Surgery Enhanced Recovery After Surgery (ERAS) Studies: A Systematic Review**

**Abstract Presenter:**

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**Purpose:** In an effort to improve post-operative outcomes and optimize patient recovery, Enhanced Recovery After Surgery (ERAS) protocols have gained popularity.[1] The objective of this systematic review was to assess the reporting and methodological quality of plastic surgery ERAS studies.

**Methods:** All plastic surgery ERAS studies, published between January 2021 to November 2023 were assessed for reporting quality, and those published between January 2020 to November 2023 were assessed for methodological quality. Time-periods were selected based on publication dates of The Reporting on ERAS Compliance, Outcomes, and Elements Research (RECOVER) Checklist [2] (reporting quality) and Recommendations from the ERAS® Society for the development of ERAS guidelines [1] (methodological quality). The primary outcome was reporting quality (The Reporting on ERAS Compliance, Outcomes, and Elements Research (RECOVER) Checklist [1] (40 points)). Secondary outcomes included methodological quality. For Autologous Breast Reconstruction and Head and Neck (H&N) studies, methodological quality was assessed through the appraisal of adherence to ERAS® Society guidelines.[3, 4] The methodological quality of other sub-specialty ERAS studies was appraised through adherence to Recommendations from the ERAS® Society for the development of ERAS guidelines[1] (9 points).

**Results:** Fifty studies were included (Breast Reconstruction: 29, 58%; H&N: 7, 14%; Craniofacial: 7, 14%; Aesthetic: 5, 10%; Other: 3, 6%). Mean reporting quality was 22.6/40 (56.5%; SD: 4.7). ERAS protocol elements least adhered to included: patient warming strategy (8/50, 16%), post-operative analgesia/anti-emetic plans (14/50, 28%), and post-discharge outcome tracking (14/50, 28%). Evaluation of the methodological quality of Autologous Breast Reconstruction studies revealed mean compliance of 8.0/18 (44.4%, SD: 3.5). Least complied with elements included: preoperative CTA (4/23, 17.4%), intra-operative warming (6/23, 26.1%), and post-operative wound management (2/23, 8.7%). For H&N studies, average compliance was 9.2/24 (38.3%, SD: 5.2). Least complied with elements included: pre-anesthesia pain medications (1/7, 14.3%), post-operative wound care (0/7, 0%) and post-operative pulmonary therapy (1/7, 14.3%). Least complied with elements for other sub-specialties included:

multidisciplinary ERAS development (3/16, 18.8%), and evaluation plans (3/16, 18.8%).

**Conclusions:** ERAS studies in plastic surgery are variable, with overall low reporting and methodological quality. Plastic surgeons should critically appraise ERAS protocols before adopting them to their practice.

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## **Does the Size Matter? The Impact of Plastic Surgery Residency Size on the Origin of Successful Applicants**

### **Abstract Presenter:**

Artin Allahverdian

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### **Background/Purpose:**

Many factors can influence a successful match into a plastic surgery (PS) residency program. Programs are more likely to match students from their affiliated medical school, state, and region(1). In addition, students that attend medical schools not affiliated with a PS residency program report fewer opportunities for exposure to PS education. This study aims to explore the importance of the residency program size and its influence on matching medical students from schools without a home residency

program.

### **Methods:**

Using the AAMC Residency Explorer Tool, all U.S. integrated and independent PS residency programs were identified. For each program, the number of residency spots offered per year, and the change in residency spots over the past six years, was recorded. For each current resident, the medical school attended by the resident and the affiliation of that medical school with an integrated PS residency program was documented. The number of residency positions offered by each program and the origin of residents from home (HP) versus non-home (NHP) programs were summarized using descriptive statistics. The association between number of residency positions offered and HP versus NHP were assessed using one-way ANOVA.

### **Results:**

Our analysis included 89 US integrated PS residencies. The average number of residency spots was 2.24 per year (1-5). The largest subset of PS residencies have two spots for incoming residents each year, which was the case at 38 (42.7%) of programs. The next most frequent number of spots at programs in descending order were 1 at 19 (21.3%) programs, 3 at 16 (18%) programs, 4 at 10 (11.2%) programs, and 5 at 1 (1.1%) of programs. Additionally, 26 (31%) of PS integrated residencies also have an independent residency program. Analysis showed no significant association between the number of residency spots per year and having both types of residencies versus just an integrated program (p-value=0.295). We found no statistically significant association between the number of residency spots at a program and if residents were from a school with HP or NHP (p-value<0.05).

### **Conclusion:**

This study provides an overview of factors that could connect the number of residency spots at a program and their likelihood of coming from a medical school with or without a home plastic surgery training program. Our results indicate that there was no association between either having both an integrated and independent residency or the availability of a PS residency at the residents' medical school with the number of residency spots. Therefore, applicants coming from schools without home programs can focus on the quality of training, rather than the availability of positions when determining which programs they should apply to for residency.

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## **Prenatal repair of spina bifida: what is the current status of practice in the United States?**

### **Abstract Presenter**

Stuti Garg BA

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**Purpose:** Prenatal myelomeningocele (MMC) repair offers significant benefits over traditional postnatal repair, as demonstrated by the MOMS trial [1]. We characterized the current status of practice and specialist involvement in prenatal and postnatal MMC repair.

**Methods:** The top 50 US News Children's Hospitals for Neonatology and Neurology & Neurosurgery were queried, resulting in 67 unique hospitals. Specialties involved in MMC repair were extracted via hospital websites and surveys.

**Results:** Among the 58 hospitals that offered either prenatal or postnatal MMC repair, 40 offered postnatal repair only, 18 offered both, and 7 prenatal teams included fellowship-trained fetal surgeons. Of the 40 offering postnatal repair only, neurosurgeons (n=38), orthopedic surgeons (n=34), and urologists (n=33) were most often included. Of the 18 hospitals with prenatal repair, neurosurgeons were involved most (n=18), followed by maternal-fetal-medicine (MFM) specialists (n=14). Pediatric and fetal surgeons were more likely to be involved in prenatal teams (p=0.011, p=0.035, respectively). MFM and orthopedic surgeon involvement did not differ significantly between prenatal and postnatal teams. The teams led by fetal surgeons always included neurosurgeons (n=7) and maternal-fetal medicine specialists (n=7) and were least likely to include plastic surgeons (n=1).

**Conclusion:** These data emphasize the delayed adaptation of fetal repair despite its demonstrated benefits 12 years ago in the MOMS trial. Further research is warranted to explore the reasons for delayed adoption of fetal repair and lack of fellowship-trained fetal surgeons in order to ultimately optimize MMC treatment.

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## **Patient Perspectives on Alternative Payment Models in Plastic Surgery**

### **Abstract Presenter**

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**Introduction:** Alternative payment models (APMs) offer alternatives to the traditional fee-for-service (FFS) model and are designed to promote high-value care by linking cost and quality. The transition toward APMs among insurers will influence the mechanisms, quality, and grading of plastic surgery care. To date, patient knowledge of APMs in surgery has not been investigated, but it will inevitably shape surgical care delivery once implemented. This study aims to assess plastic surgery patients' self-reported knowledge of APMs, determine the attributes of providers and institutions that patients prioritize, and evaluate how brief education on payment models alters patient values.

**Methods:** Study participants 18 or older who underwent a plastic surgery procedure from 2013-2023 were identified through an institutional database. Eligible participants were emailed a survey via REDCap to gather demographic information, baseline knowledge of APMs, and attitudes toward provider and institution attributes. Then, a brief educational excerpt on payment models was provided and was followed by an

identical post-education survey.

**Results:** 2,331 patients were contacted for participation, of whom 264 completed all surveys (11.3%). Most respondents had limited self-reported knowledge of payment models, with the greatest proportion endorsing awareness of basic principles of FFS reimbursement (17.1%) compared to APMs (7.6%), Accountable Care Organizations (7.1%), and bundled payment models (4.6%). Self-reported knowledge did not differ significantly upon sub-analysis of age, gender, education, income, insurance, deductible, or surgery type ( $p>0.05$ ).

Before education on payment models, most respondents valued patient testimonials (76%), online ratings (62%), hospital/university affiliation (87%), transparent procedure cost breakdown (70%), and revision costs (69%). Most preferred providers with better outcomes and fewer re-operations despite out-of-pocket expenses (63%) and wanted detailed procedure explanations (98%), information on complication rates (98%), and all possible implant/technique offerings (83%). A minority of respondents valued the surgeon's social media/search engine presence (28%) and an explanation of their surgeon's compensation model (30%). Few respondents wanted the most expensive device despite out-of-pocket payment (27%) and thought that knowing about revision cost breakdown (38%) or FFS compensation (20%) would influence provider selection.

After education, respondents cared more about surgery cost (29% to 47%;  $p<0.001$ ), complication rate (73% to 87%;  $p<0.001$ ), revision policy/costs (48% to 70%,  $p<0.001$ ), surgeon's compensation model (18% to 46%,  $p<0.001$ ), and explanation of their surgeon's compensation (30% to 44%;  $p=0.02$ ). They grew more hesitant to undergo surgery with APM-paid surgeons (13% to 38%,  $p=0.023$ ), and fewer supported incentivizing physicians to minimize cost while maintaining outcomes (64% to 53%,  $p=0.006$ ).

**Conclusions:** Plastic surgery patients have limited baseline knowledge of healthcare payment models. Upon education, patients tend to care more about transparency regarding costs, complications, and compensation models, with greater hesitancy regarding payment models that incentivize cost minimization. Understanding patient decision-making priorities and perspectives will help calibrate models to ensure the delivery of high-value care without compromising patient confidence.

## **Optimizing Clinical Productivity: A Single-Institution Analysis of Advanced Practice Providers in Pediatric Plastic Surgery.**

Abstract Presenter

Sarah Layon

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Jordan Rodriguez

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**Background:** Initially envisioned as support for primary care physicians, advanced practice providers (APPs) have experienced dramatic growth in both nonsurgical and surgical fields. Within surgical practices, APPs function as autonomous providers alongside surgeons to enhance continuity of care and improve efficiency. APPs are especially valuable in the field of plastic surgery due to the frequency of staged procedures, complex perioperative care, and broad scope of practice. Several surgical specialties have explored the impact of APPs, revealing increased surgical volume and reduced wait times. Literature specific to plastic surgery, however, is limited. Our study aims to evaluate the impact of increased APP utilization on surgical productivity in one of the largest pediatric plastic surgery divisions in the United States.

**Methods:** A retrospective review was conducted for the division of plastic surgery at our institution from October 2012 to September 2023. Data was extracted from the annual Surgery Department Executive Committee (SDEC) reports, an institutional tool designed to assess provider and divisional productivity. The number of clinic encounters, providers, and operating room (OR) cases were collected for each fiscal year (FY). The surgical conversion rate was calculated as the number of clinic visits to OR cases per provider. Descriptive analyses were performed to describe productivity trends.

**Results:** Over the last decade, there has been an upward trend in the ratio of clinic patients evaluated by APPs compared to MDs. In 2013, APPs completed 1 encounter for every 5 completed by MDs per provider. Since 2020, APPs have consistently matched or exceeded the number of clinic patients seen by MDs per provider. The COVID-19 pandemic generated a period of instability with clinical delays and a backlog of surgical cases. As normal operations resumed, surgical volume increased substantially despite a stable number of surgeons. In 2023, the division performed

2,047 OR cases, surpassing pre-COVID levels. The MD surgical conversion rate has also grown, increasing from 0.19 (1 OR case per 5.3 clinic encounters) in 2018 to 0.26 (1 OR case per 3.8 clinic encounters) in 2023.

**Conclusions:** The enhanced utilization of APPs in the division of plastic surgery has optimized our patient care model, increasing procedural productivity for surgeons without compromising clinic volume. In the setting of an academic institution, this helps optimize workload distribution, and provides stability in a dynamic work environment. For surgical residents, this may result in increased educational experiences and additional opportunities for evaluation.

## **Physician Assistants in Plastic Surgery: A Descriptive Analysis Using the National Commission on Certification of Physician Assistants Dataset (NCCPA)**

### **Abstract Presenter**

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**Purpose:** Physician assistants (PAs) play a vital role in the United States healthcare system, particularly amid the persistent surgeon shortage and escalating healthcare demands (1, 2). We aim to characterize the current cohort of PAs in plastic surgery by comparing them to PAs in all other specialties.

**Methods:** A cross-sectional analysis of the 2022 National Commission on Certification of PAs dataset was used to compare demographic and practice characteristics of PAs in plastic surgery with those in all other specialties. Analysis included descriptive and bivariate statistics.

**Results:** In 2022, 1.0% of PAs work in plastic surgery, and the number of PAs in this

specialty nearly doubled from 2015 (n=647) to 2022 (n=1,186). Bivariate analysis among PAs in plastic surgery and those in other settings revealed several important attributes (all  $p < 0.001$ ); PAs providing care in plastic surgery were younger (median age, 36 vs. 39), identified as female (91.0% vs. 69.4%), resided in urban locations (97.6% vs. 92.5%), and performed a higher proportion of clinical procedures for most of their patients (66.5% vs. 33.9%). Furthermore, a statistically significant higher percentage of PAs in plastic surgery report high job satisfaction and are more likely to report no symptoms of professional burnout.

**Conclusions:** The expanding PA profession amid the scarcity of surgeons presents an ideal prospect for enhanced collaboration. In an era where surgeon burnout is increasingly common and PAs express a readiness to function independently at an advanced level, expanding a PA's role becomes desirable and imperative. This collaborative approach has the potential to address workforce challenges, elevate patient care, and enhance provider satisfaction.

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## **Exploring the Association Between Historical Redlining and Mortality and Morbidity in Plastic and Reconstructive Surgery Patients**

Abstract Presenter  
Danielle Mayorga-Young

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**Introduction:** Despite the high cost of healthcare in the United States, published research has shown striking health disparities exist according to race, ethnicity, and household income, as well as other social determinants of health. More recently, health disparities have also been associated with living in a formerly redlined neighborhood. Redlining was the racially discriminatory practice by which the federal government classified neighborhoods for mortgage loan servicing using the 1940 Home Owners' Loan Corporation map. This study aims to investigate the association between historical redlining and adverse outcomes in plastic and reconstructive surgery (PRS) patients.

**Methods:** A retrospective cohort study was conducted utilizing data from patients who underwent a PRS procedure and subsequently experienced morbidity and/or mortality between January 2021 and October 2023 at a single academic institution in Rochester, NY. Patients' electronic medical records (EMR) were reviewed for demographic information, including 5-digit zip code, procedure underwent, and complication information. Patients' residential zip codes were overlaid on the 1940 Home Owners' Loan Corporation map of Rochester, NY and classified according to the federal government's classification at the time as: "Best," "Still Desirable," "Definitely Declining," and "Hazardous."

Descriptive statistics and ANOVA were performed to characterize average length of hospital stay, length of intensive care unit stay, and average number of complications experienced between the different groups.

**Results:** A total of 234 PRS patients were included in the study. A majority were female (60.3%), Caucasian (81.6%), or had private insurance at time of morbidity experienced (53.0%). Nine (3.8%) patients were found to reside in a zip code historically deemed "most desirable," 10 (4.3%) lived in a historically "still desirable" location, while 31 (13.2%) lived in an area deemed "definitely declining," and 5 (2.1%) lived in a historically "hazardous" zip code. All other patients (180, 76.9%) lived outside of the 1940 Home Owners' Loan Corporation map of Rochester, NY and therefore these neighborhoods' past redlining status could not be assessed. Length of hospital and ICU stay varied between these though not significantly (5.89, 11.00, 11.42, 5.6, vs 13.8, p-value=0.868) and (0.88, 0, 2.68, 0, vs 4.8, p-value=0.842) respectively from "most desired," "still desirable," "definitely declining," "hazardous" to outside city limits. The average number of complications also varied, but not significantly (2.44, 2.90, 2.68, 4.20, vs 2.68, p-value= 0.246).

**Conclusion:** While a significant difference was not found regarding hospital or, more narrowly, ICU length of stay or number of complications between formerly redlined

neighborhoods in this study, there are trends that merit further investigation. Healthcare providers should always be cognizant of the potential influence of environmental factors on patient health and consider targeted interventions to mitigate disparities among vulnerable populations.

## **True or False: Plastic Surgeons Should Counsel Against Peri-operative Marijuana Use.**

Abstract Presenter  
Jaeda Robinson

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Raymond Wen

**Background/Purpose:** Gender-affirming surgeries, including but not limited to, breast augmentation and transmasculine chest reconstruction have been used to help improve the overall quality of life for transgender and non-binary individuals.(1) Due to the growing rate at which these procedures are being performed, it is important to assess the variables that may impact pre- and post-surgical requirements. One variable of increasing interest is marijuana use. Advancement in the legalization and use of marijuana within the United States necessitates clinical understanding of how it may affect perioperative management and outcomes. Cannabis is currently regarded as a gateway drug, specifically to opioids; thus introducing the idea that using it may increase the likelihood of an individual developing an opioid dependency.(2) Additionally, despite marijuana's ability to mediate pain and alleviate symptoms of nausea and vomiting studies have shown that cannabis use can potentiate tachycardia and arrhythmias.(3,4) This raises a concern for both the surgical and anesthesia teams regarding how THC may impact perioperative care. This study aims to evaluate the implications of cannabis use to provide evidence-based recommendations for preoperative counseling and postoperative care as it relates to plastic surgery patients.

**Methods:** In this study, we conducted a retrospective chart review on patients who underwent gender-affirming chest surgery at The Ohio State University affiliated medical centers from March 2022 to the present. Perioperative anesthesia requirements, surgical outcomes, and postoperative narcotic use was compared between patients who reported marijuana use and those who did not. Patient demographics, amount of anesthesia medications administered, and surgical



complications were curated from patients' electronic medical records.

**Results:** Seventy-four cases with an average age of 27.8 were included in this preliminary data set. Three of these cases were excluded for a history of chronic opioid use. A fourth case was excluded due to a known history of illicit drug abuse. Of the remaining seventy cases, forty-one were identified as non-marijuana users while twenty-nine were self-reported cannabis users. Amongst non-users, 39% of patients reported use of prescribed postoperative narcotics and 24% experienced minor complications. Minor complications were defined as any event that did not require returning to the operating room. Such adverse outcomes included erythema, ecchymosis, paresthesia and decreased sensation, small hematomas, and minor bleeding around the incision site. As it pertains to marijuana users, 41% of patients disclosed use of postoperative narcotics while 17% sustained minor complications.

**Conclusion:** Despite current progression, marijuana is classified as a schedule I substance with the potential to incite opioid abuse. Such classification raises concern for clinicians regarding how cannabis use may negatively impact healthcare. Contrary to said reservations, the findings in this study suggests that marijuana use does not negatively influence perioperative surgical management, specifically pertaining to postoperative narcotic use and complication rates, when compared to non-users.

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## **Geographical Distribution of Board-Certified Plastic and Reconstructive Surgeons**

Abstract Presenter

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### **Purpose:**

Residents of rural areas in the United States (US) experience health care disparities, including limited access to specialty care such as plastic and reconstructive surgery (PRS). These surgeons have broad skillsets and are capable of treating a diverse number of health conditions. Expanding rural communities' access to PRS could help reduce health care disparities and improve patient outcomes. This study aims to characterize the geographical distribution of active, board-certified plastic and reconstructive surgeons in the US and to identify factors associated with sustaining PRS providers in rural areas.

### **Methods:**

We queried the American Society of Plastic Surgeons (ASPS) membership directory for all board-certified plastic and reconstructive surgeons practicing in the US in December 2023. Zip codes were abstracted from each entry and converted to county Federal Information Processing Standards (FIPS) codes using the 2020 Zip Code Tabulation Area to County Relationship File. We queried the 2022 Area Health Resource File for county demographics and health care resources. We labeled counties as urban or rural based on the National Center for Health Statistics Urban-Rural Classification Scheme. T-test, Chi-squared test, and Wilcoxon rank-sum test were used to compare inter-county outcomes for those with and without PRS access; multivariate logistic regression was used to identify health resources associated with PRS access.

### **Results:**

We identified 3,913 active, board-certified plastic and reconstructive surgeons in the US; of these, 177 (5%) listed practice locations in more than one county. The South region represented the most surgeons (n=1,466, 37%), and the Midwest the fewest (n=677, 17%). There were 1,044 (27%) surgeons located in the West and 720 (18%) in

the Northeast. Board-certified plastic surgeons served 626 counties throughout the US, accounting for 247,988,122 (75%) people. Counties without PRS (n=2,515) accounted for 81,486,655 (25%) people. Almost half (n=531, 46%) of all urban counties had a plastic and reconstructive surgeon while only 5% (n=95) of rural counties did ( $p<0.001$ ). In counties with PRS, the median (interquartile range, IQR) PRS density per 100,000 population was 1.6 (0.88-2.8). Compared to counties with PRS, counties without PRS had a significantly smaller median (IQR) primary care density per 100,000 population (40 [23-58] vs. 75 [54-97],  $p<0.001$ ) and general surgery density per 100,00 population (0 [0-7] vs. 10 [6-15],  $p<0.001$ ). The mean (standard deviation, SD) hospital count in counties without PRS was also lower (1 [0.94] vs. 5.6 [7.8],  $p<0.001$ ). Similarly, counties without PRS had a lower mean (SD) number of ambulatory surgery centers (0.31 [1.0] vs. 8.1 [16],  $p<0.001$ ). After controlling for population age, income, education, and insurance status, the number of ambulatory surgery centers was significantly associated with access to PRS in rural areas (adjusted odds ratio: 1.50, 95% confidence interval: 1.18-1.91,  $p<0.001$ ).

### **Conclusions:**

We found significant geographical variation in PRS access throughout the country, with many rural areas being without a plastic and reconstructive surgeon. Presence of an ambulatory surgery center increased the likelihood of access to PRS in rural counties. Additional studies are needed to identify necessary resources that may help recruit plastic and reconstructive surgeons to rural areas.

## **Glucagon-like Peptide-1 Receptor Agonists Reduce Surgical Complications in Diabetic Patients**

### **Abstract Presenter**

Ashley Zhang

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Jason Spector MD

### **Purpose:**

Glucagon-like peptide-1 receptor agonists (GLP-1 RA) are becoming common pharmacotherapies for treating diabetes and weight management. Prescription rates have increased over 200% between 2016 and 2021 (1). These medications have multi-

system impacts and no previous studies have examined their safety in surgical patients. This study examined the effect of GLP-1 receptor agonists on the rate of post-operative complications and rates of readmission in diabetic patients undergoing surgery.

### **Methods:**

We identified all patients undergoing open and closed surgical procedures at a quaternary care hospital in New York City from February 1st, 2020 to July 1st, 2023. Eye and ear surgeries were excluded. Patients with Type 1 and Type 2 diabetes were divided into two groups: patients receiving GLP-1 RA drugs at the time of surgery as part of their diabetes management and patients receiving standard of care diabetes management without GLP-1 RA drugs. Primary outcomes were postoperative complications within six months of the surgery date and hospital readmissions within 30 days of discharge. Subgroup analyses were performed in open and closed procedures and common plastic surgery procedures.

### **Results:**

A total of 41,932 surgical procedures in 16,023 patients were included, with 9,118 (21.7%) procedures in patients with an active prescription for GLP-1 RA medications at or before the time of surgery. Patients on GLP-1 RAs were younger (65 vs. 68,  $p < 0.001$ ), had a higher BMI (29.23 kg/m<sup>2</sup> vs. 28.19 kg/m<sup>2</sup>,  $p < 0.001$ ), and had higher rates of T2DM (96.6% vs. 91.7%,  $p < 0.001$ ) compared to patients not taking GLP-1 RA medications. This group also had higher preoperative hemoglobin A1C and rates of comorbid arteriosclerosis, heart failure, cirrhosis, obesity, and hypercholesterolemia/hyperlipidemia ( $p < 0.05$ ). Postoperatively, the GLP-1 RA group had lower rates of hematoma (0.1% vs. 0.3%,  $p = 0.002$ ) and readmission within 30 days (5.4% vs. 7.6%,  $p < 0.001$ ). In sub-analyses, the readmission rate in the GLP-1 RA group was lower than the non-GLP-1 RA group in both open (6.6% vs. 8.3%,  $p < 0.001$ ) and closed (4.5% vs. 6.3%,  $p < 0.001$ ) procedures. Hematoma rates were decreased in the GLP-1 RA group only in open surgeries (0.2% vs. 0.4%,  $p = 0.005$ ). In plastic surgery procedures, active GLP-1 RA use was not associated with significant differences in complication or readmission rates ( $p > 0.05$ ), although this may reflect an insufficient number of patients/surgeries in this sub-analysis.

### **Conclusion:**

In this first study examining the effects of GLP-1 RA medications in surgical patients, we found these medications decreased postoperative hematoma and 30-day readmission rates, despite being taken by patients with higher Hgb A1C levels and rates of comorbidities. Further study is ongoing to elucidate the mechanism of the observed protective effect and to identify sub-groups of patients and procedures where taking GLP-1 RA medications is particularly beneficial. Plastic and reconstructive surgeons may be

assured that active GLP-1 RA use is safe in diabetic patients undergoing surgery.

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## **Billing Practices in Craniofacial Surgery: Results of a National Survey**

### **Abstract Presenter**

Ashlie Elver MD

### **Abstract Co-Author(s)**

Clay Thames II

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**Purpose:** Accurate procedural coding reduces redundant costs and provides fair reimbursement in US healthcare. Coding standards in craniofacial surgery are unclear and poorly defined by governing organizations. We hypothesize variations in billing practices exist and aim to characterize such trends.

**Methods and Materials:** A 21-question survey was provided to 338 craniofacial surgeons and distributed to members of the American Society of Maxillofacial Surgeons and Craniofacial Surgery members. The anonymous survey collected demographics and current procedural terminology (CPT) code selections for six clinical vignettes: mandibular distraction (MDO), frontoorbital advancement (FOA), posterior vault distraction (PVD), posterior vault reconstruction (PVR), cranial springs, and le fort III distraction (LFD). Chi-squared analysis compared trends in responses.

**Results:** Of 187 recipients, 36 completed the survey (19.3%). For temporalis flaps performed in FOA, 23.5% added a muscle flap code (15733) in addition to cranioplasty codes, and this was more likely in integrated residency-trained respondents ( $p=.011$ ). For MDO, 81.8% selected both codes for external fixation (20690/20692) and mandibular osteotomies (21193/21198). Craniectomy codes (61558/61559) were commonly selected in PVR (69.7%) and cranial springs (36.4%), and only 3% billed a co-surgeon modifier with neurosurgery. In bilateral cases, 54.6% billed per distractor in MDO and 46.9% in PVD. 23.5% billed bilateral temporalis flaps, and 22.7% billed for

each cranial spring placed. Billing multiple or bilateral codes was more common in academia (temporalis:  $p=.04$ ), fellowship-trained (MDO:  $p=.001$ ), integrated residency-trained respondents (MDO:  $p=.034$ , temporalis:  $p=.036$ ), and if craniofacial was  $>75\%$  of their practice (temporalis:  $p=.04$ ). Additional codes billed in LFD included placement of external fixation device in 44.8%, application of halo appliance in 27.6%, and lateral canthopexy in 17.2%.

**Conclusion:** CPT codes in craniofacial surgery are non-specific and adapted from other specialties, as evidenced by variations in code selection, bundling, and bilateral modifications. Current correct coding initiatives may not be relevant to craniofacial surgery, and thus training backgrounds inform billing practices. More work is needed to define precise, accurate coding in craniofacial surgery.

## **Understanding the Impact of Ergonomic Practices on Musculoskeletal-related Symptoms and Emotional Wellness in Craniofacial Surgeons**

### **Abstract Presenter**

Joshua Scarcella MD

### **Abstract Co-Author(s)**

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Jeffrey Janis MD

**Background:** A systematic review conducted in 2017 found that Musculoskeletal (MSK) injuries were prevalent amongst surgeons.<sup>1</sup> Few studies have assessed the role that poor surgical ergonomic practices have had in the development of MSK injuries in plastic and reconstructive surgery (PRS), and fewer specifically in craniofacial surgeons.<sup>2,3,4</sup> The impact that MSK injuries have on the emotional well-being of craniofacial surgeons is also not well understood.

**Methods:** A branched logic survey with a maximum of 35 questions pertaining to surgical practices, MSK injuries, and emotional well-being was distributed to all members of the American Society of Maxillofacial Surgeons (ASMS). The responses were divided into two groups, surgeons who reported developing MSK injuries or physical discomfort, and those who denied developing MSK injuries or physical discomfort. Data analysis was performed to determine which factors contributed to the incidence of MSK injury and the emotional impact that these injuries had on surgeons.

**Results:** Eighty-two surgeons completed responses to the survey for an overall

response rate of 16.6%. Of which, 65.9% (n=54) suffered MSK injuries or physical discomfort, with 53.7% (29/54) reporting that they had trouble falling or staying asleep because of these symptoms within the last year. Both male and female respondents reported experiencing some level of anxiety or depression because of their MSK injuries.

**Conclusion:** The impact of developing a MSK injury may impact physical and emotional wellness. This study found that a high percentage of craniofacial surgeons have developed MSK-injuries while some have reported a negative impact on their sleep and emotional well-being.

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## **Exploring Pressure Ulcer Management in a Resource-Limited Tertiary Hospital in Nigeria**

### **Abstract Presenter**

Heli Patel

### **Abstract Co-Author(s)**

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**Introduction:**

Pressure ulcers represent a significant challenge medically, and when we consider the financial burdens they impose on healthcare systems in resource-poor settings, it becomes evermore evident. It is critical to recognize that pressure ulcers are preventable. Understanding the complex interplay between patient-related variables and pressure ulcer characteristics is paramount for effective management and prevention, especially in resource-deprived settings.

**Methods:**

Data was obtained from a tertiary hospital located in Abuja, Nigeria. Predetermined variables were obtained, encompassing patient age, gender, living conditions, ambulatory status, mobility, pressure ulcer stage, ulcer sites, infection status, necrotic tissue presence, and treatment interventions between January and June 2023. Chi-squared tests, logistic regression models, and Fisher tests were employed to uncover relationships and associations within the dataset.

**Results:**

Of the 747 patients admitted to the hospital, pressure ulcers were prevalent in 4.68% (n=35) of cases. The most prevalent age group was 57 years, constituting 11.43% of the patient cohort. In terms of gender distribution, 71.43% were male, while 28.57% were female. Interestingly, the pressure ulcer stage did not exhibit significant associations with ulcer sites ( $p = 0.08$ ), suggesting a susceptibility to advanced pressure ulcer stages across all anatomical locations. However, a significant association was observed between being bed-bound and the site of the ulcer, which was statistically significant ( $p=0.0085$ ). The sacral region emerged as the most common ulcer site, affecting 45.71% of patients, followed by multiple sites, affecting 17.14% of cases. The majority of patients (74.29%) exhibited necrotic tissue when present, while 25.71% did not. Additionally, 60% of patients received wound dressing as a treatment intervention, while 40% received surgical debridement. Notably, logistic regression analysis revealed that mobility significantly predicted treatment interventions ( $p = 0.0175$ ), underscoring its role in guiding treatment decisions. Specifically, lower ambulation status was associated with an increased likelihood of higher-stage pressure ulcers ( $p<0.001$ ). As ambulation status worsened, the odds of higher-stage pressure ulcers increased by a factor of approximately 0.291.

**Conclusion:**

While the prevalence of pressure ulcers in this study was lower than the global prevalence of pressure ulcers identified in the literature, the significant association between lower ambulation status and higher-stage pressure ulcers emphasizes the



need for tailored interventions to improve mobility and prevent advanced ulcer stages in these settings.

## **An Observational Study of Surgical Waste with Minimal Draping Technique in Pediatric Procedures**

### **Abstract Presenter**

Cindy Vu

### **Abstract Co-Author(s)**

Alejandra Ibarra-Vega

Sierra Willens

Mikhail Pakvasa MD

Miles Pfaff MD, MHS

Raj Vyas MD

### **Purpose:**

Operating rooms are significant contributors to environmental waste, pollution, and healthcare expenses. As the world grapples with the climate crisis, it is imperative that surgeons adopt innovative strategies to minimize the ecological footprint of surgical procedures and advance sustainability in healthcare. Despite compelling arguments questioning the necessity of full gowning and draping during procedures limited to the skin, many surgeons continue to adhere to traditional practices, resulting in excessive waste generation. Disposable gowns and drapes, commonly fabricated from Spunbond-Meltblown-Spunbond (SMS) polypropylene plastic, are particularly problematic due to their carbon-intensive production and non-biodegradability. Implementing measures to curtail resource consumption within healthcare is essential for the preservation of our planet. Our study aimed to measure the effect of a minimal draping technique within a pediatric craniofacial surgery setting.

### **Methods:**

The amount of waste produced by three different craniofacial surgeons was measured during cases at a children's hospital over a two-week period. One surgeon adhered to a minimal draping protocol. Waste was sorted and measured post operatively by research personnel. Clinical outcomes were collected by chart review.

### **Results:**

Data was collected from 12 cases. The results demonstrated a waste reduction of 2.1 kg ( $p = 0.006$ ) when using minimal draping, primarily driven by decreased drape and gown usage. Standard draping created an average of 5.6 kg of waste per case

compared to 3.5 kg with the minimal draping protocol. Standard draping produced an average of 1.07 kg of draping waste per case, with minimal draping the waste was decreased to 0.43 kg ( $p = .04$ ). Additionally, without minimal draping gowns accounted for .6 kg per case, while this was reduced to 0 kg with minimal draping. There was no significant difference in the types of cases performed or the duration of cases between the two groups (50 min vs 60 min,  $p = 0.37$ ). There were no post operative infections at either group within 30 days of surgery.

### **Conclusion:**

This study compared waste generation during skin-only surgical procedures performed by craniofacial surgeons using a minimal draping technique with those employing standard draping practices. Our results demonstrated a significant reduction in waste when minimal draping was applied. While this study represents an initial observational endeavor, it offers crucial insights for further advancements in the field. The acceptance of minimal draping and semi-sterile techniques in hand surgery warrants exploration across other surgical domains. The limitations of the study include its small sample size and the absence of clinical outcome measures, which will be integrated into forthcoming research efforts. These findings underscore the urgency of reevaluating surgical practices to align with sustainable healthcare principles and combat the environmental challenges posed by healthcare-related waste.

## **Medical Micro-Tourism: Practice Patterns in Management of the Roaming Patient**

### **Abstract Presenter**

Payton Grande

Abstract Co-Author(s)

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Devra Becker MD

**Purpose:** Medical micro-tourism is the practice of patient-directed transition of care amongst patients seeking medical care from a surgeon within 250 miles of their index operation, not as a direct referral (1). This can be due to patient preference, follow up at an outside emergency room, surgeon retirement or relocation, complications out of scope of primary surgeon, or other factors. This practice is not well-documented but can be frequently encountered. There is no regulation or standardization of the management

of these patients, and typical medical tourism guidelines may not apply. This study aims to further evaluate and characterize medical micro-tourism experiences and practices among surgeons.

**Methods:** A twenty-question survey was designed to evaluate surgeons' experience with medical micro-tourism patients and practice patterns utilized in their management. Institutional review board approval was attained for a survey study of practicing surgeons. The survey was distributed in December 2023 to surgical Program Chairs at a single institution for disbursement to attending surgeons, as well as online in several national surgical community spaces. Medical micro-tourism was defined as travel less than 250 miles from the patient's current residence for medical care.

**Results:** Preliminary data from forty respondents represent a variety of surgical specialties. Surgeons encountered medical micro-tourism patients frequently in both pre- and post-operative settings, most commonly for reasons including cost, access to specialized procedures, and insurance barriers. Most surgeons do not have standardized practices for management of post-operative medical micro-tourism patients. 80% of surgeons will typically stabilize any life-threatening problems and then recommend returning to the primary surgeon for further management.

**Conclusions:** Medical micro-tourism is a poorly defined area of medical care that is anecdotally prevalent in the surgical field, typically as a 'second opinion'. Nearly all surgeons have encountered these patients, not uncommonly in the post-operative setting. Additional work in this area should focus on further understanding the surgeon and patient experience in this setting and creating a standardized framework for management of micro-tourism patients.

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### **Prevalence of Depression and Anxiety Diagnoses Among Pediatric Plastic Surgery Patients Compared To Other Surgical Specialties**

#### **Abstract Presenter**

Kathryn Reisner

Abstract Co-Author(s)

Alice Yau MD  
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Marina Lentskevich  
Irene Yau DO  
Narain Reddy  
Umer Qureshi  
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Arun Gosain MD

**Background:** Depression and anxiety have been shown to affect surgical outcomes following surgery. Our study aims to describe the prevalence of depression and anxiety in the pediatric surgical population to increase awareness and advocate for addressing mental health issues in this population to optimize surgical outcomes.

**Methods:** This study was a retrospective review examining all patients with a concurrent diagnosis of depression or anxiety seen by a surgical care team at Lurie Children's from January 2012 to December 2022. Patients were included if they presented to their surgical subspecialty visit with an ICD-10 code for depression and/or anxiety. Statistical analyses compared the prevalence of depression or anxiety within surgical subspecialties and identified plastic surgery procedures most associated with mental health comorbidities.

**Results:** The study evaluated 494,034 patients from 7 surgical subspecialties: neurosurgery (5.3%), ophthalmology (10.6%), orthopedic surgery (29.1%), otolaryngology (22.4%), pediatric surgery (13.1%), plastic surgery (4.7%), and urology (14.8%). Among plastic surgery patients with depression or anxiety, 47.7% were diagnosed with gender dysphoria, 17.4% were diagnosed with soft tissue repair, and 11.6% were diagnosed with macromastia. Pediatric plastic surgery patients were more likely to have a concurrent diagnosis of depression compared to orthopedic surgery, otolaryngology, pediatric surgery, and urology (OR 2.80, 9.48, 3.46, 6.26, respectively, p-value <0.001), and were more likely to have a concurrent diagnosis of anxiety compared to ophthalmology, orthopedic surgery, otolaryngology, pediatric surgery, and urology (OR 4.19, 4.62, 3.37, 2.11, 3.60, respectively, p-value <0.001). When gender dysphoria patients were excluded, pediatric plastic surgery patients were still more likely to have anxiety compared to orthopedic surgery, otolaryngology, and urology (OR 2.65, 1.93, 2.06, respectively, p-value <0.001, 0.003, 0.002, respectively).

**Conclusions:** Our single-institution study demonstrates that rates of depression and anxiety are higher in pediatric plastic surgery patients compared to other surgical subspecialties. We found that diagnoses of gender dysphoria, soft tissue repair, and

macromastia were most associated with mental health comorbidities. This information is important so that plastic surgeons may play a role in caring for their patients holistically and provide appropriate supplementary care to promote improved surgical outcomes.

## **Ophthalmologic Adverse Events in Hyperbaric Oxygen Therapy: A Systematic Review and Meta-Analysis**

### **Abstract Presenter:**

Rebecca Friedman

### **Abstract Co-Author(s)**

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Rebecca Lisk

**Objectives:** Hyperbaric Oxygen Therapy (HBOT) is a safe and effective treatment modality in which oxygen is administered under pressures exceeding 1 atmosphere absolute (ATA) to enhance delivery to tissues.<sup>1</sup> Increased oxygen content is thought to aid in wound healing and fighting infections.<sup>2</sup> While HBOT is generally considered safe, it is linked to some adverse events, most notably myopia and cataract formation.<sup>3</sup> Prior studies on HBOT vary in their reported incidence of ophthalmologic complications; thus the incidence and progression of these adverse events is difficult to quantify. We conducted a comprehensive systemic review and meta-analysis of the ophthalmologic complications associated with HBOT to further investigate these events.

**Methods:** A systematic review of PubMed, Embase, Cochrane Library, and Scopus from inception to June 15, 2023 was performed to identify studies reporting adverse effects on ophthalmologic health following HBOT. According to PRISMA 2020 guidelines, an initial screening of titles and abstracts was performed, followed by a full-text analysis and data extraction. Studies reporting ophthalmologic complications due to HBOT were included. Meta-analysis was then performed on relevant studies.

**Results:** A search for articles on HBOT ophthalmologic complications yielded 3,395 articles, of which 183 were relevant by abstract review. 30 studies ultimately met inclusion criteria. 836 (15.77%) of 5,301 patients treated with HBOT experienced adverse events. Myopia comprised 97.0% of events, cataract formation accounted for 1.25%, and 2.28% included other complications such as changes in intraocular pressure, lens swelling, macular edema, retinopathy, and presbyopia. Resolution of

myopia varied in timing, with 13.6% of studies indicating resolution immediately following cessation of HBOT and 54.5% resolving within 1-3 months. All cases of myopia were self-resolving, while cataract formation required surgical removal. Meta-analysis further stratified studies by location and design. While location was not a statistically significant factor in complication rates, prospective and randomized study designs had a significantly higher complication rate than retrospective reviews, suggesting that complications may be observed more frequently when patients are assessed throughout their treatment course.

### **Conclusions:**

To date, this is the largest systematic review and meta-analysis assessing ophthalmologic complications associated with HBOT. Our findings provide insights derived from 30 studies encompassing 5,301 patients and have important clinical implications for the use of HBOT. Given the high incidence of myopia and the severity of cataract formation, clinicians should be vigilant in monitoring patients receiving HBOT and must consider the potential for exacerbating symptoms in patients with pre-existing ophthalmologic disorders. Close monitoring and counseling can benefit these patients and increase their likelihood of completing HBO treatment successfully.

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## **Evaluating the Accuracy of Large Language Models in Burn Management and Resuscitation Calculations**

### **Abstract Presenter**

Cesar Abraham Gomez Cabello MD

### **Abstract Co-Author(s)**

Sophia Pressman

Sahar Borna MD

Syed Ali Haider M.B.B.S.  
Antonio Forte MD, PhD, MS

**INTRODUCTION:** Google's Bard and OpenAI's ChatGPT are two advanced language models that hold immense potential in the medical field. Burn care is a field where additional support in management would be useful. Optimal burn care is vital for minimizing complications and enhancing the well-being of affected individuals. The purpose of this comparative study is to evaluate the accuracy of ChatGPT and Bard in answering burn-related questions. In doing so, this study aims to provide insights into the strengths and limitations of each model, contributing to the ongoing dialogue on the applicability of these language models in the healthcare domain.

**METHODS:** Both ChatGPT-4 and Bard were queried with 34 questions encompassing topics such as chemical burns (n=6), burn severity classification (n=6), calculation of total body surface area (TBSA) of burn involvement (n=4), calculation of caloric needs using the Curreri formula (n=10), and calculation of fluid resuscitation requirements using the Parkland formula (n=8). A new tab was used for each question.

**RESULTS:** Overall, ChatGPT answered burn-related questions with 85.3% accuracy, which was significantly higher than Bard's 44.1% (p-value <0.001). ChatGPT-4 correctly answered 81.8% of calculated-based questions compared to Bard at 22.7%. For calculation-based questions, ChatGPT's incorrect answers were off by a median of 6.6% [IQR 3.9-14.3%] compared to Bard's incorrect calculations, which were off by a median of 130.4% [IQR 50.6-308.6%] (p-value 0.015). ChatGPT's poorest performance was in applying the Curreri formula, with a 60% accuracy rate in calculating caloric need calculations. With only 10% accuracy, Bard's poorest performance was determining fluid resuscitation requirements using the Parkland formula.

**CONCLUSION:** Compared to Bard, ChatGPT demonstrated superior accuracy in answering burn-related questions and performing resuscitation calculations. Even when incorrect, ChatGPT's calculations were relatively close. These findings underscore the promising role of ChatGPT in offering support and information in burn care management.

## **Risk Factors and In-Hospital Outcomes of Acute Respiratory Distress Syndrome (ARDS) in Burn Patients: An Analysis of the National Trauma Data Bank (NTDB)**

### **Abstract Presenter:**

Danielle Sim

### **Abstract Co-Author(s)**

Madhu Subramanian

Julie Caffrey DO

**Purpose:** Acute Respiratory Distress Syndrome (ARDS) is a common complication among mechanically ventilated adult burn patients; however, the risk factors associated with its development are not well understood. Acute kidney injury and burn severity may predict ARDS, while the role of inhalation injury is still debated. Conflicting evidence exists regarding ARDS as an independent predictor of poor hospital outcomes. Given that prior studies are limited by small sample size or single institutional data, the purpose of this study is to identify risk factors for ARDS in mechanically ventilated adult burn patients and characterize the impact of ARDS on hospital course using multi-institutional data.

**Methods:** The National Trauma Data Bank (NTDB) was queried for patients  $\geq 18$  years with ICD-9 or ICD-10 codes corresponding to burn injury from 2007-2016. Hospitalized patients with at least 48 hours of mechanical ventilation were included. Demographics, medical comorbidities, total body surface area (TBSA), injury severity score (ISS), initial Emergency Department (ED) vital signs, length of stay, and in-hospital mortality were collected. Chi-squared test, Wilcoxon rank sum test, unpaired t-test, and univariate and multivariate logistic regression were used to identify risk factors for ARDS. Propensity score matched analysis at a 1:5 ratio was used to determine the impact of ARDS on hospital course.

**Results:** This sample included 13928 patients, of which 1437 (10.3%) developed ARDS. The average age for ARDS patients was 50 (standard deviation [SD]:17) which was older than non-ARDS patients (48 [SD:18],  $p < 0.001$ ). The median (interquartile range [IQR]) ISS for ARDS patients was also greater than non-ARDS patients (18 [9-26] vs. 10 [4-25],  $p < 0.001$ ). ARDS patients had a higher incidence of inhalation injury (198 [14%] vs. 1188 [10%],  $p < 0.001$ ) and burns covering more than 20% TBSA (464 [32%] vs. 2986 [24%],  $p < 0.001$ ) compared with the non-ARDS cohort. On multivariate logistic regression after controlling for age and sex, hypotension in the ED (adjusted odds ratio [aOR]: 1.83, 95% confidence interval [CI]: 1.29-2.54,  $p < 0.001$ ), alcohol use disorder (aOR: 1.82, 95%CI: 1.39-2.36,  $p < 0.001$ ), and inhalation injury (aOR: 1.57, 95%CI: 1.04-



2.29,  $p=0.026$ ) were most strongly associated with ARDS. TBSA and ISS also increased the risk of developing ARDS (aOR:1.07, 95% CI:1.02-1.12,  $p=0.007$ ; aOR:1.02, 95% CI: 1.02-1.03,  $p<0.001$ ). After propensity score matching controlling for age, ISS, TBSA, inhalation injury, alcohol use disorder, and admission year, ARDS patients had a significantly longer median (IQR) length of stay (32 [15-53] vs. 22 [7-33],  $p<0.001$ ). In-hospital mortality was also significantly higher in the ARDS cohort (295 [37%] vs. 668 [25%],  $p<0.001$ ).

**Conclusion:** This study confirms that both TBSA and inhalation injury are associated with ARDS development. Injury severity, hypotension in the ED, and alcohol use disorder were identified as novel risk factors for ARDS after burns. Furthermore, ARDS is independently associated with worse hospital outcomes including length of stay and mortality. These findings highlight the impact of patient and injury characteristics on developing ARDS and support the consideration of ARDS when estimating mortality risk in burn patients.

## **AI In Postoperative Care: Evaluating Large Language Models For Plastic Surgery Patient Recommendations**

### **Abstract Presenter**

Cesar Abraham Gomez Cabello MD

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Antonio Forte MD, PhD, MS

**INTRODUCTION:** Since their release, large language models (LLMs) have shown promise in providing accurate medical knowledge. The medical community is actively exploring the potential applications of these LLMs to determine how to best leverage their capabilities. One potential application is as a patient resource. The purpose of this study is to evaluate and compare the ability of OpenAI's ChatGPT-3.5, ChatGPT-4, and Google's Gemini in providing postoperative care recommendations to patients who underwent cosmetic plastic surgery.

**METHODS:** Each LLM was presented with 32 questions addressing common patient concerns after liposuction, breast augmentation, abdominoplasty, mastopexy, and blepharoplasty. The understandability and actionability of responses were determined

using the Patient Education Materials Assessment Tool (PEMAT). The Flesch-Kincaid Grade Level (FKGL) and Flesch Reading Ease Score (FRES) were calculated to assess the readability of responses. Additionally, medical accuracy was evaluated with a 5-point Likert scale. Response metrics were analyzed with ANOVA and Tukey's post-hoc analysis to compare model performance.

**RESULTS:** ChatGPT-4 demonstrated the highest accuracy of 81.3% with an average Likert score (LS) of  $4.1 \pm 0.88$ , compared to ChatGPT-3.5 at 78% (LS  $4.1 \pm 0.93$ ) and Gemini at 75% (LS  $4.1 \pm 0.91$ ); however, there was no statistically significant difference in Likert scores ( $p$ -value=0.85). No significant difference was found either for PEMAT actionability scores ( $p$ =0.83), where ChatGPT-3.5, ChatGPT-4, and Gemini scored averages of 57.5%, 59.0%, and 58.0%, respectively. ChatGPT-3.5 responses averaged an  $88.3 \pm 2.7\%$  understandability score, which was statistically different from ChatGPT-4 ( $85.0 \pm 4.9\%$ ,  $p$ -value<0.01) and Gemini ( $91.0 \pm 3.0\%$ ,  $p$ -value=0.01); both ChatGPT-4 and Gemini were also statistically different from each other ( $p$ -value<0.01). Gemini averaged significantly lower FKGL ( $10.9 \pm 2.0$ ) than ChatGPT-3.5 ( $12.9 \pm 1.0$ ) and ChatGPT-4 ( $13.6 \pm 1.3$ ). This translated to higher FRES for Gemini ( $43.7 \pm 10.2$ ), which was significantly higher than ChatGPT-3.5 ( $33.7 \pm 6.8$ ) and ChatGPT-4 ( $33.7 \pm 6.2$ ) with  $p$ -value<0.01.

**CONCLUSION:** Our study has provided valuable insights into the efficacy of LLMs in delivering postoperative care recommendations to patients who underwent cosmetic plastic surgery. While ChatGPT-4 exhibited higher accuracy and clarity in its responses, ChatGPT-3.5 and Gemini were notably more understandable. However, all three models demonstrated shortcomings in providing actionable and concise guidance, necessitating the continued involvement of surgeons for follow-up care. Although LLMs have demonstrated their potential as adjunctive tools in postoperative patient care, further refinement and research are imperative to enable their evolution into comprehensive standalone resources.

## **Role of Video Education for Plastic and Reconstructive Surgery Patients**

Abstract Presenter  
Joseph Ribaudó

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**Purpose:** Patient education is a critical aspect of Plastic and Reconstructive Surgery. Proper patient understanding is critical to mitigate anxiety and improve post-op care. However, patient education can be time consuming and difficult, especially if the patient has low health literacy. This can disproportionately impact patients from low socioeconomic status. A potential solution to these barriers is surgical education videos. Educational videos can provide patients with a reference for surgical education and post-op care. This project has two goals. Our first goal is to determine health literacy's role in patient satisfaction with pre-operative education and if there is a need to improve it. Our second goal is to determine the role of patient education videos in a pre-operative setting.

**Methods:** To address our first aim, we administered an amazon MTurk survey to individuals that had a prior surgery. The survey comprised of 5 questions from the HLS-EU-Q47 (a validated health literacy metric) and one question to rate participant satisfaction with pre-operative education (range 0-100). To address our second aim, we showed patients at our institution videos explaining their upcoming surgery. Videos were shown after the patient had their initial consult with the surgeon, which included pre-operative education. Videos were created by Understand.com and are pre-approved by ASPS. Videos shown included abdominoplasty, breast augmentation, mastopexy, and lower face lift. Before the video, patients were given a survey of three questions from HLS-EU-Q47 and one question to assess their satisfaction with their pre-operative education. After the video, patients were given a survey to determine if understanding and anxiety improved.

**Results:** 39 participants filled out our MTurk survey. Our cohort mean age was 48.3 years and comprised of 23 females and 16 males. The mean health literacy score was 66.3/100. The mean satisfaction with pre-operative education was 78.3/100. Pearson correlation analysis demonstrated a significantly, strong positive relationship between health literacy and pre-operative education satisfaction,  $R=.74$ ,  $p=6.8 \times 10^{-8}$ . At our institution, 6 patients were enrolled for pre-operative video education. Ages ranged from 25-65 and all patients were female. Mean health literacy was 94.3/100. Mean pre-video reported satisfaction with surgical education was 85.6/100. After the video, all participants reported improved understanding of their upcoming procedure. 3/6 (50%) reported improvement in anxiety surrounding the upcoming procedure. Lastly, all participants reported the video was beneficial and recommend others to watch it.

**Conclusion:** There is opportunity to improve patient education in Plastic and Reconstructive Surgery. Videos provide a unique opportunity that require minimal work on the physician end, while providing patients with an educational source they can continuously watch. People with lower health literacy had lower reported satisfaction with pre-operative education, demonstrating a health literacy gap that must be addressed. Despite a high level of health literacy and perceived pre-operative understanding, our patients had substantial improvement in understanding and anxiety from educational videos. This further demonstrates that videos can help patients of all health literacy levels understand their upcoming procedure, improving patient experiences and outcomes. This will improve access for all. We are continually enrolling patients at our institution.

## **National Survey of Current Perinatal Policies for Surgical Trainees Highlights Need for Change**

### **Abstract Presenter:**

Ellen Shaffrey MD

Abstract Co-Author(s)

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**Introduction:** Pregnant surgeons, including trainees, are more likely to have major pregnancy complications, including preterm labor, intrauterine growth restriction, and miscarriage, compared to non-surgeons. Obstetric complication rates for surgeons are significantly higher than the general US population (82% vs 15%), with one 2019 study showing a 56% obstetric complication rate in plastic and reconstructive surgery residents.<sup>1</sup>

As women comprise an increasingly larger proportion of surgical trainee positions, careful and deliberate consideration of policies that promote a safe pregnancy in this population is a necessity. This study aimed to determine the current practices of surgical residency programs regarding existing policies around pregnant trainees and to define accommodation guidelines for pregnant trainees to improve the health and safety of both mother and fetus.

**Methods:** An internally validated 20-question survey was emailed to program directors and coordinators of surgical training programs in the United States, including plastic and reconstructive surgery, otolaryngology-head & neck surgery, vascular surgery, and general surgery programs. The survey comprised questions about programs'

experience with pregnant trainees, whether a perinatal policy exists, and specific accommodations they make to protect pregnant trainees. The survey additionally included an open response section for additional comments. The survey was issued in November and December 2022, and data were collected until January 2023.

**Results:** Surveys were emailed to 608 surgical programs; the response rate was 23.5% (n= 143), including 20 plastic and reconstructive surgery programs. When asked if their program has a policy for pregnant trainees, 84.4% responded yes. 60.3% of programs report providing protected time off for miscarriages. However, only 36.9% provide information to pregnant trainees regarding workplace exposures that pose a risk of fetal anomaly or miscarriage.

Regarding accommodation for surgical trainees, only 47.1% incorporate rest breaks for pregnant trainees, and 20% protect the number of hours a pregnant trainee operates per week. 24.2% of programs adjust overnight shifts or call schedules for pregnant trainees, and of those that adjust call shifts, 20% require pregnant trainees to "make up" these missed call shifts. Less than half (40%) of programs have a contingency plan in place for non-child-bearing residents who take on the work of their colleagues during pregnancy or postpartum.

Many of the open responses on the survey mentioned how difficult it can be to accommodate pregnant surgeons while also not overburdening their non-childbearing colleagues. Additional responses were encouraged by the timeliness of the survey, as they are currently revamping their institutional perinatal policies.

**Conclusion:** While a majority of training programs report a pregnancy policy, most of these policies appear to be severely deficient in addressing the aspects of surgical training that place both fetus and mother at risk of complications. This data indicates a need for standardized, safe pregnancy protocols to recruit and retain women into surgical specialties and protect the childbearing trainee and her unborn child.

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# **Does Interfacility Transfer Increase Risk for Infants Undergoing Myelomeningocele Repair? Analysis of 1672 Cases**

## **Abstract Presenter**

Andrew James

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**Introduction:** Neonates born with myelomeningocele (MMC) may require transfer from their place of delivery to a specialized institution for surgical repair. This study aims to investigate the of impact interfacility transfer on neonates undergoing myelomeningocele (MMC) repair.

**Methods:** All MMC repair cases from 2015-2021 were extracted from the National Surgical Quality Improvement Program Pediatric (NSQIP-P) database. Transferred and non-transferred cohorts were compared for associations between transfer status and post-operative complications. Stepwise regression was completed to identify predictors of adverse outcomes.

**Results:** From 2015-2021, 1672 MMC repairs were identified, 753 of which were transferred from an outside facility. Transferred patients were significantly more likely to be born vaginally (27.2% vs 18.9%,  $p<0.001$ ), born premature (20.6% vs 15.3%;  $p=0.005$ ), and born with low birth weight (16.7% vs 12.6%;  $p=0.017$ ). Transferred patients were more often classified as ASA III (65.9% vs 61.0%;  $p=0.032$ ). Transferred patients were more frequently declared an emergent (30.0% vs 19.2%;  $p<0.001$ ) and an urgent case (37.3% vs 24.9%;  $p<0.001$ ). Post-operatively, transferred patients were significantly more likely to experience cardiac arrest (0.9% vs 0.2%;  $p=0.026$ ), require supplemental oxygen at discharge (9.56% vs 4.79%;  $p<0.001$ ), and die over a week after surgery ( $n=13$  vs  $n=3$ ;  $p=0.016$ ).

**Conclusion:** Patients with MMC who are transferred in the immediate post-natal period for surgical repair may have worse postoperative outcomes. Every attempt should be

made to diagnose MMC pre-natally, so that delivery can occur at an institution equipped to surgically manage these patients.

## **The Professional Time Out: A Tool to Improve Communication for Psychological Safety and Higher Team Performance in the Operating Room.**

### **Abstract Presenter**

Damini Tandon MD

### **Abstract Co-Author(s)**

Teri Moak MD

Susan Mackinnon MD

Ruby Taylor MD

### **Introduction:**

We introduce a pre-operative surgical pause called the "Professional Time Out" (PTO). It emphasizes the common goal of respect for the wellbeing of the patient and entire healthcare team, as well as the importance of clearly communicating any operating room (OR) issues at an appropriate time. This study aims to assess the impact of the PTO on team performance, psychological safety, and patient care at our institution.

### **Methods:**

In this pilot before-and-after survey study at a single tertiary academic center, six attending surgeons (plastic surgery, general surgery, and otolaryngology) were trained in the PTO intervention. Surgical staff were given voluntary surveys to assess endpoints first during pre-intervention phase, then during post-intervention phase (each 3 months long).

Staff included attending surgeons/anesthesiologists, surgical/anesthesia residents, medical students, anesthesia nurses, scrub nurses, and surgical technologists. Primary endpoints included professionalism, collaboration, patient care and verbalization of unprofessional behavior (UB). Secondary endpoints included opinion-sharing, involvement, and ratings of case involvement/case flow/case efficiency. Five endpoints were specifically classified as empowerment metrics: opinion-sharing, involvement, verbalization of UB, reporting UB to a colleague, and reporting UB to a superior. Case flow/case efficiency/case involvement were evaluated on 1-10 scale (scalar variables), all other endpoints were rated on 5-point Likert scale from strongly agree to strongly disagree (nominal variables). Endpoints were compared between pre-intervention and post-intervention groups.

**Results:**

333 survey responses were collected; 180 in the pre-intervention phase, 153 in the post-intervention phase. Pre- and post-intervention groups had similar gender demographics ( $p=0.499$ ).

After PTO implementation, there was significant improvement in 4/4 primary endpoints (professionalism ( $p<0.001$ ), collaboration ( $p<0.001$ ), patient care ( $p=0.010$ ), verbalization of UB ( $<0.001$ )) and 5/8 secondary endpoints (opinion-sharing ( $p<0.001$ ), involvement ( $p<0.001$ ), verbalization of UB ( $p<0.001$ ), reporting UB to colleague ( $p<0.001$ ), and reporting UB to superior ( $p=0.007$ )). Even the secondary endpoints without significant change (case flow/case efficiency/case involvement) trended towards improvement with higher mean responses after PTO implementation.

We compared responses by role in the five empowerment metrics for three rungs on the hierarchical ladder: medical student, scrub nurse, and surgical attending. Pre-intervention empowerment metric responses were lowest for medical students; on the 1-5 Likert scale, baseline median values fell between 3-4 for medical students, 4-5 for scrub nurses, and 5 for attendings. After PTO implementation, there was significant improvement in 5/5 metrics for medical students, 3/5 metrics for scrub nurse, and no metrics for attendings (already at maximum baseline).

When asked about opinion of the PTO, 95.4% of survey respondents felt it was either properly instituted at this time (52.3%) or needed and overdue (43.1%).

**Conclusion:**

Our data show significant improvement in team members' perception of professionalism, collaboration, opinion-sharing, involvement, patient care, verbalizing and reporting UB with implementation of the PTO. Improvement was notable in all empowerment metrics for the medical students, who are traditionally lowest in the hierarchy compared to scrub nurses and surgical attendings. This pre-operative pause is a simple, concise, cost-free way to prime the surgical team for professional, open communication. It has the potential to positively impact OR dynamics and patient outcomes.



# **Perceptions of the Competency-Based, Time- Variable Curriculum for Plastic Surgery Training: A National Survey of Fellowship Program Directors**

## **Abstract Presenter**

Elizabeth Moroni MD

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**Introduction:** The Competency-Based, Time Variable (CBTV) model for graduate medical education emphasizes performance and skill mastery, rather than time-based benchmarks. In the upcoming year, residents from CBTV programs will begin applying to fellowship, with some graduating in 5 years of clinical training. This study aims to understand the perception of CBTV applicants from the perspective of fellowship program directors.

**Methods:** An anonymous online survey invitation was sent to fellowship program directors in hand surgery, aesthetic surgery, microsurgery, craniofacial surgery, and gender affirmation surgery. The asked participants to rank the relative importance of various factors for CTBV applicants versus applicants from traditional 6-year plastic surgery training programs.

**Results:** A total of 195 eligible participants were identified, of which 49 (25.1%) responded. 12 (25.5%) of respondents indicated that they would view a 5-year CBTV applicant favorably, 14 (29.7%) would view a 5- year CBTV applicant unfavorably, and the remaining 23 (46.9%) stated that graduation in 5 clinical years would not affect their view of an applicant. Compared to traditional applicants, 60% of respondents rated letters of recommendation of greater importance when considering CBTV applicants, and 46% rated residency program reputation of greater importance when considering CBTV applicants. In-service exam scores, dedicated research experiences, and number of publications were on average rated equally as important in both groups.

**Conclusion:** Fellowship directors have varied views on 5-year CBTV applicants. Fellowship program directors place greater importance on letters of recommendation and residency program reputation when evaluating competency-based applicants.

# **Navigating the Plastic Surgery Match as an Underrepresented Applicant: Insights into Diversity, Equity, and Inclusion**

## **Abstract Presenter**

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**Purpose:** Plastic surgery remains the most competitive specialty in the Match. Efforts have been made to improve outcomes for applicants who are underrepresented in medicine (URiM) and those without home plastic surgery programs. The effect of preference signaling and virtual versus in-person interviews on URiM applicants remains unclear. This study seeks to understand the values and experiences of URiM students in the 2023-2024 plastic surgery Match.

**Materials and Methods:** Two anonymously recorded surveys were sent before and after interviews to all applicants at four plastic surgery programs during the 2023-2024 plastic surgery application cycle. Inclusion criteria were racial minorities, gender minorities, first-generation college students, and those without home programs. The pre-interview survey assessed awareness and utilization of URiM resources and the decision-making process of selecting sub-internships and assigning preference signals. The post-interview survey sought to assess the virtual/in-person interview experience and equity of the interview process. Descriptive and bivariate analysis was conducted with Fisher's exact test in R version 4.3.0.

**Results:** There were 79 and 44 complete responses for the pre-interview and post-interview survey respectively. Over half of URiM applicants were dual applicants to non-plastic surgery specialties. Operative autonomy (78.5% vs. 75.9%), operative volume (78.5% vs. 77.2%), and alignment with career interests (74.7% vs. 81.0%) were top program qualities considered when selecting sub-internships and assigning preference signals respectively. Emphasis on DEI (55.7% vs. 58.2%) and minority representation (55.7% vs. 58.2%) were moderately important. Program websites (97.5%) and social media accounts (84.8%) were highly utilized resources when considering preference

signaling and crafting signal statements but were found to be lacking in specificity and useful or updated information (37.7% vs. 34.3%).

Applicants received an average of 12.7 total interviews, 2.3 of which aligned with preference signals. 72.7% of applicants do not believe preference signaling contributes to improving equity in the Match, but 86.4% would recommend continuing the program. 88.6% of applicants attended both virtual and in-person interviews. While virtual interviews provided less financial strain, improved ease of scheduling, and increased ability to participate in more interviews (all  $p < 0.001$ ) compared to in-person, most applicants (77.3%) preferred in-person interviews and believe that virtual interviews are disadvantageous. Applicants find that in-person interviews provided significant advantages in showcasing an application holistically, understanding the program culture, interacting with faculty and residents, and assessing fit into a program (all  $p < 0.001$ ). 61.4% of applicants do not believe that interviews are distributed fairly and believe there should be an interview cap.

**Conclusions:** Providing specific and updated information on program websites and social media content will better inform underrepresented applicants for choosing sub-internships and preference signaling. Despite financial constraints, in-person interviews were the preferred form of interviewing compared to virtual interviews as it allowed for better comprehensive exposure of the applicant to the program and vice versa. Interview caps and travel scholarships for interviews may be considered as future interventions to improve equity in the plastic surgery Match.

## **Evaluating Operating Room Waste in Common Plastic Surgery Procedures**

### **Abstract Presenter:**

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**Background:** Most hospital regulated medical waste (RMW) originates from operating rooms (1, 2) Operating room (OR) waste reduction efforts including intentional instrument selection and reprocessing of single-use medical devices can be cost-effective in surgical settings (3). In plastic surgery, various environmentally sustainable interventions have been implemented (4). This study sought to quantify the type and amount of waste in common plastic surgery procedures and determine factors to improve efficiency.

**Methods:** A prospective observational study quantifying OR waste and cost was performed at two sites - a tertiary hospital (HOS) and an ambulatory surgical center (ASC) - in the same healthcare system from June 2023 to February 2024. Any item that was opened and went unused, defined as not touching the surgeons' hand or the patient, was classified as "waste." Patient demographics, procedure type, operative time, surgical and nursing team composition, RMW weight and cost was collected. Univariate analysis was performed to identify predictors of OR waste production.

**Results:** A total of 12 abdominoplasty and 22 reduction mammoplasty were included. Most procedures were performed at the HOS in older patients compared to the ASC ( $p=0.05$  and  $p=0.04$ , respectively). The combined median procedure cost of both abdominoplasty and reduction mammoplasty (\$724.50 [\$623.25, \$1,275.50] vs. \$598.00 [\$531, \$793.25],  $p=0.03$ ) and weight of blue wrap used to cover sterile instruments (334.50 g [294.25 g, 359.25 g] vs. 251.50 g [245.25 g, 268.75 g],  $p<0.0001$ ) were greater at ASC compared to HOS. Cases with traveling OR staff had a significantly higher median procedure cost than those with permanent OR staff (\$749.00 [\$598.00, \$1,038.25] vs. \$610.50 [\$465.25, \$756.50],  $p=0.04$ ).

**Conclusion:** These findings suggest areas for potential improvements, especially at the ASC where median procedure costs and weight of sterile blue wrap are increased compared to HOS. Cases with traveling OR staff were found to have greater median procedure costs but not due to increased waste costs. Continued investigation may elucidate factors contributing to inefficiencies in common plastic surgery procedures.

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## **Experience As A Plastic Surgeon In Training In An Area Dominated By Drug Cartels**

### **Abstract Presenter**

Daniel Saldivar Reyes MD

### **Abstract Co-Author(s)**

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### **INTRODUCCIÓN:**

Gunshot wounds are now a worldwide public health problem. In the past 15 years wounds caused by weapons of this type have undergone a major increase (1). Statistics show that in 2014 20,010 homicides were recorded in Mexico (11,514 of which were caused by firearm projectiles), i.e., a proportion of 16 per 100,000 inhabitants at national level (2). It's clear that differences exist between different Federal districts in our country, and that these should be considered. According to the latest INEG data, in 2014, the state of Nuevo León has remained among the first 12 regions over the years. After the report of the Attorney General's Office of the State of Nuevo León was released, the month of October of this year concluded with 118 homicides, adding a total of 1,150 cases so far in 2023 (3). Firearm projectiles cause damage by tissue disruption, leading to hemorrhages and infections. The amount of kinetic energy transferred from a projectile to the surrounding tissues, internal organs and structures which are damaged directly, as well as the final location of the projectile, all determine the severity of gunshot wounds. It is vitally important that doctors and health institutions are expert in external, internal and terminal ballistics associated with clinical symptoms to manage these types of catastrophic injuries.

### **Methods:**

We made a retrospective analysis utilizing the photographic database from the Plastic Surgery Department of all the patients admitted between March 1, 2023, and January 1,

2023, that suffered gunshot wounds and required some form of intervention.

### **Results:**

A total of 51 cases were obtained, 28 of which presented facial wounds requiring intervention from the craniofacial clinic, 10 presenting hand wounds with multiple fractures and tissue exposure requiring intervention from the hand and microsurgery clinic (1 requiring coverage with a lateral arm flap), 13 patients presented forearm wounds requiring nerve or vascular repair (4 of whom also needed a flap for defect coverage), and finally, one patient with a foot wound and bone exposure requiring a reverse sural flap.

### **Discussion:**

Given the high prevalence of drug cartel related violence in our area, it's common in our medical practice to treat patients with gunshot wounds. During our time as plastic surgery residents, we have attended a significant number of patients and performed numerous surgical procedures that undoubtedly contribute to our reconstructive skills. Emphasis is placed on the importance of having a hospital center with good resources and well-prepared medical professionals, as these patients require intensive care and procedures that require a third level hospital.

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## **Improving Free Flap Monitoring: Evaluation of a Time-Efficient Educational Nursing Module**

### **Abstract Presenter:**

Shelby Chun Fat MD, MS

Abstract Co-Author(s)

Youssef Aref

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**Background/Purpose:**

Postoperative monitoring is vital to allow successful salvage of free flaps when complications arise<sup>1</sup>. Flap monitoring is not always done by surgeons or those experienced in flap care<sup>1</sup>. Intensive, in-person in-service modules have demonstrated the ability to improve free flap monitoring knowledge and confidence among nursing staff<sup>2</sup>. A more succinct learning module that can be completed independently could potentially reach a much larger audience while remaining effective. We conducted a pilot study of an online learning module to improve nursing staff knowledge and confidence regarding free flap monitoring.

**Methods and Materials:**

A HealthStream module about how to monitor and care for free flaps for nurses was assigned to all nurses at a single site. Participants were asked to read a pamphlet and watch an 11-minute video. Participants completed a pre- and post-course survey and quiz to assess comfort level and knowledge, respectively, of free flap monitoring. Pre- and post-course test scores along with participant background information was collected and analyzed.

**Results:**

59 nurses completed our HealthStream module with the pre- and post-course assessments. All nurses work in the PACU with 57 (96.6%) not currently working in the ICU. 39 (66.1%) of participants have been a nurse for at least 10 years, with 24 (40.7%) having been in the ICU for 1 year or less. 40 (67.8%) of the nurses not currently working in the ICU have previous ICU experience. 36 (61%) report taking care of a free flap patient while 22 (37.3%) have not, however, 15 (25.4%) have taken care of a flap patient in the past year while 43 (72.9%) have not. Pre-course comfort monitoring free flaps showed 18 (30.5%) neither comfortable or uncomfortable, 24 (40.6%) uncomfortable, and 16 (27.1%) comfortable. Post-course comfort monitoring flaps showed 14 (23.7%) neither comfortable nor uncomfortable, 10 (17%) uncomfortable, and 31 (52.5%) comfortable. On regression, none of the background experience for years as a nurse, in the ICU, and recent or overall free flap monitoring experience was associated with pre-course comfort level ( $p\text{-value} > 0.05$ ). Mean quiz scores significantly increased following the module (49.58% vs 100%,  $p\text{-value} < 0.001$ ).

**Conclusion:**

Our module provides a quick and time-efficient module for improving comfort level of nurses with monitoring free flaps. Although our module should be applied to other institutions for generalizability, our results could indicate our module as a short module that could potentially increase salvage rates among free flaps that experience

complications.

## **Medspa- Right for You or Your Practice?**

### **Abstract Presenter:**

David Hopp MD

**Background:** A 10-year experience with founding and operating multiple medspas will be presented. The advantages and disadvantages of owning and operating one or more medspas and their impact on any plastic surgery practice will be presented. Comparisons will be made between single location and multiple location medspa businesses.

**Methods::** Over 10 years ago many services traditionally reserved for the plastic surgeons office were moved to separate and complimentary retail locations creating the "medspa cottage industry" for plastic surgeons. The goals of such a separation include; 1) Frequent visits of patients both old and new 2) Growth of ancillary services besides surgery. 3) Achieving complimentary "youthfull" results not attainable through surgery. 4) Separate potential profit center for plastic surgeons; including a new source for surgery patients.

**Results:** 10 years of medspa experience demonstrate that success is dependent many factors; some familiar to plastic surgeons and some less familiar such as: 1) Choosing the right location. 2) Managing the build out and furnishings 3) Choosing the menu of services 4) Finding/training staff 5) Choosing the technology 6) Choosing the right software infrastructure 7) Marketing 8) Selling surgery 9) Making a profit

**Conclusion::** The pro's and con's of medspa ownership and their impact on plastic surgery practices will be outlined in detail. Success depends on the type of plastic surgery practice, the retail business acumen of the plastic surgeon, and the primary goals of the medspa.



# **The utility and feasibility of telemedicine for surgical consultations in upper and lower extremity surgery: A retrospective review of one surgeon's practice**

## **Abstract Presenter:**

Ruby Taylor MD

## **Abstract Co-Author(s)**

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## **Purpose:**

The COVID-19 pandemic prompted the use of telemedicine to continue healthcare appointments while minimizing in-person contact. Subsequently, there was a rise in telemedicine utilization for pre- and post-operative appointments for upper and lower extremity surgery, with research highlighting adequate levels of patient and provider satisfaction. However, there have been only two studies investigating whether telemedicine appointments are equivalent to in-person appointments for assessing surgical candidacy in extremity surgery. We conducted a retrospective review comparing surgical decision-making during telemedicine consultations versus in-person consultations, and hypothesize that telemedicine consultations are equivalent to in-person consultations when determining if a patient would benefit from surgery.

## **Methods:**

A retrospective review of electronic medical records of new patients at a tertiary referral center seen by the senior surgeon (S.E.M.) between June 2020 and January 2023 was performed. EMR visit notes for all initial surgical consultations were reviewed, and data were extracted regarding patient demographics, reason for visit, diagnosis, and ultimate surgical decision at the conclusion of the visit. Records were divided into four surgical decision-making categories: 1) Yes-the patient was offered a surgical procedure; 2) No-the patient was not offered a surgical procedure; 3) Undecided-the provider and patient discussed one or more operations which may benefit the patient, but the patient requires further conservative management, diagnostic workup, or assessment by another provider; and 4) Declined-the patient was offered surgery, but declined. Fisher's exact tests were used to compare proportions of patients in each surgical decision-making category across both visit types.

## **Results:**

391 out of 921 new patient records were reviewed. For patients with an in-person

surgical consultation (n=130), 61 patients (47.3%) were categorized as "Yes", 41 patients (31.8%) were categorized as "No", 22 patients (17.1%) were categorized as "Undecided", and 5 patients (3.9%) were categorized as "Declined." For patients with a telemedicine surgical consultation (n=261), 101 patients (38.7%) were categorized as "Yes," 62 patients (23.8%) were categorized as "No," 91 patients (34.9%) were categorized as "Undecided," and 7 patients (2.7%) were categorized as "Declined." Fisher's exact test indicated a significant difference in spread of surgical decisions between in-person and telemedicine consultations ( $p = 0.002$ ).

For patients with telemedicine surgical consultations, 81.2% of patients with an initial "Yes" categorization eventually underwent surgery. For patients with in-person surgical consultations, 82.0% of those with an initial "Yes" categorization eventually underwent surgery. These proportions were not significantly different per a Fisher's exact test ( $p = 0.669$ ).

### **Conclusions:**

Among patients who were recommended for surgery at their initial consultation, the proportion of patients who eventually received surgery was equivalent between telemedicine and in-person consultations. This indicates that telemedicine consultations can accurately identify surgical candidates for upper and lower extremity surgery. In the telemedicine consultation group, the increased percentage of patients in the "Undecided" category represents the utility of telemedicine to reach a group of patients with very recent nerve injury, and discuss the complex algorithm for management before a definitive surgery would be offered.

## **The Plastic Surgery Central Application vs. ERAS: Which Is Preferred?**

### **Abstract Presenter**

Benjamin Sarac MD

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**Purpose:** The Plastic Surgery Central Application (PSCA), designed to provide an equitable and streamlined application for both applicants and programs, was first designed in 2019, piloted in the 2020–21 application cycle, and is now in its fourth cycle in 2023–24. It has included preference signaling since the 2022–23 cycle, a feature in which applicants can send five "signals" to programs to express interest. We surveyed both PDs and applicants following the 2023 Match on their perceptions of PSCA versus Electronic Residency Application Service (ERAS).

**Methods:** Surveys were deployed to applicants from three integrated plastic surgery programs during the 2022–23 cycle and all PDs. Respondents were asked basic demographic information, which application system they preferred: PSCA or ERAS, how well they were able to highlight/evaluate different areas of the application, and about their experiences specifically with preference signaling.

**Results:** Forty-two (48%) program directors (PDs) and ninety-three (29%) applicants responded. Most PDs (72%) and applicants (59%) preferred PSCA, with only 18% and 27% preferring ERAS, respectively. The remainder had no preference. Ninety-three percent of applicants reported the cost savings of the PSCA were important. Most applicants (78%) and PDs (80%) were in favor or strongly in favor of the preference signaling program.

**Conclusions:** Most applicants and PDs prefer PSCA over ERAS. These data, in conjunction with the cost savings, suggest that the PSCA may be a better alternative for the integrated plastic surgery match. Future analyses of these application systems will help guide provide the best application for prospective residents.

## **From Sutures to Lawsuits: Characterization of Medical Malpractice Litigation in Plastic Surgery**

### **Abstract Presenter**

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## **Purpose**

Each year, plastic surgeons face an approximately 15 percent chance of being named in a malpractice lawsuit [1]. Although as a specialty, annual indemnity payments are relatively low, the risk for liability – and subsequent fear and apprehension – has been shown to negatively affect practice patterns and physician well-being [2]. In order to minimize risk of litigation and assuage these concerns, it is thus critical for practitioners to have a general understanding of the factors influencing plastic surgery malpractice lawsuits. Heretofore, however, assessments of these factors have been limited in scope or temporality with global reviews only extending to 2019. We therefore sought to create an updated characterization of litigation in plastic surgery.

## **Methods**

The Westlaw legal database was queried using a combination of Boolean and natural language searches to identify malpractice cases in the United States that were finalized between January 2015 and January 2024. Inclusion criteria included a plastic surgeon as a named defendant and a cause of action for professional malpractice or negligence. The data was analyzed using descriptive statistics, t-tests and Fisher's Exact tests (JMP, Version 17).

## **Results**

After screening for inclusion criteria, 268 cases were identified. Most plaintiffs were females (n=219, 81.7%). Reported age at time of the inciting incident ranged from 1 to 73 years old (average: 43.5). Additional defendants were named in 79.5 percent of cases, including surgical practices (61.6%), hospitals or surgical centers (24.6%), other surgeons (17.2%), anesthesia providers (6.0%), and medical device companies (2.2%). Residents were named in 8.6 percent of cases. Additional causes of action were included in 57.1 percent of cases, most frequently lack of informed consent (36.2%), loss of consortium (11.6%), and negligent hiring or supervision (10.4%). Most of the suits (n=178, 66.4%) arose from cosmetic procedures. The most common adverse outcomes reported were disfigurement (47.4%) and injury (27.2%). Eighteen suits were for patient death. Legal outcome was most frequently determined by jury verdict (n=141, 52.6%). Disposition by summary judgment and settlement occurred in 26.1 and 12.3 percent of cases, respectively. Overall, defense verdicts occurred in 198 cases (73.9%). Verdicts in favor of the patient, however, were more likely in cases involving patient death (p=0.004) and those with additional claims for lack of informed consent (p=0.03), loss of consortium (p=0.05) and wrongful death (p=0.03). When plaintiffs prevailed, awards ranged from \$2,500 to \$13,000,000 (median \$462,500).

## **Conclusion**

Malpractice lawsuits can exact significant emotional and financial costs upon practitioners. Analysis of precedent helps identify patterns in litigation to highlight patient concerns and guide adjustments in practice to mitigate risk. Although likely under-representative of cases resolved by settlement, this data underlines the importance of shared decision making, the clear communication of reasonable postoperative expectations, and informed consent.

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## **Audit of Operation Notes in Plastic and Reconstructive Surgery Unit ALERT Comprehensive Specialized Hospital**

### **Abstract Presenter**

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### **Abstract Co-Author**

Ataklitie Baraki Berhe MD

**Introduction:** Apart from treating a patient one of the most essential part of patient care is precise, thorough and accessible documentation of medical records, one element of this being operation notes.<sup>1,2</sup> High quality operation notes ,as crucial parts of patient care, are means of communication among professionals, source of data for audits and researches, and a source of information in court.<sup>1,3,4</sup> The Royal College of Surgeons of England (RCSEng) has produced a guideline in 2014 titled 'Good Surgical Practice', that outlines the minimum standards that need to be documented on operation notes.<sup>5</sup> This study aims to assess the adherence of ALERT hospital plastic and reconstructive unit to these guidelines.

**Objectives:** To evaluate operation notes in the plastic and reconstructive unit of ALERT hospital against RCSEng 2014 standards, identify causes of incompleteness and suggest possible ways of improvement in the quality of operation notes.

**Methods:** The study is a cross sectional retrospective study conducted in plastic and reconstructive surgery unit of ALERT hospital, using stratified random sampling of 341 operation notes written since April 2020, supplemented by survey questionnaire administered to 22 doctors to assess their experience and opinion regarding operation note standards.

**Results:** None of the RCSEng GSP 2014 standards were consistently documented. Only 3 standards were documented in more than 90% of operation notes. Most operation notes were written by residents. Participants of survey questionnaire believe that lack of quality of operation notes affects follow up and future interventions for patients. More than 95% of the respondents reported that they do not write all the standards consistently and most commonly attributed reasons are absence of formal education on the subject and operation note proforma incompleteness. The survey participants suggested introduction of formal teaching about operation note writing, update of the existing operation note proforma and educating the staff about the standards to improve the quality of operation notes.

**Conclusion:** Operation notes in plastic and reconstructive surgery unit of ALERT hospital are not up to standard per RCSEng GSP 2014 guideline. Formal education, update of existing operation note proforma, posting aide memoires in the operation theatres and clinical education of the staff about the standards are the proposed solutions to improve the quality of the operation notes.

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## **Buyer Beware: An Analysis of the Readability and Comprehensibility of Direct-to-Consumer Advertisements for Cosmetic Use of Botulinum Toxins**

### **Abstract Presenter**

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**Purpose:** In addition to the over 8.7 million neurotoxin injections performed by licensed practitioners in 2022, an increasing number of individuals are turning to the black market for unregulated DIY Botox.[1,2] In light of the potential safety consequences and the demonstrable role of direct-to-consumer advertisements in neurotoxin popularity, increased attention has been directed towards enhanced regulation of DTC advertisements.[3] In November 2023, the U.S. Food and Drug Administration (FDA) published a final rule amending the regulations for DTC television advertisements of prescription drugs. Although the rule mandates "consumer-friendly language" and concurrent presentation of the Major Statement's audio information in text, it fails to specify a required reading level.[4] Given concerns for persistent patient misinformation in the absence of a restricted standard, this study sought to analyze current DTC advertisements for botulinum toxins to evaluate current readability and comprehensibility.

### **Methods**

A natural language search of YouTube was conducted in November 2023 to identify DTC advertisements for botulinum toxins. Advertisements produced after January 2015 from three companies – Botox Cosmetic, Jeuveau, and Xeomin – were included for analysis. Commercials directed toward non-cosmetic use were excluded. A single author (K.S.) produced written scripts including the dialogue and text for each commercial. Each was analyzed using validated metrics to assess readability and understandability including the Coleman-Liau, Flesh-Kincaid, Gunning Fog, SMOG, and

Fry instruments using Readability Studio Professional Edition, Version 2020 (Oleander Software, Ltd, Vandalia, Ohio). The maximum required reading speed for the text was also calculated.

## **Results**

Fourteen commercials were identified. DTC advertisements had a mean reading grade level of 8, 11, and 12 based on the Gunning Fog, Smog, and Coleman-Liau metrics, respectively. Despite short sentences, on average, 16 percent of the accompanying text consisted of complex words, which increased overall reading difficulty. Twenty-five percent of the text consisted of unfamiliar words. The average speed required to read all on-screen text was 817 words per minute.

## **Conclusion**

Both the auditory and text components of direct-to-consumer advertisements for botulinum toxins are written at an elevated reading level that is inappropriate for the general population per informed consent guidelines. As the FDA's final rule fails to require a specific reading level and the cushioning effect of learned intermediaries is increasingly tested with black market products, users remain at heightened risk for misinformation of the products' potential complications.

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## **Evaluating Plastic Surgery Resident Satisfaction Globally: Predictors and Recommendations for Training Enhancement**

### **Abstract Presenter**

Georgios Karamitros MD



Abstract Co-Author(s)  
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Sofoklis Goulas

**Background:** Measures of quality in resident training in plastic and reconstructive surgery (PRS) programs are scarce and methodologically inconsistent [1, 2, 3, 4, 5]. Our research provides insights from current PRS trainees globally, mapping their training inputs, expected outputs, and recommendations for program improvements.

**Methods:** A global online survey was conducted among PRS residents across 67 countries to gauge their satisfaction with residency training, capturing crucial training inputs such as the number of surgeries attended and seminars they participated in. We also extracted residents' proposed recommendations for program improvement. We investigated the explanatory role of training inputs, demographics, hospital characteristics, and country income on resident satisfaction and graduate competence.

**Results:** The analysis incorporated data from 518 PRS residents. On average, residents attend 9.8 surgeries and 1.3 seminars per week. Simultaneously, there is a positive correlation between the perceived level of professional competency and training inputs, particularly seminars attended ( $p$  – value = 0.001). Male residents tend to report higher satisfaction ( $p$ -value =0.045) with their training (67%) compared with their female counterparts (58%), while those with family responsibilities also demonstrate slightly higher satisfaction levels.

**Conclusions:** Our analysis expands the evidence base regarding a "global hunger" for more comprehensive seminar-based and hands-on surgical training. Resident recommendations on program improvement reveal the need to address gaps particularly in aesthetic surgery training. The development of healthcare business models that allow for aesthetic procedures in training institutions is crucial in the promotion of aesthetic surgery training during residency. Policymakers, program directors, and stakeholders across the world can leverage these findings to formulate policies addressing the weaknesses of training programs.

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## **Characterizing Financing Strategies and Private Equity Investments in Plastic Surgery Practices: A Ten-Year Analysis**

### **Abstract Presenter**

Justin Cheng MD

### **Abstract Co-Author(s)**

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**Background:** Private equity (PE) investments in plastic surgery have increased dramatically over the past several years. (1-4) However, the current literature offers limited insight into other financing strategies and attributes that can make plastic surgery practices attractive to potential investors. We aim to characterize the companies and investors involved in deals related to plastic surgery practices and to assess the financial performance of these investments.

**Methods:** We performed a retrospective review of deals related to plastic, reconstructive, and aesthetic surgery practices in the United States from Jan 2014 to Jan 2024 using Pitchbook, a financial database that contains public information on companies and investors. (5) Inclusion criteria were privately held companies with financial backing and companies that underwent an acquisition or merger, including chains, multidisciplinary practices, and ambulatory surgery centers. Exclusion criteria included companies without backing and publicly held companies as well as facial plastic surgery, oculoplastic surgery, dermatology, and medical spa practices without a

plastic surgeon. Data were collected on types of investments, number of employees, years since founding, geographic region, city population, and last financing date and size. One-way ANOVA tests and chi-square tests were conducted, and significance level was set at  $p < 0.05$ .

**Results:** Over the past 10 years, 136 plastic surgery practices were involved in 190 deals with 83 investors, totaling \$1.2 billion. Nearly all were motivated by expansion; only one (0.7%) was triggered by bankruptcy. The most common financing strategies practices used were PE backing ( $n=50$ , 36.8%), debt financing ( $n=45$ , 33.1%), and corporate backing or acquisition ( $n=32$ , 23.5%). Practices that pursued debt financing were more likely to be founded recently than those that pursued corporate backing or acquisition ( $p=0.004$ ). PE-backed deals were more likely to be larger than debt financing or corporate backing or acquisition deals ( $p=0.0004$ ) with four notably large deals taking place in 2022 and 2023 ranging from \$9 to \$725 million.

**Conclusion:** While the majority of financing events are quite small and there is considerable variability in financing size within each year, there have been several large PE transactions in the past two years suggesting a changing investment landscape. Debt financing from well-known banking institutions may be critical to driving growth among younger practices. Plastic surgery practices looking to expand their footprint should be aware of all available financing strategies.

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### **Reconstructive**

#### **Preserving Sensation: A Systematic Review of Neurotization in Breast Reconstruction**

**Abstract Presenter**

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**BACKGROUND:** Breast cancer is one of the most common types of cancer diagnosed worldwide which has allowed breast reconstruction to become a well-established part of patient care and recovery (1). However, following mastectomies, both with and without radiation, sensation is often lost, impairing patient satisfaction in multiple dimensions such as intimacy, body image, and the ability to discern harmful temperatures and pain (2,3). Despite growing interest in neurotization in breast reconstruction, there is limited research on the efficacy of maintaining or restoring protective sensation. This systematic review explores the outcomes of innervated autologous breast reconstruction and evaluates the influence of oncologic intervention on these results.

**METHODS:** A PRISMA systematic search was conducted through Pubmed, Scopus, and Cochrane Library for original research articles between 2000 to 2021 (4). Eligible studies of innervated autologous oncoplastic breast reconstruction were extracted for risk of bias assessment, pre- and post- surgical interventions, as well as tactile, thermal, and nociceptive sensation evaluations.

Semmes-Weinstein Monofilament Test (SWMT):

SWMT provides standardized scores, corresponding to applied force, for evaluating acuity of tactile sensation. Extrapolated from guidelines for the distal extremities, SWMT above the range of 4.56-6.45 suggests loss of protective tactile sensation (5). A conservative threshold of 4.56 was used to assess innervated and non-innervated flaps.

**RESULTS:** Of 336 articles, 15 studies met the inclusion criteria and were extracted for flap type, radiation, donor and recipient nerves, method of sensation measurement, and demographic control. Eight studies included SWMT scores. The average score for non-innervated flaps was greater than 4.56 in contrast to innervated breasts which averaged consistently within protective range. Through a mixed model, adjusting for sample size,

non-innervated flaps scored 0.91 units higher which was statistically significant ( $P < 0.001$ ). Articles including thermal and pain sensation also suggested greater sensitivity but with limited statistical significance. Our analysis was also limited due to heterogeneity of data and risk of bias.

**CONCLUSION:** Microsurgical nerve-grafting poses promising potential for restoring protective sensation in post-mastectomy patients. Despite the significant implications of restoring intimate and thermal senses and growing interest in microvascular breast reconstruction, current literature is limited in quantity and quality. This warrants future research with continued SWMT along with quantified thermal and pain measurements to further evaluate the efficacy of innervated autologous breast reconstruction.

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### **Predictors of Complications and Revision Surgery Following Periorbital Mohs Surgery**

#### **Abstract Presenter**

Christeebella Akpala

#### **Abstract Co-Author(s)**

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**Background:** The Facial Mohs micrographic surgery (MMS) is a precise surgical technique used for the removal of skin cancers, offering functional superiority and greater aesthetic outcomes than conventional techniques. While complications associated with periorbital MMS have been extensively documented in the literature, notable variances exist in reported rates. For instance, Michelotti et al. observed a complication rate as high as 23%, with 19% necessitating revision surgery [1]. Conversely, other studies have reported considerably lower complication rates, such as 0.72% [2]. This discrepancy underscores the complexity inherent in periorbital MMS and the need for comprehensive investigation into potential predictors that could provide some added value to current existing literature and clinical practice.

**Purpose:** The aim of this study is to identify potential predictors of complications and the necessity for revision surgery following MMS in the periorbital region. Our retrospective analysis stands apart as we endeavor to identify predictive factors for complications, particularly those necessitating revision surgery in periorbital cases. By delineating such factors, we aspire to furnish clinicians with enhanced prognostic tools, thereby facilitating the anticipation and potential mitigation of complication rates.

**Methods:** This retrospective study from 2014 to 2022 was approved and deemed exempt by our institution's Review Board. We analyzed data from 100 patients' charts who underwent Mohs reconstruction from the Mayo Clinic Database. Variables including defect zone, patient demographics, smoking history, Fitzpatrick skin class, Glogau scale of photoaging, history of skin damage, preoperative diagnosis, and immunosuppression status were assessed for their association with postoperative complications and revision surgery needs. The analysis was done using Fisher's exact test for count data. Instances where patients underwent multiple MOHS procedures followed by reconstruction for malignancies in different periorbital anatomic locations were treated as distinct cases.

**Results:** The overall complication rate was 22.5% following reconstruction of periorbital Mohs defects, with ectropion being the most common complication being (15.5%) followed by scar hypertrophy (5.6%), infection (2.8%), lagophthalmos (2.8%), and skin graft necrosis (1.4%). Analysis of the current cohort revealed no significant predictors of complications among the examined variables, except for immunosuppression status, which showed a significant association with an increased risk of complications ( $p=0.0351$ ). Additionally, there was no discernible trend observed for the necessity of revision surgery, underscoring the unpredictable nature of surgical outcomes in the periorbital region. It is important to acknowledge the limitations of this study, particularly

the relatively small sample size of 100 patients.

Conclusion: While Mohs remains the go-to option for the treatment of skin cancers in the face region, immunosuppressed patients exhibited higher risk of postoperative complications within the periorbital region. The absence of reliable predictors for complications so far emphasizes the complexity of managing outcomes in this delicate area.

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## Antimuscarinics For Burn Patients: Helpful or Harmful for Sensation Recovery?

Abstract Presenter  
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### Background:

Burn injuries are a major cause of morbidity and mortality, often leading to nerve damage in the skin, resulting in debilitating pain and/or numbness. Numbness in burn scars can hinder protective sensation, increasing the risk of future injury. Strategies to enhance nerve regeneration post-burn injury are crucial. Previous research has identified antimuscarinic drugs as potential therapeutic targets for peripheral neuropathies, such as diabetic and chemotherapy-induced neuropathy. By blocking muscarinic receptors, these drugs have shown to promote sensory neuron growth and stabilization by enhancing cytoskeleton development and mitochondrial trafficking. This

study aimed to investigate whether antimuscarinic drugs can impact neuronal regeneration following burn injury.

**Methods:**

We performed a retrospective analysis using the TriNetX Research Database. Patients presenting with burn injuries were identified. We created an experimental cohort of burn patients that were taking one of the antimuscarinic drugs approved to treat overactive bladder at the time of their burn injury: darifenacin, fesoterodine, oxybutynin, propiverine, solifenacin, tolterodine, and trospium. A control cohort consisted of patients not taking antimuscarinic medication. Patients with a history of skin sensation disturbance were excluded. Propensity matching was performed based on burn total body surface area (TBSA), anatomical burn location, age, sex, race, and diagnosis of overactive bladder and incontinence. Paresthesia development between 3 and 18 months post-injury was used as a proxy for nerve regeneration.

**Results:**

We identified 13,406 burn patients taking an antimuscarinic medication, along with 460,505 burn patients not taking an antimuscarinic medication. After propensity matching, 10,534 patients in each group were included for analysis. 3.98% of burn patients on antimuscarinic medication developed paresthesia between 3- and 18-months post-injury compared to 2.07% of matched controls ( $p < 0.0001$ ). Patients taking an antimuscarinic medication had statistically significant higher odds of developing paresthesia (OR: 1.96; 95% CI: 1.66, 2.314).

**Conclusion:**

Burn patients taking antimuscarinic therapies were more likely to develop paresthesia following their injury. While paresthesia is an uncomfortable sensation for patients, it can also be a sign of regenerating sensory neurons. Improved regeneration and subsequent sensory recovery could help to treat abnormal sensations or numbness: significant causes of morbidity for burn patients. While questions remain about if this paresthesia translates to improved sensory recovery in burn patients where the normal architecture of the skin is damaged and potentially hostile to nerves, preliminary analysis suggests antimuscarinic therapies are impacting nerve regeneration after burn injury.



## **Preliminary Analysis of Postoperative Outcomes in Patients with Connective Tissue Diseases Following Breast Reconstruction with DIEP Flaps**

Abstract Presenter

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**Purpose:** Connective tissue diseases (CTDs) have a wide variety of impacts on patients' health including impaired wound healing (1). Although prevalence rates of CTDs vary between different patient populations, the overall prevalence is very low (2). There is currently a paucity of research examining postoperative outcomes in patients with CTDs who undergo microsurgery, especially following breast reconstruction. In this study, we assessed postoperative outcomes in patients with CTDs who underwent breast reconstruction with the deep inferior epigastric perforator (DIEP) flap.

**Methods:** We conducted a single-institution preliminary retrospective study of all patients that underwent breast reconstruction with DIEP flaps between the years 2020 and 2023. 318 DIEP flaps were performed on 184 patients. 7 of these patients, who underwent 13 DIEP flaps, were diagnosed with connective tissue diseases including Sjögren's, systemic lupus erythematosus, systemic sclerosis, undifferentiated ANA+ CTD, juvenile arthritis, and Kawasaki disease.

**Results:** The two groups with and without CTDs did not differ significantly with respect to age, BMI, smoking history, hypertension, and diabetes. Major complications including stroke, cardiac arrest, myocardial infarction, deep vein thrombosis, hematoma requiring takeback, and overall reoperations occurred at similar rates between groups. Minor complications including dehiscence, skin necrosis, ulcerations, epidermolysis, fat necrosis, and local infection at the surgical site also occurred at similar rates between groups. Patients with CTDs developed hematomas and seromas that were able to be managed outpatient at significantly higher rates than patients without CTDs (42.86% and 10.73% respectively,  $p=0.038$ ).

Our data suggests that breast reconstruction using DIEP flaps is safe for patients who have CTDs. Patients with CTDs do not appear to be at an increased risk for major complications following the procedure; however, these results imply that they are at increased risk for minor hematomas and seromas that do not require significant intervention. Although our study is limited by the small sample size of CTD patients, this sample size reflects the low prevalence rates of these diseases.

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## Assessing Nasal Tip Rotation Following Nasal Reconstruction with a Paramedian Forehead Flap

Abstract Presenter  
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**Purpose:** The paramedian forehead flap stands as the gold standard in soft tissue nasal reconstruction for optimal aesthetic and functional results (1). Despite its widespread use for nasal defect correction, there remains a gap in research regarding its influence on nasal tip rotation. Brennen et al. examined nasal tip rotation before and after rhinoplasty, utilizing the nasolabial angle (NLA) as a metric, and observed a significant elevation in NLA immediately post-rhinoplasty (2). However, postoperative decreases in nasal tip rotation months after septorhinoplasty have also been described (3). We present a retrospective review of patients who received a paramedian forehead flap (MFF) for nasal reconstruction comparing the NLA pre- and post-MFF.

**Methods:** We performed a retrospective review encompassing all patients who underwent a MFF by a single surgeon (J.F.T.) from January 2017 to January 2023. Inclusion criteria contained patients who underwent nasal reconstruction with a MFF

and had studio photographs taken before MFF placement and after MFF division and inset, those who did not have studio photographs were excluded. The NLA was measured of these patients pre-MFF placement and post-MFF division and inset using Adobe Photoshop. The NLA was measured as the angle between line drawn through the midpoint of the nostril aperture and the line drawn perpendicular to the Frankfurt horizontal while intersecting the subnasale. A paired two sample t-test was used to evaluate a significance between pre-MFF placement and post-MFF division and inset NLA to determine if the forehead flap impacted nasal tip rotation.

**Results:** A total of 28 patients were included in the study, with a mean age of  $67.1 \pm 13.6$  years, and 75.0% of the patients were female. The primary etiology for the nasal defect was Mohs surgery for basal cell carcinoma resection, observed in 18 cases (64.2%). The average defect size was 12.0 cm<sup>2</sup>, ranging from 0.3 cm<sup>2</sup> to 33.4 cm<sup>2</sup>. The mean NLA prior to MFF placement was  $96.6^\circ \pm 8.3^\circ$ , and the mean NLA after MFF division and inset was  $95.5^\circ \pm 8.3^\circ$  ( $p = 0.35$ ). The average time between MFF placement and NLA measurement was  $482.8 \pm 397.0$  days.

**Conclusion:** Few studies exist regarding nasal tip rotation after paramedian forehead flap, but this study demonstrates that there was no significant difference in NLA pre- and post-MFF. Therefore, the current work serves as a proof of concept that forehead flap reconstruction may be effective at restoring and maintaining patient nasal tip rotation post-operatively. Further studies are needed to discern changes in NLA after paramedian forehead flap at standardized post-operative time intervals.

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**Evaluating the Cost Effectiveness of the Anterolateral Thigh Free Flap for Lower-Extremity Reconstruction in Rural Africa**

Abstract Presenter  
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**Purpose:** There is a disproportionate incidence of disability secondary to lower limb trauma in Sub-Saharan Africa (SSA) (1). Disability-adjusted life years (DALYs) are the standard unit used by the Global Burden of Disease Study to quantify the morbidity and mortality due to disease (2). The World Health Organization (WHO) recommends that cost-effectiveness of an intervention be measured based the ratio of procedural cost to GDP/capita (3). This study provides the first known assessment of the cost-effectiveness of free flaps for lower extremity reconstruction in SSA.

**Methods:** We performed a retrospective review on all patients who received an anterolateral thigh (ALT) free flap for lower extremity reconstruction by a single surgeon at an institution in rural Kenya from November 2022 to November 2023. Billing Information for all patients was retrieved. DALYs were calculated based on the database of the Global Health Cost-Effectiveness Analysis Registry using a disability weighting of 0.173 for a long-term untreated amputated lower limb, a discount rate of 0.03 and an age weighting parameter of 0.04.

**Results:** Ten patients (9 male) received ALT free flaps for lower extremity reconstruction. Average age was 43.3-years. The most common indication for flap was traumatic fracture with soft tissue defect. Average cost of hospital admission was \$864. The average DALY per lower extremity reconstruction was 7.14. The GDP/capita for Kenya is \$2,070. The average cost per DALY averted was \$121.

**Conclusions:** Interventions performed for less than three times the GDP/capital per DALY are considered cost-effective by the WHO. Interventions performed for less than one GDP/capita per DALY are very cost-effective. In our setting, ALT free flaps for lower extremity reconstruction are very cost effective as they can be performed for 5% of the GDP/capita per DALY. Efforts should be made to increase microsurgical capabilities in

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## **The Effect of Length of Stay on Early Readmission in Microsurgical Breast Reconstruction**

Abstract Presenter  
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**Background:** Postoperative care following microsurgical autologous reconstruction varies greatly among institutions. Goals of close in-house postoperative monitoring include early identification of any flap complications requiring intervention or operative takeback. Even though most thrombotic complications take place within the first three postoperative days, they could still occur up to the first week post-operation. Therefore, early postoperative discharge may theoretically result in early readmission with comparatively late microvascular complications. In the current study, we evaluate nationwide trends in postoperative length of stay (LOS) for deep inferior epigastric perforator (DIEP) flaps for autologous breast reconstruction to determine whether a longer postoperative admission reduces the risk of early readmission, presumably due to anastomotic compromise.

**Methods:** Unilateral and bilateral DIEP flap breast reconstructions from October 2019 to January 2024 were reviewed from the Vizient Clinical Database. A Spearman's rank correlation coefficient analysis was performed to evaluate the relationship between LOS

and 7-, 14-, and 30- day readmission rates.

**Results:** 28,079 DIEP surgeries were recorded, with 59.8% bilateral, 19.9% right-sided and 20.2% left-sided procedures. Mean length of stay was  $3.9 \pm 1.4$  days for bilateral and  $3.7 \pm 1.3$  days for unilateral DIEP procedures. We found no significant correlation between LOS and 7-, 14-, or 30- day readmission rates for both bilateral and DIEP reconstructions with correlation coefficients 0.014, 0.060, and 0.109, respectively. There was no difference when subdivided by unilateral or bilateral reconstruction.

**Conclusion:** Longer postoperative stay may not reliably protect against early readmission for vascular compromise following DIEP flap breast reconstructions. In a first use of the Vizient clinical database for plastic surgery related outcomes research, we demonstrate that it may be more cost effective to discharge uncomplicated DIEP flaps on postoperative day 3 or 4.

## **The Impact of Socioeconomic Factors on Autologous Breast Reconstruction Outcomes in an Underserved Population**

Abstract Presenter  
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### **Background:**

Socioeconomic status (SES) and race have been implicated as factors that predict health inequities. Low median household income (MHI) has been shown to correlate with increased complications in implant-based reconstruction. However, limited data exists regarding the effect of SES on free flap breast reconstruction.(1) We aimed to

determine the impact of SES and self-identified race on surgical outcomes in autologous breast reconstruction.

### **Methods:**

This was a single-center, retrospective study of patients who underwent free flap breast reconstruction between 2013 to 2023. SES variables included US Census Bureau reported MHI, US Department of Agriculture food insecurity data, neighborhood area deprivation index (ADI), and insurance provider. Demographics, 30-day postoperative complications, and the number of elective revisions were recorded. Univariate analysis and multiple linear regressions were performed. Findings were considered statistically significant for  $p < 0.05$ .

### **Results:**

221 patients were included with an average age of  $51 \pm 9.7$  years, average body mass index (BMI) of  $31 \pm 5$  kg/m<sup>2</sup>, and an average Charlson Comorbidity Index of  $3.3 \pm 1.5$  points. Most patients underwent bilateral reconstruction (116/221, 52.4%) and the most common flap was a DIEP (196/221; 88.6%). Our population had MHI of \$71,303, well below the Virginia average of \$87,249. Average neighborhood ADI was  $5.7 \pm 2.4$ , with a median of 6 (our state's median is 5).<sup>(2)</sup> For ADI, higher values indicate lower SES. 88 patients (40%) had either public or no insurance, while 133 (60%) had private insurance. There were no differences in demographics between groups, except for self-reported race. The public insurance group had 48% White and 45% Black patients, while the private insurance group had 62% White and 28% Black patients ( $p < 0.05$ ). Average neighborhood ADI was significantly worse in the public insurance group ( $6.2 \pm 2.3$  versus  $5.3 \pm 2.5$ ,  $p < 0.05$ ) and MHI was lower (\$69,052 versus \$73,997,  $p = 0.09$ ). There was a trend toward longer time between mastectomy and free flap reconstruction for the publically insured (603 versus 429 days,  $p = 0.1$ ). Publically insured patients had significantly fewer elective revisionary operations ( $1.4 \pm 0.8$  versus  $2.1 \pm 0.7$  revisions per patient,  $p < 0.05$ ). There were no differences in postoperative complications, including infection, hematoma, seroma, unplanned reoperation, and flap loss ( $p > 0.05$ ). On multivariate analysis controlling for SES revealed that age and race played a significant role in elective revisions, with an increase by 0.01 in number of revisions per patient year of age ( $p = 0.0055$ ), and a decrease of 3.6x for Black compared to White patients ( $p = 0.0029$ ).

### **Conclusions:**

Our results suggest autologous free flap breast reconstruction outcomes are not negatively influenced by patient SES. However, age and self-identified race may have a significant impact on the patient's choice to pursue free flap reconstruction or later revision. Further investigation into the best estimations of SES and patient-reported

outcome measures is warranted to understand barriers to reconstruction.

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### **Outcomes in combined autologous breast reconstruction and gynecologic procedures: does timing matter?**

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#### **Background:**

Many breast cancer patients have ovarian hormone-positive cancer and therefore undergo prophylactic bilateral salphingo-oophrectomy (BSO) and/or total abdominal hysterectomy (TAH) to decrease the risk of breast cancer recurrence and gynecologic cancer development. The timing and safety for performing autologous breast reconstruction (ABR) with gynecologic procedures is under debate. Sequential operations can introduce abdominal scar tissue and multiple operating room visits, while simultaneous operations can increase operative time and have been speculated to increase complications. This study aims to determine the effect of concurrent abdominally based ABR and gynecologic procedures on complication rates and patient-



reported outcomes.

### **Methods:**

Female patients over the age of 18 who underwent abdominally based ABR at a tertiary academic medical center from 2010 to 2023 were retrospectively evaluated. We compared three groups: 1) ABR patients who underwent ABR and TAH and/or BSO on the same day, 2) patients whose ABR and TAH and/or BSO were performed on separate days, and 3) patients who underwent ABR without TAH and/or BSO. Outcomes of interest included presence of any complication, return to the operating room, and BREAST-Q Physical Well-being of the Abdomen scores (assessed preoperatively and at 6 months and 1 year postoperatively). Multiple imputation was used to account for missing BREAST-Q scores.

### **Results:**

Overall, 2,288 patients met criteria for inclusion in our study, with 66 patients in Group 1 (2.88%), 256 patients in Group 2 (11.19%), and 1,966 patients in Group 3 (85.93%). Patients in Group 1 were more likely to undergo bilateral breast reconstructions (82% vs. 68% vs. 44%;  $p<0.001$ ) and were younger (median 45 [IQR: 41, 50] vs. 48 [43, 53] vs. 52 [45, 58];  $p<0.001$ ) than patients in Groups 2 and 3. Patients who underwent additional gynecologic procedures (Groups 1 and 2) were more likely to have history of psychiatric comorbidities than patients in Group 3 (64% and 65% vs. 53%;  $p<0.001$ ).

BREAST-Q Physical Well-being of the Abdomen scores were not significantly different at preoperative, 6-month, and 1-year postoperative time points between all cohorts (72 [60, 86] vs. 65 [54, 81] vs. 69 [58, 81];  $p=0.7$ ).

The proportion of patients in all cohorts who developed complications (38% vs. 47% vs. 43%;  $p=0.3$ ) and returned to the operating room (14% vs. 13% vs. 16%;  $p=0.4$ ) did not significantly differ. No statistically significant differences in BREAST-Q scores, complication rates, and return to the operating room emerged during pairwise comparisons.

### **Conclusions:**

Our findings suggest that patients who undergo BSO and/or TAH at the same time as abdominally based ABR have similar complication rates and short- and long-term Physical Well-being of the Abdomen as those who undergo sequential operations or do not undergo gynecologic surgery. Although additional investigations with a larger sample size are necessary, the present study suggests ABR and concurrent BSO and/or TAH safely combine risk-reducing procedures for hormone-positive breast cancer patients without any added morbidity.

# **Post-Operative Complications in Combined versus Staged Breast Reconstruction and Risk-Reducing Gynecologic Surgeries: A Multi-Institution Multi-Surgeon Analysis**

Abstract Presenter  
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**Background:** Patients with or at a high risk of breast and gynecological cancers often undergo mastectomies with breast reconstruction and risk-reducing gynecological surgeries, either in a staged or combined manner, to treat the existing cancer, prevent potential future cancers, and manage their overall risk (1,2). Previous studies have illustrated mixed results regarding complication rates associated with combined procedures, however, conclusions were limited by sample sizes or study design (e.g., de-identified database analyses) (3,4,5). The objective of this study was to compare the incidence of complications in combined versus staged procedures.

**Methods:** We conducted a retrospective review of patients undergoing staged or combined mastectomy with breast reconstruction and gynecological procedures at Beth Israel Deaconess Medical Center, RUSH University Medical Center, and the University

of Colorado Anschutz Medical Campus from September 2007 to October 2023. Bivariate analyses were conducted to compare patient demographics and ninety-day breast-related complication rates between the cohorts. Complications of interest included emergency department visits, need for reoperations, and readmissions. All p-values equal to or less than 0.05 were considered significant.

**Results:** A total of 246 patients were identified who underwent combined or staged mastectomy with breast reconstruction and risk-reducing gynecological surgery, with 88 patients in the combined group and 158 patients in the staged group. The mean age in the population was  $46 \pm 9$  years with no significant difference ( $p=0.7$ ) between the cohorts. The median BMI was significantly different between the groups with 27 kg/m<sup>2</sup> (interquartile range: 8) in the staged group and 25 kg/m<sup>2</sup> (interquartile range: 5) in the combined group ( $p=0.01$ ). More patients in the staged group had history of radiation when compared to the combined group (41% vs. 24%,  $p=0.04$ ), while there was no significant difference for the other comorbidities examined. There was no significant difference in breast-related complications between the staged and combined cohorts, however, patients in the staged group had significantly more reoperations (17% vs. 8%,  $p=0.04$ ), readmissions (16% vs. 7%,  $p=0.037$ ) and ED visits (18% vs. 8%,  $p=0.036$ ) when compared to the combined group.

**Conclusion:** Contrary to previous studies, our findings suggest that patients undergoing combined mastectomies with breast reconstruction and risk-reducing gynecological procedures are not at increased risk of postoperative complications. This data is pertinent to patients' informed decision-making when considering combined management of breast and gynecological cancers.

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## **National Practice Patterns and The Impact of Plastic Surgery Volume on Flap Reconstruction for Deep Sternal Wound Infections**

Abstract Presenter

Myles Lavalley

Abstract Co-Author(s)

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Matthew Wright MD

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**Background:** Deep sternal wound infection (DSWI) is a serious and life-threatening complication of open cardiac surgery. Debridement and flap reconstruction has become standard of care, but the presence of a DSWI is associated with significant morbidity and mortality. The aim of this study is to investigate national patterns of flap-based management and outcomes for DSWI following coronary artery bypass grafting (CABG).

**Methods:** We queried the National Inpatient Sample (NIS) from 2016 to 2018 for patients with DSWI who underwent CABG. The outcomes of interest were reception of flap reconstruction and in-hospital mortality. Plastic surgery volume per facility was determined based on procedure codes for flaps, breast reconstruction, and complex hand reconstruction. Sociodemographic and clinical variables that differed significantly ( $p < 0.20$ ) on univariate analysis were incorporated into binary logistic regression ( $p < 0.05$ ).

**Results:** There were 120,440 patients who underwent CABG procedures, of whom 1,399 (1.2%) were diagnosed with DSWI and included for analysis. Among these SWI patients, 113 (8.1%) patients were treated with a flap procedure during their stay (Table 1). There were 134 (9.6%) patients who died during admission. Higher yearly plastic surgery facility volume predicted a higher probability of flap reconstruction (OR: 1.002, 95% CI: 1.001-1.002,  $p = 0.0013$ ). Female sex (OR: 0.68, 95% CI: 0.55-0.84,  $p < 0.001$ ) and rural (OR: 0.32, 95% CI: 0.13-0.79,  $p = 0.013$ ) or urban non-teaching (OR: 0.39, 95%

CI: 0.27-0.56,  $p < 0.001$ ) hospital status predicted lower probability of flap reconstruction. Older age (OR: 1.028, 95% CI: 1.019-1.037,  $p < 0.001$ ) and higher comorbidity burden (OR: 1.026, 95% CI: 1.021-1.030,  $p < 0.001$ ) predicted higher risk of in-hospital mortality. On average, patients with in-hospital mortality were associated with a \$316,155 increase in total hospital charges when compared to those without mortality ( $p < 0.001$ ).

**Conclusion:** DSWI encounters treated at high-volume plastic surgery facilities were more likely to undergo flap operations. Given that flap reconstruction has been associated with improved outcomes, reduction in total hospital stay, and costs, the findings of this study indicate that patients with DSWI are best served at high-volume plastic surgery facilities. The rate of flap reconstruction is significantly lower than expected for management of SWI in some demographic groups. Our analysis highlights a gap in the consistency of practice patterns for DSWI management, with decreased flap reconstruction rates noted in females, rural hospitals, and urban non-teaching hospitals.

### **Assessing Risk Factors for Respiratory Failure Following Abdominal Wall Reconstruction Using a Global Federated Database: A Propensity Score-Matched Analysis of 12,788 Cases**

Abstract Presenter  
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#### **Background:**

Postoperative respiratory complications and adverse airway events are potentially life-threatening events that can occur following abdominal wall reconstruction. Clinical and physical risk factors including medical comorbidities, hernia volume, and increased intra-abdominal pressure have been proposed to increase patient risk for these complications. The purpose of this study was to determine the risk of respiratory complications in adults undergoing abdominal wall reconstruction and factors affecting complication rates using a national database.

#### **Methods:**

This is a retrospective cohort study performed with the TriNetX database collecting case data from 61 healthcare organizations. Adult (age  $\geq 18$  years) patients undergoing abdominal wall reconstruction with component separation were included based on CPT codes (49560, 49561, 49565, 49566, and 15734). Respiratory failure occurring within 90 days was determined by ICD-10 codes (J96.00, J95.82, J95.3, J95.821, J95.2, J95.3, Z99.11, and J96. 20). Patient demographics, medical comorbidities, and complications were compared using single-variable analysis. Risk factors were stratified by system or specific pathology. Propensity score-matched analysis was applied to each risk factor to assess the risk of respiratory failure. Statistical significance for each analysis was set to  $p < 0.05$ .

### **Results:**

The database returned 12,788 cases of abdominal wall reconstruction meeting inclusion and exclusion criteria. The average age at reconstruction was 57.3 ( $\pm 12.8$ ) years. White (77%) non-Hispanic (78%) females (55%) were the most common demographic. We identified 1,263 cases with no risk factors and 11,525 cases having any of the outlined risk factors present. Propensity score-matching yielded cohorts of 1,252 cases each, and analysis showed that having multiple ( $\geq 2$ ) risk factors (odds ratio [OR], 4.693 (2.9-7.59);  $P=0.0001$ ) or history of COVID-19 and additional ( $\geq 1$ ) risk factors (OR, 4.80 (3.2-7.19);  $P=0.0001$ ) demonstrated a higher risk of respiratory complications. A diagnosis of obesity increased risk independently of other comorbidities (OR, 2.464 (1.28-4.76);  $P=0.0057$ ). Other chronic conditions (anemia, chronic kidney disease, diabetes, cardiovascular disease, pulmonary disease, or hepatic disease) did not demonstrate statistical significance.

### **Conclusions**

Respiratory failure following abdominal wall reconstruction is a serious complication. Obesity and the presence of multiple chronic medical comorbidities are independent risk factors for respiratory failure following abdominal wall reconstruction. This data can be used to further risk-stratify patients preoperatively and facilitate postoperative monitoring.

### **Prospective Study of Patient Reported Outcome Measures (PROMs) after Prepectoral and Subpectoral Two-stage Implant-based Breast Reconstruction**

Abstract Presenter

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### **Introduction:**

Implant-based reconstruction (IBR) is the most common form of post-mastectomy breast reconstruction in the United States, the majority of which are performed in a two-stage manner (expander-to-implant). While IBR has historically been performed predominantly in the subpectoral plane, prepectoral implant positioning with use of an acellular dermal matrix (ADM) may offer relative benefits including mitigation of animation deformity, improved chest-wall positioning, and fewer muscle spasms. This prospective cohort study aims to compare prepectoral and subpectoral two-stage IBR through interval administration of patient reported outcome measures (PROMs) up to 12 months after the first stage of surgery.

### **Methods:**

Patients undergoing two-stage IBR at a single institution from November 2021 to December 2023 were identified pre-operatively and recruited for enrollment. Females at least 18 years of age undergoing two-stage IBR using ADM following mastectomy were included. Enrolled patients were administered a set of BREAST-Q scales (Satisfaction with Breasts, Satisfaction with Implants, Breast Sensation, Breast Symptoms, Animation Scale, Physical Wellbeing-Chest) and the EQ-5D-5L pre-operatively and post-operatively at 6 weeks, 3 months, 6 months and 12 months. Chart review was performed to gather demographic and clinical variables. Comparative analysis of PROMs between the prepectoral and subpectoral cohorts was performed independently at each timepoint; within-group time dependence analysis and regression pending.

### **Results:**

A total of 281 patients consented to participate in the study, of whom 191 have completed two-stage IBR (123 prepectoral and 68 subpectoral) and were included in analysis. Prepectoral and subpectoral patients completed surveys at the following timepoints, respectively: Baseline (77, 39), 6 weeks (59, 36), 3 months (64, 43), 6

months (74, 38), 12 months (71, 46). Baseline characteristics including age, race/ethnicity, BMI, smoking history, diabetes, indication for surgery, and history of chemotherapy and radiation did not significantly differ between the two treatment groups ( $p>0.05$ ). A greater proportion of subpectoral patients had hypertension (9 [7.3%] vs. 14 [21%];  $p=0.007$ ), and a greater proportion of prepectoral patients underwent bilateral reconstruction (99 [80%] vs. 44 [65%];  $p=0.016$ ).

Between the prepectoral and subpectoral cohorts, there was no significant difference in BREAST-Q and EQ-5D-5L scores at any time point ( $p>0.05$ ). The only significant difference in PROMs between cohorts at any point was that a greater proportion of subpectoral patients endorsed swelling of the arm (lymphedema) ipsilateral to their reconstruction (9 [27%] vs 3 [5.8%];  $p=0.016$ ) at 6 months post-op; this difference resolved by 12 months (7 [19%] vs 10 [18%];  $p>0.9$ ).

### **Conclusions:**

This prospective study offers preliminary evidence that prepectoral and subpectoral two-stage IBR offer comparable patient reported outcomes up to 12 months post-operation. Across all timepoints evaluated, there was no significant difference between prepectoral and subpectoral IBR patients with respect to breast satisfaction, satisfaction with implants, breast sensation, breast symptoms, breast animation, physical wellbeing of the chest, and quality of life. Data acquisition is ongoing, so results may be subject to change.

## **The Influence Nerve Surgical Techniques at Time of Amputation on the Prevalence of Heterotopic Ossification in Transtibial Amputees**

Abstract Presenter

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**Introduction:** Heterotopic ossification (HO) can form after extremity amputation and may cause pain and functional impairment, and prevalence has been described, but



mainly in military populations. (1-2) Also, the association of HO and symptomatic neuromas has been described. (3) Therefore, we aimed to describe the prevalence of HO in a civilian population of transtibial amputees. Moreover, we hypothesize that amputees who underwent prophylactic active nerve surgery (Targeted muscle reinnervation or Regenerative Peripheral Nerve Interface) at time of amputation will show a lower rate of HO formation. (4)

**Methods:** Adult patients undergoing transtibial amputation at a tertiary care center between 2000 and 2023 were included. Patient data were collected through medical chart review. The most recent post-amputation X-ray of the residual limb was assessed for HO presence, according to the Walter-Reed classification, by two researchers, and confirmed by 5 clinicians independently. (5) Multivariable regression was conducted to identify factors associated with HO presence.

**Results:** In total, 665 of 632 patients were included. HO was identified in 354 X-rays (53.2%), and was commonly present on the distal residual tibia (67.2%) and the distal residual fibula (68.7%). Floating HO, which was not attached to the distal residual limb but present in the soft tissue envelope, was identified in 7.9% of X-rays. Pain in the affected limb was reported in 53.2% of patients with HO. In patients who underwent passive (traditional) nerve surgery at time of amputation, HO was identified in 55.1% of cases. This was significantly higher compared to patients who underwent active nerve surgery at time of amputation (36.8%,  $p=0.009$ ). Also, symptomatic neuromas were significantly more common in patients for whom HO was identified (68.2%), versus patient that did not show HO on X-ray (31.8%) ( $p=0.012$ ). Both passive (traditional) nerve surgery (OR:2.3,  $p=0.003$ ) and the presence of a symptomatic neuroma (OR: 2.2,  $p=0.001$ ) were independently associated with a higher prevalence of HO following multivariable analysis.

### **Summary:**

- HO is a common finding in transtibial amputees and does not occur in the military population.
- Avoiding symptomatic neuroma formation, using prophylactic nerve surgery during amputation, might aid in decreasing HO prevalence and should be considered.

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**Immediate lymphatic reconstruction decreases the risk of lymphatic abnormalities in women who undergo axillary lymph node dissection for breast cancer treatment**

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**Background:**

Risk factors that increase the likelihood of developing lymphedema following axillary lymph node dissection (ALND) are well-described in the literature. However, this information is based on varying and arbitrary cutoffs for lymphedema diagnosis, such as a 10% volume change in the extremity. Further, many studies do not include patients' use of compression. This can decrease the reported incidence of lymphedema based on volume criteria due to a reduction in arm swelling with compression use. Therefore, perhaps instead of examining risk factors for development of lymphedema, we should examine factors that contribute to normal lymphatic function. This study aims to identify protective factors associated with normal lymphatic function after ALND for treatment of breast cancer.

**Methods:**

This was a prospective study of women treated with unilateral ALND for breast cancer at a single tertiary cancer center between 2020 and 2023. The patients were randomized to a control arm or treated with immediate lymphatic reconstruction (ILR) at the time of ALND. Patients with normal lymphatic function were defined as meeting all of four criteria: <10% arm volume change from baseline, <10 bioimpedance change from baseline, no compression use, and stage 0 on indocyanine green lymphography at one year follow up. All other patients were classified as having abnormal lymphatic function. Two sample T-tests, Fisher's exact test, and Pearson's Chi-squared test compared characteristics groups. Univariate and multivariate logistic regression were used to examine variables possibly associated with normal lymphatic function. Variables of interest included age, BMI, race, neoadjuvant chemotherapy, adjuvant chemotherapy, radiation of chest wall/breast, radiation to the axilla, number of axillary lymph nodes removed, number of nodes positive for malignancy, and if immediate lymphatic reconstruction (ILR) was performed at the time of ALND.

**Results:**

Of 112 patients with one year follow up, 34 patients (30.4%) had normal lymphatic function, and 78 patients (69.6%) had abnormal lymphatic function. As expected, one year volume change from baseline, bioimpedance change from baseline, compression use, and ICG stage significantly differed between patients with normal and abnormal lymphatic function ( $p<0.005$ ). A higher percentage of patients underwent ILR in the normal lymphatic function group compared to the abnormal group (68% vs 42%,  $p=0.014$ ). Other factors were not significantly different between groups.

On univariate analysis, ILR was the only variable significantly associated with normal lymphatic function. The odds of normal lymphatic function in patients who had ILR were 2.85 times higher than that of patients who did not (OR=2.85, 95% CI=1.24 to 6.85,  $p=0.015$ ).

**Conclusion:**

ILR is significantly associated with normal lymphatic function one year after ALND. These findings suggest that undergoing ILR may be protective against developing breast cancer-related lymphedema.

# **Nasal Alar and Tip Reconstruction Following Mohs Surgery Using Fresh Frozen Costal Cartilage: A Novel Approach**

Abstract Presenter

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**BACKGROUND:** Skin cancer patients who undergo Mohs surgery may require subsequent reconstruction. Reconstructive rhinoplasty for large nasal defects that affect the nasal frame typically requires cartilage grafts for structural support. Autologous cartilage is the primary source of supporting grafts for reconstructive rhinoplasty. However, autologous grafts require a donor site with an added risk of complications. Irradiated allografts have been introduced but are reported to have higher rates of infection, resorption, and tissue necrosis. A newer type of graft, fresh frozen cadaveric costal allograft (CCA), offers the benefit of not requiring a donor site, thus reducing operating room time and possible donor site complications. Furthermore, the use of CCA may lead to reduced costs, given that the product costs approximately \$400 to \$600 and the reduction in surgical expenses often far exceeds this price. The purpose of this study is to evaluate the safety and efficacy CCA for reconstructive rhinoplasty after skin cancer removal.

**METHODS:** We retrospectively reviewed the medical history and operative data of sixteen patients who underwent reconstructive rhinoplasties using CCA after basal cell carcinoma resection. CCA underwent a process of sterilization without irradiation. The cadaveric cartilages were stored in frozen conditions (-40°C to -80°C), and temperature was maintained using dry ice during shipment. Pre and postoperative photographs of the patients were obtained, and anthropometric measurements were taken from 2D photos to evaluate nasal tip projection. Adverse events including infection, tissue necrosis, resorption, and reoperation were evaluated.

**RESULTS:** The average age was 73 years (range 59 to 90). The average duration of follow-up was 7 months (range 3 to 15 months). Types of grafts used included: Alar batten graft (n=9, 56.3%), nasal tip graft (n=6, 37.5%), and alar batten graft with nasal

tip graft (n=1, 6.2%). Measurements taken from the 2D photos of the patients showed no significant resorption or deviation at 6-month or 12-month follow-up. No significant complications related to the use of the cartilage were noted.

**CONCLUSION:** Our study highlights a low complication rate and positive surgical outcomes following the use of non-irradiated CCA for reconstructive rhinoplasties after skin cancer resection. Further investigation involving a larger sample size and greater variation in types of rhinoplasty grafts would add to the existing data supporting the efficacy of CCA over other grafting materials.

## **The “True Cost” of Lymphedema: A Prospective Cohort Study Assessing Financial Toxicity in Lymphedema Patients**

Abstract Presenter  
Nerone Douglas

Abstract Co-Author  
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**Background:** Despite numerous studies exploring the monetary costs of lymphedema care, there remains a gap in our understanding of treatment-induced distress, or "financial toxicity" (FT), in lymphedema patients. This study aims to (1) categorize the degree of FT in our cohort of patients, (2) evaluate current disparities in lymphedema care using Area-Deprivation Index (ADI), and (3) identify the association between FT and lymphedema disease progression.

**Methods:** This is a single-institution prospective study of adult patients with chronic lymphedema. Surveys were administered at the time of evaluation in our multidisciplinary lymphedema clinic. FT was measured using an adaptation of the comprehensive 11-item COST-FACIT instrument. A secondary-cost survey was also distributed to obtain patient demographics, clinical history, and lymphedema spending history. Surveys were logged into RedCap, patients were anonymized and given a unique identifier to link responses for later analyses.

**Results:** 38 patients were interviewed and 36 met inclusion criteria and were included in the final analysis. 7 (19.4%) patients were male, and 29 (80.6%) were female. 23 (63.9%) patients had government-based insurance such as Medicare/Medicaid, and 13 (36.1%) patients had private, employer-based, or individually-purchased insurance. 17

patients (47.2%) had upper-extremity lymphedema, 19 (52.8%) had upper-extremity lymphedema; all patients with upper-extremity lymphedema were breast-cancer related lymphedema. Patients with advanced stage lymphedema (Stage 3) had the lowest COST-FACIT scores (indicating higher FT) of 18.90, compared to lower disease stages (Stage 0, 1, and 2) which results in higher COST-FACIT scores (indicating lower FT) (21, 23.5, and 26.63, respectively). A Spearman Ranked Correlation test was performed and resulted in a weak indirect association between lymphedema disease stage and COST-FACIT scores ( $p=0.36$ ). Patients from higher ADI neighborhoods (indicating most disadvantaged) were significantly strongly associated with having a lower COST-FACIT score (indicating higher FT) compared to those from lower ADI neighborhoods (indicating least disadvantaged) ( $p<0.008$ ). A Pearson Correlation test was computed to assess the linear relationship between COST-FACIT scores and patient-reported disability through the Lymphedema Life Impact Scale (LLIS) assessment. There was a strong, negative indirect correlation between the two variables ( $p<0.001$ ) indicating that patients with lower COST-FACIT scores (indicating higher FT) were significantly correlated with having a higher level of patient-reported disability on the LLIS.

**Conclusions:** Lymphedema imposes a substantial financial strain on patients. Solely evaluating the monetary aspect of lymphedema care fails to unveil the "true cost" burden of this chronically debilitating disease for patients. Patients from highly disadvantaged neighborhoods are more likely to experience FT, have more advanced lymphedema staging, and report higher levels of disability. Capturing the financial burdens pressuring patients is essential to understanding treatment-induced stress known as FT.

## **Immunological Innovations in the World's First Partial Face and Whole Eye Transplantation**

Abstract Presenter  
Alay Shah MD

Abstract Co-Author(s)  
David Tran MD  
Daniel Ceradini MD  
Bruce Gelb  
Eduardo Rodriguez MD  
Sachin Chinta

**Background:**

Previous attempts at whole eye transplantation (WET) were ultimately deemed unsuccessful due to both technical and immunologic limitations. Since the first face transplant (FT) in 2005, significant strides have been made in our understanding of both, with multiple groups establishing technical feasibility of FT. Coinciding with this, an improved understanding of immunologic processes and rejection affords the opportunity to revisit WET, especially given its unique immune properties.

**Methods:**

We report on a 46-year-old male who sustained a high voltage electrical injury resulting in severe facial injuries and left eye enucleation. With a cPRA of 32%, following identification of an appropriate donor, the patient underwent a combined partial face and WET with optic nerve coaptation and immune induction using rituximab and anti-thymocyte globulin. Notably, donor derived CD34+ stem cells were injected, locally, at the site of optic nerve coaptation for their potential role in immunomodulation.

**Results:**

Operation time was approximately 22 hours with a total ischemia time of 2 hours and 59 minutes. Initial induction immunosuppression consisted of thymoglobulin at a total dose of 6mg/kg and 1000mg rituximab. Intraoperative administration of isolated donor derived CD34 hematopoietic stem cells directly at the optic nerve coaptation was performed. No postoperative complications were observed during the initial hospital course. Mycophenolate, tacrolimus, and prednisolone were used to maintenance immunosuppression. Now, more than nine months days postoperatively, no evidence of acute rejection, dnDSA, or adverse events have been observed.

**Conclusion:**

Following a combined partial face and whole eye transplantation, our patient's postoperative course has been notably free of acute rejection or adverse events over nine months. This period of stability, following transplantation surgery involving optic nerve coaptation and local CD34+ stem cell application, suggests potential advancements in the management and viability whole eye transplants.

**Supercharged and Expanded Supraclavicular Fasciocutaneous Pedicle Flap for Post-Burn Head and Neck Reconstruction: A Case Series**

Abstract Presenter  
Matthew Loper

Abstract Co-Author(s)  
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**Background:** Supraclavicular fasciocutaneous flaps are a staple choice in face and neck reconstruction due to their location, skin thickness, mobile pedicle, and diverse vascular supply.(1) Gradually pre-expanding these flaps results in reduced donor skin thickness, ensuring a closer match with the recipient site's skin thickness while also decreasing donor site morbidity.(2) Supercharging involves dissecting an additional arterial supply with a given flap, then performing anastomosis with a recipient site artery to decrease the risk of postoperative flap ischemia, necrosis, or failure.(3) Because these problems are common in supraclavicular flaps, especially when pre-expanded, the following flap was supercharged using paravertebral dorsal vessels and the temporal artery. Three cases were performed using the supercharged and expanded supraclavicular fasciocutaneous flap (SSFF), and the results are described here.

-Methods: In a retrospective review, three cases were identified in which the expanded SSFF was used for face and neck reconstruction following long term post-burn sequelae. All cases were performed at the Hospital do Servidor Público de São Paulo between 2017 and 2018. The cases consisted of two stages: During stage 1 of the procedure, the tissue expander was carefully positioned, and the donor flap was gradually expanded, allowing for controlled tissue growth in preparation for subsequent flap rotation. Stage 2 involved reconstruction using the pre-expanded SFF, which was supercharged via anastomosis between the dorsal paravertebral perforator and the temporal artery. Indications included 1) a 16 y/o male with severe thermal burns to the face, anterior neck, chest, and right upper extremity at age 10, 2) a 16 y/o male with severe thermal burns encompassing the entire face at age 10, and 3) a 41 y/o male with severe thermal burns to the neck and chest at age 11.

**Results:** In the clinical cases, flap sizes varied based on defect correction needs and ranged from 297 cm<sup>2</sup> to 1984 cm<sup>2</sup>. Donor sites were closed primarily, and there was no full-thickness necrosis or flap loss. Complications during tissue expansion included one instance of an expander site hematoma, which resolved spontaneously. Complications after reconstruction included epidermolysis of distal flap edges and post-operative flaccidity, which were corrected operatively, and fibrotic band formation on flap edges, which was corrected via z-plasty revision.



**Conclusions:** Large face and neck reconstructions are complicated by the diverse morbidities associated with post-burn scar contractures, as well as the unique qualities of the recipient skin. Pre-expanding a SFF increases the flap size for reconstruction and ensures a closer match between the flap thickness and the unique thickness of facial and cervical skin. Additionally, anastomosing the dorsal paravertebral perforator to the temporal artery enhances flap survival. More cases are needed to prove significant risk reduction compared to traditional SFF face and neck reconstruction.

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## **Improving Perfusion in Pulsed-Dye Laser Therapy: A Novel Anesthetic Protocol**

Abstract Presenter

Jessica Nye

Abstract Co-Author(s)

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Matthew Greives MD

**Purpose:**

Pulsed-dye laser (PDL) therapy is the treatment of choice for capillary malformations (CM). Patients with extensive CMs, or ones located on the face, frequently require anesthesia during treatment. However, the vasodilatory effects of sevoflurane can reduce blood flow through the malformation thus reducing the laser's ability to capture the hemoglobin chromophore. At our institution, we have started using a normotensive anesthesia protocol because we believe it improves treatment response due to the maintenance of blood pressure. The following study aimed to compare the efficacy of laser therapy between our novel anesthetic protocol with standard inhalation anesthesia.

**Methods:**

This was a prospective study of pediatric patients with CMs who were treated with PDL therapy. Patients received the traditional anesthetic technique of inhaled sevoflurane gas (SEVO) or our non-hypotensive protocol of inhaled nitrous oxide for peripheral intravenous catheter placement, followed by total intravenous anesthesia (TIVA) of ketamine, dexmedetomidine, and fentanyl boluses. The erythema of the CM and adjacent normal tissue were measured using a handheld spectrophotometer prior to induction, post-induction, at the end of the case, and at their post-operative appointment. Patient heart rate (HR), systolic, and diastolic blood pressures (SBP, DBP) were recorded at the time of the 4 color measurements. Tissue perfusion was evaluated by comparing the mean difference between pre-induction versus post-induction vitals and erythema. Treatment response was then assessed by the difference in erythema between the CM and normal tissue prior to induction and at their follow-up appointment.

**Results:**

Ten patients underwent a total of 24 rounds of laser ablation. The 10 patients (41.7%) in the SEVO group had a mean reduction in their DBP of  $19.56 \pm 6.44$  mmHg ( $p = 0.02$ ) and erythema of their CM by  $11.40 \pm 4.29$  ( $p = 0.03$ ) following induction. Whereas the 14 patients (58.3%) in the TIVA group had a mean reduction in their DBP of  $3.80 \pm 6.10$  mmHg ( $p = 0.56$ ) and erythema of their CM by  $2.59 \pm 3.74$  ( $p = 0.50$ ). Fourteen of the 24 cases (58.3%) had follow-up measurements taken after a median of 56 (40, 66) days from treatment. Patients in the TIVA group exhibited a reduction in the erythema of their CM by -8.0 (-10.7, 5.3), compared to those in the SEVO group who had an increase in erythema of 9.3 (-6.5, 14.3) following treatment ( $p = 0.15$ ).

**Conclusion:**

Patients that received the SEVO protocol experienced a significant reduction in their DBP and the erythema of their CM following induction. While patients in the TIVA group had a modest decrease in these measurements, they subsequently exhibited a better color response following therapy. Although not all patients undergoing PDL therapy for CMs need anesthesia, our data indicates that the ones that do should use a normotensive protocol to improve treatment efficacy.

## **Comparison of Long-Term Breast Sensation and BREAST-Q Outcomes in Primary Coaptation Versus Allograft Nerve Repair for DIEP-Flap Reconstruction**

Abstract Presenter: Sophia Salingaros

Abstract Co-Author(s): Ashley Zhang, Sophia Arbuiso, Chase Alston, Isaiah Rhodes, Grant Black MD, Marcos Lu Wang MD, David Otterburn MD

**Purpose:** Autologous breast reconstruction, regarded as the gold standard post-mastectomy approach, faces remaining challenges in loss of breast and nipple sensation with suboptimal patient-reported outcomes (1). In an effort to preserve sensation, neurotization of autologous breast flaps has become a highly investigated topic (2). Previously, flap neurotization relied on surgeons identifying sensory nerves of adequate length to allow for direct coaptation or harvesting an autograft from a donor site, but the introduction of nerve allografts has allowed for increased candidacy for neurotization without donor site morbidity. In this study, we sought to investigate sensory and BREAST-Q outcomes in patients receiving deep inferior epigastric perforator (DIEP) flap reconstruction neurotized via direct coaptation and allografts.

**Methods:** Patients with direct nerve coaptation DIEP reconstruction who underwent neurosensory testing with a pressure-specified sensory device and/or completion of a BREAST-Q survey were retrospectively identified and matched to patients with allograft-neurotized DIEP flaps with similar follow-up times. Primary outcomes were cutaneous sensitivity of nine different breast areas and BREAST-Q scores for the four scales qualified by the U.S. Food and Drug Administration (Physical Well-being (Chest), Psychosocial Well-being, Sexual Well-being, and Satisfaction with Breasts) and the Sensation Module (Breast Sensation, Breast Symptoms, and Quality of Life impact of sensation loss). Statistical analysis was performed in R, comparing baseline patient information and outcomes of interest between the two groups.

**Results:** 29 women (52 flaps) were included in this study, with 17 flaps reconstructed with an autograft and 34 flaps reconstructed with an allograft. The two cohorts were similar in age, comorbid conditions, reconstruction sequence and breast cancer therapy. Sensation outcomes were analyzed in 11 autograft DIEPs with an average follow-up time of 92.67 months and 12 allograft DIEPs with an average follow-up time of 84.79 months. No significant differences in cutaneous sensitivity were found between the two groups at any breast area ( $p > 0.05$ ). BREAST-Q surveys were returned by 11 patients receiving an autograft with average follow-up time of 94.42 months and 16 patients receiving an allograft with an average follow-up time of 61.56 months. The two groups

had comparable scores for all survey scales included in this study ( $p > 0.05$ ).

**Conclusions:** Our results demonstrate comparable sensory and BREAST-Q outcomes in DIEP flaps neurotized by direct coaptation and nerve allografts. These findings suggest that the foreign material of allografts does not impede long-term sensory recovery, despite the presumed superiority of native nerves. Nerve allografts circumvent the requisite donor-site morbidity of autografts, provide "off-the-shelf" reliability and predetermined graft length, and potentially present a more cost-effective option due to shorter operation time.

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## Evaluating the Predictive Value of Comorbidities and Laboratory Values on Postoperative Complications in Sartorius Flap Patients

Abstract Presenter: Daniel Soroudi

Abstract Co-Author(s): Alap Patel MD, Matthew McLaughlin, Raymond Yin, Solomon Lee MD, Adam Wallace MD, Scott Hansen MD

**Background:** The pedicled sartorius muscle flap is recognized for its utility in reconstructing complex groin wounds due to its proximity to the groin, relatively straightforward dissection, and minimal to no functional loss. However, there is no comprehensive understanding of how comorbidities and laboratory values, including hemoglobin (Hgb), albumin, and C-reactive protein (CRP), influence complication rates. This understanding is crucial, as complications may compromise vascular repairs and grafts, potentially endangering limb viability. Thus, this study explores the relationship between such factors and postoperative complications.

**Methods:** A retrospective cohort analysis was conducted on patients who underwent sartorius flap procedures for groin wounds from 2014 to 2020. At our institution, the sartorius muscle flap is used primarily when assisting vascular surgery with complex

groin reconstruction after various bypass operations, including redo procedures. Data collected include patient demographics, existing comorbidities, laboratory values, and postoperative complications. Data were summarized as means  $\pm$  standard deviations, and univariate analyses using odds ratios (OR) and 95% confidence intervals (CI) evaluated the impact of variables on postoperative outcomes. P-values  $<0.05$  were considered statistically significant.

**Results:** Of the 425 cases included, the mean age was  $66.3 \pm 12.5$  years, with a distribution of 61.2% males and 38.8% females. Body mass index (BMI) was  $26.4 \pm 6.3$ . Clinical characteristics showed a mean creatinine level of  $1.2 \pm 1.0$  mg/dL, Hgb of  $11.2 \pm 2.1$  g/dL, albumin of  $2.9 \pm 0.8$  g/dL, and CRP of  $95.6 \pm 87.4$  mg/L. 70.8% had hypertension, 80.2% had peripheral vascular disease (PVD), and 35.5% had coronary artery disease (CAD). 11.1% had insulin-dependent diabetes mellitus (IDDM) and 21.6% had non-insulin-dependent diabetes mellitus (NIDDM). In 42.1% of the cases, incisional wound vacuum-assisted closure was utilized, prophylactic antibiotics were administered in 31.3%, and drain placement was employed in 91.5%.

145 (34.1%) patients had a postoperative complication. Having IDDM (OR=0.50, CI=0.27-0.93,  $p=0.028$ ) or higher BMI (OR=0.94, CI=0.91-0.97,  $p<0.001$ ) was clinically associated with a reduced risk of complications. Prophylactic antibiotics use significantly lowered complication risk (OR=0.58, CI=0.38-0.88,  $p=0.011$ ). Further, rising hemoglobin levels were correlated with increased complication rates (OR=1.12, CI=1.01-1.23,  $p=0.026$ ). There was no statistically significant impact with regards to patient albumin (OR=0.89, CI=0.35-2.26,  $p=0.810$ ), CRP (OR=1.00, CI=1.00-1.00,  $p=0.861$ ), or creatinine (OR=0.85, CI=0.70-1.03,  $p=0.089$ ). Other variables, including gender, hypertension, hyperlipidemia, tobacco use, PVD, COPD, CAD, and additional laboratory markers, did not demonstrate a statistically significant correlation with complications.

**Conclusion:** The study elucidates the complex relationship between comorbidities, laboratory values, and postoperative complications in patients undergoing sartorius flap reconstruction. Unexpectedly, IDDM and a higher BMI were protective against postoperative complications, which may be related to higher vigilance on the part of the providers in caring for these complex patients. As clinically expected, prophylactic antibiotics decreased complications; however, higher hemoglobin was associated with higher complication risk. This is of unclear clinical significance. When evaluating these patients, caution should be taken when assessing comorbidities, which are often numerous in complex vascular surgery patients undergoing bypass procedures. These findings encourage further research into developing refined risk assessment models to enhance surgical success and patient recovery.

## **The Feasibility of Establishing a Microsurgical Practice in a Limited Resource African Settings: An Experience from Western Kenya**

Abstract Presenter: Matthew Liao

Abstract Co-Author(s): Isaiah Rhodes, Sophia Arbuiso, Ashley Zhang, Chase Alston, Samuel Medina, Niles Batdorf MD, Patricia Chesang, Giles Hayden, David Otterburn MD

**Purpose:** There is a disproportionate burden of patients requiring microsurgical reconstruction in low- and middle-income countries (1). Despite this, there are few plastic surgery departments which have demonstrated the capacity to perform free flap procedures in rural African contexts (2). The purpose of this study was to investigate the feasibility of a surgeon certified by the American Board of Plastic Surgery establishing a microsurgical practice at a resource limited, non-governmental hospital in rural western Kenya.

**Methods:** We performed a retrospective review on all patients who received a free flap procedure by a single surgeon at one institution from November 2022 to November 2023. Information was retrieved relating to age, sex, medical history, wound etiology, flap performed, peri- and post-operative complications and length of stay.

**Results:** Nineteen free flaps were performed on 17 patients (13 male). Average age of patient was  $39 \pm 18.5$ . Most common indications were lower extremity soft tissue defects (10) and facial reconstructions for orofacial gangrene (4) and neoplasms (2). The most common flap performed was anterolateral thigh ( $n=11$ ). All procedures were performed under surgical microscope. 13 patients (76.4%) experienced a post-operative complication. Overall flap survival rate was 94.7% percent.

**Conclusions:** Despite high rates of complications, microsurgical practices can be safely established in limited-resource African settings with flap survival rates that are similar to those reported in many western settings. Given the burden of patients necessitating microsurgical reconstruction in LMICs, expanding efforts to partner in training and providing resources to plastic surgeons working in LMICs is warranted (4).

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## **Risk Factors for Vascular Compromise of Lower Extremity Free Tissue Transfer**

Abstract Presenter: Brian Truong

Abstract Co-Author(s): Karen Li, Christian Lava, Cameron Akbari, Richard Youn MD, Christopher Attinger MD, Karen Evans MD

**BACKGROUND:** After free tissue transfer, the most critical period with the highest risk of flap failure is within the first 72 hours (1). Most takebacks demonstrate signs of vascular compromise within these first 72 hours (2), and the majority of thrombi present within the first two postoperative days. The atraumatic, highly comorbid, chronic wound patient population who undergo lower extremity free tissue transfer have multiple thrombogenic factors that may contribute to higher rates of takeback. Thus, this study aims to identify any perioperative risk factors that contribute to rates of takeback.

**METHODS:** A retrospective review of patients that underwent lower extremity free tissue transfer (FTT) at a single-center academic institution between the years of 2011 and 2023 were included in this study. Patient medical comorbidities, history of immunosuppression, surgical details, postoperative complications, and overall outcomes data were collected. Rates takeback to the operating room for any complication was recorded between and further characterized by timing and reason for takeback. Statistical univariate analyses were performed to evaluate any significant associations between the rates of FTT takeback and patient-related or surgical factors.

**RESULTS:** A total of 300 patients with LE FTT were reviewed. Takeback rate was 6% (n=18), which occurred at a median of 18.6 hours (IQR:20.86) from end of FTT procedure. Overall flap salvage rate was 72.7% (n=8/11). From post-FTT to takeback of zero to 12 hours, the flap salvage rate was 100% (n=2/2). From 12 to 24 hours, the flap salvage rate was 66.7% (n=4/6) and from 24 to 72 hours, the flap salvage rate was also 66.7% (n=2/3). Common reasons for takeback were venous thrombosis requiring anastomotic revision. Of the patients who had takebacks, their average CCI was 3.9 (SD:2.3). On univariate analysis, the two venous anastomoses was independently associated with lower rates of takeback (OR=0.11, CI=0.03-0.41). Chronic steroid use (OR=8.7, CI=2.0-36.8) were significantly associated with higher rates of takeback. On multiple logistic regression, chronic steroid use (OR:10.8, CI=2.14-54.7) remained as a predictive risk factor for rates of takeback while two venous anastomoses remained independently predictive of lower rates of takeback (OR=0.10, CI=0.03-0.39).

**CONCLUSION:** Vascular compromise leading to an emergent procedure in LE FTT remains a greatly feared complication, especially in a highly comorbid population. In our study, the greater number of venous anastomoses predicted lower odds of takeback. Careful postoperative monitoring, timely intervention, and two venous anastomoses should be considered when technically possible to maximize chances of outflow, especially in this highly comorbid and vasculopathic population.

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**Diving DIEPer: Insights from a Comprehensive Federated Database Study on Nutritional Factors and DIEP Flap Outcomes**



Abstract Presenter: Kimberley Brondeel MD

Abstract Co-Author(s): Virginia Bee MD, Grant Torres, Julie Park MD, Michael Smith

**PURPOSE:** Autologous breast reconstruction using Deep Inferior Epigastric Perforator (DIEP) flaps has been successfully performed in patients across all BMI categories. However, higher rates of adverse outcomes, such as wound complications and flap failure, have been reported in patients with elevated BMIs. This study aims to utilize the TriNetX research network database to investigate outcomes in patients undergoing DIEP flap autologous breast reconstruction, focusing on the impact of different BMIs and exploring alternative nutritional markers beyond BMI.

**METHODS:** Our retrospective analysis involved screening de-identified patient records spanning 20 years, encompassing data from 107,714,666 patients and 62 healthcare organizations across the US. Patients who underwent DIEP flaps were identified by CPT code and stratified into two BMI cohorts: 18.5-34.9 (n=837) and 35+ (n=4,328). Patients with BMI over 35 were further categorized by degree of diabetic control based on their most recent HgA1c values: 7% and under (controlled) or 7.01% or more (uncontrolled). Cohorts were propensity-matched for age, race, ethnicity, smoking status, diabetes, and history of irradiation prior to comparing 90-day measures of association outcomes defined by ICD-10 codes.

**RESULTS:** Patients with a BMI of 35+ had significantly higher rates of infection (RR 1.632, p=0.0021) and dehiscence (RR 1.708, p=0.0001) compared to those with a BMI of 18.5-34.9. No significant differences were observed in rates of seroma, hematoma, or revision between the two BMI cohorts. In the subgroup analysis of patients with a BMI of 35+ based on diabetes control, uncontrolled patients had a significantly higher rate of operative hematoma or seroma and revision of the reconstructed breast compared to controlled patients (p=0.0003). Low albumin levels were associated with higher revision rates (p=0.0009).

**CONCLUSION:** Beyond BMI, considering a broader range of nutritional markers can enhance preoperative assessments and interventions to improve outcomes in autologous breast reconstruction. The significance of uncontrolled diabetes underscores the importance of evaluating glycemic control in predicting adverse outcomes. Despite higher BMIs, patients may still exhibit low albumin levels that predispose patients to additional complications and wound healing issues, occasionally needing operative intervention beyond standard care. Additionally, utilizing a large, federated database

enables a thorough analysis across diverse patient profiles, overcoming limitations inherent in single-center studies.

## **Fillet Flap Coverage for Closure of Diabetic Foot Amputations: A Retrospective Review of 70 Patients**

Abstract Presenter: Elonay Yehualashet

Abstract Co-Author(s): Christian Lava, Karen Li, Rachel Rohrich, Karen Evans MD, Richard Youn MD, Christopher Attinger MD

**Background:** In the United States, 2.4 to 4.5 million individuals suffer from chronic lower extremity (LE) wounds, with a rising incidence due to an aging population, diabetes mellitus (DM), peripheral vascular disease (PVD), and obesity. The fillet flap (FF) leverages the "spare parts" algorithm in reconstructive surgery—utilizing tissue from amputated or otherwise non-salvageable body parts, avoiding donor-site morbidity. However, its efficacy for minor LE amputations due to chronic LE wounds remains understudied. This study aims describes our institutional experience with FF in high-risk patients with chronic LE wounds.

**Methods:** A retrospective review of patients undergoing foot amputation with FF coverage for chronic LE wounds between January 2013 to August 2023 was conducted. Patient characteristics, operative details, and postoperative outcomes were collected. Primary outcome was FF survival, defined as no necrosis  $\leq 7$  days postoperatively. Secondary outcome was complications, categorized into short- (<30 days postoperatively) and long-term ( $\geq 30$  days postoperatively).

**Results:** A total of 70 patients were included for analysis. Mean age and body mass index (BMI) were  $65.0 \pm 13.7$  years and  $28.8 \pm 6.4$  kg/m<sup>2</sup>, respectively. In 45 patients (64.2%) with preoperative angiography, patency rates were: first dorsal metatarsal (n=10, 22.2%), lateral plantar (n=7, 15.6%), medial plantar (n=6, 13.3%), and dorsalis pedis (n=4, 8.9%) arteries. Mean follow-up duration was 9 (IQR: 32) months. Fourteen (20.0%) patients experienced short-term complications, including re-ulceration (n=7, 10.0%), deep surgical site infection (SSI; i.e., abscess, gangrenous necrosis; n=6, 8.6%), and superficial SSI (i.e., cellulitis, n=4, 5.7%). Eleven (15.7%) patients necessitated reoperation for debridement (n=4, 5.7%), wound closure (n=4, 5.7%), flap necrosis (n=3, 4.29%), incision and drainage (ID; n=1, 1.4%), and/or split-thickness skin grafting (STSG; n=1, 1.4%), foreign body exploration (n=1, 1.4%). Twenty-eight (40.0%)

patients experienced long-term complications, including re-ulceration (n=21, 28.6%), deep SSI (n=16; 22.9%), and superficial SSI (n=5, 7.1%), and hematoma formation (n=1, 1.4%). Thirty-two (52.89%) patients necessitated re-operation for debridement (n=16, 22.9%), ID (n=8, 11.4%), STSG (n=6, 8.6%), wound closure (n=5, 7.1%), hematoma evacuation (n=1, 1.4%), and/or removal of heterotopic bone (n=1, 1.4%). Collectively, FF survival was 90% (n=63).

**Conclusion:** FF facilitates reconstruction in complex cases and should be integrated into each chronic LE wound algorithm to avoid additional donor-site morbidity and facilitate stump-length preservation or limb salvage.

### **Incidence of Post Operative VTE following Panniculectomy in Patients with History of COVID-19**

Abstract Presenter: Charles Lee MD

Abstract Co-Author(s): Xingchen (Cindy) Li MD, Mary Newland, Ashley Sun, John Potochny MD

**Purpose:** Venous thromboembolism (VTE) is well-documented post operative complication with potentially life-threatening sequelae.[1] While the risk of VTE in plastic surgery patients is low, these devastating consequences pose a critical need for assessment of risk factors.[2] Recent research has elucidated that a history of COVID-19 infection may be an additional predisposing risk factor to VTE formation. [3,4] Therefore our study aims to assess the risk of VTE in panniculectomy patients with the history of COVID-19.

**Methods:** The TriNetX LLC. National Health Research database was queried to identify patients who underwent panniculectomy in the years 2017-2020 (pre-pandemic) and 2020-2023 (post-pandemic). In addition, post-pandemic patients were further studied by querying the data to look for those with a history of COVID versus those without. These cohorts were analyzed to calculate the incidence rate of VTE in the 30 days post operative period.

**Results:** A total cohort of 7,114 patients who underwent panniculectomy on prophylactic anticoagulation were identified. There were 3,015 patients in the pre-pandemic and 4,099 patients in the post-pandemic group. In the post-pandemic group, there were 790 patients with a prior history of COVID and 3,309 patients without. The

rate of VTE was not significantly different in the pre (3.2%) versus post (3.0%) pandemic cohorts ( $p=0.64$ ). However, in the post-pandemic cohort, there was a significant difference in VTE rates between patients with (4.9%) and without (2.5%) prior history of COVID ( $p=0.0002$ ).

**Conclusion:** Our study showed there was no significant increase in VTE incidence after panniculectomy during the pandemic. However, patients with a history of COVID may be more susceptible to postoperative VTEs as its true long term morbid effects are yet to be fully understood. Therefore, history of COVID should be carefully considered when determining a patient's VTE risk and warrants further study for optimal perioperative and postoperative anticoagulation strategies.

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## **Pain relief with targeted muscle reinnervation: does delay to treatment matter in a rodent amputation model?**

Abstract Presenter: Kassandra Ogbodu

Abstract Co-Author(s): Gabriella Mraz, Gwendolyn Hoben MD, PhD

**Background and Preliminary Data:** Targeted muscle reinnervation (TMR) is a procedure that was originally designed to create a strong electrical signal for prosthesis but has recently been found to significantly reduce pain in amputees and traumatic neuromas. Effects on pain were never studied pre-clinically and the mechanism for how TMR provides pain relief remains unknown. As such, there is a fundamental gap in understanding the changes related to pain effected by connecting large mixed motor-sensory nerves to small intramuscular branches. One component of that gap is studying TMR's effects on pain modulation related to timing of the intervention. Our project is unique in that it elucidates the temporal effects of TMR on spontaneous pain behavior. Clinically, these findings may be applied to better optimize pain-related treatment in chronic amputees.

**Hypothesis:** There will be less noxious pain behavior responses after nerve transection in the group treated with early TMR compared to late TMR interventions. TMR following amputation will not result in analgesia when there is a delay in interventional surgery greater than 6 weeks.

**Methods:** Young adult male (200g) Sprague-Dawley rats were randomized into 4 different groups, each with 4 rats. All groups underwent left hindlimb amputation in which the branches of the sciatic nerve were individually ligated. Following amputation at time= 0, delayed TMR was performed at the time indicated by their group:

- (1) Group 1: 1 week
- (2) Group 2: 3 weeks
- (3) Group 3: 6 weeks
- (4) Group 4: 9 weeks

All rats were subjected to 4 pain behavioral tests to assess sensitivity to mechanical stimuli (pin test), thermal stimuli (acetone test), and detect spontaneous pain behaviors (guarding, HomeCage). Behavior tests were performed 1 week prior to intervention (pain baseline) and 2 and 4 weeks following TMR.

**Results:** There is a decrease in noxious pain behavior responses after 4 weeks across intervention groups that received an intervention in 6 weeks or under. Additionally, rats who received earlier surgical interventions show increased grooming, exploring, sleeping and drinking patterns that better resemble baseline values.

**Discussion:** This project tested the analgesic effectiveness of TMR against a robust pain phenotype after major nerve injury in rodents. In this model, the pain phenotype in rats that received amputations were significantly reduced in groups with early TMR, which is considered to be 6 weeks or under. These results would mirror clinical

applications of limb amputations and the timing of TMR intervention as TMR has been shown to be less effective in chronic amputees. We are moving forward to further increase the cohort sizes to better understand the effects of TMR with increasing delay. Ultimately, the findings of this project will help us to understand the clinical consequences of delayed TMR in chronic amputees.

## **Predictors and Outcomes of Repeated Unplanned Reoperations After Free Tissue Transfer**

Abstract Presenter: Dylan Kim

Abstract Co-Author(s): Christine Rohde MD, MPH, Christina Bear

**Introduction:** Free tissue transfers are often completed in patients with high comorbidities, which carry significant risk for postoperative complications, including one or more reoperations. The prevalence of or factors associated with such repeated operations remain uncharacterized. The objective of this study is to understand the prevalence and timing of these reoperations, as well as quantify demographic and clinical predictors of such outcomes.

**Methods:** The 2013-2022 National Surgical Quality Improvement Program database was queried for free tissue transfer operations based on CPT codes. Records were characterized with demographic, comorbidity, preoperative, and intraoperative variables. The occurrences of one or more unplanned reoperations were characterized by timing after the principal operative procedure and the indication for reoperation. Furthermore, multivariate logistic regression was performed to identify predictors for first and second reoperation ( $p < 0.05$ ).

**Results:** There were 23,889 free tissue transfer patients who met inclusion criteria, and the most common areas of reconstruction were breast (64%) and head/neck (17.5%). 3,040 (12.7%) patients had one unplanned reoperation, 663 (2.7%) had two unplanned reoperations, and 162 (0.7%) had more than two unplanned reoperations. The rate of thirty-day mortality increased from 0.3% in patients with no reoperation to 1.2% in patients with more than two reoperations. For head and neck procedures, thirty-day mortality increased from 1.08% to 2.43% comparing no reoperations to more than two, and breast procedure thirty-day mortality decreased from 0.04% to 0%. Head and neck reconstruction possessed the highest rates of initial reoperation (16.7%) and second reoperation (4.0%). In head and neck procedures, the most common indication for initial

reoperation was vascular repair or reanastomosis (31.2%). In comparison, the most common indication for first reoperation in breast procedures was incision and drainage (37.3%), whereas the most common indication for second reoperation was wound debridement or repair (36.8%). The average time from first to second reoperation was  $6.7 \pm 6.5$  in head/neck and  $6.2 \pm 7.2$  days in breast procedures ( $p=0.48$ ). Overall, patients who experienced two reoperations had a significantly earlier occurrence of initial reoperation on average ( $4.9 \pm 6.1$  days) when compared to those who only experienced one reoperation ( $8.8 \pm 9.1$  days) ( $p<0.001$ ).

The most significant predictors of first reoperation included hypertension, ASA class greater than 2, inpatient setting, smoking history, immunosuppressive therapy, longer operative time, higher body mass index, breast procedure, and longer length of stay ( $p<0.001$ ). The most significant predictors of second reoperation were longer operative time, higher body mass index, and longer length of stay ( $p<0.001$ ). Notably, an initial reoperation for vascular repair or reanastomosis also conferred a higher risk for subsequent reoperation ( $p<0.001$ ).

**Conclusions:** Prevalence of one or more reoperations in free tissue transfer, as well as associated rates of mortality, is significant. In addition to well-characterized factors like comorbidities and perioperative status, specific regions of reconstruction and indications for initial reoperation may indicate a higher risk for subsequent reoperation, informing general postoperative risk assessment. The association of subsequent reoperations with earlier timing for the first reoperation also supports close postoperative monitoring for patients who experience reoperation in the first week after initial surgery.

### **Characterizing Trends in Rate of Lymphedema After Axillary Lymph Node Dissection with and without Immediate Lymphatic Reconstruction**

Abstract Presenter: Andre-Philippe Sam

Abstract Co-Author(s): Kella Vangsness, Michael Chu MD, Alex Wong MD, Mouchammed Agko MD, Jeff Chang MD, Antoine Carre MD

**Introduction:** Axillary lymph node dissection (ALND) is a common procedure used in the treatment of advanced breast cancer that has spread to the regional lymph nodes. One of the untoward and difficult complications of ALND is upper extremity lymphedema (LE). According to the current literature, rates of lymphedema are variable and have been linked to various comorbidities. To address this, Immediate lymphatic reconstruction (ILR) is one of the tools used by reconstructive plastic surgeons at the

same time as ALND to abate the incidence of postoperative LE. In this study, we aim to compare rates of lymphedema in patients undergoing ALND with and without ILR at a single institution.

**Methods:** Patients undergoing ALND at a single institution were reviewed retrospectively. Lymphedema Index (L-Dex) score was used to identify patients with lymphedema. Patient demographics, BMI, comorbidities, lymphedema onset time (days), and number of lymphatic bypasses were noted. Categorical data was analyzed using Pearson's Chi-square test and multivariable logistic regression was performed for factors associated with lymphedema. Odds ratio was used to compare the incidence of LE with and without ILR.

**Results:** In our cohort, 186 patients underwent ALND; 44 (24%) underwent ALND with ILR and 142 (76%) only ALND alone. Out of the patients undergoing ILR, 8 patients (18%) developed LE, compared to 44 patients (31%) without ILR. In patients who developed LE in the ILR group, mean onset of lymphedema was 543 days compared to 389 days in the cohort without ILR. In patients undergoing ILR, the mean number of lymphatic bypasses performed was 3.54. On multivariate analysis, the number of lymph nodes (LN) dissected was found to be a significant predictor for lymphedema in the non-ILR cohort ( $p=.025$ ). In both cohorts, patient age, ethnicity, BMI, and number of bypasses performed were not found to be significant in the incidence of LE. The mean follow-up for each patient undergoing ALND with and without ILR was 3.2 years.

**Conclusion:** In our cohort, we found that immediate lymphatic reconstruction demonstrated a decreased rate of lymphedema in patients undergoing ALND and ILR than ALND alone. In this study, the odds of developing lymphedema in the ILR cohort were 51% less than ALND alone. There was an increased incidence of lymphedema with ALND that contained  $> 19$  LN. In our subgroup analysis, we found ILR to be protective against lymphedema as the patients that did develop LE in the ILR cohort developed LE on average 8 months later than the ALND alone group. Immediate lymphatic reconstruction may be a valuable tool to minimize the incidence of lymphedema and should be considered as an option when treating advanced breast cancer in patients receiving ALND.

## **Comparing the outcomes of Direct versus Indirect Revascularization in Local Flap Reconstruction of the Foot and Ankle**

Abstract Presenter: Rachel Rohrich



Abstract Co-Author(s): Christian Lava, Cameron Akbari, Christopher Attinger MD, Karen Li

**Background:** Revascularization in patients at risk of critical limb ischemia is integral for limb salvage and prevention of future amputation (1). Local flaps of the foot and ankle remains a versatile tool in reconstructive limb salvage for the atraumatic and chronic wound population. In patients with diseased vessels, a debate remains whether local flap success necessitates direct arterial flow to the respective angiosome. Our study aims to compare the outcomes of local flaps who received direct (DR) or indirect (IR) revascularization in a highly comorbid population with advanced arterial disease.

**Methods:** Patients who received endovascular revascularization (ER) prior to local flap reconstruction for chronic wounds in the foot and ankle were retrospectively reviewed. Preoperative angiograms were reviewed to determine the location of ER. Patients were compared by direct revascularization (DR) on the same pedicle used for the local flap, or by indirect revascularization (IR), where ER was performed in a different angiosome than the pedicle used for the local flap. Patient demographics, Charlson Comorbidity Index (CCI), angiographic details, minor complications, major outcomes requiring reoperation, and long-term outcomes were collected.

**Results:** There were a total of 33 patients who received ER in the LE prior to local flap reconstruction, with 57.6% (n=19) receiving DR and 42.4% (n=14) receiving IR. Overall, patients had a mean CCI of 6.7 (SD:1.8), high prevalence of diabetes mellitus (80.4%), peripheral arterial disease (90.9%), and end-stage renal disease (33.3%) with no significant differences between groups. History of vascular bypass was more frequent, but not significant, in the IR group (35.7% vs. 15.8%,  $p=0.238$ ). On preoperative angiogram, abnormalities showed that the IR group had significantly higher proportions of diseased posterior tibial vessels ( $p=0.037$ ) and diseased peroneal vessels ( $p=0.037$ ). There were no significant differences in immediate flap success (DR:100% vs. IR:88.9%,  $p=0.169$ ) or partial flap necrosis between postoperative day zero to 12 (DR:0.0% vs. IR:16.7%,  $p=0.066$ ). Rates of major complications from infection (DR:28.2% vs. IR:22.2%,  $p=0.736$ ), ischemia (DR:4.0% vs. IR:11.1%,  $p=0.562$ ), or dehiscence (DR:8.0% vs. IR:16.7%,  $p=0.634$ ) requiring reoperation were similar between two groups. Overall limb salvage (LS) rate was 70.0%, and comparable between groups (DR:68.0% vs. IR 72.2%,  $p=0.766$ ).

**Conclusion:** DR and IR are viable ways to perfuse the foot and achieve similar rates of limb salvage after local flap reconstruction. There were no significant differences in rates of immediate flap success or major complications between DR and IR groups. However, this patient population represents a highly comorbid population with

ubiquitous histories of diabetes and peripheral vascular disease. A multidisciplinary vasculo-plastic approach should be utilized for these patients preoperatively to optimize bloodflow and postoperatively with close long-term follow-up.

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## **Evaluation of Wound Healing Characteristics Utilizing Dehydrated Human Amnion/Chorion Membrane after Mohs Micrographic Surgical Excision**

Abstract Presenter(s): Thomas Ren

Abstract Co-Author(s): Robert Ruzic, Duc Bui MD, Sami Khan MD

**Introduction:** Conventional healing methods following Mohs surgery such as secondary intention healing and local flap usage can prolong healing times and introduce secondary wounds/scars, respectively. Dehydrated human amnion/chorion membrane allografts such as Epifix (MiMedx, Marietta, GA), have emerged as promising adjuncts in this process by providing scaffolds that mimic the natural architecture of the skin allowing for more uniform re-epithelialization and decreased healing times. This study will evaluate the wound healing characteristics following Epifix usage in post-Mohs surgical wounds.

**Methods:** 46 patients who underwent Mohs surgery had reconstructive procedures utilizing Epifix. A retrospective analysis of demographic information and operative variables including: age, cancer type, smoking history, body mass index, wound location, wound size, wound depth, healing time, number of treatments, graft usage, and graft size.

**Results:** Of the 46 patients, 19 were women and 27 were men. The mean age was 73 years. 9 patients had squamous cell carcinoma and 37 had basal cell carcinoma. The mean wound size was 2.64 cm<sup>2</sup>. The mean number of Epifix treatments was 2.26. 34 of the 46 patients received full thickness skin grafts post treatment. The mean healing time from the date of Mohs surgery was 42 days. Statistical analysis using Fisher's exact test with a  $p < 0.05$ , showed no significant differences regarding healing time when

comparing by wound size, location, and depth. Wounds on the nasal tip had significantly more treatments than other locations.

**Conclusion:** The application of Epifix following Mohs surgery provides favorable healing times when compared to previous methods. Nasal subunits such as the nasal dorsum and alar required significantly less treatments when compared to the nasal tip with no significant differences in wound healing time. Future studies will include larger cohorts with greater variation in wound size, location, and compare aesthetic outcomes of Epifix to other reconstructive methods.

## **Reverse Anterior Component Separation As an Option for Soft-Tissue Reconstruction Following Internal Hemipelvectomy**

Abstract Presenter: Cole Roblee

Abstract Co-Author(s): R. Evey Aslanian, Caitlin Priest MD, Theodore Kung MD, Geoffrey Siegel, Janet Biermann, William Kuzon MD, PhD

**Purpose:** Traditionally, soft tissue reconstruction following internal hemipelvectomy is performed using pedicled contralateral vertical rectus abdominis myocutaneous (VRAM) flap, but this technique has significant donor site morbidity (Proctor et al., 2019). Applied in reverse, the principles of anterior component separation (Ramirez et al., 1990) create sufficient laxity to enable closure without a donor site. Here, we compare outcomes of reverse anterior component separation (RACS) technique with VRAM for soft-tissue reconstruction following internal hemipelvectomy at our institution.

**Methods:** Patients undergoing internal hemipelvectomy and reconstruction with either RACS or VRAM between 1994 and 2024 were identified using EMERSE, a full-text EMR search engine available to researchers at our institution (Hanauer et al. 2015). BMI, Charlson Comorbidity Index (CCI), smoking history, pre-operative oncologic treatment, operative details, complications, length of stay and best postoperative ambulatory status were collected from retrospective chart review and bivariate analysis was performed to compare patients undergoing RACS and VRAM. Fisher's exact testing was used for categorical variables and Wilcoxon rank sum testing was used for continuous variables.

**Results:** A total of 17 were included, of which 7 had reconstruction with RACS and 10 had reconstruction with VRAM. The mean age at surgery was 56.1 (SD 15.6), the mean

BMI was 29 (SD = 6.6) and the mean CCI score was 4.47 (SD = 1.77), none of which varied significantly by type of reconstruction. No patients had a history of smoking. Among patients undergoing RACS, a total of three (42.9%) had any complication, compared with 8 (80%) patients who underwent VRAM, although this difference was not significant ( $p=0.16$ ). One (14.3%) patient who underwent RACS required readmission, compared with 4 (40%) who underwent VRAM, although again this difference was not statistically significant ( $p=0.33$ ). Of patients who underwent RACS, three (42.9%) were able to ambulate without assistance and 4 (57.1%) with assistance, compared with patients who underwent VRAM among whom three (30%) could ambulate without assistance and 7 (70%) could ambulate with assistance ( $p=0.48$ ).

**Conclusion:** RACS enables soft tissue closure following internal hemipelvectomy while minimizing donor site morbidity. Compared with VRAM, RACS had lower complication rates, although these were not statistically significant, likely due to small sample size. Surgeons should recognize reverse anterior component separation as an alternative to VRAM in patients undergoing repair following internal hemipelvectomy.

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## **Sartorius Re-Inset is a Safe Closure Option for Vascular Procedures Involving the Groin**

Abstract Presenter: Matthew McLaughlin

Abstract Co-Author(s): Alap Patel MD, Raymond Yin, Daniel Soroudi, Adam Wallace MD, Solomon Lee MD, Scott Hansen MD

**Purpose:** Open vascular surgery procedures involving the groin carry a high risk of complications that can compromise the vascular graft or repair and the associated extremity. Muscle flaps, including the sartorius muscle flap (SMF), over revascularization sites are known to reduce complications (1). However, little is known about how many times the SMF can be elevated and re-inset safely in patients who undergo repeat procedures in the same groin region.

**Methods:** A retrospective cohort study was performed on all patients who underwent vascular procedures of the groin with SMF plastics closure over a six-year period at a single institution. Surgical cases involving SMF closure were classified according to the number of re-insets involved (primary SMF closure, first SMF re-inset, or second SMF re-inset). A mixed-effects multivariable logistic regression model with a random intercept accounting for clustering by patient was used to evaluate the association between the number of SMF re-insets and all-cause surgical complications. Complications included hematoma, seroma, lymphocele, infection, wound breakdown, flap loss, and unplanned return to the operating room.

**Results:** There were 348 separate vascular procedures involving SMF closure performed on 228 unique patients. Two hundred eighty-two (81%) procedures were primary SMF closures, 60 (17%) were first SMF re-insets, and 6 (1%) were second SMF re-insets. Compared to primary SMF closures, cases involving first SMF re-insets were associated with lower odds of all-cause surgical complications (adjusted odds ratio [aOR] = 0.24, 95% CI = 0.08–0.69,  $p = 0.008$ ). Cases involving second re-insets were not associated with surgical complications when compared to primary SMF closures (aOR = 0.39, 95% CI = 0.03–5.18,  $p = 0.475$ ). Obesity (i.e., BMI > 30) was also independently associated with increased odds of surgical complications (aOR = 3.19, 95% CI = 1.26–8.09,  $p = 0.015$ ).

**Conclusion:** Re-insetting the SMF for closure of vascular procedures of the groin can be performed safely at least once in patients undergoing reoperation in this region. In fact, SMF re-insetting may be a superior option to alternative closure types for repeat groin procedures given its low complication rate. Identification of obesity as a risk factor

for complications may guide pre-operative risk assessment and management strategies in these patients. Future research should investigate whether additional SMF re-insets can be reliably performed to inform surgical decision-making.

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## **Not Just an Aside: A Retrospective Review of Flank Hernia Repair Outcomes**

Abstract Presenter(s): Jane Ewing,

Abstract Co-Author(s): Zachary Gala MD, Jane Ewing, Mehdi Lemdani, Reena Sulkar, Kirin Naidu, Chris Amro MD, Niv Milbar MD, Daniel Mazzaferro, MD, Ayaka N. Deguchi MD, Robyn Broach, John Fischer MD, MPH, Stephen Kovach MD

**Introduction:** Defined in 2009 by the European Hernia Society, flank hernias are a subclass of lateral abdominal wall hernia. Surgery involving the spine, aorta/IVC, retroperitoneum, and organ transplantation can lead to weakening of the lateral abdominal wall and subsequent herniation. Despite the reference to a seemingly generic anatomic location, flank hernias represent a specific subset of hernias that are lateral to the rectus and within three centimeters of the umbilicus, distinct from lumbar, iliac and subcostal defects. Less commonly reported than incisional/midline hernia, outcomes are poorly defined and there exists no consensus abdominal wall closure technique. Herein, we examine flank hernia repair and patient outcomes.

**Methods:** A retrospective review of all ventral hernia repairs between October 2013–August 2022 performed by the senior authors was conducted. Operative reports were used to identify flank hernias. All other ventral hernias were excluded. Demographic, comorbidity, perioperative, and surgical outcome-related information was collected.

**Results:** A total of 39 flank hernias (19 male, 20 female) were included in this study. The average age was 60 years [26 years, 83 years] and average BMI was 31.3. Roughly 33% of the cohort were former smokers (having quit within 30 days), and most patients (56.8%) were classified as ventral hernia wound group (VHWG) 2. Patients had

a mean 2.2 prior abdominal surgeries and 0.79 prior hernia repairs. One patient had prior mesh infection, and four had prior wound infections. There were 23 patients that underwent a concurrent abdominal procedure (59%), and 22 hernia repairs involved lysis of adhesions (considered distinct from concurrent procedures). The average hernia defect size was 219.95 cm<sup>2</sup>. One defect was closed primarily. The remaining 38 repairs incorporated mesh, with plane placements as follows: 15 onlay, four sublay, and 16 underlay. Mesh types included synthetic (19), biosynthetic (16) and biologic (2). Two patients experienced post-operative cellulitis (5.1%), five had a surgical site infection (SSI) (12.8%), and three encountered delayed healing (7.7%). There was a total of 11 recurrences (28.9%), with average time to recurrence of 724 days [203 days, 2022 days]. Mean follow-up was 2.7 years [18 days, 9.5 years].

**Conclusion:** Flank hernias represents a unique and challenging situation for reconstruction. Defect size, location, and proximity of surrounding structures are driving factors in its repair. We describe 39 flank hernia repairs, with an average follow-up of 2.7 years with a recurrence rate of 29%. Recurrence rates described in the literature, though decreased, reflect more ideal patient populations with frequent retromuscular and/or bone-anchored mesh repairs. Although this represents a limited cohort, outcomes analysis of flank hernias are sparse, and future investigations are warranted.

### **Fix to Flap: Does Delaying Soft Tissue Coverage after Internal Fixation in Lower Extremity Open Fractures Increase Infection Rate?**

Abstract Presenter: Stephen Parlamas

Abstract Co-Author(s): Kylie Swiekatowski, Bora Kahramangil MD, Imran Rizvi MD, Mohin Bhadkamkar MD, Yuewei Wu-Fienberg MD

**Purpose:** Delays from presentation to soft tissue coverage within 72 hours in patients with lower extremity open fractures are associated with better outcomes. Orthoplastic teams should know how long flap coverage can be safely delayed from internal fixation, rather than presentation, because these procedures can be coordinated. We compared infection rates of patients with flap coverage delays within 24 hours, 24-72 hours, and over 72 hours of internal fixation.

**Methods:** This is a retrospective cohort study of adult patients in a Level 1 trauma center from 2011 to 2021. Patients sustained lower extremity open fractures and received free or local flaps after internal fixation. Infection rates among patients with

various delays of flap coverage were compared. A multivariate logistic regression model (including patient demographics, flap composition, bone fixation technique, perioperative antibiotic use, the three aforementioned time intervals, the time from presentation to flap coverage, and time from fixation to flap coverage) was created to determine the predictors of wound infections.

**Results:** A total of 274 patients were included, and 76 (27.7%) developed a surgical site infection. The average time between fixation and flap coverage was 84.9 hours in non-infected patients and 106.6 hours in infected patients ( $p=0.074$ ). The infection rates among the time intervals were (23.2%, 25.0%, and 31.5%, respectively;  $p=0.40$ ). A positive correlation was found between the length of delay and infection rate in the multivariate logistic regression. Time from fixation to flap coverage was the only significant predictor of wound infection ( $p=0.04$ ).

**Conclusion:** Time from fixation to flap placement is an effective predictor of infection rate. Although the infection rate of the >72 hours group did not reach significance, we believe a larger cohort would yield statistical significance. Early flap coverage of open fractures is ideal to mitigate infections as indicated by the trend in the data. More studies using fixation as the starting time point are warranted to further establish a "safe" time frame.

### **Risk factors for limb loss following Free tissue transfer in the comorbid population: long term outcomes in 300 patients.**

Abstract Presenter: Karen Li

Abstract Co-Author(s): Christian Lava, Meghan Currin, Cameron Akbari, Christopher Attinger MD, Richard Youn MD, Karen Evans MD, Woori Lee

**Background:** Diabetes and PAD are the top causes of non-traumatic amputation in the US (1). The debate on optimal criteria for limb salvage or amputation persists, especially in complex cases (2). Lower extremity (LE) free tissue transfer (FTT) is an efficacious reconstructive tool aiding successful limb salvage (3). Despite efforts, comorbid patients remain at risk of amputation (2). This study aims to identify amputation risk factors following microsurgical FTT in the nontraumatic chronic wound population.



**Methods:** A single-institution, retrospective review of LE FTT patients (June 2011 to December 2023) collected demographics, medical history, Charlson Comorbidity Index (CCI), preoperative laboratory testing, preoperative angiogram details, microsurgical details, complications, and long-term outcomes. Patients who progressed to amputation (AMP) were compared to patients with successful limb salvage (LS). Variables conferring future amputation risk were examined using univariate logistic regression.

**Results:** 300 LE FTT patients had a 12.7% (n=38/300) amputation rate at a median of 168 (IQR:220) days. Of the 38 amputations, 63% were attributed to infection, 13% to flap failure, 11% to critical limb ischemia, 3% to hematoma, and 11% to other causes.

In comparison to the LS cohort, patients in the AMP cohort had significantly higher CCI (4 vs. 5,  $p=0.0375$ ), Longer length of stay (25 vs. 34.5 days,  $p=0.0001$ ), and longer postoperative length of stay (14 vs. 17 days,  $p=0.0055$ ). The pre-operative vascular status revealed no significant differences in vessel runoffs between the AMP and LS cohorts and rates of pre-LE FTT vascular interventions were comparable (AMP = 23.7% vs. LS=17.9%,  $p=0.396$ ). Patients in the AMP cohort had significantly higher rates of wounds in the hindfoot (36.8% vs. 19.5%,  $p=0.015$ ) and plantar foot (34.2% vs. 17.2%,  $p=0.013$ ). Postoperative complications were markedly higher for the AMP group (57.9% vs. 24.1%,  $p=0.000$ ), including delayed complications like dehiscence (OR: 2.560,  $p=0.019$ ), infection (OR: 4.875,  $p=0.000$ ), and recurrence of osteomyelitis (OR: 8.600,  $p=0.000$ ) prior to amputation.

On univariate analysis, risk factors for amputation included diabetes (OR: 3.582, CI:1.582-8.106), neuropathy (OR: 3.649, CI:1.728-7.703), CKD (OR: 1.867, CI:1.276-2.731), higher CCI (OR: 1.157, CI: 1.003-1.334), ESRD (OR: 5.271, CI:1.761-15.779), hindfoot defects (OR: 2.413, CI:1.167 - 4.991), plantar foot defects (OR: 2.507, CI: 1.193-5.272), history of Charcot arthropathy (OR: 4.207, CI: 1.731-10.223), and elevated a1c levels (OR: 1.203, CI:1.061-1.365). On multivariate logistic regression, history of Charcot arthropathy remained a significant risk predictor of amputation (OR:3.2, CI:1.2-8.3).

**Conclusion:** Multiple risk factors for amputation following LE FTT patients with non-traumatic chronic wounds were identified. This study informs optimal treatment strategies, potentially enhancing overall management in complex limb salvage decisions.

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## **Antibiotics and Surgical Site Infection in Expander based breast Reconstruction Trial (ASSERT)**

Abstract Presenter: Christine Rohde MD, MPH

Abstract Co-Author(s): Surinder Kaur PhD, Kristen Broderick MD, Adeyiza Momoh MD, Brett Phillips MD, MBA, Graham Schwarz MD, Summer Hanson MD, PhD, Katie Sommers MPH, Cheng-Shiun Leu PhD, Brian Gastman MD

This study was conducted by the ASSERT Group

**Purpose:** The clinical practice of prescribing postoperative prophylactic antibiotics following postmastectomy breast reconstruction with tissue expanders ranges widely from none to 7 days of postoperative antibiotics, to antibiotics until the drains are removed. The Centers for Disease Control and Prevention (CDC) recommends a single preoperative antibiotic dose for clean and clean-contaminated procedures, even in the presence of a drain<sup>1</sup>. Definitive studies to determine an optimal therapeutic strategy to prevent surgical site infection (SSI) in implant-based plastic surgical procedures are lacking. The goal of this multi-institutional, prospective, randomized control trial is to determine whether the CDC recommended single preoperative dose (SPD) of antibiotics is not inferior to one week of postoperative (WPO) prophylactic antibiotics in preventing SSI in Tissue Expander based Immediate Breast Reconstruction (TE-IBR) following mastectomy.

**Methods:** 499 women, 18 years old or older, undergoing TE-IBR were screened and 235 were enrolled across five participating centers after central IRB approval. Following enrollment, subjects were randomized to SPD or WPO groups using permuted block randomization stratified by site to ensure balance on treatment allocation within each site. The WPO group received a single preoperative dose of IV antibiotic with additional

intraoperative doses as recommended based on operative time, plus seven days of postoperative antibiotics. SPD Group received a single preoperative dose of IV antibiotic only (CDC recommendation), with any intraoperative doses based on operative time. The other operative details proceeded according to the surgeon's standard procedure. Data was collected using a standard case report form into a central study database set up by The Plastic Surgery Foundation. The patients were followed until TE removal either for infection or exchange or until study end. The primary outcome of interest was SSI by CDC guidelines within 30 days of surgery. The study used non-inferiority trial design to examine whether the test product (SPD) is not worse than the comparator (WPO) by more than a non-inferiority margin of 6% set for this study.

**Results:** Data from 102 patients randomized to SPD arm and 112 to the WPO arm were used for analysis. 21 patients were withdrawn (18 had change in surgery and no TE placement, 2 withdrew consent, 1 withdrawn by provider). The SSI rate in SPD arm was 17% as compared to 11% for the WPO arm, which is within the non-inferiority margin set for this study but not significant ( $p=0.496$ ). The rate of TE removal for infection within 30 days of surgery was 6% in SPD arm as compared to 2% in WPO arm. Hospitalization rate (9% in SPD vs 6% in WPO) and Return to OR rate (11% in SPD vs 10% in WPO arm) within 30 days of surgery were also comparable within the two groups.

**Conclusions:** The two groups have comparable hospital readmission and premature expander removal rates due to SSI. The SSI rate within 30 days of surgery did not differ by more than the non-inferiority margin of 6%. While the findings from this multi-institutional randomized control trial did not demonstrate that a single preoperative dose of antibiotics is not inferior to a 7-day postoperative antibiotic regimen in preventing SSI in TE-IBR, there was also no evidence to support the 7-day regimen was significantly better.

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The ASSERT trial was supported by The Plastic Surgery Foundation.

## **An Evaluation of Load Placement Location on 3D Printed L-Strut Implants in Complex Septoplasty through Finite Element Analysis**

Abstract Presenter: Iulianna Taritsa

Abstract Co-Author(s): Sujata Syamal, Angelica Hernandez MD, Jose Foppiani Mudr., Kirsten Schuster MD, JD, Dr. Samuel Lin MD

**Introduction:** Repairing nasoseptal asymmetry and deviation in rhinoplasty involves implanting autologous nasal septal cartilage grafts. Patients with severe septal deformations may present challenges of limited septal cartilage available for repair. Utilizing 3D printed L-strut implants to replace septal cartilage may enhance current surgical approaches, but their mechanical strength is understudied. Silk-Fibroin Gelatin (SFG) has known biocompatibility and mechanical behavior that mimics cartilage tissue. Using Finite Element Analysis (FEA) models, we compared the mechanical behavior of 3D printed SFG to septal cartilage under two loading conditions to evaluate its potential for septal cartilage replacement.

**Methods:** The FEA model applied a 0.1 N loading force at the nasal tip (given the septum's role in tip projection and a region subject to forces exerted during physical exams) or the "keystone" region (an area critical for dorsum support). Analyses included deformation, stress, and strain energy (energy required to restore the original shape when load is removed).

**Results:** All models had a maximum deformation located at the nasal tip and maximum stress at bony-chondral junctions. SFG exhibited lower deformation and strain energy than septal cartilage. All stress magnitudes were lower than individual material yield stresses indicating they likely undergo reversible deformation.

**Conclusion:** Our results suggest that 3D printed SFG implants potentially exhibit similar mechanical response to septal cartilage while undergoing loads at the "keystone" and nasal tip. These results are promising and drive future work using FEA to further evaluate 3D printed septal implant structure and suitability for use as septal cartilage replacement in complex septoplasty.

## Hidradenitis Suppurativa: Is It Worth The Risk To Close?

Abstract Presenter: Joshua Rayham MPH

Abstract Co-Author(s): Deangelo Ferguson MD, Herman Houin MD, Kenneth Moquin MD, Aamir Siddiqui MD

**Introduction:** Hidradenitis Suppurativa (HS) is a chronic, debilitating inflammatory skin disorder that primarily affects the apocrine gland bearing areas of the body (1). It is characterized by recurrent painful nodules, abscesses, sinus tracts and scarring that negatively impacts a patient's physical health and impairs their quality of life (QoL) (2). Surgical intervention is warranted for complicated and advanced stage disease when medical treatments have failed. We hypothesize that completely excising HS lesions with primary closure of defects that are amenable to closure would significantly improve patient's QoL and overall function, even in the setting of high risk for dehiscence.

**Methods:** We conducted a retrospective cohort study of 84 patients diagnosed with HS undergoing surgical excision of axillary disease at a single institution. The study evaluated healing outcomes, physical limitations and QoL improvements. Patients completed pre- and post-surgery Disabilities of the arm, shoulder and hand (DASH) and Short Form-36 Health Survey (SF-36) assessments. Shoulder range of motion (ROM) measurements (flexion/abduction) were recorded pre-surgery, at 3 months and 1-year post-surgery by a physical therapist. Weeks to heal (WTH), wound dehiscence and return-to-work (RTW) status were collected.

**Results:** 84 patients in total with 147 axillary excisional sites. Of the 147 sites, 122 were closed primarily of which 73 (60%) remained closed (closed/closed) and 49 (40%) experienced wound dehiscence (closed/dehiscd). None of the closed\dehiscd patients were offered further surgery. All were instructed to allow the wounds to heal in with local wound care. 25 sites were left open to heal by secondary intention (open). The patients within the closed/closed cohort showed statistically significant differences in all parameters, WTH (4.4 vs 16.3,  $p<0.001$ ), RTW (6.3 vs 18.7,  $p<0.001$ ), DASH (25.8 vs 38.4,  $p<0.001$ ), SF-36 (27 vs 35.2,  $p=0.046$ ), abduction ( $114.1^{\circ}$  vs  $100.2^{\circ}$   $p=0.001$ ) and flexion ( $131.7^{\circ}$  vs  $113.5^{\circ}$ ,  $p<0.001$ ) when compared to open. Patients within the closed/dehiscd cohort also showed statistically significant differences in RTW (7.4 vs 18.7,  $p<0.001$ ) and abduction ( $111.4^{\circ}$  vs  $100.2^{\circ}$ ,  $p=0.008$ ) when compared to the open cohort. When comparing closed/dehiscd to closed/closed there was no statistically significant difference in abduction ( $111.4^{\circ}$  vs  $114.1^{\circ}$   $p=0.713$ ), RTW (7.4 vs 6.2,  $p=0.711$ ) or SF-36 (27.3 vs 27,  $p=1.0$ ).

**Conclusion:** Surgical excision is integral in the management of recalcitrant HS. In the axilla, these incisions can have a high dehiscence rate (40%) due to risk of infection, tension, moisture, intertrigo. Despite the dehiscence, many patients treated with excision and surgical repair experienced improved QoL, ROM, healing and expedited RTW. In most cases, dehiscence represents partial or subtotal opening of the wound, so the openings are smaller than surgical sites left open to heal secondarily. With the disease foci eliminated, patients are able to resume more normal activities in a timelier manner when compared to wounds left open to heal secondarily.

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## **Does Length of Stay Impact Patient-Reported Outcomes Measures in Non-Traumatic Limb Salvage Patients Undergoing Free Flaps?**

Abstract Presenter: Christian Lava

Abstract Co-Author(s): Karen Li, Rachel Rohrich, Woori Lee, Jie Jung Shih, Richard Youn MD, Christopher Attinger MD, Karen Evans MD

**Background:** The management of non-traumatic lower extremity (LE) limb salvage patients undergoing free tissue transfer (FTT) is complex and necessitates a multidisciplinary approach. The duration of hospitalization may reflect the surgical complexity, complications, and patient care burden, potentially influencing their recovery. However, its impact on patient-reported outcome measures (PROMs)-key to evaluating functionality, satisfaction, and quality-of-life (QoL)-remains understudied. This study aims to investigate the influence of length of stay (LOS) on PROMs in limb salvage patients undergoing FTT procedures.

**Methods:** A single-center cross-sectional study was conducted, including patients who underwent FTT, with a postoperative visit between June 2022 and January 2024. Length of stay (LOS) was categorized as hospital (i.e., difference between admission and discharge dates) and postoperative (i.e., difference between date of surgery and

discharge dates). The 12-Item Short Survey (SF-12; QoL), PROM Information System Pain Intensity (PROMIS-3a; pain), and Lower Extremity Functional Scale (LEFS; ambulatory function) were completed at multiple time points: 1-month, 3-months, 6-months, 1-year, 3-years, and 5-years postoperatively. Patient demographics, comorbidities, preoperative characteristics, and amputation details were collected.

**Results:** A total of 41 patients underwent FTT, totaling 86 survey sets. Median postoperative duration of survey completion was 6.4 (interquartile range [IQR]: 2.4-25.5) months. The majority were male (n=33, 74%). Mean age and body mass index were 60.2±14.0 years and 29.9.9±5.7 kg/m<sup>2</sup>, respectively. Mean Charlson Comorbidity Index (CCI) was 4.1±2.7. Comorbidities included diabetes mellitus (n=23, 56.1%), peripheral vascular disease (n=21, 41%), and chronic kidney disease (n=6, 14.6%). Mean hospital and postoperative LOS were 28.5±12.2 and 14.6±7.2 days, respectively. Patients with a longer postoperative LOS showed reduced ambulatory function (r=-0.247; p=0.048), although this was not observed with hospital LOS (r=0.1566, p=0.609). Both hospital and postoperative LOS were associated with increased pain postoperatively (r=-0.390, p=0.002 and r=-0.332, p=0.007, respectively). QoL did not show significant differences based on either hospital LOS (r=0.1566, p=0.609) or postoperative LOS (r=-0.075; p=0.808).

**Conclusion:** This study demonstrates that LOS following FTT procedures significantly influences PROMs, including ambulatory function and pain intensity, which may be multifactorial. Collecting PROMs over time with larger sample sizes is critical for enhancing our understanding of patient experiences in the face of limb loss.

## **The Modified Frailty Index (mFI-5) Predicts Adverse Outcomes Following Ventral Hernia Repair with Components Separation in a National Database**

Abstract Presenter: Allison Diaz

Abstract Co-Author(s): Wen-Yu Lee, Cheongeun Oh, Laura Kimberly

**Background:** Approximately 400,000 ventral hernia repairs (VHR) are performed annually in the US and complex abdominal wall reconstruction is often required for advanced repair (1). Experienced plastic surgeons may perform components separation technique, which is reserved for large and complex hernias. Associated costs of VHR approach 3.4 billion, with emergency repairs and other postoperative complications comprising a considerable proportion of costs (2). As hernia reoccurrence rate has been

shown to increase with each subsequent reoperation and been associated with postoperative complications (3,4), it is crucial to perform effective preoperative risk assessment. Frailty measures have demonstrated increased predictive capability for various surgical complications as compared to historical surgical risk proxies including age, BMI, and other single comorbidities (5). The 5-factor modified Frailty Index (mFI-5) is a patient-specific measure based on existence of diabetes, congestive heart failure, chronic obstructive pulmonary disease, hypertension requiring medications, and functional health status. The purpose of this study was to examine the association between the mFI-5 and various postoperative complications following ventral hernia repair in patients who received component separation technique as reported in the National Surgical Quality Improvement Program (NSQIP) database.

**Methods:** A retrospective review of the NSQIP database from 2015 to 2020 was performed for patients who underwent VHR with components separation technique. Descriptive analyses of demographics, comorbidities, ASA Class, mFI-5 score, complications, and incisional/ventral hernia repair were performed. Frailty scores were calculated for each patient, a score of 1 was considered mild frailty and  $\geq 2$  was considered severe frailty. Multivariable regression was performed for frailty, age, BMI, smoking status, chronic steroid use, sex, ASA class, and hernia characteristics to determine relationship to all-cause 30-day complications, surgical site complications, length of stay, readmission and reoperation. All statistical analyses were performed using R software, and  $P < 0.05$  was considered statistically significant.

**Results:** A total of 14,575 patients were identified. Mild frailty was a significant predictor of all-cause complications (OR 1.22, 95% CI 1.11–1.34), readmission (OR 1.20, 95% CI 1.06 – 1.37) and length of stay (OR 1.04, 95% CI 1.01–1.07) ( $p < 0.05$ ). Severe frailty was a significant predictor of all-cause complications (OR 1.50, 95% CI 1.34–1.68), readmission (OR 1.37, 95% CI 1.17–1.59) length of stay (OR 1.14, 95% CI 1.10–1.19) and reoperation (OR 1.24, 95% CI 1.01–1.52). Age was only a positive predictor for length of stay (OR 1.27, 95% CI 1.18 – 1.36) ( $p < 0.05$ ). Smoking status and ASA class of 4 were predictive of all outcomes. Of hernia characteristics, mesh use was found to be protective for all outcomes. Elevated BMI was predictive of surgical site complications and reoperation. Chronic steroid use was predictive of length of stay.

**Conclusion:** Frailty, as measured by the mFI-5 index, has predictive capacity for many postoperative complications for VHR with component separation technique. Given the high comorbidity prevalence and complication rate in patients receiving components separation for ventral hernia repairs, there is a role for preoperative frailty assessment in risk stratification and optimizing safe patient outcomes.



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## Do Not Put Burn Education on the Back Burner: A Retrospective Analysis and National Survey on Plastic Surgery in Surgical Burn Care

Abstract Presenter: Sumaarg Pandya

Abstract Co-Author(s): Christopher Fedor, Hilary Liu, Mario Alessandri Bonetti MD, Tiffany Jeong, Jose Antonio Arellano MD, Kevin Li, Francesco Egro MD, Msc, MRCS

**INTRODUCTION:** Burns injuries represent a leading cause of mortality and morbidity in the United States (1). Serious injuries are surgically managed by burn surgeons trained in plastic or general surgery. However, due to the Accreditation Council for Graduate Medical Education (ACGME)'s recent elimination of the burn surgery requirement for general surgery training, the role of plastic surgery in burn surgery care has become increasingly important (2). This study aims to quantitatively investigate the current role of plastic surgery in burn care at a single academic institution with an affiliated ABA-verified Burn Center and capture the exposure medical students receive on burn training.

**METHODS:** A retrospective cohort study was performed of burn patients admitted to UPMC Mercy, the only comprehensive ABA-verified Burn Center and Level I Trauma Center in Western PA, from January 2012 to December 2022. Data from all patients admitted for burn injuries was obtained from a prospectively maintained internal database.

A survey was also distributed to over 200 AAMC medical student representatives. Participants were asked about their education related to burns, including the timing and settings of burn education, topics covered, and perceived level of preparedness for managing burn injuries. Data was collected anonymously and analyzed using descriptive statistics.

**RESULTS:** 3843 patients were admitted for burn injuries, with 39.3% (n=1509) requiring surgery. Plastic surgeons were consulted for 17.5% (n=264) of these patients, performing a total of 658 procedures. Burn patients operated on by plastic surgeons received an average of  $2.49 \pm 2.02$  procedures. Most of the procedures performed by plastic surgeons involved severe and deep burns or anatomically challenging areas, such as the hand (n=362; 55.0%) and head/neck (n=165; 25.1%). These procedures involved acute coverage of complex burn injuries or delayed reconstruction of postburn deficits, such as scar contracture.

Survey results demonstrated that 63% of respondents received education on burns during their medical school tenure. The primary mode of instruction was through lectures (60%), followed by interest groups (40%). Topics on burn depth and total body surface area were universally covered. However, only 38% of students reported feeling satisfied regarding preparedness for managing burn injuries, and 20% learned about referral guidelines.

**CONCLUSIONS:** Plastic surgeons play a crucial role in the acute and reconstructive care of burn patients, often performing multiple procedures with injuries to anatomically complex areas. Since burn training is no longer required for general surgery residency, plastic surgeons are uniquely positioned to fill the ongoing shortage of burn specialists. Otherwise, we anticipate a significant decrease in access to quality burn care.

The survey results demonstrate that plastic surgery emerged as the predominant specialty associated with burn education. Previous studies underscore the significance of mentorship and educational exposure in shaping students' career preferences (3, 4), emphasizing its importance in cultivating the future generation of surgeons committed to the field of burn surgery.

This study aims to encourage burn education within training curricula. Increasing plastic surgery representation in burn surgery would leverage their highly specialized skillset in wound healing and reconstructive surgery, ultimately improving burn patient outcomes.

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## Predictive Value of Intraoperative Pulmonary Function Tests for Postoperative Pulmonary Complications in Abdominal Wall Reconstruction

Abstract Presenter: Madeline Bald

Abstract Co-Author(s): Grant Wagner, Ann Carol Braswell, Fabiola Aguilera Galviz MD, Jorge De La Torre MD, MSHQS, FACS

**Background:** Patients undergoing abdominal wall reconstruction (AWR) have an increased risk of respiratory compromise. Studies have evaluated the impact of AWR on pulmonary function tests (PFTs); however, the prognostic utility of intraoperative PFTs for predicting complications following AWR remains uncertain (1-3). This study aims to investigate the association between intraoperative PFT values, particularly peak inspiratory pressure (PIP), and postoperative pulmonary complications in patients undergoing AWR.

**Methods:** An IRB approved single-institution retrospective review was performed of patients undergoing AWR for ventral hernia repair between January 2017 to September

2022. Demographics, including age, gender, smoking history, and history of COPD or emphysema were noted. Clinical characteristics, intraoperative PFTs including PIP and tidal volume (TV), and postoperative respiratory complications were recorded. Major complications were defined as requiring mechanical ventilation or BiPAP. Minor complications were defined either as the use of antibiotics, supplemental oxygen, nebulizer, anti-tussitives, or a complication that resolved without requiring treatment. Univariate and multivariate analyses were used to predict postoperative pulmonary complications.

**Results:** The cohort included 168 patients (118 women, 50 men) with a mean age of 55 years and mean BMI of 33. The mean TV was 415mL and the mean PIP was 19.44cmH<sub>2</sub>O. 52 patients (30.95%) experienced respiratory complications postoperatively with 10 patients (5.95%) experiencing major complications. The two most common major complications noted were acute respiratory distress syndrome and severe dyspnea. The average amount of time from the day of surgery to complications overall to present was 3.45 days. Increasing TV was not found to be significantly associated with major or minor postoperative respiratory complications. Increasing PIP was significantly associated with both major and minor postoperative respiratory complications after adjusting for age, smoking, and history of COPD or emphysema ( $p < 0.001$ ). In those who developed postoperative respiratory complications, the mean PIP was 21.65cmH<sub>2</sub>O versus a mean of 18.55cmH<sub>2</sub>O in those who did not develop complications ( $p < 0.001$ ).

**Conclusion:** Intraoperative elevations in PIP are associated with increased susceptibility to major and minor pulmonary complications following AWR independent of relevant patient risk factors. These findings hold potential significance in guiding postoperative care strategies for patients undergoing AWR.

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## **The Staple Single-Incision Retrorectus Surgery for Ventral Hernia Repair: Results from a Single Institution**

Abstract Presenter: Devi Lakhiani

Abstract Co-Author(s): Thomas Johnstone, Katrina Thede MD, Cory Banaschak DO, Rahim Nazerali MD, Paul Szotek MD

**Introduction:** Ventral Hernia (VH) repair poses many challenges. Consensus holds that minimally invasive techniques reduce the incidence of infection from open VH repair. Additionally, strong evidence suggests that placing the reinforcing mesh in the retrorectus (i.e., sublay) plane optimizes outcomes. However, both dissection of the retrorectus plane and the consolidation of the posterior rectus fascia can be technically challenging. To reach ideal repair, we describe a novel, minimally invasive technique for VH repair, the staple single incision retrorectus surgery (sSIRRS).

**Methods:** Between September 2018 and May 2021, a retrospective review identified 30 patients with VH that underwent repair by sSIRRS. Data about patient demographics, comorbidities, hernia characteristics, operative details, and postoperative outcomes were recorded.

**Surgical Technique:** A small, 3-4cm incision is created directly over the hernia. Dissection exposes the defect and the anterior rectus fascia. The hernia is reduced. The retrorectus space is then entered in a cephalad direction on either side of the linea alba. Dissection is continued to create enough space on either side of the linea alba to insert a laparoscopic articulating powered stapler. Caudad dissection can also be undertaken to provide complete dissection from sternum to pubis. The tissues are compressed, and the stapler is fired. This creates an anterior and posterior staple line while plicating any diastasis recti and expanding the retrorectus space. A small amount of manual dissection is required beyond the staple line to allow placement of the jaws. With completion of the retrorectus space dissection, a reinforced biologic tissue matrix or synthetic mesh can be placed. Prior to placing the mesh reinforcement in the retrorectus space, the posterior fascial defect is closed with a running 2-0 PDS suture. The space is measured, and the mesh is cut to size. To anchor the mesh, 18" 0 barbed suture is

placed at the apex of the cephalad and caudad staple line. The mesh is then cabled into position.

**Results:** Of the 30 patients, the average age was 57.5 years. Two patients had diabetes, fourteen had hypertension, and four were smokers. Average BMI was 31.3 kg/m<sup>2</sup>. Hernia recurrence was the primary indication for surgery for twenty patients. 63% of patients were discharged upon completion of the operation. One patient on anticoagulation, which was held perioperatively, had a postoperative hematoma, resolving without any intervention. No other complications were observed during the 90-day postoperative period. No patients had hernia recurrences with a follow-up time of 45.9 months (range: 23.3-55.5).

**Conclusions:** The sSIRRS technique allows minimally invasive repair of VHs. VHs repaired with this approach have had no recurrences and minimal complications at long-term follow up. Compared to other approaches (e.g. MILOS, eTEP), the sSIRRS technique had a reduced length of stay. This technique approaches ideal repair in a time of increasing ventral hernia burdens in an aging population.

## **Surgical Site Infection Rate and Antibiotic Trends in Irradiated Implant-Based Breast Reconstruction**

Abstract Presenter: Grace Anne Longfellow

Abstract Co-Author(s): William DeBrock MD, Pragna Shetty MD, Jessica Biagiotti MD, Annie Bright, Jennifer Carr MD

**Background:** Up to 75% of women undergoing breast reconstruction after mastectomy choose implant-based breast reconstruction (IBBR). Surgical site infection (SSI) can lead to reconstruction failure. This may also lead to oncologic treatment delays. Although most literature demonstrates approximately a 10% SSI rate with IBBR, there are reports of rates as high as 30-50%. However, there is scant data on SSI rates in patients receiving postmastectomy radiation therapy (PMRT) who undergo IBBR. Furthermore, there is no consensus on postoperative antibiotic protocols for this population. This study aims to evaluate SSI rate among IBBR patients who receive PMRT as well as evaluate postoperative antibiotic regimens used in this population.

**Methods:** A retrospective, single institution study was performed. All adult female patients who underwent IBBR between June 2020 and July 2023 were included.

Patients who received autologous surgery during any part of reconstruction were excluded. Complications, including SSI and reconstruction failure, were collected. Postoperative prophylactic antibiotic regimens used after implant or tissue expander (TE) device placement were analyzed.

**Results:** Our cohort included 301 patients. The median age was 48 years (IQR 41 – 56). Thirty percent of patients included underwent PMRT (N=91). There was no difference in the rate of SSI after TE placement in patients who eventually underwent PMRT and patients who did not undergo PMRT (11% versus 10.9%,  $p = 0.57$ ). Additionally, PMRT was not associated with a significantly higher rate of SSI (18.5%) following TE to implant exchange versus non-radiated patients (12.9%,  $p = 0.31$ ). Duration of prophylactic postoperative antibiotic therapy after implant exchange was not associated with an increased risk of SSI or implant loss ( $p = 0.62$  and  $p = 0.15$ , respectively).

**Conclusions:** PMRT was not associated with significantly higher risk of SSI after TE to implant exchange in the setting of postoperative antibiotic prophylaxis. Postoperative prophylactic antibiotic duration did not significantly impact the risk of SSI or implant loss in patients. With increased efforts to promote antibiotic stewardship, further studies are needed to evaluate antibiotic use in patients undergoing PMRT and IBBR to improve evidence-based practices.

## **Venous Thromboembolism Chemoprophylaxis in Burn Patients**

Abstract Presenter: Eloise Stanton MD

Abstract Co-Author(s): Artur Manasyan, Haig Yenikomshian MD, T. Justin Gillenwater MD

**Introduction:** Venous thromboembolism (VTE) is extensively studied in trauma patients, but burn patients require special consideration due to their unique pathophysiology and management strategies. Currently, there are no specific prophylaxis recommendations to help mitigate VTE in burn patients.

**Methods:** The US National Trauma Data Bank (NTDB) was analyzed to identify patients with burn encounters from 2017-2021 using ICD-10 event codes. Our primary outcome measure was incidence of VTE, which included deep venous thrombosis and pulmonary embolism. Secondary outcome measures included need for blood transfusion and need to return to the operating room due to hemorrhage from skin/soft

tissues/extremities. Multivariable regressions were conducted to evaluate the relationship between various VTE chemoprophylaxis types, timing of VTE prophylaxis, and VTE incidence while controlling for age, sex, %TBSA and inhalation injury.

**Results:** A total of 326,614 patients with burn injuries were identified in the NTDB during the study period, of whom 5,604 (1.7%) had a VTE event during their hospital admission. The majority of patients did not receive VTE chemoprophylaxis (54.1%). Of those that did, the most commonly used VTE chemoprophylaxis drug was low molecular weight heparin (LMWH) (37.9%), followed by unfractionated heparin (UH) (4.1%). Chi-squared analysis found that LMWH was significantly less associated with VTE incidence compared with UH. However, when controlling for age, sex, inhalation injury, and %TBSA, there were no differences among chemoprophylaxis type and incidence of VTE. Longer time to VTE chemoprophylaxis was significantly associated with increased odds of VTE when controlling for the same covariates (OR=1.04 95% CI 1.03=1.07,  $p<.001$ ). Neither VTE prophylaxis type nor timing of VTE prophylaxis administration was significantly associated with an increased need for blood transfusion. Heparin was the only VTE prophylaxis type significantly associated with increased odds of returning to the OR for a bleeding-related complication ( $p<.001$ ).

**Conclusions:** A majority of burn patients in the NTDB did not receive VTE chemoprophylaxis. In patients who did get chemoprophylaxis, unfractionated heparin may be associated with a higher rate of VTE and surgical bleeding complications when compared with LMWH. Delayed initiation of VTE prophylaxis correlates with a higher likelihood of VTE occurrence. Developing specialized VTE prevention guidelines for this population can enhance their care and outcomes.

## **Safety and Efficacy of Lower Extremity Reconstruction In Patients with Stimulant Use Disorder**

Abstract Presenter: Erin Ross

Abstract Co-Author(s): Christopher Pham MD, Idean Roohani, Joseph Carey MD, T. Justin Gillenwater MD, Haig Yenikomshian MD

**Purpose:** The physiologic and psychosocial effects of stimulants use have potential to negatively impact surgical outcomes. Stimulants, such as cocaine and amphetamines, cause endothelial dysfunction and vasospasm, which can predispose these patients to peri- and post-operative complications.(1, 2) In addition, stimulant use can also result in



behavioral complications such as loss of follow-up or noncompliance.(3) In this study, we evaluate the effects of stimulant use on surgical complications and ambulatory status following flap-based lower extremity reconstruction.

**Materials & Methods:** Patients undergoing free or local flap to the lower extremity from June 2007 to January 2022 were eligible for inclusion. Stimulant use was defined as positive urine toxicology on admission or self-report of recent regular stimulant use. Stimulant non-use was defined as negative urine toxicology and self-reported lack of stimulant use. Patients with a history of stimulant use with unclear chronicity of use were excluded. The association of stimulant use with 1) flap complications (partial or full flap loss, revision or amputation) and 2) ambulatory status (full vs wheelchair or assistive device) at last follow up were assessed first by Chi-square test, then by multiple logistic regression while adjusting for age, BMI, race/ethnicity, and smoking status.

**Results:** Among 326 patients with flaps to the lower extremity from 2007 to 2023, 111 patients had sufficient data to determine stimulant use status; 49 stimulant users and 62 stimulant non-users were identified. 45 patients underwent free flaps and 66 underwent local flaps, with a trend toward more free flaps in stimulant users (51% vs 32%,  $p=0.07$ ). Most flaps were performed for trauma for stimulant users and non-users alike (96% vs 91%,  $p=0.46$ ). Flap complications rates were similar for stimulant users and non-users (20% vs 17%,  $p=0.91$ ), and there remained no relationship after adjusting for potential confounders (OR 1.03,  $p=0.96$ ). Duration of follow-up did not differ by stimulant use status (median 3.8 vs 3.2 months,  $p=0.73$ ), with return to full ambulatory status also not associated with stimulant use (44% vs 41%,  $p=0.92$ ). After adjusting for potential confounding factors, stimulant use remained unassociated with return to full ambulation (OR 0.73,  $p=0.47$ ); only age was associated with return to full ambulatory status (OR 0.97,  $p=0.03$ ).

**Conclusions:** These findings are reassuring that it is safe to perform flap-based lower extremity reconstruction in active stimulant users. With adequate adherence to follow-up, stimulant users can have favorable lower extremity reconstruction outcomes.

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## **Prospective Comparison of Elective Revision Procedures after Subpectoral and Prepectoral Two-stage Implant-based Breast Reconstruction**

Abstract Presenter: Anissa Saylany

Abstract Co-Author(s): Prima Prajapati, Andrew Malek, Goutam Gadiraju, Matthew Prospero, Tanujit Dey PhD, Andrea Pusic MD, MHS, FACS, FRCSC, Manraj Kaur PhD, Justin Broyles MD

**Introduction:** As mastectomy rates rise with advances in cancer screening and diagnosis, more patients are pursuing post-mastectomy implant-based reconstruction (IBR), the majority of which are performed in a two-stage manner. IBR traditionally involves implant placement in the subpectoral plane; however, emerging evidence suggesting prepectoral IBR may superior patient outcomes. Following IBR, patients may opt to pursue revision procedures to optimize comfort or cosmesis. Revision procedures increase total costs, resource utilization, and risks of undergoing breast reconstruction and should be considered in patient and provider decision-making. This study aims to compare rates of revision procedures between patients who underwent subpectoral and prepectoral two-stage IBR up to 12 months post-operation.

**Methods:** Patients at a single institution from November 2021 to December 2023 were identified pre-operatively and recruited for enrollment. females who were at least 18 years old undergoing skin or nipple sparing mastectomy with two-stage IBR using acellular dermal matrix were included. Exclusion criteria for analysis was being less than 12 months after index surgery. Additional revision procedures including fat grafting, implant exchange, removal of implants, conversion to autologous reconstruction, capsular revision, and skin excision, were monitored for enrolled patients up to 12 months post-initial operation. Chart review was performed to gather demographic and clinical variables. Statistical analysis including chi-square test, Fisher's exact test, and multivariate regression with covariates of surgical plane, age, race, BMI, diabetes, treatment laterality (unilateral vs. bilateral), chemotherapy, and lymph node procedure

(sentinel lymph node biopsy or axillary lymph node dissection) was performed to compare the prepectoral and subpectoral cohorts. Statistical significance was set at 0.05.

**Results:** A total of 48 subpectoral patients (80 breasts) and 91 prepectoral patients (166 breasts) were enrolled. In total, 3 (6.3%) subpectoral and 16 (18%) prepectoral patients underwent at least 1 additional revision procedure ( $p=0.064$ ), trending toward more revisions for prepectoral patients. Multivariate regression found that neither surgical plane (subpectoral vs. prepectoral OR 0.39, 95 percent CI 0.08, 1.42,  $p=0.2$ ) nor any other covariates were associated with greater odds of a patient undergoing an additional revision procedure ( $p>0.05$ ).

At the breast level, 5 (6%) subpectoral and 32 (19%) prepectoral breasts underwent revision surgeries ( $p=0.007$ ). There was no significant difference in specific types of revision procedures between the subpectoral and prepectoral treatment groups ( $p>0.05$ ). Additional fat grafting was performed in 5 (6%) subpectoral and 18 (11%) prepectoral breasts ( $p=0.2$ ). Implant exchange occurred in 1 (1%) subpectoral breast and 9 (5%) prepectoral breasts ( $p=0.2$ ). Conversion to autologous flap reconstruction was observed for no subpectoral and 4 (2%) prepectoral breasts ( $p=0.3$ ). Capsular revision was performed for no subpectoral and 6 (4%) prepectoral cases ( $p=0.2$ ). Skin excision was conducted in no subpectoral breasts and 8 (5%) prepectoral breasts ( $p=0.06$ ).

**Conclusions:** The findings of this prospective study suggest that there is a greater tendency for patients who undergo prepectoral IBR to pursue additional revision surgeries when compared to patients who undergo subpectoral IBR. Understanding such trends can aid surgeons in appropriate patient selection and counseling. Data acquisition is ongoing, so results may be subject to change.

### **Diabetic Neuropathy and Functional Gait Challenges: Exploring gait differences in patients with and without peripheral neuropathy within a diabetic population**

Abstract Presenter: Meghan Currin

Abstract Co-Author(s): Holly Shan, Olivia Allen, Christian Lava, Karen Li, Richard Youn MD, Christopher Attinger MD, John Steinberg DPM, Jayson Atves DPM, Karen Evans MD

**INTRODUCTION:** Peripheral neuropathies (PN) are a broad range of disorders affecting the peripheral nervous system commonly associated with diabetes mellitus (DM). As the disease progresses, patients may experience decreased mobility, altered gait, and ulceration that ultimately lead to loss of function. As a consequence, these patients may undergo non-traumatic lower extremity (LE) amputation. Early identification of gait abnormalities in PN patients may aid in optimizing limb salvage (LS) outcomes, specifically pertaining to postoperative healing and prevention of re-ulceration in the future. This study aims to analyze spatiotemporal gait parameters of DM patients with and without PN.

**METHODS:** Patients were prospectively enrolled between June 2021 and January 2024 if they were (1)  $\geq 18$  years old, (2) able to safely and independently ambulate without pain or assisted devices, (3) had no open lower extremity (LE) wounds, and (4) no LE surgeries within the last three months. Patient demographics, comorbidities, preoperative characteristics, and amputation details were collected. Participants completed a protocol including wearable sensors, a 120-second walk test, and a 30-second Romberg (sway) test. The Motility Lab software (Hamilton Thorne) provided data on cadence, gait speed, elevation midswing, single limb support, double limb support, stride length, and sway. Data analysis used an independent sample t-test ( $p < 0.05$ , STATA VSN 18.0). A multivariable logistic regression analysis including chronic kidney disease (CKD) and peripheral vascular disease (PVD) was performed to control for confounding variables.

**RESULTS:** Of the 452 patients completing spatiotemporal gait testing, 185 (69.2%) patients had DM. Of whom, 128 (30.8%) had PN (PN+) and 57 (30.8%) did not have PN (PN-). Mean age was  $63.50 \pm 10.89$  years. Mean body mass index (BMI) was  $31.80 \pm 8.06$  kg/m<sup>2</sup>. PN+ patients had significantly higher rates of CKD ( $n=32$ , 29.1% vs.  $n=8$ , 15.1%;  $p < 0.001$ ) and PVD ( $n=50$ , 39.1% vs.  $n=8$ , 14.0%,  $p=0.001$ ). There were more males in the PN+ cohort than the PN- cohort ( $n=89$ , 69.5% vs.  $n=28$ , 49.1%;  $p=0.008$ ). PN predicted slower gait speed ( $0.81 \pm 0.23$  vs.  $0.89 \pm 0.21$ ;  $p=0.018$ ) and cadence ( $97.12 \pm 11.64$  vs.  $100.81 \pm 11.33$ ;  $p=0.027$ ), lower single limb support ( $35.47 \pm 3.13$  vs.  $36.98 \pm 0.33$ ;  $p < 0.001$ ), increased double limb support ( $29.30 \pm 5.71$  vs.  $26.12 \pm 4.77$ ;  $p < 0.001$ ), shorter stride length ( $0.99 \pm 0.22$  vs.  $1.05 \pm 0.20$ ;  $p=0.031$ ), and increased sway ( $0.21 \pm 0.18$  vs.  $0.16 \pm 0.10$ ;  $p=0.016$ ). Multivariate regression revealed PN decreased single limb support ( $\beta = -1.02$ ,  $p=0.033$ ) and increased double limb support ( $\beta = 2.53$ ,  $p=0.005$ ).

**CONCLUSION:** PN significantly impacts gait parameters of patients with DM, indicating a deterioration in their walking patterns. Recognizing the early signs of gait

abnormalities can aid in timely interventions to minimize the risk of ulcers and further complications, underscoring the importance of a multidisciplinary approach to patient care.

## **The Use of Biologic Agents in Head and Neck Reconstruction after Mohs Cancer Resection: Lessons Learned from 520 Consecutive Cases**

Abstract Presenter: Rami Elmorsi MD

Abstract Co-Author(s): Lucia Martinez-Sanchez, Hrishabh Bhosale, Paul Hung, John Shuck MD,  
Matthew Hanasono MD, Peirong Yu MD, Alexander Mericli MD

**Background:** Head and neck defects following Mohs resection pose a reconstructive challenge that requires consideration of aesthetics and function. While the use of biologic agents has expanded greatly beyond their original use in burn management, objective data and analysis concerning biologics in the reconstruction of head and neck defects are still lacking. The purpose of this study was to evaluate the use of biologic agents in reconstructing skin and soft tissue defects of the head and neck while illustrating lessons learned from over a decade's worth of cases performed by a single plastic surgeon (J.F.T.).

**Methods:** We conducted a retrospective review of patients who underwent head and neck reconstruction using biologic agents, such as Integra and ACell, from January 2013 to June 2023 performed by senior author. Patients who underwent some form of head or neck reconstruction using biologics were included. Cases lost to follow-up or lacking sufficient documentation were excluded. Each case was evaluated for key patient characteristics, defect location, defect size, and reconstructive modality. Patient outcomes were analyzed, including time to healing, use of secondary biologics or grafts, and complications.

**Results:** 520 patients underwent head and neck reconstruction by senior author. Defects mostly involved the scalp (36.7%) or the nose (25.6%), with variable sizes. Integra was the most common biologic agent used for reconstruction (63.3%). 50.6% of patients required a split-thickness or full-thickness skin graft following the biologic and 41.5% healed completely with the biologic alone. Patients had a median (IQR) time to healing of 72.5 (45.8-127.5) days as measured through follow-up. We measured

complications as patients who required more than one biologic or one skin graft, since this is the customary practice, and found it to be 71 cases (13.7%). The median defect size was significantly larger in patients who experienced complications that required additional biologics or grafts ( $p < 0.001$ ). There was no significant difference in complications in patients older than 75 years, smokers, or patients taking anticoagulants ( $p > 0.05$ ).

**Conclusions:** Reconstruction of head and neck defects following Mohs resection poses a significant challenge. While these deformities are commonly reconstructed using primary closures, skin grafts, and local flaps, incorporating biologics provides surgeons with an additional and valuable tool. This study, the most extensive to date, underscores the advantages and effectiveness of biologic agents. Biologics are less invasive than local flaps and offer reliable results that can be applied across a range of defect locations and sizes. In most patients, biologic agents were used in a two-staged procedure with skin grafting for better skin tone matching and cosmesis. However, we also found that a sizable percentage of patients healed completely with the biologic alone, with no need for follow-up skin grafts and additional donor site morbidity. Although reconstruction is safe to perform on elderly patients, smokers, and patients on anticoagulation, a larger defect size is a predictor of complications. The lessons learned from the past decade highlight the growing role of biologics in head and neck reconstruction, given their high success rate and tolerability.

### **Characterization of soft tissue reconstruction following chordoma resection: a series of 68 consecutive cases**

Abstract Presenter: Shanmuga Priya Rajagopalan

Abstract Co-Author(s): Danielle Sim, Waldemar A. Rodríguez-Silva, Siam Rezwana, Ananya Dewan, Carisa Cooney MPH, CCRP, Salih Colakoglu MD

**Purpose:** Chordomas are rare, malignant bone tumors of the axial skeleton requiring surgical removal. Soft tissue reconstruction is often needed post-extirpation to reduce the risk of peritoneal content herniation into the sacral defect. Reconstruction can be challenging secondary to tumor size and large resection margins. Several studies have explored use of various muscle flaps such as gluteus maximus (GM), paraspinous

muscle (PSM), and vertical rectus abdominis muscle (VRAM); however, little data exist to inform reconstructive approaches based on anatomical considerations. The purpose of this study is to describe pre-surgical factors associated with post-chordoma resection reconstruction and evaluate patients' post-operative outcomes.

**Methods:** We retrospectively reviewed charts of patients who underwent surgical resection for chordoma and reconstruction by plastic and reconstructive surgery at a single institution between 2013-2023. We abstracted patient demographics, tumor characteristics, surgical details, and post-operative complications. Wilcoxon rank sum, Chi-squared test, Fisher's exact test, and Kruskal-Wallis with post-hoc pairwise analyses were used to compare outcomes based on reconstruction method.

**Results:** Among patients presenting with chordomas, 68 met inclusion criteria having chordomas derived from the lower lumbar (L4-L5) or sacral regions; 67 underwent sacrectomy. A majority of patients received GM flaps (n=36, 53%); VRAM and PSM flaps were the second most-commonly used [n=12 (18%) each]. The remaining 8 (12%) patients underwent reconstruction without incorporation of muscle (e.g., Fascio cutaneous flaps). GM and VRAM flaps were primarily used to reconstruct defects at the level of the sacrum (n=47, 98%) while 7 (58%) and 5 (42%) PSM flaps were used for lumbar and sacral reconstruction, respectively. Non-muscle reconstruction was most often used for sacral chordomas (n=6, 75%). The median (interquartile range [IQR]) tumor volume among patients with GM flaps was 92cm<sup>3</sup> (12-246) and 468cm<sup>3</sup> (271-1592) for VRAM flaps. Median (IQR) tumor volume for PSM flaps was 77cm<sup>3</sup> (34-239) and 25cm<sup>3</sup> (16-86) for non-muscle reconstruction. Tumor volume in patients who underwent VRAM flap reconstruction was significantly greater than those who underwent GM flaps (p=0.0022) or non-muscle reconstruction (p=0.015). Median (IQR) defect diameter managed by VRAM flaps was significantly longer compared with GM flaps [33(30-46) cm vs. 22(15-30) cm, p=0.001]. Mesh was used to reinforce the defect site in 42 patients; no differences in mesh use frequency between reconstructive options were noted. Median (IQR) follow-up was 34 (13-73) months. Post-operatively 27 (68%) patients developed surgical complications, 12 (44%) of whom experienced more than one. Overall, dehiscence occurred in 16 (24%) patients. Other complications included infection (n=9, 13%), seroma (n=5, 7%), and partial flap necrosis (n=2, 3%). Reconstruction type was not associated with incidence of post-operative complications. Chordoma recurred in 12 (17%) patients.

**Conclusion:** We found that surgical reconstruction following chordoma resection varied depending on chordoma spinal level, tumor volume, and defect diameter. GM and VRAM flaps were more often used following removal of sacral chordomas, with VRAM flaps generally used for larger defects; complication rates were similar among the

included reconstructive options. Future studies should further characterize presurgical factors to guide decision making for reconstructive surgeons to optimize soft tissue coverage after chordoma resection.

## **Examination of Treatment Response to Sirolimus in Patients with PROS vs Non-PROS Vascular Anomalies**

Abstract Presenter: Jessica Nye

Abstract Co-Author(s): Jose Barrera, Jackson Green, Matthew Greives MD

**Purpose:** Advancements in genomic analysis have led to the discovery of casual genes underlying many vascular anomalies (VAs), providing the basis for targeted gene therapy. The umbrella term PROS, PIK3CA-Related Overgrowth Spectrum, unifies a group of overgrowth disorders linked by somatic pathogenic variants in PI3K, a regulator of mTOR. Given that patients with PROS have a known, or likely, gene mutation in the PI3K/AKT/mTOR pathway, this study aimed to compare their response to treatment with sirolimus, an mTOR inhibitor, to patients with non-PROS VAs.

**Methods:** A retrospective single institution review was conducted of patients with VAs initiated on sirolimus therapy from 2019 to 2023. Records were reviewed for patient demographics, VA type, associated symptoms, measurements, and duration of treatment on sirolimus. A positive response to treatment was defined by patient/parent report of improvement in symptoms, quality of life, and/or reduction in size of the lesion via imaging or clinical assessment.

**Results:** Of the 30 patients initiated on oral sirolimus, 21 (66.7%) met the criteria for a diagnosis of PROS. The median age at the start of treatment was 1.3 years (IQR: 0.0-6.3) and 60% of the patients were female. The median duration of treatment was 396 days (IQR: 231-536). Swelling or overgrowth was the most common symptom in the PROS group (85.7%), followed by an elevated d-dimer (52.4%), and functional impairment (28.6%). In the non-PROS group, the d-dimer level was elevated in 88.9% of patients, 44.4% complained of swelling/overgrowth, and 33.3% reported bleeding of their VA. The median time to positive treatment response was 52 days (IQR: 44-98) in the non-PROS group compared to 36 days (IQR:29-52) in the PROS group (p=0.06).

**Conclusion:** In this study, patients with PROS experienced a positive response to treatment with sirolimus faster than those with non-PROS VAs. While sirolimus is an



established treatment modality for VAs, its effect on PROS patients is often rapid and profound. As alternative candidates become available for the treatment of VAs, studies should continue to evaluate the relationship between genetic status and time to treatment response.

## **Alma Ata Declaration's Impact on Global Plastic Surgery: Essential Plastics Surgery is a Key to Achieving Health for All**

Abstract Presenter: Alexander Chang

Abstract Co-Author(s): Daniel Najafali, Joseph Nthumba, Tesfahun Ali Said, Sthefano Araya,  
Peter Nthumba MD

**Background:** The 1978 Alma-Ata Declaration became a landmark document that significantly shaped the global health agenda and in turn global surgery. It placed an emphasis and priority on low-cost primary healthcare, while inadvertently portraying surgical care as resource intensive thereby overshadowing essential surgery. Recently, there has been a growing recognition of surgery as a fundamental aspect of healthcare and its contributions to the global burden of disease has seen a shift along with advocacy. This review underscores the impact of the 1978 Alma-Ata Declaration by summarizing the body of literature pertaining to its influence on surgery as a whole with an emphasis on plastic surgery by identifying themes and offering a new perspective for its role on the global stage.

**Methods:** A PRISMA-adherent review encompassing articles on the Alma-Ata Declaration and global plastic surgery was undertaken using PubMed and Google Scholar in January 2024. All articles that were relevant to the 1978 Declaration and mentioned its impact on surgery were included. Data were extracted regarding the characterization of surgery's role on the global stage, influence on global burden of disease, and concluding remarks from the author with respect to primary care and/or essential surgery.

**Results:** A total of 12 articles were included in the final review that discussed Alma-Ata in the context of surgery and primary care. There were 5 (42%) studies focusing on essential surgery, with 2 (17%) also focusing on anesthesia delivery in combination with surgical access. Roadblocks to global surgery were highlighted to be that it was not

viewed as cost-effective and was portrayed as resource intensive. Despite the goal of achieving "Health for All," the Alma-Ata Declaration supported primary care initiatives while erroneously overlooking surgical need. Plastic surgery related procedures were identified in only 2/12 (17%) of articles. Regarding actionable items, 2 (17%) focused on eye health with the remaining focusing on basic surgery. Both publications before 2000 identify the steep challenges that lay ahead in order to achieve "health" for all, while all 10 of the post 2000 papers acknowledged the failure to meet the goal, providing us with a sobering reality check on our ambitious goal towards equitable healthcare.

**Conclusion:** Despite the intentions of the Alma-Ata Declaration to achieve primary healthcare for all, global surgery and particularly global plastic surgery did not pan out as planned. The declaration failed to recognize the importance of surgical services as part of comprehensive health care, not to mention the numerous challenges low-or-middle-income-countries (LMIC) face. As a result, access to safe and timely surgical care remains limited in many LMICS, contributing to a significant burden of surgically treatable conditions and preventable deaths. To address these challenges and truly bring surgery to everyone, barriers and gaps in delivering surgical care must be closed. There is a need to overhaul how we approach global surgery, moving away from a one-size-fits-all approach and towards a more tailored and sustainable model. This requires collaboration between governments, international organizations, and local stakeholders to develop and implement context-specific strategies that prioritize equity, accessibility, and quality in surgical care.

### **A single-center study on surgical outcomes and complications of breast reconstruction in patients diagnosed with inflammatory breast cancer**

Abstract Presenter: Yizhuo Shen

Abstract Co-Author(s): Goutam Gadiraju, Sean Yonamine, Justin Broyles MD, Matthew Prospero

**Purpose:** Breast reconstruction among patients with inflammatory breast cancer (IBC) poses unique challenges due to the need for intensive trimodal therapy and the need to balance risk of recurrence or disease progression with the optimal timing of reconstruction. Due to oncologic treatment, patients are traditionally advised to undergo delayed reconstruction at least 12 months following adjuvant radiotherapy. The National Cancer Database does not distinguish between those who undergo delayed versus immediate reconstruction, so research on optimal timing of reconstruction is limited.

Further study on clinical and patient-reported outcomes, especially regarding reconstruction timing, is necessary to optimize treatment planning and quality improvement in this unique patient population.

**Methods:** A single-center retrospective study was conducted on patients with IBC who underwent breast reconstruction at our institution. Using our institutional IBC program database, we identified patients who were diagnosed with IBC between 1996 and 2023 and underwent immediate or delayed breast reconstruction. Patients without reconstruction-related clinical or operative documentation in their electronic health record were excluded from complete chart review. Clinical staging, timing of reconstruction, and type of reconstructive procedure were recorded. Detailed retrospective review of operative and follow-up documentation was conducted to analyze reconstruction-specific outcomes. Complications captured in review included infection, skin necrosis, dehiscence, seroma, and hematoma at the donor and recipient sites. Flap complications included skin flap necrosis, partial flap/fat necrosis, and total flap loss. Aesthetic outcomes included breast asymmetry. Multivariable analysis was precluded by limited sample size.

**Results:** Of 51 patients diagnosed with IBC (46 Stage 3, 1 Stage 4, 4 unknown) who underwent reconstruction, 82% received reconstruction in the delayed setting. The majority of patients were of white race (86%) and non-Hispanic (63%) with a mean age of 48 years (range 22-86 years). The mean times between reconstruction and initial mastectomy, chemotherapy, and radiation were 557 (SD 619) days, 616 (SD 388) days, and 471 (SD 267) days, respectively. Of the 51 patients, chart review was conducted for 23 patients (20 autologous, 2 two-stage implant-based with latissimus dorsi, 1 single-stage implant-based). Among autologous reconstruction (19 DIEP, 1 TRAM) and two-stage implant-based and latissimus dorsi reconstruction patients, there were 2 or fewer instances of donor and recipient site complications. Additionally, there were no instances of total flap loss, but 2 instances of mastectomy skin flap necrosis and 4 instances of partial flap loss/fat necrosis were identified. All 23 patients had documentation of breast asymmetry following reconstruction.

**Conclusions:** There is a lack of consensus on appropriate timing of breast reconstruction in patients with IBC given their typical treatment course as compared to non-IBC patients. This study suggests that patients with IBC who elect for reconstruction do so on average more than 12 months status-post mastectomy, chemotherapy, and radiation. Comparison of complication rates to reconstructed non-IBC patients is limited by the sample size of this study. Larger, prospective studies are greatly needed to further characterize oncologic and surgical characteristics that may influence outcomes among the reconstructed IBC population.

# **VASCULARIZED FIBULAR BONE GRAFT IN ONCOLOGIC LOWER LIMB DEFECTS - SYSTEMATIC REVIEW AND META-ANALYSIS**

Abstract Presenter: Abdulaziz Elemosho MD

Abstract Co-Author(s): Kerry-Ann Mitchell MD, PhD, Syed Farhan, Jason Souza MD, Oluwatobi Faniyi

**INTRODUCTION:** Vascularized fibular bone grafts (VFBG) have gained popularity in limb preservation surgery, for reconstruction of long bone defect<sup>1</sup>. Large bone defects are created by wide excision of sarcomas, and this traditionally has been reconstructed with avascular allografts with local tissue flaps. However, reconstruction with allografts is associated with significant morbidity as they have a high rate of infection and nonunion<sup>2</sup>. The long bones of the lower extremities transmit a great amount of force, and reconstruction of these bones can be challenging.

VFBGs are well suited for this role as they have long cylindrical shape, great mechanical strength, predictable vascular pedicle, and limited donor-site morbidity<sup>3</sup>. Further, they hypertrophy over time, according to the transmitted stress, and can fill a large defect<sup>3,4</sup>.

Outcomes after lower extremity reconstruction are still lacking in the literature. Our study aims to congregate the available evidence on outcomes of VFBGs for lower extremity salvage procedures.

**METHODS:** We conducted an extensive literature search using the major databases including PUBMED, EMBASE, Web of Science and Scopus. Articles were screened following the PRISMA guidelines by two independent authors. Only articles written in English Language with complete data were included. Meta-analysis of proportion was used to report the outcomes and complications.

**RESULTS:** Of the 1150 retrieved articles, 21 qualified for inclusion, reporting on 285 patients who had bony defect after sarcoma resection. Mean age was 16.7yrs [mean range: 9.8-30yrs], and mean defect size was 14.7cm. 175 patients had adjuvant chemotherapy, and 17 patients received adjuvant radiotherapy. Bone graft survival rate was 91.9% [95% CI: 19.48 - 70.42 P=0.0037], Graft union rate was 83.5% [95% CI: 29.22 - 73.31, P=0.008], and mean time to union was 11.3months. Mean MSTS score

was 26 and mean follow up time was 40.6months. Graft fracture rate was 21.8% [95% CI: 0.00 - 56.75, P=0.48], and Limb Length discrepancy rate was 17.5% [95% CI: 24.47 - 83.43 P=0.0061]. Local recurrence rate was 2% [95% CI: 0.00 - 72.54, P=0.161].

**CONCLUSION:** VFBG are a suitable choice for lower extremity salvage surgeries and are associated with high rate of graft survival and union. The time to union is also fast, and patients mostly return to their pre-morbid activity level.

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## Risk factors for eventual limb loss following free tissue transfer in patients with peripheral vascular disease- long term follow up

Abstract Presenter: Sabrina Deleonibus

Abstract Co-Author(s): Karen Li, Christian Lava, Cameron Akbari, Richard Youn MD, Christopher Attinger MD, Karen Evans MD

**Background:** The indication for lower extremity (LE) limb salvage using free tissue transfer (FTT) has continued to expand to patients who have historically needed primary amputations. However, the prevalence of peripheral vascular disease (PVD) and other comorbidities in this patient population remain as risk factors for chronic limb ischemia and amputation despite efforts towards limb salvage. The aim of this study was to determine the risk factors for limb loss in patients with PVD receiving LE FTT.

**Methods:** LE FTTs performed by a single surgeon from July 2011 to January 2023 were reviewed. Patient demographics, comorbidities, preoperative management, intraoperative details, flap outcomes, and postoperative complication data was collected. Preoperative angiograms were reviewed for evidence of arterial abnormalities. Patients with PVD were those who had any evidence of diseased vessels on angiogram in the anterior tibial, posterior tibial, peroneal, or dorsalis pedis vessels. Univariate analyses were performed to determine significant covariates to the primary outcome, which was progression to ipsilateral amputation.

**Results:** Among 300 patients who received LE FTT, there were 130 patients with evidence of diseased vasculature (PVD) on preoperative angiogram. Angiogram abnormalities in the PVD group showed that 60.0% had a 2-vessel run-off (VRO), 30.0% had a 1-VRO, and 10.0% had 0-VRO. The PVD group was significantly older (60 vs. 55,  $p=0.000$ ) and had a higher Charlson Comorbidity Index (5 vs. 3,  $p=0.000$ ). They also had significantly higher rates of comorbidities including diabetes (66.2% vs 45.9%,  $p=0.000$ ), neuropathy (52.3% vs. 36.1%,  $p=0.005$ ), chronic kidney disease (CKD) (22.3% vs. 10.6%,  $p=0.007$ ), and congestive heart failure (8.5% vs. 2.9%,  $p=0.035$ ). On postoperative complications, the PVD cohort had significantly higher rates of dehiscence (20.8% vs. 11.8%,  $p=0.033$ ) and infection (19.2% vs. 10.0%,  $p=0.022$ ). The overall amputation rate was not significant between two groups (PVD:15.4% vs. No PVD: 10.6% ,  $p=0.216$ ).

On multivariate analysis, risk factors that remained independent for eventual amputation included history of cerebrovascular accident (OR:16.9, CI: 1.74-165.0), end-stage renal disease (ESRD) (OR:16.3, CI: 2.0-132.9), albumin level (OR: 5.6, CI: 1.4-23.1), intraoperative transfusion (OR: 4.9, CI: 1.1-20.9), and post-FTT infection (OR:7.1, CI: 1.8-27.9).

**Conclusion:** Patients with a history of ESRD, CVA, lower preoperative albumin level, intraoperative transfusion or a post-FTT infection appeared to be at a much higher risk for eventual amputation. Close multidisciplinary follow-up in these patients focused on medical management, vascular optimization, and infection control are needed to achieve long-term limb salvage.

## **Co-application Of Disaggregated Cellular Suspension With Hydrogel Scaffolds Facilitates Healing Full-thickness Defects In Mice In One Step: A Pilot Study**

Abstract Presenter: Gurtej Singh

Abstract Co-Author(s): Shi Fu, Huiting Luo, Kuan-Che Feng, Shiffoni Sukhlal, Mimi Borrelli MD,  
Sami Khan MD, Miriam Rafailovich, Marcia Simon, Duc Bui MD, Alexander Dagum MD

**PURPOSE:** Acellular Dermal Matrix (ADM) products are pivotal in reconstructing full-thickness skin defects, significantly reducing donor site requirements and time to closure (1). Traditionally, these products necessitate a two-stage surgical process, wherein skin grafting follows the vascularization and integration of the ADM (2). This study introduces an innovative approach by co-applying scaffolds with cells, specifically utilizing autologous skin cell suspension (ASCS) technology. This method enables the delivery of a heterogeneous mix of autologous, freshly disaggregated skin cells directly to the patient's wound. Employing a nude mouse model, our research investigates the feasibility of combining collagen/fibrin scaffolds with freshly disaggregated human skin cell suspensions (hSCS).

**METHODS:** Tissue-engineered skin constructs were created by seeding collagen/fibrin scaffolds (3.3 mg/mL) with human Keratinocytes, Fibroblasts, Dental Pulp Stem cells (DPSCs), and Human Umbilical Vein Endothelial cells (HUVECs). After 21-days, cells had self-assembled into epidermal/dermal layers with a histological appearance of native human skin. The constructs were then disaggregated using ASCS technology into hSCS (0.8 million cells/mL). Full-thickness circular dorsal wounds (d=8 mm) on athymic male mice (10-11 weeks, n=2) were created and treated with tissue-engineered skin constructs (control) or acellular collagen/fibrin scaffolds co-applied with hSCS on the under/top surface scaffolds (design 1) or top of the scaffolds only (design 2). On day 7, wounds were assessed and prepared for H&E staining and Image J analysis.

**RESULTS:** Our findings reveal pronounced differences at both macroscopic and microscopic levels across all three experimental groups. The co-application of scaffolds with hSCS notably diminished both wound bed length and perimeter compared to treatments utilizing cellular tissue-engineered skin constructs. This suggests that the disaggregation process may expedite wound closure by fostering quicker healing. Specifically, in design 1, the rapid formation of a scab and significant reduction in scaffold depth underscored an accelerated and hypercellular healing response. Conversely, design 2 exhibited a more uniform cellular distribution, apparent vascularization, and preservation of scaffold depth up to day 7. These observations imply a slower matrix turnover and a more substantial role of the scaffold in maintaining

wound structural integrity.

**CONCLUSION:** Collagen/fibrin scaffolds, when co-applied with freshly disaggregated human skin cell suspensions (hSCS), have shown potential in accelerating the healing of full-thickness wounds in mice. Our findings indicate that scaffolds yield the best outcomes when exclusively paired with disaggregated hSCS on the scaffold surface. Looking ahead, our research will explore varying hSCS concentrations, introduce additional time points for analysis, and employ further staining techniques. These steps aim to determine the most effective co-application methods and understand how changes in technique influence vascularization and the scaffold's role in wound remodeling.

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## **Robotic-assisted free omental flap for scalp reconstruction**

Abstract Presenter: Joel Prince MD

Abstract Co-Author(s): Dakota St. Pierre, Matthew Loper, Guilherme Barreiro MD

**Introduction:** Robotic-assisted reconstructive surgery is emerging as an invaluable tool for plastic surgeons, offering benefits such as enhanced visualization, reduced donor site morbidity and easier patient recovery. While robotic-assisted harvest of a free omental flap has been documented for a few applications such as lymph node transfer, [1,2] its use in scalp reconstruction has yet to be well described.

**Case description:** We present the case of a 64-year-old female who suffered a severe dog attack resulting in a substantial bilateral frontoparietal scalp defect with both partial- and full-thickness loss. Following initial wound management, she opted for definitive reconstruction with free tissue transfer of the omentum. The omentum was harvested using the da Vinci Xi surgical system and was extracted from the abdomen through a Pfannenstiel incision. The omentum measured 25.5 x 35 cm ex vivo. The tissue was



then transferred to cover the scalp defect. Both superficial temporal vessels were exposed, but due to the zone of injury, these were found to be inadequate. Therefore, a novel anastomosis was performed. The superficial temporal vessels were dissection more proximal into the substance of the parotid until a deep branch was identified. These middle temporal vessels were found to be more robust and suitable for microsurgical anastomosis. Bipedicle anastomosis of the free omental flap was performed to the bilateral middle temporal vessels. The flap provided stable coverage for the scalp wound, facilitating delayed split-thickness skin grafting upon development of a healthy bed of granulation tissue.

**Discussion:** This case represents the largest robotically harvested free omental flap reported (892.5 cm<sup>2</sup>). It highlights the utility of this technique for coverage of large defects and outlines an alternative to the conventional scalp reconstruction with a free latissimus dorsi flap. While laparoscopic omental flap harvests have been previously described,[3] robotic assistance offers additional advantages as a minimally invasive technique such as improved surgeon ergonomics and finer dexterity similar to microsurgical techniques. Additionally, alternative recipient vessel sites are described. The middle temporal vessels, proximal branches off the superficial temporal vessels, run deep to temporal fascia with branches to the muscle and fascia. With dissection into the substance of the parotid, they can be identified and usually are of adequate caliber for micro anastomosis. These vessels can provide a great alternative to avoiding potentially problematic interposition vein grafts required to reach the facial vessels outside the zone of injury.

**Conclusion:** Robotic-assisted free omental flap is a good option for scalp reconstruction, providing robust tissue that can readily accept autografts and easily be sculpted. Its use warrants consideration in other cases requiring free tissue transfer given the advantages of a robotic harvest coupled with the predictability of its blood supply. Additionally, in cases where the superficial temporal vessels are unsuitable, the middle temporal vessels present a promising alternative for anastomosis.

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## **The Use of Cadaveric Rib Graft In Pediatric Chest Wall Reconstruction**

Abstract Presenter: Matthew Parham

Abstract Co-Author(s): Heather Burns MD, Sarah Layon, Ricardo Alfaro Zeledon, Laura Monson MD, Erica Xue MD

**Background:** Pediatric chest wall defects are reconstructive challenges as rib resections must be reconstituted to stabilize the chest wall in a way conducive for future growth. Currently employed techniques involve reconstruction using rigid or non-rigid fixation to reestablish the function and contour of the chest wall. We describe a novel technique utilizing cadaveric rib graft wrapped in vascularized muscle as an effective alternative due to its allogeneic properties and potential for revascularization.

**Methods:** The purpose of this study is to describe bony chest wall reconstruction in pediatric patients who underwent oncologic extirpative surgery or congenital reconstruction involving the removal or absence of  $\geq 1$  rib, with a focus on reconstruction using cadaveric rib graft. Pediatric patients who underwent reconstructive surgery at our institution from January 2020 to December 2023 were included for retrospective analysis. Data collected included age at surgery, etiology, defect size and location, reconstructive materials, complications, and functional status.

**Results:** Five patients met inclusion criteria with an average age of 6.2 years at the time of chest wall reconstruction. Diagnoses included Ewing sarcoma (n=2), sarcoma (n=2), and osteoblastoma (n=1). Defect size averaged 8.3 cm (range 5-12 cm). Three out of 6 patients had 3 ribs removed (range 1-3 ribs). Three patients underwent pleural reconstruction with either Strattice Tissue matrix™ or Gore-Tex mesh®. Four patients had bony reconstruction using a split cadaveric rib graft that was secured with resorbable plates (n=2), steel wiring (n=2), or polypropylene suture (n=1). All patients had soft tissue coverage using unilateral pedicled muscle flaps which included the latissimus dorsi, serratus anterior, rectus abdominis, trapezius, and/or rhomboid. Complications included wound dehiscence (n=2) and delayed wound healing (n=1). There were no complications requiring reoperation. All 5 patients had full range of motion of the shoulder girdle and upper extremities and exhibited appropriate chest wall

contour at postoperative follow-up (average 10.8 months).

**Conclusions:** This is the first case series describing the use of cadaveric rib wrapped with vascularized muscle in combination with resorbable plating and other fixation techniques to reconstruct the pediatric chest wall when greater than 1 rib is resected. Preliminary follow up demonstrates adequate functional and aesthetic outcomes with a low incidence of complication. Longer term follow-up will be needed to ascertain the effects of cadaveric rib based reconstruction on growth outcomes.

### **Conjoined Twin Separation Techniques and Outcomes – A New Classification System and Case Series at a Tertiary Pediatric Care Center**

Abstract Presenter: Brody King MD

Abstract Co-Author(s): Kala Pham, Alexandra McLennan, Erica Xue MD, Edward Buchanan MD

**Purpose:** Successful separation and reconstruction of conjoined twins requires a qualified multidisciplinary surgical team, often requiring several staged procedures. The classification system for conjoined twins provides an anatomic description of the most prominent site of union (suffix 'pagus') with modifications based on the number of shared external structures (prefixes di-, tri-, tetra-) (1). However, this system is less effective for analyzing the surgical complexity and determining specialist needs for successful separation and reconstruction. We present the Texas Children's Hospital (TCH) classification system for conjoined twins, with the approach, techniques, and outcomes of separation and reconstruction in 4 sets of conjoined twins at a tertiary pediatric hospital.

**Methods:** A retrospective review was conducted for 4 sets of conjoined twins (8 patients) cared for at Texas Children's Hospital from 2014-2023. Data collected included the size and experience of surgical teams, surgical techniques used, complications, and length of stay. Each twin was then each classified using the proposed TCH classification system, includes all shared structures denoted with a letter; Cranium (C), Thorax (T), Abdomen (A), Pelvis (P), and the degree of fusion in each region ranging from 1 to 4, with 1 point given for each involved structure including soft tissue (skin, muscle, fascia), bone, viscera, and major neurovascular structures.

**Results:** The types of conjoined twins included thoraco-omphalopagus (T3A3, n = 1),

thoraco-omphalo-ischiopagus (T3A2P4, n = 1), ischiopagus (P4, n=1), and omphalopagus (A2, n=1). Preoperative tissue expansion was required in 75% of twins, while 1 required embolization of shared hepatic vessels. After separation, reconstruction including the use of sternal plates and wires (n=3), acellular dermal matrix (n=3), fasciocutaneous flaps (n=4), component separation (n=2), and complex closure (n=4) was completed by plastic surgeons, in concert with other surgical teams. The three patients who underwent sternal reconstruction required additional staged procedures including cadaveric rib grafts (2), pectoralis or omental flaps, and hardware removal. Surgical complications included TE extrusion/failure requiring reoperation (66%), sternal hardware failure (66%), surgical site infection (38%), seroma (13%), and hydronephrosis (13%). Half of the patients required at least 1 unplanned reoperation, and 62.5% of patients required long-term tracheostomy or gastrostomy tube for more than one year. The average length of PRS follow-up was 25 months. The average hospital length of stay was 65 days from separation to discharge. All patients survived.

**Conclusions:** Appropriate planning with multidisciplinary care leads to successful conjoined twin separation and reconstruction, with morbidity driven primarily by the extent of shared tissues/organs and the need for staged procedures. Although unavoidable in most cases, pre-separation tissue expansion and sternal reconstruction carry a high risk for complications and reoperation. The TCH classification system is a useful tool in the early assessment of each twin's degree of fusion, which will improve multidisciplinary team building, surgical planning, and expectation management with parents.

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#### **Lower Extremity Reconstruction with Concomitant Gustilo class 3 Fractures in the Pediatric Population**

Abstract Presenter: Amjed Abu-Ghname MD

Abstract Co-Author(s): Raghav Upadhyaya, Edward Buchanan MD, Edward Reece MD, William Pederson MD, Amy Xue MD

**Background:** The management of lower extremity soft-tissue defects (LESTD) with concomitant Gustilo class 3 fractures can be challenging to the reconstructive surgeon, particularly in the pediatric population. While these injuries are rare in children, they can result in long lasting implications. Their complexity is made even more difficult by the limited amount of literature and lack of consensus in the orthoplastic management of these injuries. In this study, we review our own institutional experience with these complex injuries.

**Methods:** A retrospective review was conducted of all patients referred to the plastic and reconstructive surgery service for lower extremity open fracture soft tissue reconstruction at a single Pediatric Level 1 Trauma Center between 2012 and 2022. Only patients with Gustilo class 3 fractures were included in the review. Data including surgical timing, perioperative findings, operative approach, and postoperative outcomes were reviewed and analyzed.

**Results:** Of 67 patients requiring definitive soft tissue coverage secondary to fractures of the lower extremity, 8 patients had Gustilo 3 fractures and met inclusion criteria. The mean age of the patients was 12.5 years. Six patients had Gustilo 3B (G3B) fractures and two had Gustilo 3A (G3A) fractures. Five patients with G3B underwent reconstruction with free latissimus dorsi flap and one patient with a pedicled flap and adjacent tissue transfer. On the other hand, both patients with G3A underwent reconstruction with local flaps. On average, the first operative intervention occurred within 12 and 24 hours of injury for G3B and G3A, respectively. Mean time for definitive soft tissue reconstruction was 7 and 9 days from injury for G3B and G3A with the mean number of reoperations being 3 and 0.5, respectively. There were 2 cases of primary flap loss and 1 case of postoperative wound infection requiring additional surgical intervention. 2 patients required an Ilizarov frame for bony transportation over an average of 239 days. Functionally, no limb-length discrepancies nor growth restrictions were observed with 5 patients bearing weight as tolerated and 3 fully weight bearing on extensive follow up (mean 318 days).

**Conclusion:** Long bone open fractures associated with LESTD present unique challenges, particularly in the pediatric population. Multidisciplinary collaboration, timely microsurgical reconstruction with judicious surgical exploration and repair allows for uniform healing at an age of exponential skeletal growth. A delicate balance must be kept between soft tissue coverage and bony reconstruction to restore form and function in pediatric patients.

# **Perioperative Anticoagulation Status and Intravascular Flap Thrombosis Events in Lower-Extremity Limb Salvage with Free-Flap Reconstruction: A Single Center Retrospective Analysis**

Abstract Presenter: Ethan Song MD

Abstract Co-Author(s): Emmanuel Emovon, Joshua Kim, Pranav Haravu MD, Whitney Lane MD, Suhail Mithani MD, Detlev Erdmann MD, PhD, MHSc, Brett Phillips MD, MBA, Geoffroy Sisk MD

**Background:** Acute intravascular thrombosis is a significant postoperative complication in patients undergoing lower extremity salvage with free tissue transfer. The impact of perioperative anticoagulation on thrombotic events in free flap lower extremity salvage is not well understood. This study aims to characterize the incidence and risk of thrombotic events in patients undergoing lower-extremity limb salvage with free tissue transfer.

**Methods:** A single-institution retrospective chart review was conducted assessing all patients who underwent lower-extremity limb salvage using free flap reconstruction between January 2015 and September 2023. Patient demographics, operative characteristics, anticoagulation/chemoprophylaxis dosage, and outcomes were collected. Bivariate analysis was conducted in R version 4.3.0, with p-values less than 0.05 indicating significance.

**Results:** The 137 patients that were included overall had a median age of 57.1 [IQR: 37,65.8] years and a median BMI of 28.6 [IQR: 25,31.8]. The majority of patients were male (n=77, 56.2%). The indications for flap coverage were postoperative wound complications in 79 (57.7%), acute lower extremity trauma in 50 (36.5%), and oncologic resection in 8 (5.8%). The most commonly utilized reconstructive flap options were the radial forearm (n=53, 38.7%), followed by the anterolateral thigh free flap (n=47, 34.3%).

Flap thrombosis was reported in 19 (13.9%) patients after a median 14.1 [IQR: 3.6,43.6] hours postoperatively. Venous thrombosis (n=16, 84.2%) was more common than arterial thrombosis (n=5, 26.3%), and nearly all events (n=17, 89.4%) were identified in postoperative patients utilizing standard DVT chemoprophylaxis. Preoperatively, dosing of anticoagulation was prophylactic in 63 (46.0%), therapeutic in 3 (2.2%), and deferred in 71 (51.8%). Postoperatively, 124 (90.5%) were on standard chemoprophylaxis, 12 (8.8%) on therapeutic, and 1 (0.7%) received no agent. There was no significant difference between utilization of anticoagulation agent and dosage with flap thrombosis

in the preoperative ( $p=0.999$ ) and postoperative setting ( $p=0.720$ ). Antiplatelet therapy was infrequently added in the perioperative timeframe, and was used in 32 (23.4%) patients preoperatively and 34 (24.8%) postoperatively. There was no significant difference between utilization of antiplatelet therapy and flap thrombosis in the preoperative ( $p=0.772$ ) and postoperative setting ( $p=0.782$ ). Patients who endured thrombotic events were more likely to have total flap loss ( $p<0.001$ ), infection ( $p=0.050$ ), and postoperative bleeding ( $p=0.019$ ). Operative length and dangling protocols were not associated with risk of thrombotic events. Overall flap success rate was 92.7% with a flap salvage rate of 47.4% after thrombotic events.

**Conclusion:** Acute intravascular thrombosis was strongly associated with adverse outcomes, including flap loss and infection. Perioperative chemoprophylaxis regimen varied widely and nearly all thrombotic events after free flap reconstruction were identified in patients with standard postoperative chemoprophylaxis dosage. A standardized, stratified escalation of dosages of VTE chemoprophylaxis may be appropriate to minimize postoperative thrombotic events.

### **Delayed Lymphatic Reconstruction for Patients with Breast Cancer Related Lymphedema After Immediate Lymphatic Reconstruction: A Single Institution's Five-Year Experience**

Abstract Presenter: Nicole Le MD, MPH

Abstract Co-Author(s): Kristen Whalen MD, William West III, Sarah Moffitt, D'Arcy Wainwright MD, Tina Tavares, Nicholas Panetta MD, FACS

**Introduction:** Immediate lymphatic reconstruction (ILR) has been utilized in the prevention of breast cancer related lymphedema (BCRL) with good success. However, a subset of these patients still developed BCRL. We aimed to evaluate delayed lymphatic reconstruction with lymphaticovenicular bypass (LVB) in the management of BCRL after failed ILR.

**Methods:** Patients who developed BCRL despite ILR between 2018 and 2023 were included in this study. Patients were offered delayed LVB if they had visible lymphatic channels seen on indocyanine green (ICG) lymphangiography. BCRL was assessed based on symptoms, circumferential limb measurements, and bioimpedance spectroscopy.

**Results:** A total of 33 patients out of 394 patients (8.4%) developed BCRL after ILR. Of these 33 failures, 12 patients underwent delayed LVB. The average age was  $55 \pm 9$  years, and average BMI was  $32.6 \pm 7.1 \text{ kg/m}^2$ . The mean number of anastomoses completed was  $2.9 \pm 1.5$  during ILR and  $3.8 \pm 1.9$  during delayed LVB. All patients had adjuvant radiation therapy. Eight patients (24.2%) developed recurrence of their breast cancer. Patients developed BCRL about  $13.7 \pm 8.6$  months after ILR. Of the seven patients with delayed LVB for whom adequate follow up was available, six noted improvements in BCRL.

**Discussion:** Analysis of failed ILR is important in understanding the factors that place patients at higher risk for BCRL. With close follow up, patients that develop BCRL despite ILR can be offered delayed LVB with relatively good success.

### **Partnered Patients Fare Better: Single Relationship Status is Predictive of Tube Feed Dependency in Reconstructed Head and Neck Male Cancer Patients**

Abstract Presenter: Rami Elmorsi MD

Abstract Co-Author(s): Lucia Martinez-Sanchez, Hrishabh Bhosale, Paul Hung, John Shuck MD, Matthew Hanasono MD, Peirong Yu MD, Alexander Mericli MD

**Introduction:** Dysphagia is a debilitating consequence of head and neck cancer and its treatments, profoundly impacting patients' quality of life and health status. Severe dysphagia is linked to lower survival rates, highlighting the critical need for effective interventions. Recent studies have shown that social support is a significant factor influencing outcomes in this patient population, including survival. Herein, we evaluate the influence of a significant other on the return to oral feeds following head and neck defect reconstruction in cancer patients.

**Methods:** A pilot analysis was conducted on oral cavity, laryngotracheal, and pharyngoesophageal reconstructions performed at our center between 2019 and 2023. Patients' medical records were reviewed for demographic, oncological, surgical, and postoperative outcome data.

**Results:** The study cohort comprised 140 patients, with 61.4% ( $n = 86$ ) being male. The average follow-up duration was 16 months (Standard deviation, 14.4 months). Of the



patients, 27.1% (n=38) were single, divorced, or widowed. Return to oral feeds was significantly associated with being in a relationship (88% vs. 77.2% for partnered vs. single patients,  $p=0.046$ ). Stratification by gender revealed sustained significance in males (87.6% vs. 64.3% for partnered vs. single males,  $p=0.003$ ) but not in females (88.9% vs. 89.7% for partnered vs. single females,  $p=1$ ). Multivariate logistic regression, adjusted for sex, confirmed relationship status as a significant predictor of return to oral feeds (Odds ratio, 2.52;  $p=0.028$ ). Further subgroup analysis of male patients only, incorporating additional clinically relevant variables such as smoking history and area of resection, reaffirmed being in a relationship as a significant predictor (Odds ratio, 4.16;  $p=0.023$ ) of return to oral feeds.

**Conclusions:** Our study underscores the importance of social support in head and neck cancer treatment outcomes. We found that being in a relationship significantly predicts return to oral feeds, particularly in male patients, suggesting a potential role of social support in postoperative recovery. However, these findings were not sustained in female patients, indicating the need for further exploration of gender-specific factors influencing rehabilitation outcomes in head and neck cancer surgery.

## **Evaluating Non-Surgical Strategies in Lymphedema Management: An Umbrella Review of Methodological Quality and Clinical Outcomes**

Abstract Presenter: Sai Anusha Sanka

Abstract Co-Author(s): Shreya Raman MD, KEVIN HE, Sarah Zubli, Lauren Yaeger, Gary Skolnick MBA, Joani Christensen MD  
Justin Sacks MD, MBA

**Purpose:** Lymphedema presents a challenge to patients and healthcare providers, with surgical interventions typically reserved for severe cases. A comprehensive approach that combines surgical options with various nonsurgical modalities (such as manual lymphatic drainage (MLD) and compression therapy) is essential for effective patient care. This umbrella literature review aims to fill this knowledge gap by analyzing the effectiveness and safety of various non-surgical lymphedema treatments to promote evidence-based approaches in lymphedema management, thereby improving patients' quality of life.

**Methods:** A systematic search strategy was developed following PRISMA guidelines. We searched PubMed and Embase databases up to December 2019 for studies on

surgical and non-surgical lymphedema management. A total of 448 articles were retrieved and screened against inclusion criteria focusing on systematic reviews and/or meta-analyses that addressed clinical outcomes yielding a total of 19 studies. Two independent reviewers conducted screening and data extraction, with conflicts resolved by a third reviewer. The methodological quality of non-surgical articles was critically appraised using a checklist developed by an umbrella review methodology working group (Aromataris et al., 2015). Data from each study, including interventions, patient demographics, and clinical outcomes, were methodically cataloged.

**Results:** Results from the umbrella review showed that non-surgical interventions, particularly manual lymphatic drainage (MLD) applied in over twenty sessions, significantly reduced extremity volume, although its efficacy in conjunction with complete decongestive therapy (CDT) or compression therapy remains indeterminate. Other conservative treatments were associated with improvements in lymphatic flow and limb size reduction without complications, while compression therapy enhanced range of motion. However, kinesio taping and exercise therapy showed no statistically significant volume reduction. Acupuncture and low-level laser therapy exhibited promising trends and considerable volume reduction, respectively, meriting further investigation. The methodological quality assessment of the reviewed articles overall suggests a rigorous adherence to review protocols and critical appraisal.

**Conclusion:** The management of lymphedema remains a challenge due to the chronic nature of the condition and its impact on patients. This review highlights the importance of a multifaceted approach that encompasses non-surgical treatments, tailored to the individual's condition. The effectiveness of manual lymphatic drainage (MLD) and other conservative measures, particularly when applied consistently and intensively, underscores their importance in a comprehensive treatment regimen. However, the limited effectiveness of kinesio taping and exercise therapy in reducing limb volume calls for further research to refine these treatments. Additionally, emerging therapies like acupuncture and low-level laser therapy show potential, warranting further exploration and validation in larger trials.

These findings can guide clinicians in evidence-based decision-making, encouraging an integrative approach to lymphedema management. Future research should focus on long-term outcomes and optimization of individual treatment components that consider patient preferences and comorbidities. The ultimate objective is to improve the quality of life for individuals with lymphedema, underscoring the need for continued innovation and investigation in the field of lymphedema management.

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## **State-Based Surgical Implications of Gunshot Wound Related Traumatic Injuries Stratified by Gun Law Strength**

Abstract Presenter: Sai Anusha Sanka

Abstract Co-Author(s): Shreya Raman MD, KEVIN HE, Sarah Zubli, Lauren Yaeger, Gary Skolnick MBA, Joani Christensen MD, Justin Sacks MD, MBA

**Purpose:** Gun-related violence and safety has garnered national attention in the U.S. Gunshot wound (GSW) injuries pose the healthcare system an economic burden as high as \$126 billion per year. Previous investigations at the national level have implicated the largest surgical burden to fall onto orthopedic and plastic surgeons costing nearly \$77 billion worth in reconstructive care. Orthopedic and plastic surgery intervention was required in 99.7% of surgically treated GSW injuries and associated with 9% of these surgically treated mortalities. In the context of increased variation among state-based approaches to gun safety laws, we sought to understand the tricornary relationship between state-specific gun laws, incidence of various GSW etiologies and their subsequent burden on reconstructive surgery.

**Methods:** Twelve states were selected based on available data under the Healthcare Cost and Utilization Project - State Inpatient Database (HCUP-SID) and stratified by their gun law grade ranking validated by the Giffords Law Center to Prevent Gun Violence. HCUP-SID was then queried for GSW type and injuries and subsequent surgical interventions indexed under the ICD-10 coding system for the following specialties: neurosurgery, head and neck surgery, thoracic surgery, cardiac surgery, vascular surgery, gastrointestinal surgery, genitourinary surgery, and reconstructive (orthopedic and plastic) surgery. These numbers were then normalized to the respective populations of each state. Cochran-Armitage statistical modeling was then employed to determine correlations between gun law grade, incidence of GSW events, and number of subsequent surgical proceedings.

**Results:** Increased gun law grade was negatively correlated with overall GSW events as well as those stemming from self-harm, unintentional, assault-related deaths ( $p < 0.005$ ). Similar trends were revealed between gun law grade and mortalities caused by GSWs ( $p < 0.005$ ). Regarding the surgical burden of GSW treatment, there was a significant association between gun law grade and interventions within head/neck, thoracic, cardiac, vascular, GI, as well as orthoplastic reconstructive surgery. Orthoplastic surgeries accounted for the largest surgical burden in the treatment of GSWs in ten of twelve included states.

**Conclusions:** Our study is the first to characterize the interrelated correlation between state-based differences in gun law legislation, GSW etiological incidence, and their respective surgical burden. The implications of our data suggest that states with a lower gun law grade (ie. weaker gun safety measures) experience higher overall GSW injuries (particularly stemming from assault, self-harm, and accidental categories) as well as mortality. Such states are also saddled with a higher burden in surgical treatment of GSW events, which in most states (similar to national trends) often falls onto reconstructive surgeons. Our work will contribute to the ongoing policy debate on how to best address the GSW epidemic and the rising costs associated with its surgical treatment - a topic that is clearly relevant to the practice of reconstructive surgeons.

### **The Relationship of Nodal Pathologic Complete Response to Neoadjuvant Chemotherapy with Success of Immediate Lymphatic Reconstruction**

Abstract Presenter: D'Arcy Wainwright MD

Abstract Co-Author(s): Nicole Le MD, MPH, William West III, Sarah Moffitt, Kristen Whalen MD, Brielle Weinstein MD, Tina Tavares, Nicholas Panetta MD, FACS

**Background:** Over the past decade, immediate lymphatic reconstruction (ILR) at the time of axillary lymph node dissection (ALND) has emerged as the standard of care for prevention of breast cancer related lymphedema (BCRL). More recently, neoadjuvant chemotherapy (NC) has been increasingly utilized to reduce locoregional and distance disease with favorable results. (1,2) Nodal pathologic complete response (pCR) is defined as the absence of axillary disease following NC and ALND. (2,3) Our study aims to evaluate the impact of nodal pCR on success of ILR.

**Methods:** A retrospectively maintained, IRB approved study followed patients who

underwent ILR at the time of ALND at our tertiary care center between 2018 and 2023. Patients who presented for at least one follow up in our multidisciplinary lymphedema clinic met criteria for inclusion. Patient demographics, oncologic therapy, intraoperative factors and surgical outcomes were evaluated. Pathologic response to NC and outcomes following ILR were further explored. Nodal pCR was defined as 0 positive lymph nodes after ALND.

**Results:** 392 patients underwent ILR at our institution from 2018 to 2023. Neoadjuvant chemotherapy was completed by 367 patients (94%). Average patient age was 51 +/- 12 years with a BMI of 28.4 +/- 6.7 kg/m<sup>2</sup>. Thirty-one (8.4%) of these patients developed BCRL. Of patients who underwent NC, 146 (40%) had a nodal pCR and 221 (60%) did not. The average number of lymphatic vessels identified for ILR were similar between groups (3.00 ± 1.41 v. 3.23 ± 1.42, p = 0.09). In comparison of pathologic response and development of lymphedema, 14 (45.2%) patients with nodal pCR developed BCRL vs. 17 (54.8%) with an incomplete response, p=0.52. Patients without nodal pCR were not significantly more likely to develop lymphedema compared to those with complete response (OR: 0.80 (0.38-1.68), p=0.55).

**Conclusion:** This data comments upon our institution's outcomes following ILR, with a focus on the impact of nodal pCR on available lymphatics at time of ILR and development of BCRL. Consideration of this data is critical as NC remains an increasingly popular early breast cancer treatment. Nodal pathologic response does not appear to impact the number of available lymphatics or success of ILR in our population, and as a result patients should be considered candidates regardless of final axillary pathology. As ALND become less common with advances in NC, further comparative studies between patients with nodal pCR who do and do not undergo ALND + ILR will help further guide lymphatic intervention.

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## **Optimizing Recovery in Pectus Excavatum Correction Utilizing the Enhanced Ravitch Protocol**

Abstract Presenter: Alexa De La Fuente Hagopian MD

Abstract Co-Author(s): Souha Farhat MD, Raghav Upadhyaya, Grace Gasper, Min Kim, Michael Klebuc MD

**Introduction:** Pectus excavatum (PE) is a common congenital chest wall deformity characterized by a depression of the sternum and deformation of the adjacent costal cartilages. Correction is frequently achieved utilizing the Ravitch procedure which includes cartilage resection and sternal osteotomy followed by manual reduction and internal fixation with locking reconstruction plates. Recent modifications to the treatment protocol at our institution include mechanical reduction of the sternum utilizing a Rultract ratcheting crane retractor avoiding the need for a right thoracotomy and subsequent chest tube. Additional changes include intercostal nerve blocks with liposomal bupivacaine and utilization of Enhanced Recovery After Surgery (ERAS) pain management. This study examines the impact of these changes on postoperative recovery following surgical correction of pectus excavatum.

**Methods:** A retrospective review of the Electronic Health Record over the past 10 years was conducted to identify patients who underwent PE correction using a standard Ravitch procedure versus the enhanced Ravitch protocol (ERP) utilizing the Rultract, intercostal blockade and ERAS pain management protocol. Data pertaining to postoperative pain scores (determined by Visual Analog Scale (VAS)), length of stay (LOS), and postoperative outcomes were collected and analyzed using descriptive statistics.

**Results:** Of 22 patients who underwent chest wall reconstruction and met inclusion criteria, 8 patients received a standard Ravitch procedure, and 14 patients were managed with the ERP. Patients receiving ERP demonstrated a significant decrease in LOS compared to those undergoing the traditional repair, with an average LOS reduction from 5 days to 1.9 days ( $p < 0.00005$ ). Additionally, patients receiving ERP experienced a significant decrease in postoperative pain, with pain scores on postoperative day 1 (POD1) decreasing from an average of 5.38 to 3.9 ( $p < 0.024$ ). Similarly, average pain scores at discharge decreased from 5 to 2.7 ( $p < 0.006$ ). No patients in the ERP group developed a pneumothorax or required a chest tube in

contrast to the standard treatment group where this was encountered in all patients.

**Discussion:** The ERP including utilization of the Rultract retractor, allows for improved visualization and access to deformity intraoperatively, which facilitates a more precise correction while minimizing trauma to the surrounding tissue and structures. Additionally, we believe the liposomal bupivacaine nerve blocks and ERAS pain management protocol utilization show improved postoperative patient comfort and satisfaction demonstrated as lower postoperative pain scores decrease in LOS and early mobilization.

**Conclusion:** Implementation of the enhanced Ravitch protocol including utilization of the Rultract retractor, liposomal bupivacaine nerve blocks and ERAS pain management is associated with a statistically significant reduction in patient length of stay and postoperative pain while negating need for chest tubes.

### **An update on survival of the first 50 face transplants worldwide – a multicenter study**

Abstract Presenter: Lioba Huelsboemer MD

Abstract Co-Author: Bohdan Pomahac MD

**Purpose:** A total of 50 face transplants have been reported since 2005, from 18 centers in 11 countries. The long-term overall outcomes of patient and graft survival and their complication rates (rejection, malignancies, graft loss) along with maintenance immunosuppressive therapy have not yet been assessed in a global multi-center approach.

**Materials & Methods:** Data was collected at home institutions of participating centers retrospectively until October 2023. The survival of the transplants was assessed with Kaplan-Meier analysis and the correlation between therapy regimen and rejection episodes was explored with Spearman correlation analysis.

**Results:** 14 (77.7%) out of 18 (100%) centers worldwide participated and provided data for 46 (92%) out of 50 (100%) face transplants. The median follow-up time was 8.9 years (range 0.2 to 16.7 years). The 5- and 10-year survival of the transplants was  $85 \pm 5\%$  and  $74 \pm 7\%$ , respectively. The median number of acute rejection episodes per year was 1.2 (range 0 to 5.3) for the transplants that were lost and 0.7 (range 0 to 4.6) for the transplants that survived. Graft loss due to chronic rejection was reported in four (8%) patients, of which two (4%) patients were successfully retransplanted. Ten patients

(20%) died during follow-up. Two (4%) patients were diagnosed with newly developed malignancy (Liver cell carcinoma at 10 years posttransplant; small cell lung cancer at 10 years posttransplant). A triple therapy of Tacrolimus, Mycophenolate Mofetil and Prednisone was the most common maintenance therapy, used in 34 patients (68%). Four patients (8%) were treated with only Tacrolimus and Prednisone while three patients (6%) were treated with a combination of Belatacept and triple therapy. In three patients (6%) Tacrolimus was exchanged with Sirolimus. No correlation between episodes of acute rejection and maintenance therapy regimen was seen.

**Conclusion:** The overall survival of the face transplants over the past 18 years is encouraging. These data suggest that the acceptable long-term survival of face transplants makes them a safe reconstructive option for extensive facial defects.

## **CLOSED INCISION NEGATIVE PRESSURE THERAPY FOLLOWING AUTOLOGOUS ABDOMINAL TISSUE BREAST RECONSTRUCTION: A PILOT RANDOMIZED CONTROL TRIAL**

Abstract Presenter: Lucas Gallo MD

Abstract Co-Author(s): Morgan Yuan, Mark McRae MD, FRCS(C), Christopher Coroneos MD, Sophocles Voineskos MD

**PURPOSE:** Patients who undergo deep inferior epigastric perforator (DIEP) breast reconstruction have either closed incision negative pressure therapy (ciNPT) or standard dressings applied to the closed abdominal donor site. As there remains clinical equipoise regarding the ability of ciNPT to reduce abdominal wound dehiscence, research in the form of a parallel, two-arm RCT is warranted. This pilot study aims to determine whether an adequately powered randomized control trial (RCT) evaluating the superiority of ciNPT is feasible at our institution.

**METHODS:** This is a parallel, between-group, RCT pilot study. This study was single-blinded and allocation concealment was maintained by a study statistician. A convenience sample of consecutive patients who consented to DIEP reconstruction were approached for enrollment. Participants were included if they were  $\geq 18$  years old and consented to elective immediate or delayed breast reconstruction. Participants were randomly assigned intra-operatively following abdominal incision closure to receive either ciNPT versus standard dressing in a 1:1 ratio using randomly permuted block sizes of 4 or 6. The primary outcome(s) was patient study eligibility, recruitment, and retention. Descriptive statistics were used to analyze clinical and feasibility data.

**RESULTS:** A sample size rule of thumb of 12 participants per arm ( $n=24$ ) was used.



The pilot achieved an eligibility rate of 87.5%, a recruitment rate of 89.3%, and a post-randomization retention rate of 100%. With respect to the primary clinical outcome of abdominal wound dehiscence, we identified a 16.6% and 41.6% incidence of abdominal wound dehiscence in the ciNPT and control group, respectively.

**CONCLUSION:** As per the defined feasibility criteria, the authors have chosen to continue the protocol without modifications for the main study. Given study event rates, a fully powered RCT would require a total sample size of  $n=114$  participants.

## **Long-Term Outcomes of Microsurgical Therapies for Secondary Lymphedema: A Systematic Review and Meta-Analysis**

Abstract Presenter: Walter Jungbauer MD

Abstract Co-Author(s): Santana Solomon BS, Yu-Hui Chang, Alanna Rebecca MD, William Casey III, MD, Daniel Rhee MD

**Purpose:** Secondary lymphedema often arises in the setting of surgery, malignancy, and/or radiation.(1) In patients with lymphedema failing conservative therapy, surgical intervention may be warranted.(2) Two microsurgical techniques frequently used in the treatment of lymphedema include lymphaticovenous anastomosis (LVA) and vascularized lymph node transfer (VLNT),(3,4) but long-term outcomes data for these modalities are lacking. The purpose of this systematic review is to compile existing data surrounding LVA and VLNT in patients followed for greater than two years post-operatively, assessing their efficacy on relevant outcomes such as cellulitis and limb circumference.

**Materials & Methods:** This study was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. The PubMed, Scopus, and Cochrane databases were searched from inception until October 2023, and inclusion criteria required that patients were adults >18 years of age who were treated for secondary lymphedema with LVA or VLNT and followed for at least 24 months. Primary outcomes (cellulitis events per year, limb circumference) were stratified by upper and lower extremity, and meta-analysis was performed using R 4.3.1. Pooled effect sizes were estimated by the random-effect models, and other analyses included subgroup analysis (by upper/lower extremity) and sensitivity analysis.

**Results:** In total, 21 studies provided data on patients treated for secondary lymphedema via LVA ( $n = 216$ ) or VLNT ( $n = 432$ ). The cohort possessed a mean age of  $56.4 \pm 3.7$  years with corresponding mean BMI of  $26.7 \pm 3.7$ . All patients were

followed for at least 24 months post-operatively. For patients treated for upper extremity lymphedema, LVA significantly reduced the mean cellulitis rate from 1.25 events/yr to 0.20 events/yr ( $p<0.0001$ ), and VLNT reduced the cellulitis rate from 2.53 events/yr to 1.47 events/yr ( $p<0.0001$ ). Similarly, in patients treated for lower extremity lymphedema, LVA decreased cellulitis rates from 1.48 to 0.07 events/yr ( $p<0.0001$ ), while VLNT reduced cellulitis from 5.59 to 0.50 events/yr ( $p<0.0001$ ). Limb circumferences were noted to be improved for both upper and lower extremity limbs treated by VLNT.

**Conclusion:** LVA and VLNT are microsurgical therapies that produce durable improvements in cellulitis rates at two years post-operatively. VLNT was also shown to reduce limb circumference. Cellulitis and limb circumference are relevant outcomes which greatly impact patient quality of life in the lymphedema patient population, and VLNT and LVA should continue to be explored as options in the treatment algorithm for secondary lymphedema.

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## Unveiling the Domino Effect: Reoperations in DIEP Reconstruction Amplify Morbidity

Abstract Presenter: Kevin Vega MD

Abstract Co-Author(s): Marwan Abougergi, Sameer Patel MD, Heather Peluso MD

**Introduction:** The deep inferior epigastric perforator (DIEP) flap is a dependable microvascular technique for breast reconstruction with low revision rates. Previous literature has identified risk factors associated with reoperation among patients undergoing DIEPs. The goal of this study is to delve into the repercussions of reoperation on patient outcomes, providing a comprehensive understanding of its

impact.

**Methods:** This is a retrospective cohort study using the Nationwide Readmission Database. The Nationwide Readmission Database is the largest all-payer publicly available readmission database in the US. Patients were included if they had an ICD 10-PR code for DIEP flap reconstruction from January to June in 2016-2020. Reoperations within the index admission for DIEP reconstruction were identified using ICD 10-PR codes. The primary outcome was 180-day readmission rates. Secondary outcomes included deep venous thrombosis/pulmonary embolism rates, most common reasons for readmission, in-hospital and 180-day mortality, and resource utilization, characterized by total hospitalization charges and costs and length of stay. Confounders were adjusted for using multivariate regression analysis. Total hospitalization charges and costs were adjusted for inflation over time using the consumer price index. Statistical analyses were conducted using STATA MP, 14.0.

**Results:** A total of 19,208 patients underwent DIEP reconstruction and were included in the study, 2.4% (469) of whom had a reoperation during the index admission. The mean age was 51 years for both groups (reoperation and no-reoperation). The all-cause 6-month readmission rate was 10.5%. Patients who underwent a reoperation during their index admission were 77% more likely to get readmitted than patients who only had their DIEP reconstruction (adjusted odds ratio (aOR):1.77, 95% confidence interval (CI):1.23-2.57,  $p<0.01$ ). In addition, patients with a reoperation during their index admission were almost 9 times more likely to form a deep venous thrombosis with or without a pulmonary embolus in the hospital (aOR:8.93, CI:6.10-13.09,  $p<0.01$ ) and 3 times more likely to do so in the next 6 months (aOR:2.84, CI:1.26-6.40,  $p=0.01$ ). The most common reasons for readmission were infection, followed by secondary reconstructions for deformities/disproportions of the reconstructed breast, then sepsis, and finally, pulmonary embolisms. In-hospital and 6-month mortality rates were less than 1% for both groups. Reoperation increased the adjusted mean length of stay by 1.6 days (adjusted mean difference (aMD):1.6, CI:1.12-2.00),  $p<0.01$ ). Consequently, the adjusted mean difference in the total hospitalization charges (aMD):\$68,651, CI:\$49,916-\$87,386),  $p<0.01$ ) and total hospitalization costs (aMD:\$15,261, CI:\$11,138-\$19,383,  $p<0.01$ ) were increased among patients who underwent a reoperation during their index hospitalization compared to patients who did not.

**Conclusion:** Reoperation after DIEP flap reconstruction is associated with increased 6-month readmission rate, DVT/PE rates both during the index admission and within the subsequent 6 months, and healthcare resource utilization. Reoperation during the index admission increases the long-term morbidity associated with DIEP reconstruction.

## **Utilizing Body Contouring Techniques and Flaps in the Management of Hidradenitis Suppurativa and Excess Skin in Massive Weight Loss Patients: An Integrative Approach**

Abstract Presenter: Marion Tapp MD

Abstract Co-Author(s): Daniel Zaki MD, Mario Blondin MD, Kyle Robinson MD

**Introduction:** The management of Hidradenitis Suppurativa (HS) in patients who have undergone massive weight loss represents a unique surgical opportunity, allowing not only the removal of excess skin but the repurposing of this tissue for the strategic treatment of HS. This case series presents an integrative approach that leverages body contouring techniques alongside vascularized flap reconstructions derived from redundant tissues, aiming to address both conditions simultaneously. This strategy underscores a unique alternative surgical approach compared to conventional methods that treat these issues in isolation.

**Methods:** We retrospectively reviewed a series of 15 patients who underwent surgical treatment for HS and excess skin following massive weight loss. The interventions included localized HS excisions combined with reconstructive surgeries for excess skin removal, employing panniculectomy, brachioplasty, thighplasty, mastopexy, and monsplasty with co-localized regional flaps for optimal aesthetic and functional results. Patient selection criteria, surgical techniques, and post-operative care protocols are described. 2 patients from the series are highlighted below.

**Results:** Case 1: A 47-year-old female, post-laparoscopic gastric bypass, presenting with a significant weight loss of 110 pounds. The patient suffered from recurrent skin rashes, infections, and exacerbation of her abdominal and axillary hidradenitis. This patient was offered a panniculectomy in which redundant soft tissue was removed in addition to the active abdominal hidradenitis allowing for re-draping of unaffected abdominal skin into the defect thus resolving both issues. After the patient had adequately healed, she underwent excision of her right axillary hidradenitis with utilization of a posterior arm flap for pedicled coverage of the defect. This allowed for a brachioplasty type excision of the excess arm tissue while also providing vascular tissue to the defect.

Case 2: A 27-year-old female, post-gastric sleeve, presented with an 85-pound weight loss and complaints of excess skin and hidradenitis in the inguinal region and mons. The patient underwent excision of HS with the utilization of redundant medial thigh

tissue for coverage. Thus, the patient benefited from contouring of her medial thigh with an anteromedial thigh flap while providing healthy, unaffected tissue into the area of previous HS.

**Conclusion:** This study is the first to describe a combined surgical approach leveraging body contouring and reconstructive techniques in the surgical management of HS and excess skin in patients following massive weight loss. This strategy not only optimizes aesthetic and functional outcomes but also offers a holistic solution to the complex challenges these patients face. These patients benefited from a marked improvement in the physical manifestations of both HS and excess skin. Our findings suggest that this approach is safe and effective in the management of HS and excess skin removal after massive weight loss. Further research and new applications of these techniques may encourage a shift in current clinical practice.

## **The Utility of Mobile Surgical Units in Plastic and Reconstructive Surgery in Austere Environments: A Systematic Review**

Abstract Presenter: Osaid Alser, MD, MSc(Oxon) MD

Abstract Co-Author(s): Bernardo Galvan, Ariel Santos, Brittany Bankhead, Mark Jason Torres

**Background:** Mobile surgical units (MSUs) have been utilized for many years to facilitate surgical care at the frontlines. However, their current role in plastic and reconstructive surgery particularly in austere environments and low-to-middle-income countries (LMICs) is unclear.

**Methods:** A search strategy was developed to include studies evaluating MSUs in general with sub-analysis of plastic surgery uses. A PRISMA-compliant literature search was conducted using PubMed, Cochrane, Embase, Scopus, and Web of Science from inception to April 2023. Title and abstract, and then full-text screening against eligibility criteria was performed independently by two reviewers and consensus was achieved by a third reviewer.

**Results:** Reviewers identified 460 studies, of which 6 were included in the analysis. Model types included tent (n=2), truck/bus (n=2), train (n=1) and lastly a portable bubble that serves as a sterile operative field (Figure 1). The main use was in orthoplastic surgery particularly in limb amputation and reconstruction (n=3) with two models used in burn and hand surgery. Three of these models were used by the US military in combat

zones. The main benefits reported for MSUs were improving access and time to intervention therefore preventing delays in care. Limitations reported were limited space in case of mass casualties, scarce resources, lack of operating room sterility for later cases therefore potential increased risk of surgical site infection. The overall quality of studies included was poor with most of the studies being case series (level 4) on the Oxford Center for Evidence-Based Medicine scale (n=5, 83.3%).

**Conclusions:** The study results show that MSUs can be good alternatives for providing plastic surgical care in austere environments and LMICs, however further improvement of MSUs is required to improve their portability, safety and reduce perioperative morbidity.

### **The long-term Postoperative Pain Course Following Primary and Secondary Targeted Muscle Reinnervation in Amputees**

Abstract Presenter: Floris Raasveld MD

Abstract Co-Author(s): Maximilian Mayrhofer-Schmid, Justin Mccarty DO, MPH, Ian Valerio MD, MS, MBA, FACS, Kyle Eberlin MD

**Introduction:** Targeted muscle reinnervation (TMR) has been demonstrated to be effective in the surgical treatment of neuropathic pain for amputees. (1, 2) However, data on the long-term postoperative pain course for patients that undergo Primary, prophylactic (<14 days since amputation), or Secondary ( $\geq 14$  days) TMR surgery for preexisting pain, and their difference, remains insufficiently described. This study aims to describe the long-term postoperative paincourse for these patients to aid in managing postoperative expectations.

**Methods:** Chart review was performed for major upper and lower limb amputees who underwent Primary and Secondary TMR and who were prospectively enrolled between January 2018 and January 2024, with a minimum follow-up up of 12 months. Pain scores reported on the Numerical Rating Scale (NRS, pain on a 0-10 scale) were collected up to latest follow-up. Mean NRS pain levels were compared between Primary and Secondary TMR cohorts. For Secondary TMR patients, it was assessed whether the difference in baseline and post-operative pain reached the Minimally Clinically Important Difference (MCID,  $\Delta\text{NRS}=3.0$ ). (3) Multilevel mixed-effects models were utilized to analyze the difference in pain and visualize average postoperative pain courses.

**Results:** A total of 144 amputees (60.4% male; 60.4% Secondary TMR patients) were included. The median follow-up was 2.4 years (IQR: 1.5-3.3). Primary TMR patients demonstrate a more rapid decline in pain, typically achieving average mild pain levels at 12 months (3.0, versus 4.1 for Secondary TMR patients ( $p<0.001$ )) before stabilizing. Secondary TMR patients demonstrate a less rapid, yet consistent decrease in pain, reaching an average mild pain level at the 36-month mark (NRS=2.7, versus 2.3 for primary TMR patients ( $p<0.001$ )). The difference in pain between Primary and Secondary TMR patients is significantly different over the complete trajectory ( $p<0.001$ ). On average, Secondary TMR patients reach the MCID at the 36-month mark, compared to pain at baseline (NRS=6.0 to NRS=2.7,  $\Delta$ NRS=-3.3,  $p<0.001$ ).

**Summary:** - Primary TMR patients illustrated a consistent postoperative decrease in pain score, reaching low levels of pain at 12 months before stabilizing.

- Secondary TMR patients demonstrate slower but consistent decline in pain levels, and reach the MCID at the 36-month mark.
- Primary TMR patients demonstrate lower pain levels over the whole trajectory.
- These trends may assist in illustrating and understanding the long-term postoperative pain course and counseling patients in pain expectations following TMR.
- This data reinforces the durability of both Primary and Secondary TMR over a long timeframe.

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## Nipple Areolar Malposition vs. Ideal Position After Nipple-Sparing Mastectomy Reconstruction

Abstract Presenter: Alessa Mikaela Mendoza

Abstract Co-Author(s): Sahar Borna MD, Antonio Forte MD, PhD, MS, Olivia Ho MD, FRCSC, MMSc, MPH, FACS, Sarvam TerKonda MD, Brian Rinker MD

**PURPOSE:** Malposition of the nipple areolar complex (NAC) is a non-optimal complication of nipple-sparing mastectomy (NSM) reconstruction, NSM that preserves the NAC and surrounding skin and results in both a more naturally appearing reconstructed breast and improved patient quality-of-life. NAC malposition may undermine these major reconstructive benefits, but there are various aspects of surgical technique that may potentially affect the NAC positioning: use of acellular dermal matrix (ADM), reconstruction type (direct-to-implant vs tissue expander), implant or tissue expander plane of placement, and mastectomy incision location.

**METHODS:** To better understand NAC malposition and these potential surgical factors, measurements and data were recorded for 88 NSM reconstruction patients between January 2020 and May 2023. Statistical analyses comparing actual and ideal measurements were completed and demonstrated that, while patients' measurements strayed from the ideal at both pre-operative and post-operative timepoints, most patients had worsened malposition post-operatively compared to pre-operatively. Analyses of the surgical variables was performed using mixed effect regression models.

**RESULTS:** Findings were significant for ADM usage ( $p=0.003$  and  $p<0.001$ ) and direct-to-implant reconstruction type ( $p=0.058$  and  $p=0.029$ ), being associated with NAC malpositioning along the vertical axis. Subpectoral placement of tissue expanders or implants ( $p=0.012$  and  $p=0.011$ ) and breast-splitting mastectomy incision type ( $p=0.003$ ) were found to result in increased malposition.

**CONCLUSION:** These findings demonstrate how certain NSM reconstruction surgical techniques may influence NAC positioning by highlighting which variables may have a higher risk of NAC malpositioning. These factors should be carefully considered with surgeons' operative planning and with patient counselling regarding reconstructive options.

**Evaluating the Efficacy of Lymphovenous Bypass (LVB) in Lower Extremity Phleboedema and Venous Ulcer Treatment**



Abstract Presenter: Chen-Hsiang Kuan MD

Abstract Co-Author(s): Ying-Sheng Lin MD, Sung-Chuan Chao

Chronic Venous Insufficiency (CVI) commonly manifests as venous leg ulcers (VLUs), which account for approximately 70% of all persistent leg ulcers. Traditional treatments encompass chronic wound management, pharmacotherapy, utilization of compression garments, and surgical options such as debridement and skin grafting. However, these interventions frequently result in suboptimal skin graft adherence and high recurrence rates of ulcers. Additionally, patients often continue to experience refractory ulcers and enduring phleboedema, despite the surgical rectification of varicose veins and management of deep vein thrombosis.

In recent years, Lymphovenous Bypass (LVB) - a procedure that redirects lymphatic flow into the venous system - has emerged as a promising therapy for lymphedema. Given the symptomatic similarities between phleboedema (C3) and lymphedema, LVB presents a potential treatment strategy for phleboedema as well.

Between May 2021 and June 2023, a prospective study was conducted on patients with non-healing stasis ulcers following four weeks of conventional care, or those suffering from lower extremity edema that adversely affected their quality of life despite undergoing varicose vein treatments (Mueller phlebectomy or endovascular laser therapy). Exclusion criteria included severe peripheral arterial disease and untreated deep vein thrombosis or iliac vein compression. Data collected encompassed demographic information, the trajectory of wound healing, rates of ulcer recurrence, lymphoscintigraphy results, and responses to the Venous Leg Ulcer Quality of Life (VLU-QoL) questionnaires.

The cohort consisted of 31 patients who underwent LVB, with skin grafting performed as needed. The average age was  $62.6 \pm 14.7$  years, with a predominance of male patients (20, 64.5%). The majority were classified as CEAP C6 (25, 80.6%). Postoperative observations included wound healing and phleboedema resolution within two months, with enduring outcomes observed in patients exhibiting a singular etiology of CVI over a minimum follow-up of one year. The VLU-QoL questionnaire, which had a 39.3% response rate, indicated enhancements in quality of life, including activities, psychological well-being, and symptom distress.

The employment of Lymphovenous Bypass for CVI management has demonstrated an elevated success rate in skin grafting, alleviation of wound pain/neuralgia, limb

decompression, and enhanced wound healing, with sustained outcomes. Patient-reported outcome measures (PROMs) further underscore the potential advantages of LVB. To validate these findings, large-scale randomized controlled trials and pathophysiological investigations are imperative.

### **Comparison of immediate versus delayed lymphatic reconstruction: Which option works better to prevent post-mastectomy lymphedema?**

Abstract Presenter: Jae Ho Chung MD, PhD

Abstract Co-Author(s): Yijun Moon MD, Kijae Kim MD, Jae Min Lee MD, Hyung Chul Lee MD, Eul Sik Yoon MD

**Background:** An immediate lymphatic reconstruction (ILR) combining axillary reverse lymphatic mapping and lymphovenous anastomosis (LVA) has been gradually in the spotlight as a novel surgical technique to prevent lymphedema.[1] However, there is a counterargument that connecting small lymphatic vessels to large veins in the axillary region is not physiologically reasonable given the pressure gradient.[2] Since it is difficult to decide whether to perform ALND preoperatively, our center perform not only ILR, but also distally based delayed lymphatic reconstruction (DLR). In this study, we will compare the incidence of postoperative lymphedema between the ILR treatment group and DLR treatment group during the same period.

**Methods:** In this retrospective cohort study, we analyzed 38 patients who had undergone mastectomy for node-positive unilateral breast cancer in our institution between November 2020 and October 2021. To compare the effect of preventive LR, we divided the patients into a ILR group (n=16) and a DLR group (n=22). For patients with at least 24 months of follow-up, we analyzed patient demographics and individual characteristics of patients who developed lymphedema.

**Results:** During a mean follow-up of 28 months, one patient (6.3%) was confirmed to have upper extremity lymphedema in the ILR group, whereas 5 out of 22 patients (22.7%) were diagnosed in the DLR group. In terms of individual LE patients, 5 out of 6 (83.3%) were treated with radiation, and were diagnosed between 7 and 21 months after lymphatic reconstruction (median = 18 month)

**Conclusions:** Our results suggested that ILR in the axillary region seems to have a

better prophylactic effect than distally-based DLR. There is a need for larger studies with longer follow-up to confirm the findings obtained in our study.

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## Histological observation using video-capillaroscopy in reconstructive microvascular surgery and lymphaticovenous anastomosis: characteristics and limitations

Abstract Presenter: Ayaka N. Deguchi MD

Abstract Co-Author(s): Chihiro Matsui MD, Reiko Tsukuura MD, Hayahito Sakai MD, Toko Miyazaki, Takumi Yamamoto MD, Takakuni Tanaka, Hiroshi Mizuno MD

**Purpose:** Video-capillaroscopy is a non-invasive imaging modality widely used in the field of rheumatology to evaluate microcirculation. We have previously reported successful capture of real-time blood flow in 1-mm superficial layer of flaps using video-capillaroscopy, leading to possible application of this device in intraoperative assessment of real-time blood flow in microsurgery. In this study, we used video-capillaroscopy to observe different tissue components of the donor and recipient sites in reconstructive microvascular surgery and lymphaticovenous anastomosis (LVA). Additionally, we report histological characteristics of the findings and the conditions limiting the use of this modality.

**Methods:** Twelve patients (7 males and 5 females) between the ages of 54 to 76 years underwent head and neck microvascular reconstruction from 2021 to 2024. The donor- and recipient-sites were evenly divided into four areas (quartiles) as observation points, and the central portion was observed using video-capillaroscopy (GOKO-BscanZD, GOKO Imaging Devices Co., Japan). Additionally, lymph vessels of 20 lower extremity lymphoedema patients between the ages of 32 to 83 years (mean age 61.7 years) in

LVA surgeries from 2022 to 2023 were evaluated using this device.

Perforating branches of the donor-site were detected at the junction of blood vessels and fascia at a total of 42 locations for 12 patients (mean: 3.5 perforators). The muscle, fascia, skin surface, adipose tissue, and de-epithelialized skin were observed. At the recipient site, the cervical skin, mandibular periosteum, sternocleidomastoid muscle, and cervical adipose tissue were detected. In LVA surgery, lymph vessels in adipose tissue were observed. Blood flow was defined as clear detection of red blood cells movement and was assessed using a four-point evaluation scale. Zero points were given if there was no blood flow. One, two, three, and four points were given for blood flow found in <25%, 25-50%, 50-75%, >75% of the observed area, respectively. Papaverine hydrochloride was applied for preventing perforator spasm.

**Results:** The mean score for the donor-site was  $\leq 1$  points for muscle, fascia, and de-epithelialized skin; and  $>3$  points for other tissues. The mean scores at the recipient-site were 0 for muscle, 2.0 for bone periosteum, 2.7 for skin papillary, and 3.5 for adipose tissue. Evaluation for muscle and fascia using video-capillaroscopy was intractable due to poor LED penetration. De-epithelialized skin was challenging to observe due to damage within 1-mm depth from the skin surface. Likewise, assessment of skin papillary region near skin incisions was not possible. A total of 67 lymph vessels were observed at the time of LVA surgery with an average score of 2.6. The mean preoperative ICG stage of lymph vessels in which blood flow could not be observed was 3.5.

**Conclusion:** Video-capillaroscopy, a portable, non-invasive imaging modality, still has its limitations to application on muscles, injured areas within 1-mm depth, and lymph vessels with high ICG stage. However, consistent observation of abundant blood flow in the skin, adipose tissue, periosteum, perforators, and lymph vessels via video-capillaroscopy in our study demonstrates the hopeful efficacy of this device in microvascular surgery and LVA.

## **The Radial Forearm Adipofascial Flap for Lower Extremity Coverage: New Incites on an Established Technique**

Abstract Presenter: Hunter Moyer MD

**Introduction:** The coverage of lower extremity soft tissue defects from trauma, cancer and deep seated wounds often requires complex free tissue transfer. The anterolateral

thigh, gracilis, and radial forearm have been proven to be safe and effective means for limb salvage and functional recovery.<sup>1</sup> Classically, a major drawback of the radial forearm flap is the high incidence of donor site morbidity.<sup>2</sup> Raising an adipofascial (AF) forearm flap preserves skin at the donor site and its relative thinness makes it a versatile flap with minimal bulk over the ankle and foot. With the intention of improving donor site morbidity and aesthetics, we compare the radial forearm AF flap to the suprafascially-dissected fasciocutaneous (FC) flap for coverage of lower extremity soft tissue defects.

**Methods:** This is a retrospective review of 29 consecutive patients treated with free AF or FC radial forearm flaps to the foot and ankle between February 2018 and September 2023. Records were reviewed to determine the type of defect and preceding surgery, time to reconstruction, complications, and reoperations.

**Results:** Of the 29 patients, 7 underwent FC reconstruction and 22 AF reconstruction. There was no significant difference in patients age, BMI, and comorbidities between the AF and FC groups. In addition, there was no difference in operative time, dissection time, or hospital length of stay. There was a significantly lower rate of reoperation and donor site revision in the AF group compared to the FC group with a similar rate of recipient site complications. Four patients underwent reoperation in each group (FC 57.1%, AF 18.2%, p-value= 0.046), and 3 patients underwent donor site revision in the FC group compared to 1 patient in the AF group (FC 42.9%, AF 4.5%, p-value=0.0091).

**Conclusion:** In the author's experience, the radial forearm should be considered a workhorse flap in the reconstruction of lower extremity soft tissue injury. This series shows that the use of the AF flap resulted in improved functional and aesthetic outcome with a decreased need for reoperation and donor site revision.

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## **UTILITY OF PISCINE REGENERATIVE DERMAL MATRIX IN EXTENDING THE REACH OF PEDICLED MUSCLE AND FASCIOCUTANEOUS FLAPS IN COMPLEX SOFT TISSUE RECONSTRUCTIONS**

Abstract Presenter: Matthew Endara MD

**Aim:** Reconstructive surgeons aim to provide durable solutions for complex wounds with exposed vital structures, emphasizing minimal donor site morbidity. While muscle and fasciocutaneous flaps are often the gold standard, their limitations sometimes necessitate additional interventions like skin grafts. Minimizing donor site morbidity is crucial in treatment planning, driving the search for solutions to avoid secondary flap or graft harvest. This abstract explores the use of decellularized fish skin grafts (FSG) as a regenerative matrix product to extend flap reach during transfer.

**Method:** Ten patients requiring soft tissue coverage underwent reconstruction using muscle or fasciocutaneous flaps combined with decellularized FSG. FSG was utilized when flaps alone were unable to fully cover the wound or when minimizing tension on the surrounding structure, such as the lower eyelid, was desired. In these cases, FSG replaced traditional skin grafts or additional flaps.

**Results/ Discussion:** FSG supported flaps involving various muscles and fasciocutaneous areas in all 10 patients, with successful tissue transfer and rapid FSG integration. Flaps supported in this way included the lateral gastrocnemius muscle, abductor digiti minimi muscle in addition to keystone, dorsal nasal, rotation advancement and filet of toe fasciocutaneous flaps. The wounds healed without further surgical intervention, and patient satisfaction was high.

**Conclusion:** Decellularized fish skin grafts prove effective in extending flap reach while minimizing donor site morbidity. The rapid integration of FSG facilitates quick re-epithelialization and complete closure, demonstrating its utility in challenging cases.

## **Nasolabial Flap Variations And Alternatives In Nasal Ala Reconstruction**

Abstract Presenter: Oliver Scheufler MD, PhD

Abstract Co-Author: Julian Ramin Andresen

**Background:** The nasolabial flap is widely used to reconstruct the nasal ala, because of several advantages of nasolabial tissue, including its location, color-match, excellent blood supply, minimal donor deformity, absence of hair, and ease of transfer (1). Different nasolabial flap variations have been advocated, including two-staged (2) and single-staged flaps (3-5). However, when to choose which variation remains unclear. The performance of nasolabial flap variations was analyzed and compared to other reconstructive options.

**Methods:** Consecutive alar reconstructions performed during a 10-year period (January 2012 to December 2021) were studied retrospectively. Charts and surgical reports were reviewed for defect size, reconstructive technique, cartilage grafts, surgical complications, and secondary procedures. Patients were followed up clinically at 3, 6 and 12 months. Aesthetic outcomes were evaluated using standard digital photographs.

**Results:** 148 alar reconstructions were performed in 84 female and 64 male patients (mean age, 69 years; range, 19-89 years). Average defect diameter was 1.6 centimeters, involving the right and left ala in 70 and 78 cases, respectively. 110 reconstructions (74 percent) were performed with nasolabial flaps, 90 single-staged and 20 two-staged, including 68 nasolabial-cheek flaps, 32 nasolabial island flaps and 10 nasolabial transposition flaps. 38 reconstructions (26 percent) employed other flaps in 20, skin-fat grafts in 14, and direct closure in four cases respectively. Alar rim grafts (95 primary and 5 secondary) were used in 100 patients.

Complications occurred in 42 patients (28 percent), including hematoma, delayed wound healing, flap necrosis, vestibular stenosis and alar crease obliteration. Planned secondary procedures were performed in 20 nasolabial island flaps and 12 paramedian forehead flaps. Unplanned secondary procedures were performed in 42 single-stage nasolabial flaps (47 percent). None of the other single-stage flaps or skin-fat grafts were revised.

**Conclusions:** Single-stage and two-stage nasolabial flap variations provide a versatile and safe means for reconstruction of the nasal ala, pending adherence to specific principles of flap design, harvest and inset. They are particularly suitable for patients with a well-developed nasolabial fold and excess cheek skin. Two-stage flaps are advantageous for patients with a pronounced alar crease and thick nostrils as well as younger patients, while single-stage flaps are more suitable for patients with a flat alar crease and thin nostrils as well as older patients. Scars should be placed at the borders of anatomical subunits, in existing folds or creases and over convex contours in areas with light reflections, whenever possible. With the right indication, single-stage nasolabial flaps produce aesthetically pleasing results and compare favorably to two-

stage flaps. However, unplanned secondary surgery is frequent.

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## **Predicting Lymphedema After Immediate Lymphatic Reconstruction: Development Of An Artificial Intelligence Predictive Model**

Abstract Presenter: Berk Ozmen MD

Abstract Co-Author: Graham Schwarz MD

**Purpose:** Lymphedema is an important complication, impacting quality of life and increasing healthcare burdens. Early prediction and intervention are crucial for effective management of this condition. In this study, we aim to develop and validate an artificial intelligence (AI) model, specifically the eXtreme Gradient Boosting (XGBoost) algorithm, to predict the occurrence of lymphedema after immediate lymphatic reconstruction to enhance clinical decision-making and surgical outcomes.

**Methods:** A comprehensive dataset comprising 131 patients who had undergone immediate lymphatic reconstruction was analyzed. The dataset was systematically divided into training (70%), validation (20%), and testing (10%) sets to optimize and validate the AI predictive model. The XGBoost algorithm, an AI algorithm, known for its efficiency and accuracy in handling structured data, was employed as the cornerstone of our predictive model. The model's performance was rigorously evaluated through cross-validation on the training and validation sets, followed by a final assessment on a set aside test set.

**Results:** AI model demonstrated remarkable predictive accuracy, achieving an accuracy metric of 0.8620 on the test set, indicating its robustness and reliability. These



results underscore the precision of the XGBoost model in identifying patients at risk of developing lymphedema following immediate lymphatic reconstruction.

**Conclusion:** The findings of this study highlight the significant potential of AI predictive models in predicting lymphedema after immediate lymphatic reconstruction. The high accuracy achieved by the XGBoost model underscores its applicability in clinical settings.

### **Patient Outcomes in 32,019 DIEP (Deep Inferior Epigastric Perforator) Flap Reconstructions: Insights from the Largest National Readmission Database**

Abstract Presenter: Sthefano Araya

Abstract Co-Author(s): Heather Peluso MD, Nathan Doremus, Jaina Lane, Heli Patel, Lindsay Talemal MD, Daniel Najafali, Alexander Chang, Sameer Patel MD

**Background:** The DIEP flap is a dependable technique for microvascular breast reconstruction with low revision needs. Prior NSQIP data shows a readmission rate of 5.6%, LOS of 3.9 days, and complication rates for hematoma, vascular reoperation, and dehiscence at 3.68%, 1.99%, and 2.8%, respectively, with infection rates at the recipient site at 0.4% and medical complications at 6.4%. (1-3) Our study expands on these metrics using a larger US database to examine readmissions, mortality, morbidity, and LOS.

**Methods:** We conducted a retrospective study using 2017-2020 Nationwide Readmissions Database data, focusing on patients with DIEP flap reconstruction. Our primary measure was 30-day readmission, and secondary metrics included mortality, readmission causes, complications, and resource use, adjusted for confounders through multivariate analysis.

**Results:** A total of 32,019 DIEP flaps were identified in the overall cohort, with a median age of 51 years. The most common indication for breast reconstruction was following mastectomy. The rates of in-hospital, 30-day, and calendar-year mortality were all less than 1% (confidence interval 1.29-3.99), indicating low mortality rates associated with DIEP flap reconstructions respectively. The 30-day readmission rate was 5.8% (CI: 5.4%-6.3%), with infection being the most common cause of readmission, which had not been previously reported in the literature, with a rate of 2.0%. The main causes of readmission were infection (2.0%), wound dehiscence (0.19%), pulmonary embolism

(0.19%), sepsis (0.18%), and hematoma (0.18%). Reoperation rates within the same admission were 7% during the index hospitalization and 11% during readmission. The average length of stay for patients undergoing DIEP flap breast reconstruction was 3.7 days (CI 3.65-3.82), consistent with current literature. In terms of the financial aspect, the mean adjusted hospitalization total charge was found to be \$133,939 (CI: \$128,021-\$139,856), representing the listed price for the services rendered. The mean cost, reflecting the actual expenses incurred, was calculated to be \$35,252 (CI: \$34,029-\$36,475). These findings emphasize the significant difference between charges and costs in healthcare, highlighting the financial complexities associated with DIEP flap reconstructions.

**Conclusion:** Our study provides significant insights into patient outcomes and complication rates in DIEP flap breast reconstruction. Notably, we discovered that the infection rate requiring readmission from DIEP flap reconstruction is 2.0%, which has not been previously reported in the literature. Additionally, we observed a higher reoperation rate (7% vs 5.6%) and a lower dehiscence rate (0.2% vs 2.8%) based on data from the largest nationally representative readmission database in the United States. Importantly, our investigation showed comparable reoperation rates and length of stay.

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#### **Spraying New Horizons: A One-Year Audit of Aerosolized Autologous Skin Cells in Diverse Plastic Surgery Reconstructions**

Abstract Presenter: Ethan Paulin MD

Abstract Co-Author(s): Marc Gorvet DO, Ke Nan Huang MD, Elizabeth Zellner MD, Helen Perakis MD, Edmond Ritter MD

**Introduction:** The Autologous Skin Cell Suspension (ASCS) technology is a new addition to the plastic surgery toolbox that can expand the regenerative potential of donor split-thickness skin defects after reconstructing full-thickness skin defects. Over the past year, our plastic surgery team has used the ASCS technology in the reconstruction of a wide range of wounds. Here, we review our outcomes and report on our experience using the aerosolized skin spray technology for soft tissue reconstruction.

**Methods:** A one-year audit was conducted to retrieve all cases involving epidermal autografting at our institution, from January 2023 to January 2024. Patients of all ages were included. From the electronic medical records, the perioperative protocols followed for application of the epidermal autografting, patient demographics, and long-term clinic follow-up reports were obtained. Given the range of applications across the 4 senior plastic surgeons retrieved in our audit, 2 representative cases for each indication were selected for in-depth review of the protocols used, complications, and long-term clinical outcomes.

**Results:** A total of 32 cases involving epidermal autografting were conducted, and 8 cases (age range 5 to 77 years, 3 females) were selected for discussion grouped into following indications were: oncological reconstruction, traumatic reconstruction (degloving, limb salvage), infection or wound dehiscence, and cosmetic resurfacing. ASCS application varied significantly, with the aerosolized skin spray being; combined with a split-thickness skin graft (STSG, meshed either 2:1 or 3:1), applied over free or pedicled flaps (reverse sural artery, latissimus dorsi, omental), onto donor flap donor sites, either directly onto freshly debrided wound beds or onto neodermis established using dermal matrices (as a one- or two-stage surgeries). Wound locations included the toes, dorsal foot, lower leg, thigh, chest, posterior shoulder, arm, and calvarium. ASCS preparation involved additional intraoperative steps, but these steps could be integrated to the operative workflow and did not notably increase operative time. Primary dressings were either non-adherent porous transparent dressings followed by petroleum gauze, or petroleum gauze directly. Secondary dressings almost always included a negative pressure wound vacuums. There was no noted association between dressing choice and postoperative outcomes (graft take, durability, or cosmesis). The longest follow-up was 12-months and all patients to date had 100% graft take. There were no reports of postoperative infections or need for re-debridement or revision surgeries. Patients were agreeable to reconstruction with the technology and pleased with the outcomes. The durable reconstructions exhibit early repigmentation.

**Conclusion:** Our findings underscore the expansive utility of ASCS across a wide range of wound types commonly encountered in plastic surgery. Long-term patient follow-up remains imperative to assess sustained outcomes. Despite a modest increase in procedure duration, the technology poses no additional risks while offering substantial benefits. The aerosolized ASCS technology offers a promising advancement in wound

care and may augment both the functional and cosmetic aspects of surgical reconstruction.

## **Autologous Fat Grafting for Pain Relief and improved prosthetic tolerance at Amputation Sites: A Prospective, Single-Center Study**

Abstract Presenter: Hamid Malekzadeh MD

Abstract Co-Author(s): Danielle Minteer PhD, Debra Bourne MD, Patsy Simon, M. Asher Schusterman II, MD, Francesco Egro MD, Msc, MRCS, Sydney Coleman MD, Albert Donnenberg, Vera Donnenberg, Aaron Wyse, J. Peter Rubin MD

**Purpose:** Pain at amputation sites can often lead to considerable disability and decrease in quality of life. Our prior research indicates promising early outcomes with fat grafting to address soft-tissue deficiencies and enhance local tissue quality in lower extremity amputations. (1) This prospective, single-center clinical trial aimed to evaluate the effectiveness of autologous fat grafting at amputation sites for impacting pain and function in amputees.

**Methods:** Under an FDA approved protocol and Department of Defense funding, and with strict eligibility criteria, we prospectively enrolled subjects with lower extremity amputation experiencing pain that limited prosthesis fitting and use, despite multiple attempts to refit the prosthesis and/or change its design. All subjects received autologous fat grafting, and were randomized into either the Enriched Group, using autologous adipose stromal cell-enriched fat grafting (minimum  $2 \times 10^6$ ) cells per cc of injectate), or the Standard Group, using standard autologous fat graft. Outcomes encompassed biological cell properties, limb volume appearance, CT scan-measured limb volume, pain assessment, functional outcome measures with prosthetics, and measurements related to quality of life.

**Results:** Participants in the Enriched group totaled 3 (all male, average age  $46 \pm 18$ ), while the Standard group comprised 7 individuals (4 male, average age  $56 \pm 13$ ). The most common adverse events reported were bruising and pain at the liposuction site. SVF cell viability was measured  $82.7 \pm 3.6\%$  in the Enriched. Throughout the trial, all participants experienced significant improvement in residual limb pain and phantom pain, compared with baseline, and enduring for 24 months (p value?). Pain relief occurred earlier in the Enriched group at two months post-procedure compared to the Standard group at three months post-operatively ( $p=0.02$ ). Six participants ceased pre-

treatment analgesics after fat grafting. Furthermore, there was a notable enhancement in self-rated satisfaction and functional outcomes related to prosthetic use, along with a suggestive improvement in freedom from pain ( $p < 0.05$ ).

**Discussion:** Fat grafting is a safe and effective intervention to alleviate pain, hypersensitivity, and improve prosthesis tolerability for lower limb amputation patients. Enrichment with adipose stromal cells shows potential for accelerating pain relief and expediting recovery, although fat grafting with and without SVF enrichment was effective in this study.

### **Patient Reported Outcome Measures in Recipient of First Partial Face and Whole Eye Transplantation**

Abstract Presenter: Alay Shah MD

Abstract Co-Author(s): Sachin Chinta, David Tran MD, Daniel Ceradini MD, Bruce Gelb, Eduardo Rodriguez MD

**Background:** Facial vascular composite allografts (fVCA) offer innovative solutions to severe facial injuries, aiming for functional restoration and social identity reclamation. Despite the evolution of face transplants over 18 years, patient-reported outcome measures (PROMs) for fVCA recipients are notably lacking. In a unique case of partial face and whole eye transplant, established surveys were utilized to gauge patient-reported outcomes (PROs).

**Methods:** A 46-year-old male, severely injured by high-voltage electricity, underwent a partial face and whole eye transplant. The patient consented to periodic surveys assessing psychological and social health, administered pre and post-operation using four validated scales: Derriford Appearance Scale (DAS), Body Image Disturbance Scale (BIDS), Rosenberg Self-Esteem Scale (RSES), Social Desirability Scale (SDS). To maintain reproducibility and minimize confounding variables, surveys were administered by an independent third-party without providing clarifications to the patient's inquiries.

**Results:** The survey results show an overall increase in self-esteem and self-perception of image. RSES score increased from 10 (low self-esteem) pre-operatively, to 16 (moderate self-esteem) at 8 months post-operative. There was a decrease in scores across all subcategories of DAS from pre-op to 8 months post-op, as well as an

improvement in BIDS score. Finally, the SDS remained consistent from pre-op to 8 months post-operative with the subject in the "Average Scorers" category.

**Discussion:** This case highlights the significant psychosocial improvements post-facial and eye transplant, assessed using established PROMs. The findings advocate for the development of VCA-specific PROMs and broader incorporation of PROMs in protocol evaluations to enhance patient-centered care, post-operative interventions, and overall quality of life for VCA recipients.

### **Optimizing Burn Care Outcomes: A 13 Year Retrospective Study of Burns at an Appalachian Referral Center**

Abstract Presenter: Armein Rahimpour MD

Abstract Co-Author(s): David Fox, Jacy Baxter, David Denning MD, Peter Ray MD, Rahman Barry MD

**Introduction:** Burn injuries pose a significant global health concern, standing as the 4th most common traumatic injury worldwide (1). Despite advances in medical technology, severe burns persist as a challenge with often grim prognoses, underscoring the importance of unraveling mortality risk factors. This study seeks to identify these factors specifically in Appalachian burn patients within West Virginia's sole burn intensive care unit with the hope of offering insights into refining treatment approaches and resource allocation strategies.

**Methods:** Retrospective analysis of patient data from Cabell Huntington Hospital's burn intensive care unit from January 2010 to June 2023 was conducted. Demographic and clinical variables were collected and analyzed using descriptive statistics, chi-square, Fisher's exact test, and logistic regression models to assess predictors of survival. Statistical significance was defined at  $p < 0.05$ .

**Results:** In the study involving 1,104 patients, significant differences emerged between survivors and deceased individuals. Deceased patients were notably older (mean age 66 vs. 39,  $P < 0.001$ ) and had longer hospital stays (mean 13 vs. 9 days,  $P = 0.022$ ). A higher prevalence of COPD (30% vs. 14%,  $P < 0.001$ ) and inhalation injuries (47% vs. 9.7%,  $P < 0.001$ ) was observed among deceased patients. Survivors had a lower mean Total Body Surface (TBS) burned (7 vs. 32,  $P < 0.001$ ) and a higher proportion of 2nd-degree burns (70% vs. 26%,  $P < 0.001$ ) compared to deceased patients. Conversely,

deceased patients had a higher prevalence of 3rd-degree burns (74% vs. 30%,  $P < 0.001$ ). Logistic regression analysis revealed age, COPD, inhalation injuries, TBS, and degree of burns as significant predictors of mortality. Each one-year increment in age was associated with a 1.07 times higher risk of mortality ( $P < 0.001$ ). Patients with COPD had 2.64 times higher odds of mortality ( $P = 0.001$ ), while those with inhalation injuries had 8.34 times higher odds ( $P < 0.001$ ). Additionally, each one-unit increase in TBS increased the odds of mortality by a factor of 1.1 ( $P < 0.001$ ). Patients with 3rd-degree burns had 6.45 times higher odds of mortality compared to those with 2nd-degree burns ( $P < 0.001$ ).

**Conclusion:** This study underscores the importance of recognizing specific risk factors associated with burn mortality, including age, comorbidities like COPD, inhalation injuries, TBS, and degree of burns. These findings offer critical insights for early detection and tailored interventions to improve outcomes in burn patients. By allocating resources efficiently and effectively based on identified risk factors, healthcare facilities can enhance patient care, minimize complications, and ultimately improve survival rates among burn patients in the Appalachian regions only BICU. Future research should continue to explore strategies for optimizing resource allocation and refining treatment approaches to further enhance outcomes in this patient population.

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## Biological Incorporation of Meshed Human Reticular Acellular Dermal Matrix in Soft Tissue Restoration and Skin Grafting

Abstract Presenter: Jacqueline Stoneburner MD

Abstract Co-Author(s): Kylie Tanabe, Theo Brown, Meghan McCullough MD, David Kulber MD

**BACKGROUND:** Coverage of open wounds is challenging in certain regions of the body, as both wound contraction and its impact on range of motion must be considered. Inclusion of the dermal layer in skin grafts not only minimizes contraction but also provides a reticular scaffold to support cell infiltration and graft integration during wound

healing while improving the tensile strength and stability to the repaired skin. However, the use of full thickness autologous skin grafts is limited by donor site morbidity. Allogenic acellular dermal matrices obviate the need for an autologous donor site while maintaining the benefits of reduced contraction and improved wound healing.

**PURPOSE:** To present the evaluation of a meshed human reticular acellular dermal matrix (HR-ADM) in soft tissue restoration and wound healing in a series of wounds.

**METHODS:** Adult patients with open wounds participated in the study at a single academic institution. Patient demographics, wound etiology and duration were collected. Wound dimensions were recorded before and after application of meshed HR-ADM grafts, along with post-operative complications. The number of patients requiring secondary autologous skin grafting was noted as well as ultimate skin graft adherence, when used. Standard skin punch biopsies were taken from the wound bed pre-operatively (t=0) and 3-weeks post-operatively, and histological staining (H&E, CD31, laminin) was conducted to assess granulation and neovascularization.

**RESULTS:** 18 patients were enrolled between January 2023 and December 2023. There were 4 males and 14 females, with mean age 59 (34-84). Etiology included acute trauma and postsurgical wounds (e.g., status post fasciectomy or cancer resection). 17 wounds were acute, one wound was chronic, and the average size was 64.5 cm<sup>2</sup> (4-322 cm<sup>2</sup>). Histologically, there is increased soft tissue (granulation) within the interces and infiltration into the dermal structure which demonstrate host integration with meshed HR-ADM. Histological staining revealed robust granulation (more laminin) and neovascularization (CD31) at 3 weeks compared to baseline (t=0). Notably, there is host cell infiltration into the dermal tissue structure confirming graft integration and increased laminin and CD31 within the interces, which can support stabilizing the area for skin grafting. 17 wounds (94%) underwent secondary skin grafting at 3 weeks and graft adherence was 100%. One wound healed without skin grafting. The average wound size decreased over time: 64.5cm<sup>2</sup> (t=0), 13.6cm<sup>2</sup> (t=3 weeks), 10.6cm<sup>2</sup> (t=6 weeks). Final follow-up of 6 weeks was achieved in all patients. No flexion contractures were observed, and full range of motion was preserved in extremity wounds. There were no complications or adverse reactions to the meshed HR-ADM allograft.

**CONCLUSIONS:** Meshed HR-ADM allografts provided a reticular scaffold for tissue ingrowth and helped optimize the wound bed to support soft tissue restoration and improved skin graft take. Clinically and histologically, increased granulation and neovascularization was observed in the wound bed. All the patients benefitted from the improved wound bed yielding successful autologous skin grafting and wound closure. It



represents a valuable tool where avoidance of contracture is paramount and should be added to the armamentarium of reconstructive surgeons for treatment of open wounds.

## **Redefining Post-Abdominoplasty Breast Reconstruction**

Abstract Presenter: Lauren Kim

Abstract Co-Author(s): Langfeier Liu, Alexis Lakatta MD, Thomas Steele MD, Nicholas Haddock MD, Sumeet Teotia MD

Patients with a history of elective abdominoplasty face unique limitations when pursuing autologous-based reconstruction, as prior surgical intervention precludes them from the conventional deep inferior epigastric perforator (DIEP) flap procedure due to inadequate lower abdominal tissue. With the emergence of profunda artery perforator (PAP) flaps and lumbar artery perforator (LAP) flaps as viable alternative autologous options, patients with prior abdominoplasty procedures can now pursue reconstructive options beyond implant-based reconstruction. This study seeks to explore advancements made in autologous reconstructive options by comparing the outcomes of patients with and without a history of abdominoplasty who underwent subsequent autologous breast reconstruction.

This study utilizes data collected from a retrospective chart review of patients with and without history of abdominoplasty between January 2011 and May 2023 prior to presenting for breast reconstruction. 63 patients with a history of abdominoplasty were analyzed, of which 45 pursued autologous-based reconstruction and 18 pursued implant-based reconstruction. The 45 autologous patients with history of abdominoplasty were analyzed against 1355 autologous patients without history of abdominoplasty. Data including patient demographics, comorbidities, complications, and revisions were also analyzed. Complete BREAST-Q responses, including postoperative satisfaction with breasts, psychosocial well-being, physical well-being of chest, and sexual well-being, were tabulated and compared between groups. The LAP and PAP cohort BREAST-Q response rate was 38% and 43% respectively. All data was managed with REDCap electronic data capture tools. Statistical analysis was completed with SPSS statistical software. P-values of less than 0.05 were considered statistically significant.

There were no significant differences in age, race, BMI, and comorbidities between groups ( $p > 0.05$ ). A significantly higher proportion of patients without history of

abdominoplasty underwent DIEP flaps ( $p<0.001$ ) while a significantly higher proportion of abdominoplasty patients underwent PAP ( $p<0.001$ ) and LAP flaps ( $p<0.001$ ). Beginning in 2018, there was a notable increase in utilization of LAP flaps relative to PAP flaps in patients with a history of abdominoplasty. There were no significant differences in flap complications between groups ( $p>0.05$ ). Patients treated with LAP flap reconstruction relative to PAP flap reconstruction had significantly higher BREAST-Q scores of post-operative satisfaction with breast, post-operative psychosocial well-being, and post-operative physical well-being of chest ( $p<0.001$ ).

This retrospective analysis highlights the unique considerations and challenges encountered in breast reconstruction by patients with a history of abdominoplasty. Our findings emphasize the importance of patient-specific factors, especially prior surgeries, in guiding the selection of appropriate reconstructive techniques. The increasing preference for LAP flap procedures among patients with a history of abdominoplasty, alongside significantly higher LAP BREAST-Q scoring, supports a need for adaptable and innovative surgical approaches tailored to individual patient anatomy and medical history. Our study contributes to a growing body of evidence supporting personalized, patient-centric care in microsurgical breast reconstruction by advocating for a comprehensive assessment of patient characteristics to optimize outcomes and minimize postoperative complications and revisions.

### **Simultaneous Symmetrizing Surgery on the Contralateral Breast in Unilateral Autologous Breast Reconstruction is Cost-Effective**

Abstract Presenter: Alexander Kammien

Abstract Co-Author(s): Elena Graetz, Miranda Moore, Brogan Evans MD, Alexzandra Mattia, Eric Schneider, Haripriya Ayyala MD, Lynn Zhao MD

**Background:** Simultaneous symmetrizing surgery at the time of unilateral deep inferior epigastric perforator (DIEP) flap reconstruction has been described as a method to facilitate single stage breast reconstruction. However, the impact on cost and number of additional procedures is not well described.

**Methods:** Patients who underwent unilateral DIEP reconstruction were identified in the MarketScan administrative claims database from 2017-2021 and followed for one year. Patients were stratified into immediate (DIEP at time of mastectomy) or delayed (DIEP remote from mastectomy) reconstruction groups, then further stratified into groups that underwent simultaneous symmetrizing surgery (SSS) defined as mastopexy or reduction or no simultaneous symmetrizing surgery (nSSS). Thirty-day outcomes

included wound disruption, surgical site infection, thromboembolism, seroma/hematoma, and transfusion. Initial hospitalization cost, follow up surgery cost, and total cost were calculated. Deferred symmetrizing surgeries within one year were identified. In both immediate and delayed reconstruction groups, characteristics, outcomes, and cost between patients undergoing SSS vs. nSSS procedures were assessed using Chi-square and Fisher exact tests for categorical variables and Wilcoxon test for continuous variables.

**Results:** A total of 1136 patients were identified (43.8% immediate, 56.2% delayed). 11.8% of delayed reconstruction patients had a simultaneous reduction or mastopexy. There were no significant differences in patient characteristics or 30-day complications. Within one year of index procedure, 29.3% of SSS patients had a revision vs. 50.6 % of nSSS patients ( $p=0.001$ ). Patients in the nSSS group were proportionally more likely to undergo at least one additional procedure versus those who underwent SSS. (57% vs. 36.0%,  $p<0.001$ ). Median total cost of reconstructive encounters and follow up surgeries was significantly lower for SSS patients (\$36,123, IQR: (\$22,526 - \$66,118) vs. \$ 51,200, IQR: (\$35,364 - \$79,297),  $p=0.005$ ). Among immediate reconstruction patients, 12.7% underwent SSS and there were no significant differences between groups who underwent SSS or nSSS in outcomes (30-day or 1 year), or costs.

**Conclusions:** Patients undergoing delayed unilateral DIEP and simultaneous symmetrizing surgery (SSS) on the contralateral breast ultimately had fewer revisions and additional procedures as well as a lower total cost of reconstruction than those who did not have a simultaneous symmetrizing procedure (nSSS). Patients undergoing mastectomy, DIEP and symmetrizing contralateral surgery all at once did not experience an increase in cost or complications. In the appropriately selected patient, a symmetrizing procedure at the time of delayed unilateral autologous reconstruction may decrease overall cost and stages of reconstruction.

## **Supraclavicular Artery Island Flap for Head and Neck Reconstruction: Our Experience and Predictors of Complications**

Abstract Presenter: Joshua Hwang MD

Abstract Co-Author(s): Chloe Cottone, Can Ozturk MD, Cemile Ozturk MD, William Magner

**Purpose:** The supraclavicular artery island flap (SCAIF) has recently reemerged as a reliable and versatile means of reconstruction for complex head and neck defects as an alternative to the traditional free flaps or pedicled pectoralis flap. SCAIF has several advantages including good color match, reduced flap bulk, minimal donor site morbidity and short harvest time. Prior studies show SCAIF has similar complication rates to free flaps. Our study seeks to describe our experience with the supraclavicular flap for head

and neck oncologic reconstruction and identify comorbidities associated with major postoperative complications to enhance the plastic surgeon's options for head and neck reconstruction.

Study Design: Retrospective chart review

Setting: Tertiary academic oncologic medical center

**Methods:** A retrospective review of twenty-three patients who underwent supraclavicular flap reconstruction for oncologic defects was performed. Patient demographics, comorbidities, surgical parameters, and postoperative outcomes were assessed.

**Results:** The mean age of patients in the study was 70.17 (range 44-92), with 16 males and 7 females. Average BMI was 28.74 (range 15-52.5). Mean length of admission was 7.43 days (range 2-37) and 1.74 days in the ICU (range 0-15). The average length of follow up was 823 days (range 18-2176). Average defect size was 75.98 cm<sup>2</sup> with supraclavicular flap area of 80.32 cm<sup>2</sup> (range of 20-180 cm<sup>2</sup>). Average operative time including oncologic resection was 8.89 hrs (range 1.15-18.08 hrs).

One (4.35%) patient experienced total flap failure requiring a secondary flap reconstruction. Six (26.09%) patients had minor flap necrosis or delayed healing which was managed by local wound care. No patients suffered from shoulder contracture, salivary leak, fistula, hematoma, or infection postoperatively. Mortality was seen in 6 patients (26.09%), all of these occurring beyond 1 year post operation.

Adjuvant radiation was associated with greater postoperative complications overall. Patient history of diabetes, co-existing thrombotic complication (DVT, PE), was significantly associated with delayed wound healing at the flap site. Older age and higher BMI were correlated with longer hospital and ICU stays.

**Conclusion:** SCAIF is a reliable and safe flap for complex head and neck reconstruction, with a low rate of complications necessitating surgical revision. It represents an alternative reconstruction option for patients who are poor candidates for free flaps and has the advantage of being performed without microsurgical experience. SCAIF may also allow earlier ICU discharge and reduced hospital stay in comparison to more complex types of head and neck reconstruction. SCAIF is a versatile flap that can be utilized in select patients with benefits of quick harvest, reliable blood supply, and expedited recovery.

## **The Extended Chimeric Fasciocutaneous Scapular and Latissimus Dorsi Muscle Flap (ECS-LDF) for Reconstruction of Massive Limb Defects: A Case Series**

Abstract Presenter: Kristen Whalen MD

Abstract Co-Author(s): Sarah Moffitt, Madison Patrick, Claudia Cruz, Bilal Koussayer, Nicole Le MD, MPH, Jared Troy MD

**Background:** Large traumatic extremity soft tissue defects pose a difficult reconstructive challenge. These are often treated with large or multiple free flaps resulting in the need for a skin grafted donor site, multiple donor sites, and/or multiple anastomosis.

**Methods:** We reconstructed four limb defects with a modification to the classic scapular-latissimus dorsi chimeric flap. Extension of the cutaneous paddle to include lateral chest and axillary tissue increases the size of the skin paddle, allows for harvest of both flaps through a single incision with primary closure of the donor site, and a single anastomosis. The skin paddle and muscle flap can be oriented independently during inset to cover near-circumferential limb wounds. We refer to this modification as the extended chimeric fasciocutaneous scapular flap and latissimus dorsi muscle flap (ECS-LDF).

**Results:** Four patients underwent ECS-LDF for reconstruction of three lower extremity defects and one upper extremity defect. The average ECS-LDF size was 416.75 cm<sup>2</sup>. One patient's flap included a vascularized segment of scapular bone measuring 20 cm<sup>2</sup>. One patient had partial necrosis of the distal latissimus dorsi muscle that required debridement and skin grafting, but otherwise there were no flap related complications. Primary donor site closure was successful in all four patients. There were no donor site complications.

**Conclusion:** Four ECS-LDF flaps successfully resurfaced massive upper and lower extremity defects. This is due to the unique flexibility of the ECS-LDF, which represents an excellent addition to the reconstructive microsurgeon's armamentarium.

## **Feasibility and efficacy of complex ventral hernia repair in patients with class III morbid obesity**

Abstract Presenter: Robert Younan MD

Abstract Co-Author(s): Bhargav Doddala, David Zabel MD

**Introduction:** Patients with complex ventral hernias often encounter challenges due to medical comorbidities, notably obesity<sup>1</sup>. Despite notable advancements in abdominal wall reconstruction techniques, access to these procedures remains limited for a substantial portion of patients due to BMI. This exclusionary barrier underscores the pressing need to explore alternative surgical strategies that accommodate patients with higher BMIs.<sup>2,3</sup> This study explores the outcomes of complex ventral hernia repair utilizing epigastric artery perforator sparing skin incisions, component separation, and wide-spanning retro rectus mesh reinforcement in patients with a BMI greater than or equal to 40 kg/m<sup>2</sup>.

**Methods:** We conducted a retrospective review of patients who underwent open ventral hernia repair with component separation and mesh reinforcement by a single surgeon between 2010 and 2022. Data analysis focused on class III obese patients with BMI  $\geq$  40kg/m<sup>2</sup>. Utilizing the median BMI of the cohort (BMI 45.3kg/m<sup>2</sup>), patients were subcategorized into two groups: Group one with BMI 40-45.3 and group two with BMI >45. The outcomes evaluated were postoperative infection, return to operating room (ROR), hospital length of stay (LOS), and hernia recurrence.

**Results:** A total of 209 patients, with a BMI greater than 40kg/m<sup>2</sup>, met the inclusion criteria for our study. The majority were female (73% vs 27%,  $p < 0.01$ ). Forty-eight patients experienced postoperative wound infections, with a higher rate in Group two compared to Group one (28.1% vs 18.4%,  $p < 0.05$ ). Overall, 41.2% of patients returned to the operating room for a secondary procedure at some point during the follow up. The most common procedure performed was debridement and closure (77% of all ROR). Fewer patients in Group one returned to the operating room compared to Group two (25.8% vs 51.9%,  $p < 0.001$ ). We did not observe a statistically significant difference in the LOS between the two groups. The overall recurrence rate of hernia was 4.4%, which did not differ between the groups.

**Conclusion:** Complex ventral hernia repair with epigastric artery perforator sparing skin incisions presents as a viable option for class III obese patients.<sup>4</sup> While our findings suggest that recurrence rates may align with those of the general population, it's crucial to note that wound complications may be elevated, particularly in individuals with higher BMI. Therefore, while this procedure remains feasible, optimizing presurgical factors,

including BMI reduction, is essential to mitigate postoperative challenges and ensure favorable outcomes in this patient cohort.

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## **COVID-19 and Post-Operative Complications: More than just Hypercoagulability**

Abstract Presenter: Theresa Webster MD

Abstract Co-Author(s): Christine Rohde MD, MPH, Lauren Lowe, Dylan Kim

**Introduction:** Since the COVID-19 pandemic, numerous studies have demonstrated the virus' activation of a pro-inflammatory cascade that in turn generates a substantial increase in hypercoagulability. The correlation between COVID-19 infection and perioperative complications, particularly venous thromboembolism (VTE), has been underscored across several surgical specialties. While individuals undergoing plastic surgery procedures generally demonstrate a less than 2% incidence of VTE outcomes, the post-COVID era data remains elusive. This study sought to elucidate the relationship between COVID-19 infection and the risk of VTE outcomes across plastic surgery procedures.

**Methods:** Plastic surgery procedures were identified in the 2012-2022 National Surgical Quality Improvement Program databases by CPT code, with the pre-pandemic period being defined as 2012 to the first quarter of 2020 while the pandemic period was designated as the second quarter of 2020 to 2022. Demographic and clinical characteristics were collected for each case. The outcomes of interest were the

postoperative occurrence of VTE, defined as deep vein thrombosis (DVT) or pulmonary embolism (PE), and the occurrence of any postoperative complication. Propensity score matching based on potentially confounding covariates was used twice to 1) compare overall rates of VTE between the pre-pandemic era and the pandemic era, and 2) quantify the predictive impact of COVID-19 diagnosis in years 2021-2022 on risk of VTE and overall postoperative complications with logistic regression ( $p < 0.05$ ).

**Results:** 269,006 plastic surgery cases were identified, comprising largely general breast (77.3%) and trunk (11.3%) procedures. Non-breast free tissue transfer cases were associated with the highest rates of DVT (1.3%) and trunk procedures with the highest rates of PE (0.71%). Patients who experienced VTE were more likely to be older, of a higher BMI, and male, and also shared a higher comorbidity burden in factors like diabetes, immunosuppression, hypertension, and existing cancer diagnosis ( $p < 0.001$ ). After propensity score matching, the overall rate of VTE after the onset of the COVID-19 pandemic (0.52%) was not significantly different from the rate in the pre-pandemic era (0.48%) ( $p = 0.22$ ). Within pandemic years that contained data on COVID-19 diagnosis (2021 and 2022), patients who had COVID-19 diagnosis were associated with a significantly higher rate of VTE (1.6%) than those who did not have a COVID-19 diagnosis (0.5%) ( $p = 0.0054$ ). In the matched cohort, the impact of COVID-19 diagnosis did not significantly predict risk of VTE ( $p = 0.56$ ), but it did significantly predict risk of overall postoperative complications ( $p = 0.0032$ ).

**Conclusions:** The COVID-19 pandemic introduced a novel array of complications within surgical specialties, chief among those being increased risk of hypercoagulability. While COVID-19 diagnosis itself did not predict risk of VTE upon matched analysis, it was a significant predictor of overall postoperative complications. Our findings underscore the importance of considering patient characteristics and the evolving landscape of infectious diseases in the assessment and management of thromboembolic and general postoperative complications in plastic surgery patients with the potential need for restructuring of perioperative thromboprophylaxis.

## **Complications in Prolonged Intraoperative Ischemia Time in Free Flap Breast Reconstruction: A Systematic Review and Meta-Analysis**

Abstract Presenter: Jose Antonio Arellano MD

Abstract Co-Author(s): Hilary Liu, Alexander Commerci, Francesco Egro MD, Msc, MRCS



**Introduction:** Autologous tissue transfer is the preferred method for breast reconstruction by plastic surgeons, evolving with technology and microsurgical skills, expanding its donor site options. Flap choice depends on breast volume needs and donor site availability, with the abdomen being predominant. Muscle-sparing DIEP flap is preferred for its safety. Post-harvest, tissue undergoes ischemia-induced changes, such as a shift from aerobic to anaerobic metabolism, impaired vasodilation, and accumulation of oxygen free radicals, increasing complications like flap failure or fat necrosis. Intraoperative ischemia over 60 minutes heightens postoperative risks. This review aims to identify and address these ischemia-induced complications to enhance breast reconstruction outcomes.

**Methods:** A systematic review and meta-analysis were conducted following PRISMA guidelines. PubMed, Embase, and Web of Science were searched. Studies were included if they reported on free flap breast reconstruction and provided data on ischemia time and complications. Studies were divided into cohorts based on mean ischemia time (<60 vs. >60 minutes). Demographics, mean ischemia time, BMI, and complication rates were analyzed. The MINORS tool assessed study quality.

**Results:** Out of 3745 articles resulting from the initial search, 18 studies were included for qualitative and quantitative analysis, encompassing 5548 patients. In the cohort with ischemia time <60 minutes, the mean age was 50.8 years [95% CI: 50.23; 51.40], with a mean BMI of 26.04 [95% CI: 22.93; 29.15] and mean ischemia time of 44.92 minutes [95% CI: 35.33; 54.51]. Total complications occurred at a rate of 15.95 [95% CI: 9.87; 24.73], total flap loss at a rate of 2.05 [95% CI: 1.73; 2.43], partial flap loss at a rate of 1.44 [95% CI: 0.84; 2.45], venous congestion at a rate of 0.48 [95% CI: 0.33; 0.68], hematoma at a rate of 1.09 [95% CI: 0.22; 5.21], fat necrosis at a rate of 1.17 [95% CI: 0.93; 1.47], and infection at a rate of 0.45 [95% CI: 0.05; 3.45]. In the cohort with ischemia time >60 minutes, the mean age was 47.9 years [95% CI: 45.84; 50.06], with a mean BMI of 26.32 [95% CI: 24.20; 28.44] and mean ischemia time of 93.77 minutes [95% CI: 72.38; 115.16]. Total complications occurred at a rate of 17.72 [95% CI: 10.57; 28.18], total flap loss at a rate of 1.90 [95% CI: 1.26; 2.84], partial flap loss at a rate of 2.23 [95% CI: 1.53; 3.23], venous congestion at a rate of 1.73 [95% CI: 1.13; 2.65], hematoma at a rate of 2.89 [95% CI: 2.08; 4.00], fat necrosis at a rate of 4.63 [95% CI: 3.58; 5.97], and infection at a rate of 2.64 [95% CI: 1.87; 3.72].

**Results:** This study demonstrates that ischemia time significantly impacts postoperative complications in free flap breast reconstruction. Patients with ischemia times exceeding 60 minutes showed elevated rates of complications, including total flap loss, partial flap loss, venous congestion, hematoma, fat necrosis, and infection. These results

emphasize the importance of considering ischemia time when predicting surgical outcomes.

## **Risk Factors Associated with Post-Operative Complications and Recurrence in Axillary Hidradenitis Suppurativa**

Abstract Presenter: Megan Newsom MD

Abstract Co-Author(s): Joseph Lewcun MD, Morgan Villa, Annabel Baek MD, Brooks Knighton MD, Tae Chong MD

**Background:** Hidradenitis suppurativa (HS) is a debilitating chronic inflammatory disease affecting the intertriginous areas (1). The existing surgical outcomes data is heterogeneous which can limit its clinical applicability (1,2). This investigation sought to identify factors associated with postoperative complications and HS recurrence in an axillary hidradenitis population.

**Methods:** This retrospective study included patients who had surgical treatment for axillary hidradenitis at our institution between 2013 and 2021. Demographics, postoperative outcomes, and axillary recurrence were evaluated using univariate analysis and multivariate regression models.

**Results:** A total of 57 patients (mean age  $33.19 \pm 10.3$ , mean BMI  $35.34 \pm 6.97$ ) had surgical treatment of their axillary HS. Most (80.7%) patients identified as black and were female (91.2%). The median follow-up time was 22.1 months (IQR: 12.13, 31.95). A total of 52 patients underwent direct excision (80.7% unilateral) and 5 had unroofing procedures. Thirty-four patients' wounds were closed primarily, 15 patients healed by secondary intent, 5 patients received skin grafts, 2 patients were partially closed with sutures and packing, and 1 patient underwent pedicled flaps. Twenty-seven patients experienced complications. Two patients experienced partial skin graft loss, 3 patients developed seromas, 13 patients had a wound dehiscence greater than 1 cm, and 5 patients had surgical site infections. Hurley score, active immunosuppression, diabetes, and smoking status were not associated with post-operative complications. BMI was the only factor associated with an increased risk of postoperative complication in both univariate and multivariate analysis (OR 1.103, 95% CI 1.010 – 1.218,  $p = 0.0372$ ). There was no association between procedure type and post-operative complication ( $p = 0.3558$ ).

Of the 52 patients who had at least 6 months of follow-up, the overall axillary recurrence

rate was 19.2%. Hurley score, diabetes, and BMI were not associated with HS recurrence. Unroofing was associated with an increased risk of recurrence (OR 16.07, 95% CI 1.89 – 185.27,  $p = 0.0134$ ).

**Conclusions:** This study of a more uniform population with a specific site of HS management showed that diabetes, active immunosuppression, and smoking status are not associated with an increased risk of postoperative complications, but elevated BMI was. Interestingly disease severity, measured by Hurley score, was not associated with an increased risk of post-operative complication or disease recurrence.

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## Development and Use of Templates in Microtia Reconstruction

Abstract Presenter: Sophia Allison

Abstract Co-Author(s): Emily Chwa MD, Hannah Soltani, Akira Yamada MD, FACS, PhD

**Introduction:** Microtia reconstruction relies on meticulous preoperative planning as well as the ability to translate that planning to execution during the operation. Symmetry to the contralateral ear is one of the main goals of unilateral microtia reconstruction. An overwhelming preference, from both physicians and patients, for autologous rib reconstruction to achieve this symmetry prompts the need for a comprehensive way to measure the unaffected ear as well as design and localize the reconstructed ear. While the most popular technique today, the Nagata technique, began with free-hand drawing of the auricular framework, the senior author created a template now used in this technique which provides a systematic method to create the auricle.

**Methods:** Template development occurs through smoothly connecting several monotonic curves. Making templates whose curves are adjusted to each external ear of each patient would be unrealistically time-consuming and expensive, but it is desirable

to prepare several types of template curves so that one approximating the features of the patients' external ears' curves might be available. Image analysis of 50 external ears was completed through gray-scale processing, image thresholding, noise reduction, and polynomial approximation to the 20th degree of the helical curve. This analytical paradigm was applied to approximated curves of the antihelix as well.

**Results:** There are several templates that can assist physicians in auricle construction including those which help design the ear shape, framework templates, as well as those which assist in localization of the new auricle with respect to other facial anatomic landmarks. The auricular frame templates, developed by the senior author, are based on a curve ratio analysis of a normal auricle and come in 6 different shapes: A1, A2, B1, B2, C1, C2. The letter indicates helical shape: smooth, one flexion point, or two flexion points. The number indicates antihelical shape: square or circular. These 6 auricular frameworks come in 15 sizes ranging from 44mm to 72mm, increasing by increments of 2mm. It is essential to account for skin flap thickness when using these frameworks; for example, when someone wishes to construct an auricle with an ultimate height of 60 mm auricle, the 56 mm height template is used, accounting for the 2 mm skin flap both on top and on bottom.

Using facial landmarks such as the eyebrow and the hairline, surgeons can utilize the ear positioning template to identify the correct location of the auricular rectangle. While these preoperative planning tools are crucial to developing a surgical plan, intraoperative frameworks are available to translate preoperative planning to execution with greater ease during the operation.

**Conclusion:** Microtia reconstruction using an autologous rib cartilage graft benefits from the use of templates both preoperatively and intraoperatively to achieve bilateral symmetry. Templates offer surgeons both flexibility and guidance in developing a symmetric auricle in microtia reconstruction. These templates are useful in any kind of microtia reconstruction.

## **Ventral Hernia Repair in the Transplant Population – Is Mesh Worth the Risk?: A 10-Year Experience**

Abstract Presenter: Brielle Raine MD

Abstract Co-Author(s): Cody Fowler MD, Derek Bell MD

**Background:** The use of mesh in ventral hernia repair (VHR) is held as the gold standard (Luijendijk et al., 2000); however, the risks associated with mesh implantation may have significant consequences for immunocompromised patients (Bueno- Lledó et al., 2017). Transplant recipients require lifelong immunosuppression, putting them at significant risk for severe consequences of postoperative infections (Jackson et al., 2021). Given the risks associated with a potential mesh infection, our clinical practice has shifted away from the implantation of mesh in these patients. This study seeks to evaluate outcomes of VHR in transplant recipients with and without the use of mesh, primarily focusing on postoperative infections and hernia recurrence.

**Methods:** A retrospective chart review of all ventral hernia repairs performed for transplant recipients performed by the senior author from February 2014 to February 2024 was conducted. Demographics, baseline characteristics, surgical history, intraoperative details, and postoperative outcomes were compared between patients undergoing VHR with and without mesh. Descriptive statistics, chi square analysis, and Wilcoxon ranksum tests were used as appropriate.

**Results:** A total of 57 patients met inclusion criteria of whom 26 (45.6%) underwent repair with mesh and 31 (54.4%) without mesh. 66.7% had prior liver transplant and 36.8% had prior kidney transplant. Baseline characteristics of both cohorts were comparable. Horizontal hernia size was larger in the mesh cohort ( $10.4 \pm 4.6$  vs.  $7.7 \pm 3.8$  cm<sup>2</sup>,  $p=0.015$ ). The majority of patients underwent anterior component separation, 22.8% unilateral and 35.1% bilateral. Mesh types chosen were Strattice (53.9%), Ovitex (34.6%), and FlexHD (11.5%). Mesh placement was most commonly retrorectus (32.3%) and intraperitoneal (32.3%). Postoperative length of stay was significantly shorter after repair without mesh (Median: 3 vs. 5 days,  $p=0.001$ ). Follow-up time was longer after mesh repair ( $1044 \pm 1013$  vs.  $544 \pm 679$  days,  $p=0.032$ ). Overall postoperative complications were comparable (No Mesh 22.6% vs. Mesh 34.6%  $p=0.314$ ) with a trend towards fewer postoperative infections without mesh (3.2% vs. 15.4%,  $p=0.106$ ). All patients with mesh infections required reoperation for mesh removal and one patient died from complications of their infection. Recurrence rates were comparable (No Mesh 6.7% vs. Mesh 19.2%,  $p=0.156$ ).

**Conclusion:** VHR can be safely performed without mesh in transplant patients, reducing the likelihood of potentially life-threatening postoperative infections without a significant increase in recurrence rates.

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## **Area Deprivation Index as a Predictor of Complications in Breast Reconstruction**

Abstract Presenter: Kaylyn Pogson-Morowitz MD

Abstract Co-Author(s): Nicholas Oleck MD, Pranav Haravu MD, D. Spencer Nichols MD, Amanda Sergesketter MD, Brett Phillips MD, MBA

**Background:** The Area Deprivation Index (ADI) is a composite measure of neighborhood disadvantage that has been shown to significantly impact patient outcomes across several surgical disciplines. ADI takes into account factors such as income, education, employment, and housing quality. This study sought to examine if ADI can be used to predict complications after breast reconstruction.

**Methods:** A retrospective review was conducted to identify all patients undergoing either autologous or implant-based breast reconstruction at a single institution. Patient demographics, surgical characteristics, and data on medical and surgical complications were collected. Each patient was assigned an ADI score based on their home address. Multivariate analysis was conducted to identify independent predictors of complications after breast reconstruction.

**Results:** A total of 506 patients were included in the study, 263 of which were implant-based and 243 of which were autologous-based reconstructions. A total of 5.4% of patients had diabetes, 27.3% were former smokers, 2.0% were current smokers, and 45.5% of patients received radiation. Major complications were identified in 83 patients, minor complications in 112 patients, and no complication in 311 patients. On univariate analysis, increased ADI, type of reconstruction, and operative time correlated

significantly with "any complication" ( $p=0.022$ ,  $p<0.001$ , and  $p=0.003$ , respectively); insurance status was not significantly associated with complications. On multivariate regression, increased ADI was identified an independent risk factor for any complications ( $p=0.007$ ). Increased BMI, diabetes mellitus, and ER positive and HER2 positive tumors were additional independent risk factors for any complications ( $p=0.01$ ,  $p=0.02$ ,  $p=0.0007$ , and  $p=0.002$ , respectively).

**Discussion:** These data demonstrate that increasing ADI has a significant impact on the development of complications after breast reconstruction. Lack of resources increases a patient's risk of minor complications such as infection or wound complications but does not impact major complications such as flap loss. Patients and providers should tailor postoperative care and follow-up to help prevent the development of these complications in higher risk patients.

## **Free-Flap Phalloplasty Reconstruction for Iatrogenic Micropenis**

Abstract Presenter: Mariana Hoyos MD

Abstract Co-Author: Christopher Salgado MD

**INTRODUCTION:** Many penile enhancement methods have been explored throughout the years.

To date, penile enhancement surgery for micropenis that addresses both length and girth with a phalloplasty has not been published in the U.S.

We present 3 cases of patients who underwent free flap phalloplasty to reconstruct micropenis with a notable gain in length and girth.

**METHODS:** This is a single-center case-series of 3 patients who underwent free-flap phalloplasty to reconstruct iatrogenic micropenis. Patient demographics, comorbidities, pathophysiology, procedures performed, complications, and patient satisfaction is discussed.

## **RESULTS:**

Case 1: 56 year-old male with PMH of erectile dysfunction presented with a micropenis of 3.5" outstretched secondary to two penile implant extrusions and infection. A RFFF was designed and tubularized over the denuded phallus once vascular inflow and outflow and nerve anastomosis were established. A urethroplasty was performed on the

ventral aspect of the neophallus. The phallus measured 6.5" in length and 5.5" in girth. Complications included hemosiderin deposition that is now resolved. The patient is awaiting penile prosthesis for penetration and has tactile sensation to  $\frac{3}{4}$  of the length from the base. He is satisfied with his reconstruction.

Case 2: 69 year-old male with PMH of Peyronie's disease presented to our clinic with a micropenis of 3" outstretched secondary to two penile implant extrusions, partial necrosis, and scarring. A Latissimus Dorsi free flap was used for reconstruction. The phallus measured 11" in length and 8" in girth. There were no major complications. A perineal urostomy was performed at the time of reconstruction. The patient is currently awaiting penile prosthesis placement for penetration. Tactile sensation is present to the tip of the phallus and he is awaiting implant placement. He is satisfied with this reconstruction.

Case 3: 64 year-old male with PMH of urethral cancer and a permanent urostomy presented with micropenis secondary to radiation therapy and failed penile implants. A RFFF was used to reconstruct the penis. The final phallus measured 10" in length and 7" in girth. Sensation remains intact and the patient underwent insertion of a penile implant with successful penetration. He remains satisfied with his reconstruction after 3 years.

**DISCUSSION:** In our case-series, free flap phalloplasty for micropenis has shown to be a viable option for patients seeking both length and girth after iatrogenic causes leading to scarring and severe shortening of the penis. The average gain in length was 6" and 3.3" in girth. The latissimus dorsi flap provides a larger skin paddle for length and muscle for girth. No major complications were observed perioperatively. Successful penetration after penile implant was observed in 1 patient, while the remaining two are awaiting penile prosthesis insertion. Patient satisfaction score was high in all patients post-operatively.

**CONCLUSION:** Studies are needed to explore the outcomes of free-flap phalloplasty in iatrogenic micropenis, congenital micropenis, and for males seeking primary aesthetic enhancement of both penile length and girth. The risks and benefits of this procedure should be assessed individually and based on objective findings, functionality, and psychosocial factors.

**Effects of hypoxia and lymphangiosclerosis due to damage to the vasa vasorum of the collecting lymph vessels in lymphedema**



Abstract Presenter: Chihiro Matsui MD

Abstract Co-Author(s): Reiko Tsukuura MD, Hayahito Sakai MD, Toko Miyazaki, Hatan Mortada MD, Ayaka N. Deguchi MD, Hiroshi Mizuno MD, Takumi Yamamoto MD

**Objective:** Smooth muscle cells are found along pre-collecting and collecting lymphatic vessels, and their function depends on adequate blood supply. The structure of the vasa vasorum of the collecting lymph vessels (VVCL) has been studied, but their physiological role is not well understood. This research aims to examine the relationship between VVCL morphology and blood circulation in limbs with lymphedema, as well as validate ischemic conditions affecting lymphatic vessels.

**Methods:** The medical records of patients with lower extremity lymphedema who underwent video capillaroscopy during supermicrosurgical lymphaticovenous anastomosis (LVA) surgery were reviewed. The collecting lymph vessels, which were dissected for LVA, were examined using video capillaroscopy (GOKO Bscan-ZD, GOKO Imaging Devices Co., Japan) at 175x and 620x magnification. Software (GOKO-VIP ver. 1.0.0.4, GOKO Imaging Devices Co.) calculated the blood flow velocity of the vasa vasorum of the collecting lymph vessels (VVCL) by measuring red blood cell movement. Based on the video capillaroscopy findings, the VVCL were categorized by morphology, and the morphology types and blood flow velocity of VVCL were compared with the severity grade of lymphosclerosis. Additionally, to investigate the pure effects of hypoxia on lymph endothelial cells, a migration assay of human dermal lymphatic endothelial cells (HDLECs) was performed in hypoxic culture to determine the migration rate of the cells.

**Results:** The medical records of 20 patients with lower limb lymphedema who had lymphaticovenous anastomosis (LVA) surgery were examined. A total of 67 lymph vessels were evaluated, with varying degrees of lymphosclerosis severity graded as s0 to s3. Video capillaroscopy was used to visualize the vasa vasorum of the collecting lymph vessels (VVCL). The VVCL were categorized into 4 morphology types based on the video images. Blood flow velocity in the VVCL ranged from 0 to 189.3 mm/sec, with an average of 26.40 mm/sec. Statistically significant differences were found in both VVCL morphology and blood flow velocity according to lymphedema severity grade. The diameters of the main VVCL and branches were measured, ranging from 0 to 0.096 mm and 0 to 0.053 mm respectively. Additionally, a migration assay was performed on human lymphatic endothelial cells. The migration rate was 6.344% under normal oxygen conditions and 2.172% under hypoxic conditions after 6 hours, demonstrating hypoxia significantly reduced migration ( $P=0.00057$ ).

**Conclusion:** This study found the vasa vasorum of collecting lymph vessels can be categorized into four types, each with distinct features. Changes in the morphology and physiology of the vasa vasorum of collecting lymph vessels (VVCL) are linked to sclerotic changes caused by ischemia affecting these vessels. Additionally, the hypoxic conditions in lymphatic vessels resulting from VVCL damage directly impairs the migratory ability of lymphatic endothelial cells. This may be responsible for worsening of lymphedema.

### **Should you Consult the Plastic Surgeon? Machine Learning-Powered Nomograms to Predict Minor and Major Surgical Site Occurrences in Thigh Soft Tissue Sarcoma Reconstructions**

Abstract Presenter: Rami Elmorsi MD

Abstract Co-Author(s): Luis Camacho MD, David Krijgh, Russell Witt, Margaret Roubaud MD, Christina Roland, Alexander Mericli MD

**Introduction:** Soft tissue sarcomas (STSs) are mesenchymal tumors that most commonly affect the thigh. With evolutions in chemoradiotherapy protocols, limb salvage with wide resection and reconstruction has become the standard of care. However, patients still face a high rate of surgical complications. Thus, there is a critical need for individualized predictors of outcomes to guide the selection of the best reconstructive approach following oncological resection.

**Methods:** Data from 151 thigh STS cases were collected, including patient demographics, oncological and surgical variables, and postoperative outcomes. Surgical site occurrences (SSOs) were categorized as minor or major, with major complications indicating reoperation, interventional radiology drainage, or readmission for intravenous antibiotics. Using Bayesian permutation factor importance, variables were ranked based on their impact on the area under the receiver-operating characteristic curve for each outcome. Logistic regression and naïve Bayes machine learning models were developed and validated using a combination of forward selection, backward elimination, and 10-fold cross-validation tests. Model performance metrics included area under the curve (AUC), F1 statistic, classification accuracy (CA), precision, recall, and MCC. The best-performing model was used to construct a nomogram for individualized risk prediction.

**Results:** Logistic regression models outperformed naïve Bayes in predicting all three classes of complications. On 10-fold cross-validation, the models achieved AUCs of 0.77, 0.73, and 0.72 for SSOs, minor, and major complications, respectively. Nomograms based on this model were developed to facilitate individualized risk prediction and guide reconstructive approaches.

**Conclusions:** Our machine learning-derived nomograms enable the prediction of three different classes of postoperative complications with different reconstructive techniques, assisting surgeons in selecting the most suitable approach following oncological resection.

## Research and Technology

### ChatGPT Virtual Assistant for Breast Reconstruction: Assessing Preferences for a Traditional Chatbot versus a Human AI VideoBot

Abstract Presenter: Trudy Kim

Abstract Co-Author(s): Catherine Yu, Chandler Hinson, Ethan Fung, Omar Allam MD, Rahim Nazerali MD, Haripriya Ayyala MD

**Background:** The recent advancements in artificial intelligence (AI) has shifted the landscape of telehealth in which AI chatbots, such as ChatGPT, have demonstrated numerous potential applications in medicine (1). While text-based systems are efficient and increase the availability of health information, they are not a personal approach to patient interaction and lack human-like qualities that increase user effectiveness, usability, and trust (2). In the field of plastic and reconstructive surgery (PRS), ChatGPT has shown to be capable of providing basic, general patient education on topics such as rhinoplasty and breast augmentation (3, 4). However, preferences for a traditional chatbot versus a human AI VideoBot in the context of PRS have yet to be assessed.

**Methods:** Synthesia, an AI video generation platform, was utilized to develop a human AI avatar that was integrated with ChatGPT 3.5 to create the VideoBot. The VideoBot was then integrated into Tolstoy, a platform for creating interactive videos, to develop an interactive VideoBot whereby the human AI avatar was able to answer four of the most commonly asked questions related to breast reconstruction. We utilized Zapier, a workflow automation software, to develop a ChatGPT 3.5-integrated text-based chatbot. An anonymous 20 item survey adapted from Corritore et al.'s 2005 validated Measurement of Online Trust (5) was distributed online via Amazon Mechanical Turk to female participants. Participant demographic data was collected, and participants were asked to rank their preferences between the VideoBot and text-based chatbot on a 1-7

Likert scale (1=Strongly Disagree, 7= Strongly Agree).

**Results:** A total of 396 responses were gathered. Participants were 18-64 years old, 97% had received some form of plastic or reconstructive surgery, and 95% of those patients underwent a breast-related medical procedure. Perceptions of truthfulness, believability, content expertise, ease of use, and safety were similar between the VideoBot and chatbot. Most participants preferred the VideoBot over the traditional chatbot (63.5% versus 28.1%) as they found it more captivating than the text-based chatbot. 77% of participants would have preferred to see someone that they identified with as the human AI avatar in terms of gender and race.

**Conclusion:** There is no difference in user effectiveness, usability, and trust between the VideoBot and text-based chatbot. However, the human-like quality of the VideoBot allows for a more interactive experience than the traditional chatbot. The race and gender effect should be further explored in providing a more personable telehealth experience for patients.

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## Diversifying Plastic Surgery: Program Directors' Perspectives on Why and How

Abstract Presenter: Natalie Baxter

Abstract Co-Author(s): Rachel Hooper MD, Timothy Guetterman

**Purpose:** The paucity of underrepresented in medicine (URiM) plastic surgeons is well recognized; Black and Hispanic individuals comprise 3.6% and 5.7% of the workforce, compared to 12% and 15% of the population, respectively.(1,2) Despite recognition of this discrepancy, the racial and ethnic composition of trainees has not changed significantly over the past several decades.(3) To investigate this inconsistency, we performed a qualitative study aimed at gaining deeper insights into how residency program directors (PDs) perceive the importance of racial and ethnic diversity in training. Our primary outcome included identification of PD views and deliberate initiatives around the recruitment of URiM residents.

**Methods:** Integrated plastic surgery residency PDs and assistant PDs were invited to participate in individual semi-structured interviews. Interview questions focused on applicant selection for interview, interview day, and strategies to improve resident diversity. Interviews were deidentified, transcribed, and analyzed inductively to generate themes based on patterns observed across narratives.

**Results:** In this ongoing study, we have interviewed eight PDs, all from university-based programs in the West (n=2), Midwest (n=2), and Northeast (n=4) regions of the US. We identified three key themes: 1) Creating Exposure and Mentorship Opportunities for URiM Candidates, 2) Unique Qualities and Contribution of URiM Candidates, and 3) Building a Culture of Inclusion and Acceptance of URiM Candidates. With respect to theme one, PDs describe how the disproportionately low number of URiM plastic surgery residents is a pipeline issue that originates well before medical school. There is a consensus among PDs that intentional exposure and mentorship efforts are necessary to facilitate early recruitment to the specialty and residency preparation. Regarding theme two, PDs overwhelmingly agree that scholastic achievements be retained while enhancing diversity. In other words, equity and excellence can be achieved simultaneously. Additionally, attributes such as grit, distance-travelled, and leadership warrant consistent consideration. Furthermore, PDs recognize that diversity is important for patient care and innovation, and it is possible that the unique qualities that URiM candidates can offer are not captured in current application processes. Finally, related to theme three, PDs consistently acknowledge that explicit commitment to a culture of diversity and inclusion is important to attract and maintain URiM candidates in their programs. They understand that the presence of multiple URiM residents in a program is a poignant indication of a welcoming culture, while the presence of one or no URiM residents may raise concern for tokenism.

**Conclusions:** We identified several themes critical to the recruitment and retention of URiM trainees to plastic surgery residency. Early exposure and mentorship, including funded research opportunities, could facilitate preparation for the competitive residency application process. Program-specific and institution-wide efforts are both necessary to demonstrate support for diversity and inclusion. Additional initiatives are needed to generate interest among URiM students, enhance review of applications, and adopt innovative recruitment strategies to support diversity, equity, and inclusion in plastic surgery residencies.

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## A Comparative Analysis of ChatGPT and the American Burn Association Guidelines for Acute Burns Treatment and Referral

Abstract Presenter: Sumaarg Pandya

Abstract Co-Author(s): Mario Alessandri Bonetti MD, Hilary Liu, Tiffany Jeong, Francesco Egro MD, Msc, MRCS

**Introduction:** Burn injuries often require immediate assistance and specialized care for optimal management and outcomes. Especially in severe burns, a prompt referral to an appropriate healthcare facility is crucial in ensuring timely and effective treatment. The emergence of artificial intelligence (AI) has just recently started being applied to healthcare decision-making. However, its role in healthcare delivery is still under scrutiny. This study aims to evaluate whether ChatGPT provides safe and accurate medical answers to commonly asked questions regarding acute burn injuries and their management by comparing ChatGPT's responses to those provided by the American Burn Association (ABA).

**Methods:** Twelve commonly asked questions available on the ABA official website regarding burn injuries, management, and patient referral were prompted into ChatGPT. Each response was compared with the ABA Guidelines for Burn First Aid and Patient Referral, the gold standard for accurate and evidence-based burn care recommendations. Three burn specialists independently compared the appropriateness and completeness of each ChatGPT response based on the ABA guidelines by giving a score from 1 (poor concordance) to 5 (excellent concordance) to each answer according to the Global Quality Score (GQS).

**Results:** The average score for ChatGPT-generated responses was  $4.56 \pm 0.65$ . This indicates that raters found the answers were good to excellent quality with the most important topics covered and in high concordance with the ABA guidelines. Overall, 58% of the questions were focused on first aid and management of acute burns, while 42% focused on patient referral criteria. Of the twelve questions asked, two (16.7%) ChatGPT-generated responses scored a perfect  $5.00 \pm 0.00$ , demonstrating perfect

concordance with the ABA guidelines. Nine (75.0%) ChatGPT answers were between good and excellent quality, with average GQS scores ranging from 4.33 to 4.67. One (8.3%) response describing chemical burn referral recommendations scored  $3.33 \pm 0.58$ , indicating somewhat concordance with the ABA guidelines.

**Conclusion:** This study presents an initial comparison of commonly asked burn injury and management questions between ChatGPT-generated responses and the gold standard ABA guidelines. Based on the feedback of three experienced burn specialists, ChatGPT's answers are accurate and in high concordance with the ABA recommendations. Our results demonstrate that ChatGPT can adequately, comprehensibly, and thoroughly describe the most appropriate treatment and referral for burn injuries. We foresee that ChatGPT may play a role as a complementary tool in patient education, having a profound impact on clinical practice, research, and education.

## **SHARE's Impact on Medical Students Interested in Global Plastic Surgery**

Abstract Presenter: Noelle Thompson

Abstract Co-Author(s): Kathleen Johnson, Dominic Alessio, Jessica Blum MD, Raj Vyas MD, Christine Rohde MD, MPH, Joyce McIntyre MD, Amanda Gosman MD, Andrea Pusic MD, MHS, FACS, FRCSC

**Background:** Surgeons in Humanitarian Alliance for Reconstruction, Research and Education (SHARE) is an innovative program from the Plastic Surgery Foundation designed to address global disparities in plastic surgery. SHARE uniquely provides medical students opportunities to learn about plastic surgery from a global surgery and cultural humility perspective. To refine our curriculum, we developed a survey to investigate current global and plastic surgery education among medical students who participate in SHARE and their attitudes toward SHARE's current medical student engagement opportunities.

**Methods:** A cross-sectional survey was designed to assess barriers to involvement in plastic surgery and global surgery, motivations for joining SHARE, SHARE's impact in alleviating barriers to involvement in plastic surgery and global surgery, and whether medical students' involvement in SHARE affected interest in pursuing a plastic surgery or global surgery career. The survey was distributed via listserv to medical students involved in SHARE as of February 2024.

**Results:** Thirty-seven out of 79 medical students completed the survey (47%). Forty-nine percent were between the ages of 26-30 years old and 49% were first-generation immigrants to the United States or Canada or were a member of a first-generation family. Racial and ethnic composition included: 32% White/Caucasian, 29% Asian/Asian American, 25% Black/African American, 11% Middle Eastern/North African, and 4%

preferred not to say. While most participants (81%) were interested in pursuing plastic surgery residency, 61% attended a medical school without an integrated plastic surgery program and 31% had never had an opportunity to discuss plastic surgery cases in any setting prior to joining SHARE. Among participants who had any previous global health involvement, only 44% of these global health opportunities focused on global surgery specifically. Primary motivations for participating in SHARE were to network with plastic surgeons, learn about the experience of surgeons outside of North America, and to learn more about global surgery. The activities that medical students participated in within SHARE that enabled exposure and involvement in global plastic surgery included: clinical assemblies (36%), small groups (27%), panel at Plastic Surgery the Meeting 2023 (23%), and serving on a subcommittee (14%). The majority of participants (57%) were more interested in plastic surgery after being involved with SHARE ( $p < 0.001$ ). Ninety-three percent of participants stated that their interest in incorporating global surgery into their career was moderately or greatly increased after participating in SHARE, compared to 7% unchanged and 0% decreased ( $p < 0.001$ ).

**Conclusion:** Our study highlights the critical role that SHARE plays in alleviating barriers medical students face regarding plastic surgery exposure and global surgery education. These results will be used to target opportunities to further optimize medical students' role in the SHARE program.

## **Evaluating Efficacy of Supercritical CO<sub>2</sub> for Delipidation and Decellularization of Human-Derived Adipose Tissue**

Abstract Presenter: Jini Jeon

Abstract Co-Author(s): Riley Mayne, Tim Li, Sophia Salingaros, Xue Dong MD, PhD, David Bednarski, Tony Eisenhut, Jason Spector MD

**Purpose:** Soft tissue loss, whether resulting from surgery, trauma, or infection, often necessitates restoration to improve appearance and function. While autogenous fat transfer (AFT) is a popular method for soft tissue augmentation, it requires a surgical procedure and has well known challenges such as inconsistent graft take and the need for specialized equipment. Decellularized tissues have emerged as promising scaffolds for tissue engineering, with adipose tissue being a readily available resource. In this study, we investigated a novel decellularization method using supercritical carbon dioxide (scCO<sub>2</sub>), which holds the promise to remove cells and cellular debris while leaving the bioactive components within the ECM relatively undisturbed, especially compared to traditional methods. Our goal was to assess the efficacy of this environmentally conscious and biocompatible alternative method in decellularization using patient-derived adipose tissue.

**Methods and Materials:** Under an active IRB protocol, adipose tissue was obtained from patients undergoing breast reduction and/or abdominoplasty. Following removal of



the skin, the adipose tissue was stored at -20°C until processing. The tissue was either minced or further reduced using a blender or a cryo-mill. Delipidation was performed by treating the tissue with isopropanol at 37°C with agitation. This was followed by treatment with scCO<sub>2</sub> at 35°C and 1,450 psi for 1 hour. For decellularization, the samples were immersed in a decellularization solution containing ethanol, NovaKill™ (peracetic acid-based solution), and DI water, followed by exposure to scCO<sub>2</sub> at 35°C and 2,300 psi for 4 hours. After a wash with PBS, the samples underwent an additional scCO<sub>2</sub> treatment at 35°C and 2,300 psi for 1 hour before being stored at -20°C. The processed adipose tissue was lyophilized for DNA quantification using the DNeasy Blood and Tissue Kit and cryo-embedded for histochemical analysis.

**Results:** Different processing methods of human derived adipose tissue had varying effects on the efficacy of scCO<sub>2</sub> delipidation and decellularization. Minced adipose tissue maintained high levels of lipid and intact adipose ECM matrix comparable to non-processed tissue. Further processing of adipose with blending and cryo-milling exhibited a significant reduction of lipid content in delipidated samples compared to unprocessed tissue, with 77-90% further reduction in decellularized samples compared to those only delipidated. DNA content in delipidated and decellularized tissue ranged from 275-295 ng/mg (above the standard for decellularization). However, there was a significant decrease (41-53%) in DNA content in delipidated and decellularized tissue compared to only delipidated samples. On H&E staining, we observed compact adipose ECM matrix and no obvious nuclear components in processed tissue. This finding was supported by lack of observed DAPI positive nuclei.

**Conclusions:** Current delipidation and decellularization with scCO<sub>2</sub> can significantly reduce lipid and DNA content while preserving ECM in human derived adipose tissue. Further modification of treatment parameters such as additional rounds of scCO<sub>2</sub> and higher temperatures will be considered to improve the efficacy and efficiency of this process, to produce an adequately delipidated and decellularized soft tissue injectable for animal studies and eventual clinical use.

## **Enhancing Medical Student Education Through Gamified Immersive Virtual Reality: An Assessment of Carpal Anatomy Learning**

Abstract Presenter: Marina Lentskevich

Abstract Co-Author(s): Oday Obaid MD, Devansh Saini, Julia Corcoran MD, Pravin Patel MD

**Background:** Teaching spatial anatomy using conventional learning tools remains challenging. Virtual reality (VR) applications can be effective tools in learning anatomy in three dimensions.

**Methods:** A randomized controlled study assessed user understanding of spatial carpal anatomy using a VR Wrist Game module intervention. The 3D Wrist Game was developed out of a computerized tomography (CT) scan of a right hand & wrist by using segmentation technique. The model was then processed and used for building the game in the virtual environment. A user is provided with a headset and two hand-held controllers. As the user gestures or manipulates the controllers, corresponding actions occur in the virtual realm. Eleven first year medical students at the University of Illinois at Chicago completed the study. The VR group underwent training using the VR Wrist Game. All participants completed pre- and post-intervention questionnaires, a textbook reading, and assessment of carpal anatomy knowledge using a standardized physical model test.

**Results:** Visual-based learning was preferred by all participants, while kinesthetic learning was favored by 83% of the VR group and 80% of the control group (Pearson Chi-square = 0.020;  $p = 0.887$ ). Prior experience with video gaming and VR was similar among participants in the control and VR groups. For the VR group, prior video game experience and prior VR experience had no effect on Wrist Game scores (Spearman's  $\rho = 0.494$  and  $-0.395$ ;  $p = 0.320$  and  $0.439$ , respectively). On the physical model test, the VR group placed a significantly higher number of correctly positioned and oriented bones (Mann-Whitney  $U = 4.5$ ;  $p = 0.039$ ), and they were 20 times more likely to perform this task better than the control group (OR = 20.0;  $p = 0.055$ ). The VR group was 8 times more likely to complete the test faster (OR = 8.0;  $p = 0.140$ ). There was no statistically significant difference in the number of carpal bones that were correctly placed but incorrectly oriented. The Wrist Game score directly correlated with the physical model test score ( $r^2 = 0.82$ ;  $p = 0.019$ ). VR group participants agreed that the Wrist Game module can help practice transferable motor skills and that they would recommend the VR module to colleagues to learn and practice carpal bone anatomy.

**Conclusions:** These results suggest that VR effectively provides transferable spatial skills useful in real-life anatomy knowledge application. Faster task completion highlighted VR group's relative comfort with the three-dimensional physical model. We believe that spatial understanding, a transferable skill trained by 3D tools such as VR, is the most clinically relevant and this knowledge is the most applicable in clinical clerkships.

## **A Comprehensive Comparison of PSF and NIH Funding**

Abstract Presenter: Umer Qureshi

Abstract Co-Author(s): Christian Arcelona, Taylor Hallman, Kristof Gutowski, Gabrielle Rodriguez, Rachel Donaldson, Arun Gosain MD

**Purpose:** Plastic and Reconstructive Surgery is one of the least funded medical subspecialties by the National Institutes of Health (NIH) and has been for some time. One of the stated goals of the Plastic Surgery Foundation (PSF) is to fund new plastic surgery researchers and projects and improve the proliferation of future studies in the field. By doing this, the PSF is creating a foundation that can support future grant applications to the NIH for larger projects. The purpose of this study is to conduct a comparison of the grants the PSF has funded to plastic surgery related grants the NIH has funded. Aided by this analysis, plastic surgery researchers can use the findings from this study to improve the odds of accessing further funding from the NIH.

**Methods:** For the NIH grants, the NIH RePORTER database was queried with the names of all American Society of Plastic Surgery (ASPS) members between 2003 to 2024. The abstracts from the resulting grants were then manually read and identified as to whether the grant was related to plastic and reconstructive surgery. The abstracts were then manually categorized into the same categories the PSF uses. A second pass was completed by another researcher to ensure validity of manual data collection and categorization.

For the PSF grants, the topic data as well as the number of grants under each topic was manually extracted from the PSF archive of funded grants from 2003 to 2024.

Chi square tests were then performed between the number of grants awarded by the PSF and NIH.

**Results:** NIH and PSF funded grant topics were compared with Chi Square tests. The NIH was 0.606 times as likely to fund reconstructive or cosmetic breast related grants as the PSF, 0.204 times as likely to fund composite tissue allotransplantation related grants; 4.951 times as likely to fund cranio/maxillofacial/head and neck related grants; 2.747 times as likely to fund fat grafting related grants; 0.577 times as likely to fund hand or upper extremity grants; 0.089 times as likely to fund technology based grants; and 5.687 times as likely to fund wound or scar related grants.

**Conclusion:** Researchers who wish to use PSF grants as a steppingstone to gain more funding from the NIH may consider focusing their grants on cranio/maxillofacial/head and neck, fat grafting, and wound/scar related topics.

## **Promoting Adipocyte Survival Using Embryonically Reset Adult Endothelial Cell Chaperones**

Abstract Presenter: Riley Mayne

Abstract Co-Author(s): Jini Jeon, Tim Li, Hector Salazar Martinez, Xue Dong MD, PhD, Shahin Rafii, Jason Spector MD

**Purposes:** Though widely used in plastic and reconstructive surgery autologous fat grafts are often limited by their unpredictable and often inadequate volume retention. A major cause of graft loss is the insufficient rate and degree of revascularization of the transplanted fat, resulting in ischemic necrosis. Previous work in our lab aimed at improving the survival of transplanted fat demonstrated that human umbilical vein endothelial cells (HUVEC) transduced with E4ORF1 region of human adenovirus Type 5 (E4s) promoted adipocyte survival in both in vitro and in vivo models. Here, we analyzed if a novel cell line, reset vascular cells (R-VEC), were capable of yielding similar results. This cell population consists of HUVEC adult endothelial cells that have been transduced with the transcription factor ETV2 which is responsible for promoting and maintaining microvascular network development. This transcription factor is normally only expressed during early angiogenesis and is no longer expressed after 20 weeks in utero. This unique cell line has demonstrated promising angiogenic capabilities in in vitro culture, suggesting they might promote adipocyte survival after fat transplantation.

**Methods:** Primary mature adipocytes were isolated from patient-derived fat tissue and cultured alone, with E4s, or with R-VECs within neutralized 0.6% (w/v) collagen. 200uL of each experimental group was plated in triplicate with an R-VEC density of 250,000 cells/mL. In adipocyte conditions, a concentration of 11.5% adipocyte (V/V) was mixed within collagen alone or with ECs in addition to collagen. Constructs were harvested on days 0, 4, and 7. Perilipin immunofluorescent staining around lipid droplets was used to verify live adipocytes. An entire cross-section of each construct was imaged and stitched using imaging software. Spaces between 70-120um (the average size of adipocytes), without perilipin expression were counted as non-viable adipocytes. The percentage of viable adipocytes was calculated.

**Results:** Perilipin staining confirmed the presence of live adipocytes in all constructs and yielded consistent adipocyte survival rates at Day 0 across all groups. After 7 days, the R-VEC group exhibited significantly greater adipocyte viability when compared to both adipocytes in coculture with E4s and adipocytes in monoculture. On day 7, the R-VEC group demonstrated the highest adipocyte survival at 87.5%, with significantly lower amount in E4 at 63.4% and adipocyte alone at 49.5% ( $p < 0.05$ ).

**Conclusions:** In a biomimetic three-dimensional in vitro model of fat transplantation, co-culture of adipocytes with R-VECs resulted in superior adipocyte viability compared to culture with either E4 or HUVEC. These findings may have translational implications as R-VEC cells may be considered for future FDA authorization. Further studies are underway to determine if this pro-survival effect is resultant from the R-VEC capability to form microvascular networks, elaboration of pro-survival chemokines, or some combination of both.

## **ChatGPT: A Rapidly Growing Platform for Medical Information Delivery for the Lay Public**

Abstract Presenter: Andrew James

Abstract Co-Author(s): Yaching Hung MD, MPH, Sara Chaker Ms, Mariam Saad MD, MPH, Ricardo Torres-Guzman MD, Susan Orra MD, Shady Elmaraghi MD, Marcie Feinman, Dr. Elizabeth Dale Slater MD

**Introduction:** In 2005, Pew Research reported that 80% of Americans used the internet to search for medical information.<sup>1</sup> Medical information can be difficult for patients to understand, especially when they require surgical intervention. A survey conducted by the American Health Information Management Association Foundation found that 11% of Americans leave their appointment more confused and 25% do not feel comfortable asking their doctor certain health-related questions.<sup>2</sup> Following a doctor's visit 42% research their provider's suggestions, with 80% reporting that they use the internet to do so.<sup>2</sup> Although traditional search engines like Google, Bing, and Yahoo remain popular among Americans for locating information, Chat Generative Pre-Trained Transformer (ChatGPT) (Open AI, San Francisco, CA) has emerged as a new source to gather information. This study aimed to evaluate its applicability in medical and surgical information gathering in the lay public.

**Methods:** An 18-item questionnaire was distributed using Amazon Mechanical Turk (abbreviated as MTurk) to assess the lay public's views and experience using OpenAI's Chat Generative Pre-Trained Transformer (ChatGPT) as a means of obtaining health information related to surgical procedures. To assess knowledge and utilization of ChatGPT, chi-squared analyses were carried out to compare questionnaire answers between younger participants and participants 65 years and older. The same analysis was used to compare demographic information between participants who have used ChatGPT to those who have not. Statistical significance was defined as a 2 tailed  $P < 0.05$ . All statistical analyses were carried out using Stata 18 (StataCorp LLC, College

Station, TX).

**Results:** A total of 667 respondents completed the questionnaire. A majority of respondents (93.7%, n = 625) reported searching the internet for health information, with 68.4% reporting that they have used ChatGPT to search for health-related information. Roughly 95% of respondents reported having heard of ChatGPT (94.8%, n = 632) and almost 82% of participants had used it in the past (81.6%, n = 544). Interestingly, the most common surgical information searched was "procedure details" (27.7%), followed by "surgeon education" (19.6%). When comparing ChatGPT users to those that had not tried the chatbot, age varied significantly with higher proportions of individuals aged 25-34 having tried the chatbot than other groups ( $p = 0.002$ ). More than 60% of participants who used ChatGPT reported that they would prefer to use ChatGPT to search for medical information instead of traditional search engines due to its convenience and comprehensiveness.

**Conclusions:** ChatGPT is a rapidly growing platform for patients to obtain medical information. The Internet is still a major source of information prior to surgery and our data demonstrate that patients are most interested in information like procedure details and surgeon's education. Surgeons should be aware of the rapid evolution of medical information delivery and recognize that providing this information preemptively will help with patients' counselling processes.

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## Ghost Publications on the Plastic Surgery Common Application

Abstract Presenter: Daniela Lee

Abstract Co-Author(s): Kirsten Schuster MD, JD, John Park PharmD, Jose Foppiani Mudr., James Fanning, Vikas Bommineni, Angelica Hernandez MD, Iulianna Taritsa, Maria Escobar MD, Dr. Samuel Lin MD

**Purpose:** As matching into plastic and reconstructive surgery becomes more competitive every year, applicants feel pressured to be productive in all aspects. With the recent change of Step 1 to pass/fail, there is an even greater emphasis on research publications, with matched applicants in the 2022-2023 cycle averaging at around 28.4 total abstracts, presentations, and publications. Such high expectations may lead to temptations to falsely embellish parts of the application, especially in areas that are difficult or time-consuming to verify on the new Plastic Surgery Common Application (PSCA). Previous rates of falsified publications in plastic surgery applications vary widely, ranging from 2–34%.<sup>1,2</sup> We aim to quantify rates of publication falsification and inflation in the most recent PSCA applicant pool.

**Methods:** A retrospective review of 336 applications to our institution's integrated plastic and reconstructive surgery residency program was performed for the 2023–2024 cycle. To protect applicant identities, a randomized sample was selected to collect the following data: applicant demographics, "number of total peer-reviewed publications" reported on PSCA, and basic publication-related information from CVs. A search on the Internet for PubMed indexing of any manuscripts that applicants marked as "published" was conducted. Publications not found were flagged and validated by a third-party member unrelated to the 2023-2024 application cycle. Data was collected on a confidential and encrypted spreadsheet.

**Results:** A total of 27 out of 102 (26.5%) reviewed applicants had falsified information regarding their publication list, including incorrect author lists and unsearchable manuscripts. More common was inflation of the "number of total peer-reviewed publication number" self-reported on PSCA, done by 33 applicants (32.4%), via inclusion of "submitted" or "in-progress" manuscripts, abstracts from poster/oral presentations, surgical videos, and non-peer-reviewed articles. IMG status, Step 2 score, and number of claimed publications did not significantly differ between the groups that lied or inflated their numbers and those that did not.

**Conclusion:** The rate of research falsification and inflation in the PSCA is within the range found in the literature for previous application cycles using ERAS. However, any amount of falsification and inflation is still of concern. In the future, there may be more national discourse on measures needed to prevent professional misconduct and have greater standardization for research productivity reporting in the PSCA.

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## **AI Text-to-Image Generators and the Lack of Diversity in Hand Surgeon Demographic Representation**

Abstract Presenter: Isra Abdulwadood

Abstract Co-Author(s): Meeti Mehta BS, Kassandra Carrion, Xinfei Miao, Sonal Kumar, Parul Rai, Heli Patel, Noopur Gangopadhyay MD, Wendy Chen MD, MS

**Purpose:** Artificial intelligence (AI) models are already being extensively applied in medicine; however, recent studies have revealed the existence of significant gender and racial gaps with the utilization of AI in the care and education of patients. Resultantly, there is a growing concern that these gaps may lead to unintended biases and inequalities in patient care (1). Furthermore, demographic disparities have been established in many surgical subspecialties, including hand surgery, with women and people of color often in the minority (2). This paper intends to analyze the demographic representation of hand surgeons in AI-generated visuals models in order to shed light on any disparities and analyze the consequential implications for both the medical community and broader society.

**Methods:** We assessed three of the most popular and publicly available AI text-to-image generators, including DALL-E 3, Midjourney, and DreamStudio. Images were generated using the prompt "a photo of the face of a hand surgeon." Three reviewers independently evaluated over 300 AI-generated images, categorizing them according to gender (female and male) and race (non-White, defined as any race other than non-Hispanic White, and White). Inter-rater reliability was determined using Cohen's Kappa. Chi-square was performed to compare the distribution of female and non-White hand surgeons in the AI-generated images with current demographic data of hand surgeons in the United States. Statistical significance was established at  $\alpha = 0.01$ .

**Results:** Cohen's kappa for racial agreement across three AI platforms was 0.608 (moderate to substantial agreement), and for gender agreement was 1 (perfect agreement). Cohen's kappa did not differ when comparing each AI platform for gender or racial agreement. DALL-E 3 showed a significant difference between percentage of rater identified whites and non-whites when compared to the national average of PR (plastic and reconstructive) surgeons (76.6% white,  $p < 0.01$ )-- image output showed 64% white PR surgeons. On the contrary, DALL-E 3 did not show a significant



difference between image output percent males (91%) and the national average of PR male surgeons (83%,  $p=0.03$ ). Midjourney image outputs favored white (100%), male (100%) PR surgeons, and this was significantly higher than the national average ( $p<0.01$ ). DreamStudio showed outputs reflective of the national average of male PR surgeons (81%,  $p=0.59$ ), but showed significantly more white PR surgeons (97%) than the national average.

**Conclusion:** As AI technologies continue to shape healthcare, our study aims to underscore the urgency of cultivating more inclusive AI datasets that accurately reflect the growing diversity within the hand surgery profession. Addressing this gap is crucial for fostering equitable advancements in AI applications, enhancing medical education, and ensuring a comprehensive understanding of hand surgery.

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## Topical Tacrolimus Outperforms Topical Nitroglycerin for Pedicled Flap Survival in an Ischemic Rodent Model: Gross and Histologic Analysis

Abstract Presenter: Isaiah Rhodes

Abstract Co-Author(s): Chase Alston, Ashley Zhang, Sophia Arbuiso, Samuel Medina, Matthew Liao, Seth Aschen MD, Albert Truong MD, Marcos Lu Wang MD, David Otterburn MD

**Purpose:** A common postoperative complication associated with mastectomies is skin necrosis (1). Our previous studies have shown that topical tacrolimus (TT) decreases rates of skin necrosis in an ischemic flap rodent model (2)(3). Clinically, we treat our patients who have breast skin necrosis with topical nitroglycerin (TN). This study compares the efficacy of TT versus TN.

**Methods:** A cranially based dorsal skin flap measuring 3×10cm was raised and reinset on 25 Sprague-Dawley rats. Rats were randomized to receive either TT or TN. 0.2g of selected ointment was administered to each rat both immediately post-operatively and then twice daily. Rats were sacrificed 7 days postoperatively. Fiji software was used to measure surface area of healthy tissue, reversible ischemia and full-thickness necrosis.

Biopsies of tissue samples were taken from three randomly chosen animals in each group. Hematoxylin and eosin-stained slides were prepared. A blinded pathologist described the conditions of the dermal layer.

**Results:** The average area of the dorsal flaps in the TT and TN groups was 26.4 and 24.5 cm, respectively. In the TT cohort, the average healthy, ischemic and necrotic areas were 47.9%, 30.0%, and 22.1%, respectively. In the TN cohort, the average healthy, reversible ischemic and necrotic areas were 31.4%, 36.3%, and 32.3%, respectively. Total healthy tissue was significantly greater for rats receiving TT when compared to TN ( $p=0.035$ ). Under light microscopy, reversibly ischemic tissue of rats treated with TT demonstrated increased granulation tissue compared to rats treated with TN. Similarly, necrotic tissue of TT treated rats demonstrated granulation tissue, fibroblasts, myofibroblasts and inflammatory cells while rats treated with TN demonstrated only inflammatory cells, without associated granulation tissue.

**Conclusions:** TT treatment was associated with significantly more healthy tissue when compared to TN. The presence of granulation tissue in reversibly ischemic and necrotic flaps treated with TT and the absence of granulation tissue in flaps treated with TN correlates with our gross findings of increased healthy tissue in our TT treated rodent model compared to TN. This study has identified that topical tacrolimus may be a better treatment for postoperative skin ischemia than topical nitroglycerin. Topical tacrolimus warrants clinical investigation for this purpose.

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## **Rapid Three-Dimensional, Ultrasound-Based Flap Angiography**

Abstract Presenter: Amin Izadpanah

Abstract Co-Author(s): David Jansen MD, Abigail Chaffin MD, Reza Izadpanah

**Purpose:** Computed tomography angiography (CTA) remains the gold standard for evaluation of vascular perforators for pre-operative planning of flaps. However, CTA requires radiation exposure, contrast administration, is unable to resolve small caliber vessels, and is done in advance of surgery. Here, we present a novel method utilizing doppler ultrasound and power doppler ultrasound for the rapid generation of high quality, 3D flap angiograms.

**Materials and Methods:** A total of 48 flaps were analyzed, as part of pre-operative evaluation and planning, and included DIEP flaps (n=10), anterolateral thigh flaps (n=8), anteromedial thigh flaps(n=10), nasolabial flaps(n=4), forehead flaps(n=4), latissimus dorsi myocutaneous flaps(n=6), radial forearm flaps(n=4), and dorsal scapular artery perforator flaps(n=2). Clarius handheld ultrasound was utilized for this study. A standardized ultrasound motion sequence was optimized for each type of flap, to ensure consistency between flaps. A method was designed and optimized to perform rapid 3D reconstruction of the ultrasound data using Slicer software.

**Results:** The mean time from completion of ultrasound imaging to 3D reconstruction was 3.77 minutes (95% confidence interval 3.58-3.95 minutes). Importantly, our method also 3D reconstructs the tissue architecture enabling delineation of soft tissue and fibrous structures. Our method demonstrated efficacy in reconstruction of angiograms of large vessels, such as radial artery but also microvasculature at cutaneous, subcutaneous, and fascial levels, representing an advance beyond CTA. The use of power doppler enables highly sensitive and specific detection of low flow microvasculature and submillimeter vessels. The 3D reconstructions can be translated, rotated, zoomed in and out to facilitate visualization of structures. Moreover, measurements and annotations can be performed on the 3D reconstructions to facilitate, inform, and revise surgical planning.

**Conclusions:** Our method enables the rapid generation of 3D flap angiograms in a variety of flap types. The highly sensitive detection and 3D reconstruction of microvascular flow also represents a major advance. The data demonstrates that the procedure can be performed in under 5 minutes, making the method feasible as part of the pre-operative or post-operative setting, as well as intraoperatively to monitor flap perfusion.

**Comparing Incidences of Dehiscence in an Ischemic Rodent Model Treated with Either Topical Nitroglycerin or Topical Tacrolimus**

Abstract Presenter: Nancy Qin

Abstract Co-Author(s): Isaiah Rhodes, Sophia Arbuiso, Chase Alston, Matthew Liao, Ashley Zhang, Samuel Medina, Albert Truong MD, Seth Aschen MD, Marcos Lu Wang MD, David Otterburn MD

**Purpose:** A common postoperative complication associated with skin flaps is wound dehiscence (1). One factor that leads to dehiscence is tissue ischemia, which we treat clinically with topical nitroglycerin. We designed a study comparing topical nitroglycerin and topical tacrolimus in an ischemic rat model with flap dehiscence as one of our clinical endpoints.

**Methods:** A cranially based dorsal skin flap measuring 3×10cm was raised and reinset on 24 Sprague-Dawley rats by a single surgeon using a running suture technique with a 4-0 monofilament suture. Rats were randomized to receive either topical nitroglycerin or topical tacrolimus. 0.2g of ointment was administered to each rat immediately post-operatively and twice daily afterward. For seven days, rats were evaluated twice daily for flap dehiscence. Fiji software was used to measure surface area of viable and necrotic tissue. Bivariate analysis comparing rates of dehiscence was conducted.

**Results:** Seven rats from the nitroglycerin group and 1 rat from the tacrolimus group experienced dehiscence ( $p=0.013$ ). In all rats, suture knots were intact at the time of dehiscence. There were increased rates of necrosis in rats treated with topical nitroglycerin relative to topical tacrolimus, 32.4% vs. 22.1%, respectively. However, this did not reach a level of significance ( $p=0.068$ ). There was one incidence of post-operative death.

**Conclusions:** Significantly more skin flap dehiscence events were reported in rats treated with topical nitroglycerin than topical tacrolimus. Our findings suggest that the increased incidence of dehiscence in the topical nitroglycerin group relative to the topical tacrolimus group was secondary to increased necrosis along flap margins where tissue is most vulnerable to ischemia. The efficacy of topical tacrolimus in decreasing skin flap ischemia warrants further investigation.

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## **Oral, Inactive VD3 Significantly Improves Autologous Fat Graft Retention In A Swine Model**

Abstract Presenter: Andreea Gavrilescu

Abstract Co-Author(s): Amr Elmeanawy, Alexandra Vagonis MD, Shawn Loder MD, Yusuf Surucu MD, Hamid Malekzadeh MD, Jose Antonio Arellano MD, Rachel Ricketts, J. Peter Rubin MD. Lauren Kokai PhD

**Introduction:** Surgeons apply autologous fat grafting (AFG) to correct soft tissue defects and for tissue regeneration. However, outcomes remain inconsistent and unpredictable. Vitamin D3 (VD3) offers anti-inflammatory and pro-angiogenic factors known to improve wound healing. Our small animal proof of concept studies demonstrated promising results with VD3 for graft retention and quality. The aim of this study was to evaluate oral VD3 for AFG retention in a porcine model.

**Methods:** Three Yucatan pigs underwent AFG of inguinal adipose grafted into 16 defined dorsal zones, 5cc for each graft. Pig 1 received no medical intervention, Pig 2 received post-surgical oral VD3 thrice weekly (100K IU), and Pig 3 received oral VD3 (100K IU) thrice weekly beginning two weeks prior to surgery and continued post-operatively. The selected VD3 dose was chosen from agricultural literature showing inefficient porcine metabolism of nutritional VD3 to its metabolically active form. Pigs underwent monthly ultrasounds to estimate graft retention and collect biopsies until the study endpoint at 3 months. At sacrifice, all grafts were excised, weighed, and processed for histology. Statistical analyses (ANOVA, post-hoc tests) were performed via GraphPad.

**Results:** Mean graft retention for Control Pig 1 was 18.99% (SEM=4.57) versus 40.19% (SEM=5.65) for Pig 2 and 41.98% (SEM=6.57) for Pig 3 ( $p=0.016$ ,  $p=0.008$ ). Histologically, graft architecture was similar across all study groups and resembled intact adipose with some areas of necrosis, adipocyte loss, small accumulations of free oil, and fibrosis. Quantification of longitudinally obtained biopsies for macrophages, vasculature, and perilipin-positive adipocytes is underway.

**Conclusion:** Oral VD3 significantly increased fat graft retention compared to no treatment, with no demonstrated benefit for pre-treating graft recipients compared to post-surgical supplementation. Given the demonstrated safety profile of VD3 supplementation, with widely available serum quantification capabilities, we believe this is a feasible approach to improve fat grafting outcomes. Based on the known human conversion of VD3 from inactive precursors, we predict lower doses will be necessary in

future clinical studies to achieve therapeutic benefit, as pigs are inefficient in VD3 metabolism.

## **Consulting Dr. ChatGPT: Comparing Google and ChatGPT Responses to Patient Queries in Plastic Surgery**

Abstract Presenter: Sumaarg Pandya

Abstract Co-Author(s): Mario Alessandri Bonetti MD, Tiffany Jeong, Jose Antonio Arellano MD, Francesca DE LORENZI, Michael Gimbel MD, Vu Nguyen MD, Francesco Egro MD, Msc, MRCS, Hilary Liu

**Introduction:** In the era of digital information, patients often rely on Google to find answers to their questions on plastic surgery.<sup>1</sup> However, due to the recent surge in popularity of the large language model (LLM) ChatGPT, patients may turn to ChatGPT for their plastic surgery questions.<sup>2,3</sup> Thus, this study aims to assess the quality of ChatGPT as a potential source of patient education by comparing the answers to frequently asked questions on various plastic surgery topics (free flaps, breast reconstruction, breast implant-associated anaplastic large cell lymphoma, breast implant illness, and body contouring) provided by ChatGPT and Google.

**Methods:** The Google and ChatGPT answers to the 10 most frequently asked questions on the search terms "free flap surgery," "breast reconstruction," "breast implant associated anaplastic large cell lymphoma," "breast implant illness," and "body contouring surgery" were recorded. Five blinded plastic surgeons were then asked to grade the quality of the answers according to the Global Quality Score (GQS), a scale to assess the quality of online sources. Wilcoxon paired t-tests were performed to evaluate the difference in GQS ratings for Google and ChatGPT answers.

**Results:** In a comparison of answers provided by Google and ChatGPT on various plastic surgery topics, ChatGPT significantly outperformed Google. For free flap surgery, Google scored an average of  $2.49 \pm 1.25$ , whereas ChatGPT scored an average of  $4.47 \pm 0.84$  ( $p < 0.001$ ). For breast reconstruction, Google scored an average of  $3.18 \pm 1.14$ , whereas ChatGPT scored an average of  $4.34 \pm 0.89$  ( $p = 0.002$ ). For breast implant-associated anaplastic large cell lymphoma, Google scored an average of  $2.72 \pm 1.44$ , whereas ChatGPT scored an average of  $4.18 \pm 1.04$  ( $p = 0.002$ ). For breast implant illness, Google scored an average of  $2.66 \pm 1.24$ , while ChatGPT scored an average of  $4.28 \pm 0.97$  ( $p = 0.002$ ). For body contouring, Google scored an average of  $2.55 \pm 1.29$ , while ChatGPT scored an average of  $4.38 \pm 0.67$  ( $p = 0.001$ ).

These QQS scores indicate that for Google's responses, some information was present but important topics were missing. ChatGPT's responses were good quality, with most important topics covered. The superiority of ChatGPT's responses was attributed to their comprehensive nature and recognition of existing knowledge gaps. When asked which source they would recommend overall for patient education among ChatGPT, Google, or none, most surgeons chose ChatGPT.

**Conclusion:** ChatGPT outperforms Google in providing high-quality answers to commonly asked questions in plastic surgery. Although ChatGPT is limited by the accessibility of its references, we foresee the potential of this technology to revolutionize patient education when used in adjunct to clinical counseling.

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## **Comparison of Large Language Models in the Evaluation and Simplification of Patient-Facing Texts on Gender Affirming Surgery**

Abstract Presenter: Victoria Yi

Abstract Co-Author(s): Angelique Scialdone, Ann Marie Flusche, Kendall Reitz, William Tian MD, Ash Patel MBChB, FACS

**PURPOSE:** Patient-facing materials in gender-affirming surgery are often written at a level higher than the NIH-recommended 8th grade reading level for patient education materials.(1) However, ChatGPT has been shown to successfully optimize certain patient-facing resources in plastic surgery.(2) Therefore, the purpose of this study is to evaluate and compare the ability of large language models to analyze readability and

simplify online patient-facing resources for gender affirming procedures.

**METHODS:** Google Incognito searches were performed on 15 terms relating to gender affirming surgery ("Facial feminization surgery," "FTM top surgery," "MTF vaginoplasty," etc.). The first 20 text results for 11 out of 15 key terms were analyzed for reading level difficulty by a traditional online readability calculator, Readability Scoring System v2.0. Four keywords resulted in fewer than 20 texts and were analyzed in the same manner: "MTF Adams apple reduction" (N=13); "Gender affirming vocal surgery" (N=20); "Gender affirming rhinoplasty" (N=10); "Gender affirming forehead surgery" (N=5). Academic articles, non-English texts, and sponsored websites were excluded from this study. Seven different, easily accessible large language models were then used to assess website texts for reading grade level and simplify each text to an 8th grade reading level. The re-written texts were then re-evaluated for reading grade level with the Readability Scoring System. Descriptive statistics and t-tests were used for statistical analyses.

**RESULTS:** Online patient-facing resources on gender affirming surgery were written with a mean reading grade level of 12.7 +/- 2.7. Texts written by academic hospitals had the easiest readability at a 11.6 +/-2.8 grade level compared to private practice (13.2 +/- 2.6) and online blog sources (12.0 +/- 2.4). "Adams apple reduction" texts were the easiest to understand with a mean grade level of 10.8 +/- 2.4, and "Facial masculinization surgery" texts were the most difficult to understand with a mean grade level of 15.4 +/- 3.7. When asked to simplify texts to an 8th grade reading level, Google Gemini was most successful ( 8.5 +/- 1.5), followed by Anthropic Claude (9.6 +/- 1.9) and ChatGPT 4 (10.0 +/- 1.9). Artificial intelligence tools produced better reading level estimates ( $p < 0.0001$ ) and simplifications ( $p < 0.001$ ) for online texts describing feminizing procedures compared to masculinizing procedures.

**CONCLUSIONS:** Online patient-facing texts on gender affirming procedures are written with a readability more challenging than the NIH-recommended 8th grade reading level for patient-centered resources. Certain artificial intelligence tools were better at simplifying texts than others. Text readability and simplification were more difficult for texts on masculinization procedures. Providers should take caution when using large language models for patient education in plastic surgery, and improvements in artificial intelligence tools are required to provide more understandable patient-facing materials to transgender men.

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## **Non-extremity lymphedema: a case series**

Abstract Presenter: Maria Rios Sanchez

Abstract Co-Author(s): Samyd Bustos MD, Eugene Zheng MD, Samuel Jang, Carlos Daniel Bruces Molina MD, Gina Hesley, Christine Lee, Nho Tran MD, Vahe Fahradyan MD

**Background:** Genital lymphedema is an uncommon and disabling disease that manifests as enlargement of the genital region resulting from the disturbance of lymphatic drainage. Lymphaticovenular anastomosis (LVA) has been reported to improve genital lymphedema. Indocyanine green (ICG) lymphangiography has been a gold standard of preoperative mapping of lymphatic vessels during LVA surgery. However, there are several limitations to this technique. Previously, contrast-enhanced US (CEUS) was reported to be effective identifying lymphatic vessels in lymphedema of the upper and lower extremities. Therefore, we aimed to examine if CEUS with intradermal injections of microbubbles successfully identifies target lymphatic vessels in the preoperative management for Lymphovenous Anastomosis surgery in patients with non-extremity lymphedema.

**Methods:** IRB-approved, single-center retrospective chart review was performed for patients with non-extremity lymphedema undergoing LVA surgery between 2020-2024. Intraoperative CEUS with intradermal injection of microbubble suspension (Lumason, Bracco Suisse) was used in patients before LVA surgery. We will retrieve data retrospectively from chart review regarding sociodemographic variables, comorbidities, clinical characteristics, possible complications, and outcomes.

**Results:** A total of three patients with non-extremity lymphedema underwent a Lymphaticovenular anastomosis (LVA) surgery. The first patient was a 34-year-old female who was diagnosed with lymphangioma circumscriptum involving the lower abdomen, mons and vulva. The second patient was a 16-year-old male who was diagnosed with congenital crotal and bilateral lower extremity end-stage lymphedema. The third patient was a 31-year-old female who was diagnosed with primary lymphedema of right lower extremity and right lower abdomen and genital region. Preoperative planning for the three patients with CEUS with intradermal injections of microbubbles successfully detected lymphatic vessels in all patients, including those where ICG imaging was unsuccessful. The follow-up varied between patients. The first patient follow-up consisted in 4 monthly evaluations, even though the recovery was uneventful, 8 months later had recurring lymphedema requiring debulking surgery in the

vulva. The second patient follow-up consisted of one week, edema improved, and recovery was uneventful. The third patient follow-up consisted in 4 visits in the first nine months, lower extremity edema improved substantially, but one year later required a LVA surgery for the lymphedema on the mons, which reported an improvement on the edema.

**Conclusion:** Contrast-enhanced US (CEUS) with intradermal injections of microbubbles was able to successfully identify target lymphatic vessels in the preoperative management for Lymphovenous Anastomosis surgery in patients with non-extremity lymphedema. To our knowledge, this is the first report on the use of CEUS with intradermal injections of microbubbles as a preoperative technique to perform a LVA in patients with non-extremity lymphedema. Our case series, despite limitations like small sample size and short follow-up time, the patients showed a decrease in lymphedema without adverse effects and post-operative complications. More research on this technique for this patient population is essential. This study highlights CEUS lymphatic mapping as an efficient technique and alternative to current methods for genital lymphedema LVA surgery.

### **“Clock gene regulation as a potential mechanism for accelerating dermal wound healing”**

Abstract Presenter: Zachary Brooks

Abstract Co-Author(s): Nathan Sigel, Taro Inagaki, Satomi Arimoto, Akishige Hokugo, Reza Jarrahy MD

**INTRODUCTION:** Scarring, and in some cases hypertrophic scarring, is an unavoidable consequence of injuries and surgical procedures that represents a significant clinical challenge. Prominent scars, characterized by excessive collagen production, develop during the natural wound healing process, leaving patients with functional and psychosocial concerns. As such, managing the wound healing process, in an attempt to minimize abnormal scarring, proves to be an important facet of improving surgical treatment and postoperative recovery. Previous studies have shown that one of the core circadian clock genes, Neuronal PAS domain 2 (Npas2), regulates wound healing process through collagen synthesis and fibroblast biological activity. Npas2 appears to be a safe target for downregulation, as Npas2 knockout (KO) mice exhibited accelerated wound closure, less scarring, and did not result in embryonic or developmental pathology. The purpose of this study utilizes single-cell RNA sequencing to identify Npas2 gene expression in various identified cell classes over the wound

healing process in order to begin understanding the mechanism of action of Npas2 for wound healing.

**METHODS:** A previously established mouse excisional wound healing model was used to examine wound healing. The dorsal skin of the 12-week-old wild type C57BL/6J mice was shaved and two 5 mm diameter full skin thickness excisional wounds were created using skin biopsy punch. The open wound margin was tied with silicon splint by nylon stitch to prevent the skin contraction. On days 1, 3, 7, and 12, dermal tissues were harvested. Subcutaneous fat tissue was carefully removed, and the tissues were incubated with enzymes to isolate single cells. Cells were counted and the equal number of cells (4,000~8,000 cells/ $\mu$ L) from each animal were combined in the group for single-cell RNA sequencing (10X Genomics). The Cell Ranger output of scRNA-seq data was analyzed using R software.

**RESULTS:** Npas2 expression shows using ViolinPlots, and identified cell classes including epithelial cells and fibroblasts. Healthy, naïve skin showed low Npas2 expression across all cell types. In situ hybridization demonstrated Npas2 expression in the epidermis and dermis. Wound-induced Npas2 was expressed from day 3 onwards, primarily in all types of fibroblasts (myofibroblasts, dermal fibroblasts, and papillary fibroblasts).

**CONCLUSION:** Npas2 has the potential to serve as a genetic target for therapeutic strategies aimed at improving the outcome of surgical or injury wounds in the skin. Single-cell RNA sequencing has yielded significant results, revealing the expression of Npas2 in fibroblasts and epithelial cells. This discovery represents a major advance and provides a solid foundation for future studies focusing on the mechanisms by which Npas2 functions in the context of wound healing. By elucidating the precise role of Npas2 in these cell populations, we will aim to gain deeper insights into the underlying processes that govern wound healing, ultimately paving the way for novel therapeutic interventions and treatment strategies.

## **Novel Transforming Powder Dressing: A Systematic Review on the Use of Altrazeal for Wound Care**

Abstract Presenter: Madeline Oconnor

Abstract Co-Author(s): Kelly Ho, Nikhil Sriram, Keenan Fine, Bradley Melnick, Angelica Bartler, Kristin Huffman, Sammer Marzouk, Robert Galiano MD

**BACKGROUND:** Wound care is a critical aspect of healthcare, and advancements in therapeutic modalities continually seek to enhance the healing process. The novel transforming powder dressing (TPD), Altrazeal®, is composed of biologically compatible polymers (85% poly-2-hydroxyethylmethacrylate (pHEMA) and 15% poly-2-hydroxypropylmethacrylate (pHPMA)). It was engineered as a dressing for surgical wounds, traumatic wounds, chronic wounds, and burns. TPD is simple to use and painless to apply, as the powder is sprinkled over a moistened wound and has a wear time of up to 30 days. It has numerous purported benefits, including enhanced wound healing, pain reduction, cost reduction, and reduced care time. Multiple studies across a wide spectrum of wound types have reported on the efficacy of TPD, however, there is yet to be a systematic review that summarizes the results of these studies. This study aims to review the current literature to elucidate the impact of TPD on wound healing, pain management, and overall patient outcomes.

**METHODS:** We conducted a systematic review following PRISMA (Preferred Reporting Items of Systematic Reviews and Meta-Analyses) guidelines. Data including study characteristics, patient demographics, and wound outcomes were extracted. Articles were assessed for risk of bias and descriptive statistics were performed. The protocol for this study was registered in PROSPERO (ID: CRD42023485051).

**RESULTS:** Our systematic review included 26 articles representing 175 patients. Of these articles, 13 (50%) were case reports, 10 (38.5%) were case series, 2 (7.7%) were RCTs, and 1 (3.8%) was a cohort study. The most common wound type for which TPD was applied was venous ulcer (23.9%), followed by pressure sore (19.7%), burn (15.5%), skin graft (13.4%), diabetic foot ulcer (4.2%), Mohs defect (3.5%), abdominal wound (2.8%), trauma (2.8%), acne inversa (2.8%), chronic leg ulcer (2.8%), necrotizing fasciitis (2.8%), pilonidal cyst (2.1%), and other (3.5%). Complete re-epithelialization occurred in 90.1% of the wounds treated with TPD. A total of 19 studies (73%) discussed pain, each of which reported reduced pain with the use of TPD. No patients experienced complications related to their treatment with TPD.

**CONCLUSION:** The evaluated studies collectively suggest that TPD offers a promising re-epithelialization rate and analgesic effect across various wound types, encompassing surgical wounds, traumatic wounds, chronic wounds, and burns. Compared to the current standard-of-care dressing options, the long wear time and ease of application may also reduce the financial burden and care time associated with frequent dressing changes and thus should be the subject of future research.

## **A Patient-specific, High-throughput Engineered Biomimetic Platform for Quantification of Breast Cancer Cell Invasiveness and Endothelial Cell Angiogenic Response**

Abstract Presenter: Tim Li

Abstract Co-Author(s): Jini Jeon, Riley Mayne, Dylan Kim, Gillian O'Connell MD, Xue Dong MD, PhD, Jason Spector MD

**PURPOSE:** Characterizing triple negative breast cancer (TNBC) cell behavior within personalized in vitro models of the breast milieu is critical to understanding disease progression and advancing therapeutics. Challenges to developing such platforms include co-culturing diverse primary cell types to recapitulate the complex 3D tumor microenvironment and establishing an analytic approach for reliable assessment of cell behavior overtime. It is also crucial to provide accurate measurement of TNBC and endothelial cell invasion and migration, particularly in detecting potentially metastatic and angiogenic cell clusters. This study aims to: 1) develop a multilayer 3D platform capable of co-culturing TNBC cells, endothelial cells, and patient-derived breast adipocytes, stromal vascular fraction, and ductal epithelial organoids, and 2) employ a machine learning-based algorithm to quantify TNBC and endothelial cell migration and identify highly migratory subsets.

**METHODS:** Breast tissue from healthy patients undergoing reduction mammoplasty (n=6, average age of 31.8, BMI of 29.1) was processed to isolate mature adipocytes, stromal vascular fraction, and ductal organoids and then suspended in 0.3% collagen. The final 3D construct contained three layers: 1) a base layer with RFP-tagged MDA-MB-231 tumor cells ("Tumor"), 2) a middle layer with either biomimetic collagen containing breast derived cellular constituents ("BM") or collagen alone without cells ("Collagen"), and 3) a top layer with GFP-tagged human umbilical vascular endothelial cells ("HUVEC"). Six separate combinations were fabricated: Tumor-BM-HUVEC, Tumor-Collagen-HUVEC, Tumor-Collagen, Tumor-BM, Collagen-HUVEC, and BM-HUVEC. All groups were plated in triplicate on a 96-well plate and cultured at 37°C under hypoxic (5% O<sub>2</sub>) or normoxic (21% O<sub>2</sub>) conditions. Confocal imaging was performed on days 0 and 5. A machine learning algorithm was developed in Imaris<sup>TM</sup> software to measure vertical cell movement along the z-axis, and a regression plane of cell location was reconstructed in RStudio. Migrated cells were defined as those exceeding one standard deviation away from the fitted plane.

**RESULTS:** On days 0 and 5, confocal microscopy revealed ~800µm thick constructs with distinct TNBC and HUVEC cell layers. For migrated TNBC cells under normoxic condition, Tumor-BM-HUVEC group had the furthest migration of 125.3µm, followed by

Tumor-BM at 103.2µm, with significantly less migration in groups without breast derived cell constituents: Tumor-Collagen-HUVEC at 62.4µm and Tumor-Collagen at 60.4µm ( $p<0.0001$ ). Similar findings were observed under hypoxic conditions: Tumor-BM-HUVEC group migrated 88.4µm, Tumor-BM 84.8µm, Tumor-Collagen-HUVEC 59.1µm, and Tumor-Collagen 49.3µm. When focusing on migrated HUVEC cells, Tumor-BM-HUVEC group demonstrated significantly greater migration compared to groups without breast derived cell constituents and/or tumor cells (Tumor-Collagen-HUVEC, Collagen-HUVEC, and BM-HUVEC) under both normoxia (34.2µm vs 24.7µm, 22.2µm, and 28.5µm, respectively,  $p<0.01$ ) and hypoxia (42.0µm vs 26.6µm, 22.9µm, 29.6µm,  $p<0.0001$ ).

**CONCLUSIONS:** This novel biomimetic construct allows for reliable, precise characterization of TNBC and HUVEC cell behavior within a biomimetic breast tumor microenvironment under both normoxic and hypoxic conditions. Increased TNBC and HUVEC migration seen in the biomimetic milieu suggests that the presence of breast derived cell constituents may contribute to enhanced cancer metastasis and angiogenesis. This unique tissue engineering platform holds significant promise as a personalized, high-throughput screening tool for investigating cancer cell behavior and potential therapeutics.

## **Recent Trends in Research Collaboration and Implications for Academic Plastic Surgeons**

Abstract Presenter: Hilary Liu

Abstract Co-Author(s): Nicolas Kass, Tiffany Jeong, Jose Antonio Arellano MD, Angel Dixon, Francesco Egro MD, Msc, MRCS, Vu Nguyen MD, Jesse Goldstein MD

**Introduction:** An interdisciplinary approach benefits patient care and outcomes. Despite the benefits of collaboration, the extent to which plastic surgeons engage in interdisciplinary research has not been previously investigated. This study aims to quantify interdisciplinary collaboration patterns within plastic surgery.

**Methods:** PubMed was queried for all articles published from academic plastic surgery programs between 2018 and 2023. The resulting article list was merged with the Journal Citation Report to assess impact factor. An article was considered collaborative if the senior author was from an academic plastic surgery institution and at least one author was from a different department. A chi-squared test was performed to examine the association between collaboration and publication in a plastic surgery vs non-plastic

surgery journal.

**Results:** 21,068 articles were retrieved, 14,590 articles were reviewed after removal of duplicates, and 6686 articles qualified for inclusion. Less than half (44.8%; n=2992) of articles were collaborative, among these the majority (56.1%; n=1679) collaborated with another surgical department. The three most collaborated-with surgical specialties were general surgery (17.6%; n=522), otolaryngology (14.6%; n=437), and orthopedic surgery (11.8%; n=354). 38.1% (n=1141) of collaborations were with non-surgical specialties, most frequently, genetics and genomics (13.9%; n=416), internal medicine (8.5%; n=253); and radiology (5.1%; n=153). There were also a number of non-medical collaborations, including dentistry (4.9%; n=147) and engineering (7.6%; n=228).

Regionally, there were no significant differences in the proportion of collaborations in 15 programs in the Northeast (40.3%), 12 programs in the Midwest (42.0%), 9 programs in the South (45.8%), or 9 programs in the West (44.8%). Of note, there was no overlap between the three academic programs with the highest volume of publications (Stanford, n=490; New York University, n=380; and the University of Michigan, n=380) and three academic programs with the highest proportion of collaborative publications (Mayo Clinic, Jacksonville (79.2%; n=61); Mayo Clinic, Rochester (73.2%; n=101); University of California San Diego (61.5%; n=48)). Productivity at an institution and the proportion of their articles with collaboration were independent ( $R^2=0.0003$ ;  $p=0.9148$ ).

Similarly, there was no overlap between plastic surgery journals with the highest volume of articles and those with the highest proportion of collaborative articles (Annals of Plastic Surgery (64.3%; n=142); Aesthetic Plastic Surgery (53.8%; n=56); Journal of Plastic, Reconstructive & Aesthetic Surgery (50.8%; n=97)). Most collaborative articles were published in non-plastic surgery journals (54.8%; n=1641), and most non-collaborative articles were published in plastic surgery journals (69.7%; n=2574) ( $p<0.0001$ ).

**Conclusion:** This study defined the diverse affiliations that contribute to plastic surgery being a highly productive field by determining the prevalence of interdisciplinary collaboration in the literature. These results emphasize the importance of collaboration in research, offering valuable insights for both aspiring trainees seeking programs aligned with their research interests and academic institutions aiming to enhance the reach and impact of their research through strategic partnerships.

# Evaluating the impact of state family support policies on research representation and productivity of early-career women in plastic surgery: An AI-driven analysis

Abstract Presenter: Reid Smith

Abstract Co-Author(s): Georgios Karamitros MD, Sofoklis Goulas

**Introduction:** Even though the alarm of women under-representation in surgery has been going off for decades, most approaches to measuring women under-representation have been sporadic and inconsistent.<sup>1</sup> Our study employs an Artificial Intelligence (AI) big data approach to comprehensively and accurately document each state's gender disparity in research productivity and representation. We evaluate the impact of state family support policies, such as paid family leave (PFL) and reproductive rights, on women representation and productivity in plastic surgery research.

**Methods:** We followed Karamitros and Goulas in deploying AI technology by means of a web-scraping algorithm on PubMed to retrieve author names and affiliations for each publication on all PubMed-indexed plastic surgery journals on the SCImago classification from 2010 to 2022.<sup>2</sup> We identified authors' gender using gender API. Using information by the Guttmacher Institute and Bipartisan Policy Center we classified each state by their reproductive rights (protective vs restrictive) and PFL rights (mandatory and active or not) respectively. We statistically compared the gender gap (i.e., difference between males and females) in representation (i.e., authorship) and productivity (i.e., number of publications) between states with and without family support policies.

**Results:** First, our AI approach identified 7,489 first authors, who produced a total of 16,019 publications. A significantly smaller gender publication gap was identified in states with mandatory PFL laws and protective reproductive rights as compared with those without, respectively (0.50 vs 0.68 with  $p < 0.001$  and 0.53 vs 0.66 with  $p < 0.001$ ). When progressively restricting the sample to authors with at least 2, 5, or 10 publications, the identified impact of PFL on the publication gap grew from 0.18 to 0.54 ( $p < 0.001$ ), 0.72 ( $p < 0.001$ ), and 2.83 ( $p < 0.001$ ), respectively. Similarly, the impact of reproductive rights grew from 0.13 to 0.25 ( $p < 0.001$ ), 0.88 ( $p < 0.001$ ), and 6.28 ( $p < 0.001$ ), respectively. When considering productivity of at least 2 and 5 publications, PFL laws are associated with an increased gender gap in representation (1.27 with  $p < 0.001$  and 2.17 with  $p < 0.001$  for the 2- and 5-publication cutoff, respectively). At the same time, reproductive rights are associated with a decreased gender gap in representation (1.80 with  $p < 0.001$  and 0.45 with  $p < 0.001$  for the 2- and 5-publication cutoff, respectively). This suggests that reproductive rights may be more effective than



PFL laws in allowing women to penetrate through higher statuses of research productivity.

**Conclusion:** Our extensive data extraction via AI allowed us to investigate the direct impact of state-level protections for women on the plastic surgery labor market. Our policy evaluation suggests that state legislation can be effective in fostering gender equity and promoting research productivity parity. Our study serves as a signpost advocating for the importance of state level protections for early-career women plastic surgeons.

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#### **Evaluating Large Language Models for Surgical Chart Review of Second Stage Implant-Based Breast Reconstruction: A Comparative Analysis of Manual Review, GPT-3.5 Turbo, and GPT-4**

Abstract Presenter: Devi Lakhiani

Abstract Co-Author(s): Dhruv Dadhania, Rahim Nazerali MD

**Background:** Manual chart review is labor-intensive and error-prone. Integrating Large Language Models (LLMs), like GPT, may help to streamline research, reduce errors, and improve the reliability of plastic surgery outcome studies. This study compares the performance of GPT-3.5 Turbo and GPT-4 to manual review of patient operative reports detailing capsule revision in the second stage of implant-based breast reconstruction.

**Methods:** Filtering the STANford Research Repository (STARR) using CPT codes, we randomly selected 101 adult patients who underwent second stage implant-based breast reconstruction from January 2018 to January 2021. Manual chart review of operative reports identified patient demographics and presence of capsule revisions, including capsulectomy, capsulorrhaphy, and 'extensive' capsulotomy, defined as those

performed non-inferiorly. GPT-3.5 Turbo and GPT-4 first filtered all entries for each patient to identify a second stage breast reconstruction. Next, GPT recorded the occurrence of each capsule procedure. Discrepancies between manual review and each model were recorded.

**Results:** For the 101 patients, there were 1128 total entries; however, due to human error and inconsistencies in reporting, it was difficult to filter to only operative reports without manual review or the use of GPT. The GPT-3.5 Turbo model performed well at identifying operative reports where a second stage breast reconstruction occurred, incorrectly categorizing just one operative report. GPT-4 correctly identified all desired operative reports. When compared to the manual review, a naïve approach which determines only the presence of the word 'capsulectomy' and 'capsulorrhaphy' in the filtered operative reports for each patient yielded a 27% and 61% accuracy rate, respectively. Since we were interested in 'extensive' capsulotomies, as predefined, simply counting the presence of the term 'capsulotomy' would be incorrect, thereby requiring interpretation. Notably, many second stage operative reports did not explicitly use capsule procedure terms (e.g. 'capsulectomy'). In contrast, when instructed to determine the presence of capsulectomies, extensive capsulotomies and capsulorrhaphies during the second stage, the GPT-3.5 Turbo model correctly predicted 80.2%, 83.2%, and 82.2%, respectively. When considering this, GPT-3.5 performed well in determining the occurrence of capsule procedures with an overall success rate of approximately 81.8%. Notably, the overall recall was 0.92 with a lower precision of 0.73. The F-score was 0.814, which is a measure of model accuracy considering both precision and recall. Re-running with GPT-4 considerably improved performance, correctly classifying 89.1% of capsulectomies, 94.0% of extensive capsulotomies, and 92.1% of capsulorrhaphies. This yielded an overall success rate of 91.7%, overall recall of 0.99, and overall precision of 0.83. With GPT-4, the F-score was 0.903, indicating high efficacy at correctly identifying true positives while minimizing false positives and false negatives.

**Conclusion:** While GPT-4 demonstrated improved performance compared to GPT-3.5 Turbo, both models exhibit minimal limitations in precisely matching the manual chart review. These findings emphasize the potential for integrating LLMs into plastic surgery outcome studies, offering significant benefits in reducing human error and time spent. However, they also highlight the importance of cautious interpretation and the complementary role of manual data collection.

# **Incisional Negative Pressure Wound Therapy and Mechanisms of Efficacy: A Systematic Review and Integrated Biomechanical Model**

Abstract Presenter: Alice Wang MD

Abstract Co-Author: Dennis Orgill MD, PhD

**Purpose:** Clinical outcome studies support use of incisional negative pressure wound therapy (iNPWT), with benefits including lower rates of surgical site infection, fewer wound complications, and improved scarring. Few studies, however, have convincingly explicated the efficacy of iNPWT. This systematic review examines reported mechanisms of iNPWT efficacy, synthesizing these findings into a cohesive model with particular attention to lymphangiogenesis and the ideal mechanical environment for wound healing.

**Methods:** This systematic review was conducted in accordance with PRISMA guidelines. PUBMED, OVID, and Web of Science were searched. All studies published before February 2024 were assessed for eligibility. Inclusion criteria were full text prospective or retrospective studies in English that reported on 1) in vitro mechanistic models, 2) biomechanical studies, 3) histologic analysis, and 4) macroscopic tissue changes induced by iNPWT. Reviews, opinions, case reports, and abstracts were excluded.

**Results:** Eighteen studies met inclusion criteria. All manuscripts were published between 1997 and 2023. Several studies suggest that iNPWT increases tissue perfusion and circulation of immunomodulatory cells, thereby decreasing rates of wound infection. There is contention about how these changes occur. Some studies propose that iNPWT initially induces local tissue ischemia and triggers release of angiogenic factors including VEGF and nitric oxide, while others suggest that suction forces stent open capillary beds for enhanced flow. These differences can, in part, be due to varying imaging modalities used to assess perfusion (ICG angiography vs. doppler flow vs. thermal imaging), which is a weakness of established literature.

From a biomechanical standpoint, like traditional vac therapy, iNPWT generates macrodeformational forces that support wound healing. iNPWT provides external suction that, one study hypothesizes, aligns deep dermal structures and allows for faster recovery of tissue tensile strength in the initial postoperative period. This suction force may also reduce local edema by encouraging lymphatic uptake of serous fluid, as postulated by three included studies. Like silicone taping, iNPWT has been modelled to reduce lateral incisional tension and realign force vectors to better approximate wound

margins. These models are supported by qualitative outcomes reporting favourable scarring with use of iNPWT compared to conventional dressings.

Two studies propose the use of iNPWT as external splints in the contexts of orthopaedic incisions and hand burns, which stand out from commonly described applications for iNPWT. These applications suggest that the semirigid yet conforming nature of iNPWT is a fundamental reason why this technology is effective.

**Conclusion:** Existing literature suggests that iNPWT utilizes macrodeformational forces to better approximate incisions, increase blood flow to wound margins, and enhance lymphatic circulation. This coincides with use of iNPWT during initial stages of wound healing with hemostasis, inflammation, and proliferation, perhaps providing a superior mechanical environment for regeneration than conventional dressings. Additional factors including degree of negative suction (-75 vs. -125mmHg), optimal length of therapy, and use of contact layers have yet to be considered. Not discussed in the included studies are changes in patient behaviour with use of iNPWT, including early vs. delayed mobility, awareness of incisions, and wound care needs.

## **Creating a Low Cost, Highly Accessible Microscope: The Double Mirror Array Stereomicroscope**

Abstract Presenter: Sahand Eftekari MD

Abstract Co-Author(s): Ellen Shaffrey MD, Weifeng Zeng MD, Robert George MD, Katherine Reuter Muñoz MD, Aaron Dingle PhD, Samuel Poore MD, PhD

**Purpose:** Microsurgery is an intricate and specialized field within plastic surgery that has significant constraints due to the high resources needed for training and operation. One significant constraint is the unavailability of surgical microscopes within healthcare systems both in the United States and on the global scale. This leaves trainees with a lack of access to surgical microscopes to practice and develop their microsurgery competence. Despite prior investigations attempting to overcome this scarcity of microscopes using iPhones and virtual reality systems, there remains a gap in having high fidelity microscopes for training purposes. This investigation presents a novel microscope that utilizes low-cost materials to produce a high fidelity, highly adaptable, and travel friendly surgical microscope for microsurgery training.

**Methods:** Binocular objective lenses were modified for near field viewing and coupled

with a double mirror array in series to produce a stereoscopic microscope that does not require prisms or calibration. This system was housed within a low-profile 3D printed chassis to produce the correct orientation for a top-down view of a microsurgical field. A microscope light source was built into the chassis that may be powered either with standard 120-240V outlets or battery powered in case of resource limited environments.

**Results:** The initial proof of concept and working prototype produce a fixed magnification of either 6.5X that enables trainees to complete end-to-end anastomoses on a 2mm vessel. Eight microscopes were created and transported to Rwanda, Ethiopia, and Vietnam for microsurgery training utilized by the SHARE plastic surgery organization and the author's home institution. This investigation remains ongoing to compare the utility of this microscope against a state-of-the art surgical microscope.

**Conclusions:** Microsurgical education and practice are often hampered by the high cost and inaccessibility of surgical microscopes. Our novel stereomicroscope aims to alleviate these barriers and promote better accessibility to residents and trainees on a global scale. By providing a low cost, portable solution that does not compromise the quality of the stereoscopic image, this innovation has the potential to transform the field of microsurgical education and practice.

### **Home-Field Advantage? A Two-Year Analysis of Research Output Among Successful Integrated Plastic Surgery Applicants With and Without a Home Plastic Surgery Program**

Abstract Presenter: Bhavana Thota

Abstract Co-Author(s): Brian Sangalang, Ethan Fung, Janet Coleman-Belin, Maheen Akhter MD, Justin Camacho, Yelissa Navarro MD, Max Silverstein MD, Paige Fox MD, PhD, Rahim Nazerali MD

**Background:** Plastic surgery (PS) remains one of the most competitive specialties in the NRMP Match, with the number of applicants increasing at a rate disproportional to the growth in number of positions. Numerous studies have been conducted on research productivity trends among successfully matched PS candidates; however, few have evaluated the subset of matriculants from medical schools without home integrated PS residency programs. This study aims to characterize the research productivity of PS matriculants in 2022 and 2023, comparing those with a home PS program to those without.

**Methods:** Websites and social media accounts of Accreditation Council for Graduate Medical Education (ACGME)-accredited integrated PS residency programs were queried to identify incoming first-year residents in 2022 and 2023. For each individual, PubMed was queried for peer-reviewed publications through the September prior to their matriculation and data was cross-verified using Scopus, Google Scholar, and ResearchGate. Additional study variables included number of PS-related publications, number of first-author publications, and author h-index. Data analysis was conducted in SPSS using Shapiro-Wilk and Wilcoxon-Mann-Whitney tests.

**Results:** From the 2022 match, 86 integrated PS programs and 194 first-year residents were identified and from the 2023 match, 88 integrated PS programs and 207 first-year residents were identified. After excluding eight individuals with outlier data points and 25 individuals with no identifiable data, the final study cohort included 368 residents. Of all matched applicants, 259 (70.4%) had a home program and 109 (29.6%) did not. The average number of PubMed-indexed publications was  $5.96 \pm 6.13$ , though matriculants with a home program had significantly more than those without a home program ( $6.46 \pm 6.57$  versus  $4.77 \pm 5.51$ ;  $p = .003$ ). Additionally, matriculants with a home program had a significantly greater number of first-author publications than those without a home program ( $2.00 \pm 2.65$  versus  $1.42 \pm 2.05$ ;  $p = 0.023$ ). No significant differences were found between cohorts when comparing author h-index and number of PS-related publications.

**Conclusion:** Similar findings between groups for h-index and number of PS-related publications indicates that those without a home program have a similarly competitive research background and impact when compared to their counterparts, though they comprise a minority of the matriculant pool. The disparity in volume of publications and first-author publications may be attributed to a lack of research-related resources at schools without home programs. Future directions of this work include determining how best to ameliorate the lack of research resources at schools without home programs, especially examining the rise of virtual research laboratories aimed at providing opportunities to students who may not otherwise have them.

## **Accurate Information or Artificial Hallucination: A Study of AI-Generated Citation Accuracy**

Abstract Presenter: Ashley Choi

Abstract Co-Author(s): Youssef Aref, Artin Allahverdian, Xinfei Miao, Madeleine Givant, Curtis Cetrulo Jr., MD, FACS, Edward Ray MD, FACS

**Background/Purpose:** Artificial Intelligence (AI) harbors significant potential for efficient capture and synthesis of information, enhancing its applicability across diverse fields to optimize the learning process. Notably, investigations into the generative capabilities of ChatGPT have demonstrated its proficiency in summarizing research articles and composing abstracts, albeit with some shortcomings (1). This prompts concerns about the extent to which AI can accurately integrate and summarize information from diverse sources and fields of study. The phenomenon of "artificial hallucination," wherein AI generates convincing yet unsubstantiated facts, has been recognized as a concern within the scientific community (2). Literature on the severity of artificial hallucination in the medical domain remains limited, with existing studies revealing a propensity for AI to fabricate data not supported by scientific literature (3). While previous studies shed light on the tendencies of ChatGPT, a broader examination of artificial hallucination across alternative AI interfaces and in varied domains is warranted. Our study seeks to address this gap by investigating artificial hallucination in five generative AI platforms, including ChatGPT, Perplexity, Claude, Microsoft Copilot, and Writesonic, within the context of plastic and reconstructive surgery, an unexplored domain concerning artificial hallucination.

**Methods:** We examined five different AI systems (Microsoft Copilot, Perplexity, Claude, ChatGPT 3.5, and Writesonic). These AI platforms were prompted to generate summaries on gender-affirming surgery and facial feminization surgery. They were then instructed to provide accompanying information on literature sources (title, author, PMID, and DOI). Verification through a PubMed web search identified instances of artificial hallucination, characterized by non-existent or incorrectly labeled results.

**Results:** Notably, ChatGPT 3.5 and WriteSonic exhibited 100% artificial hallucination across all categories, while Microsoft Copilot demonstrated the highest accuracy, correctly providing 80% of titles and 60% of authors accurately. Perplexity exhibited 40% accuracy in titles. Claude, however, consistently failed to provide qualifying information, marking DOI and PMID as "not available."

**Conclusion:** In conclusion, the findings underscore the need for continued improvements in AI accuracy, particularly in source citation. The study reveals varying

degrees of artificial hallucination among the AI platforms, emphasizing the importance of ongoing screening and refinement to enhance their reliability and effectiveness in information synthesis. Authors relying upon AI to synthesize data for scientific purposes should understand the limitations and pitfalls of current AI tools.

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## **Using Mixed-Reality for Free Flap Design: LTP and DIEP Perforator Identification**

Abstract Presenter: Nicolas Kass

Abstract Co-Author(s): Sumaarg Pandya, Siri Ravuri, Anjali Raghuram MD, Elizabeth Moroni MD, Malke Asaad MD, Stephen Canton, Edward Andrews, Michael Gimbel MD

**Introduction:** Perforator location is commonly assessed preoperatively on CT via computer screen and correlated to intraoperative patient anatomy by surface landmarks. This process of translating 2D into 3D, however, can be imprecise and lead to uncertainty or difficult dissections. In particular, the Lateral Thigh Perforator (LTP) flap has highly variable anatomy that leads to multiple possible orientations. Even in more predictable flaps, such as the DIEP, improved anatomical understanding can improve decision making. Mixed reality (MR) allows three-dimensional renderings of CT data to be projected upon the donor site skin, allowing the surgeon to better visualize sub-surface anatomy. We aimed to assess the viability of this technology in both DIEP and LTP flap design.

**Methods:** The Medivis SurgicalAR system was used in conjunction with the Microsoft HoloLens 2, an AR/MR headset with a see-through visor. CT imaging was projected onto a patient undergoing a DIEP procedure, after registration using four fiducials – the bilateral anterior superior iliac spine, and superior and inferior points of the umbilicus. For the DIEP flap design, time and discrepancy of perforator location were



assessed. Although an LTP flap was not performed, the location and course of the LTP perforator was visualized and used to draw a mock flap design.

**Results:** Registration error was estimated to be 2mm in the rostral-caudal axis on the right ASIS, 4mm in the rostral-caudal axis on the left ASIS, and <1mm on both umbilicus points in all directions. Registering the hologram to the patient lasted 77 seconds. The course of the LTP pedicle vessels were clearly visualized, allowing the surgeon to easily draw an LTP flap design onto the skin with ideal location and axis orientation. Three candidate perforators were identified for the left LTP and two for the right. Flap outlining lasted 62 seconds on the left and 40 on the right. DIEP perforators were rapidly identified and traced in 21 seconds.

**Discussion:** In this first intraoperative evaluation of perforator identification for flap placement guidance, we found our process to be highly accurate and efficient. Despite concerns surrounding soft tissue deformation leading to differences between preoperative CT and patient anatomy in the OR, we did not find any differences that impacted the ability to localize perforators or outline flaps. We believe this process and technology have the potential to improve flap design and elevate the standard of care.

## **Artistry of Artificial Intelligence: Evaluating the Efficacy of AI in Creating Medical Illustrations**

Abstract Presenter: Ashley Choi

Abstract Co-Author(s): Youssef Aref, Artin Allahverdian, Edward Ray MD, FACS

**Purpose/Background:** Artificial Intelligence (AI) has emerged as a transformative force in diverse medical applications, spanning health monitoring, drug development, diagnostics, and treatment planning. Notably, AI's proficiency in identifying clinical pathologies from medical imaging has revolutionized diagnostic accuracy. Recent studies have underscored the pivotal role of AI in text-to-image generation. Despite these strides, a gap persists in assessing AI's text-to-image generation in anatomic illustration, for example, in accurately representing facial feminization surgery-an integral component of gender-affirmation addressing gender dysphoria and enhancing quality of life. This study aims to assess the quality of AI generated images by different text-to-image models through comparative analysis with a published medical illustration.

**Methods and Materials:** In this study, five image-to-text AI models-Muse AI, BlueWillow, Stable Diffusion 2.1 Demo, Gencraft, and Picsart-were employed to generate visual representations of facial feminization surgery. Each AI received a specific prompt: "Please create a visual representation illustrating the outcomes of facial

feminization surgery, depicting the facial transformation from its initial masculine state to the post-surgical feminine appearance. Ensure the left image portrays the pre-surgery condition with masculine features, while the right image depicts the post-surgery outcome with feminine features." A gender-affirming surgeon assessed the generated images across five categories: adherence to the prompt, anatomical accuracy, detail orientation, artistic quality, and clear communication. A control image depicting facial feminization surgery was sourced from the Cleveland Clinic website. Data collection was facilitated through the Qualtrics platform.

**Results:** Gencraft and Picsart exhibited exceptional performance, earning a perfect total score of 25 out of 25 (100%) with the highest ratings (5, strongly agree) in all five assessment categories, comparable to the score of a control image with 100%. In contrast, Muse AI received a score of 40% (10/25), displaying challenges in adherence to prompt, anatomical accuracy, detail orientation, artistic quality, and clear communication. Bluewillow and Stable Diffusion Demo 2.1 achieved a comparable total score of 64% (16/25). Qualitative analysis highlighted Muse AI's issues with illegible text and "jumbled" features, while BlueWillow captured facial feminization surgery (FFS) essence, retaining some masculine features. Stable Diffusion's image portrayed FFS features but included surgically implausible elements. Gencraft and Picsart stood out, receiving praise as the "best" examples, notably for their effectiveness in patient education and aesthetic features.

**Conclusion:** Our results indicate that AI has the potential to be a useful tool for generating medical illustrations but comes with inherent limitations. These limitations can vary depending on the platform used and on the type of content, such as words, that are included in the source images. Therefore, AI needs to be continually improved and tested as a potential tool for patient education.

## **Initial Demonstration of Mixed Reality-Guided Percutaneous Screw Placement in Mandible Angle Fractures**

Abstract Presenter: Nicolas Kass

Abstract Co-Author(s): Angel Dixon, Kelly Daniels, Malke Asaad MD, Anthony Tang, Sumaarg Pandya, Siri Ravuri, Anjali Raghuram MD, Stephen Canton, Edward Andrews, Jesse Goldstein MD, Mario Solari MD

**Purpose:** Mandibular angle fractures have historically high rates of reoperation and complication leading to a particularly high morbidity rate. Mandible angle fractures are notoriously difficult to operate on due to an inability to properly visualize the site of fixation. Mixed Reality (MR) is novel technology that allows users to interact with and manipulate digital information that is superimposed on the real world. We demonstrate a method of planning trajectories and guiding screw placement by using MR to visualize

the entire skull, including the mandible, prior to an incision.

**Methods:** Two "targets" made of metal and measuring roughly 4mm x 1mm were fixed to the left mandible angle of a cadaver, which was then CT scanned. The CT was uploaded into the Medivis SurgicalAR system and projected as a hologram using Microsoft HoloLens 2. Virtual target and entry points were placed on the hologram over both of the metal targets and at corresponding points on the exterior surface of the face, creating two trajectory lines at 90-degree angles to the mandible. Holes were drilled according to concentric circles around the virtual trajectory lines that became green once the distance from the drill to the entry point was less than 1.5mm and the angle of drilling was less than 2 degrees from the intended trajectory.

**Results:** We percutaneously drilled. Time to plot trajectories, place fiducials, and match the hologram to the cadaver was 4 minutes 53 seconds. Time to locate correct trajectories and drill screw guide holes was 5 minutes and 13 seconds. On assessment of the drilling accuracy, six guide holes were drilled with mean deviation from intended location of 1.67mm, with a minimum of 0mm and maximum of 3mm. Mean deviation from ideal angle trajectory of 90° was  $2.8^\circ \pm 2.7^\circ$ .

**Conclusions:** In this first preclinical validation of MR-guided percutaneous screw placement, we found the MR trajectory guidance to be rapid and highly accurate. Inaccuracies were likely due to inaccurate placement of trajectories, which can be improved with increased use. A future direction for MR software for OR usage is the ability to plot trajectories at 90° perpendicular to a given tangent to CT-identified anatomy. We believe; however, this technology is approaching high levels of utility and has the potential to both reduce complication rates as well as operating time in mandible angle fracture fixation.

## **Artificial Intelligence for the Prediction of Skin Flap Necrosis Following Mastectomy in an Underserved Urban Community**

Abstract Presenter: Caroline Baker

Abstract Co-Author(s): Alexandra Hoffman, Richard M Rookwood, Xiaolu Xu MD, PhD

**Background:** Mastectomy skin flap necrosis (MSFN) is a devastating complication of breast reconstruction. MSFN can exacerbate physical disfigurement, prolong recovery, and inflict emotional and financial strain on the patient and healthcare system as a whole. Up to 30% of patients may be affected, and current predictive methodologies fall

short (1).

In response to this challenge, we aimed to create a machine learning (ML) model to determine factors highly associated with MSFN and to predict future cases with confidence in a patient population with high incidences of comorbidities. The nature of this population presents a unique opportunity to explore the social, in addition to clinical, determinants of MSFN. In the midst of the increasing prevalence of breast cancer, prediction of this frequent complication facilitates the development of safe, personalized treatment plans, particularly for the most vulnerable patients.

**Methods:** An IRB-approved retrospective review was conducted on patients who underwent total mastectomy paired with immediate breast reconstruction at a single academic medical center in the Bronx, New York, from January 2015 to January 2022. Reconstruction was prosthetic or autologous. This study extracted 24 patient and operative factors to train and test seven machine learning (ML) models. Patient data was randomly divided into training (80%) and testing (20%) sets. Resampling was used to ameliorate class imbalance before exploring a comprehensive parameter sweep for each model. After choosing optimal parameters, models were evaluated on the unseen testing set for final performance, and feature importance analysis was conducted.

**Results:** A total of 647 breasts (428 patients) were included in this study. The patient population was predominantly non-White Hispanic (30.1%) and Black/African American (29.7%). Mean age (SD) was 49.5 (10.8) years. Notable comorbidities included obesity (mean BMI of 29.6 +/- 5.7 kg/m<sup>3</sup>), hypertension (37.6%), smoking history (32.3%), and hyperlipidemia (21.3%). The overall MSFN rate was 14.5%. The ML models showed strong predicting power with AUC up to 0.74 and accuracy up to 83%. The models also revealed 6 most significant predictors of MSFN, including race, diabetes, coronary artery disease, hypertension, hyperlipidemia, and regular preoperative use of anticoagulation therapy.

**Conclusions:** Retrospective review revealed a racially diverse population with high rates of comorbidities, factors which were found to be associated with the development of MSFN by the ML models. These findings underscore the importance of MSFN awareness and proactive preventative care in communities with poorer health outcomes. Overall, high model performance validates the use of artificial intelligence modeling in the prediction of MSFN following mastectomy with immediate prosthetic or autologous breast reconstruction.

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## **Hyperglycemia and Wound Healing: The Role of Alpha1-Antitrypsin**

Abstract Presenter: Dor Halpern MD

Abstract Co-Author: Idan Malichy

**Background:** Diabetes mellitus is a group of diseases characterized by persistent hyperglycemia. Under these conditions, wound healing is impaired. Hyperglycemic Wounds are characterized by chronic inflammation, epithelial and endothelial cell injury, and a pathologic angiogenic process. (1) Alpha1-antitrypsin (AAT) is a circulating acute phase glycoprotein that redirects inflammatory signals toward inflammatory resolution (2,3), epithelial gap repair, mature blood vessel formation (4), and expedited wound healing. (5) In hyperglycemic individuals, circulating AAT is glycosylated and inactive. Clinical-grade human AAT has a remarkable safety record and is furthermore a candidate for treating wounds in individuals with poorly controlled hyperglycemia.

**Methods:** Mice were treated with STZ to induce hyperglycemia, followed by an 8 mm dorsal excisional wound. The wound was treated with topical AAT (50 micro gram/wound) or albumin at the onset and every three days. Wound closure was measured by image analysis, and the wound was further investigated by histology and gene expression. In vitro, epithelial scratch assays were exposed to diabetic patient serum with and without clinical-grade AAT, and gap closure rates were documented. AAT was also glycosylated under laboratory conditions; cells were treated with Glycosylated-AAT, and inflammatory profiles were measured. Results: Hyperglycemic mice showed a delay in wound closure compared to normoglycemic mice. hyperglycemic mice receiving hAAT treatment demonstrated a significantly more robust healing response than albumin-treated wounds (Day 6:  $17.55 \pm 7.98$  vs.  $30.97 \pm 9.86$  percent from day 0,  $p < 0.001$ ). In vitro, cell re-epithelialization was hindered by hyperglycemic patient serum. However, adding AAT to the serum led to a twofold increase in cell density within 12 hours. Moreover, macrophages that were exposed to glycosylated-AAT showed elevated secretion of pro-inflammatory cytokines that were alleviated by naïve-AAT administration.

**Discussion:** In hyperglycemic conditions, glycosylated-AAT turns pro-inflammatory, impairing wound healing. Yet, introducing naïve-AAT notably enhances wound closure

and reduces inflammation, suggesting its role in treating diabetic wound complications.

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#### **Characterizing the Past 4 Years of Integrated Plastic Surgery Applicants: A Texas STAR Analysis**

Abstract Presenter: Eric Bao

Abstract Co-Author(s): Nicole Depaola BS, Tara Huston MD

**Background:** The integrated plastic surgery residency program is one of the most competitive residencies to match into. Therefore, prospective plastic surgery applicants may harbor a lot of uncertainty about their odds of matching. The Texas STAR (Seeking Transparency in Application to Residency) database is a new residency match database that provides data and subjective advice from successful and unsuccessful integrated plastic surgery applicants so prospective applicants can gauge where they stand. This study aims to use the Texas STAR database from 2020 – 2023 to provide an updated analysis of the trends in plastic surgery applicants, to elucidate characteristics of ideal applicants, pitfalls of unsuccessful applicants, and areas of an application where programs are putting increasing emphasis.

**Methods:** Self-reported survey data from applicants to integrated plastic surgery residency between 2020 and 2023 were obtained from the Texas STAR database.

Objective statistics from all applicants were extracted to determine their significance with regards to matching using linear and logistic regression models. The primary outcome of analysis is applicant match success. Subjective advice from successful and unsuccessful applicants was extracted and summarized into general themes.

**Results:** A total of 281 integrated plastic surgery applicants responded to the Texas STAR survey from 2020 to 2023. Of these applicants, 208 matched (74.0%) and 73 did not match (26.0%). Matched applicants had a significantly higher number of interviews offered (16.3 vs. 8.1,  $p = 0.000$ ), USMLE Step 1 score (248.7 vs. 245.9,  $p = 0.043$ ), USMLE Step 2 score (256.7 vs. 253.2,  $p = 0.009$ ), class quartile rank ( $p = 0.036$ ), number of clerkships honored (4.4 vs. 3.5,  $p = 0.005$ ), number of abstracts/posters/presentations (9.0 vs. 7.9,  $p = 0.007$ ), number of peer reviewed publications (6.6 vs. 5.4,  $p = 0.007$ ), and number of interviews attended (14.0 vs. 9.5,  $p = 0.000$ ). Matched applicants also had a significantly higher percentage of applicants who honored their plastic surgery sub-internship ( $p = 0.032$ ) and/or took a research year ( $p = 0.043$ ). Differences in AOA status, GHHS status, couples match status, secondary degrees, number of research experiences, number of volunteering experiences and number of leadership positions were insignificant. Matched and unmatched applicants most frequently mentioned away rotations, letters of recommendation, connections, and mentors as important. Research was next most frequently mentioned. The most common advice from matched applicants was to strategically apply to away rotations they would potentially attend or where is a good fit based on their application and apply broadly to residency programs. For virtual interviews, matched applicants most frequently noted good lighting as important.

**Conclusion:** Objective factors like number of publications or presentations, board scores, and clinical grades play a significant role in applicant success. Subjective factors include strategy in applying to away rotations, letters of recommendation, mentorship, connections, and research. Important tips include applying to a broad range of residency programs and having good lighting in interviews.

## **Utilization of a Smartphone Surgical Drain Monitoring Application for Improved Output Recording**

Abstract Presenter: Myles Lavalley

Abstract Co-Author(s): Theresa Webster MD, Paige Warner, Grant Feuer, Sarah Diaddigo, Hannah Scales, Michael Amrami, Mary Elizabeth Katinas, Haddy Alas, Thomas Imahiyero MD

**Background:** Prior literature has demonstrated that 8% of unplanned 30-day reoperations following posterior spinal surgery are attributed to fluid collections such as hematoma and seroma.(1) Given this high rate of reoperation it is common for surgeons to place drains to decrease the likelihood of associated complications.(2) However, prolonged indwelling time carries a unique infection risk that must be balanced.(3) While the time of drain removal is surgeon dependent, all rely upon accurate documentation of drain outputs, which is commonly performed using paper recording sheets.(4) This form of recording may have inherent limitations related to ease of use, legibility, and availability at postoperative follow-up.(5) Given these barriers, this study sought to determine whether recording drain output via a cellphone application would lead to improved adherence to drain output monitoring as well as earlier removal of drains.

**Methods:** All pediatric patients who underwent plastic surgery closure by the senior author after posterior spinal surgery from April 2023 to February 2024 were randomized to record their drain output via the traditional paper sheet or a specialized smartphone application. The parents of these patients were instructed to record the output daily from the day of discharge until drain removal. Patient demographics were retrospectively reviewed and outcomes of interest included whether the record was brought to the first postoperative visit, and whether drain outputs were recorded daily. Outcomes of interest with regard to drain output included the number days indwelling and number of days the drain output was less than 30 ml. Additionally, a 1-question Likert survey (0-10) assessing satisfaction with the designated recording method was sent to parents following drain removal. All statistical tests were conducted using John Macintosh Project (JMP) software version 17 with significance defined as  $p < 0.05$ .

**Results:** Following exclusion of patients who had their drains removed prior to discharge from the hospital, 64 pediatric patients were prospectively enrolled. At the initial postoperative visit it was determined that 7% of patients in the smartphone application group and 14% of patients in the paper method group did not record their drain output ( $p = 0.30$ ). There was no significant statistical difference between groups with regard to the number of patients who had output logged for all post-discharge days ( $p = 0.21$ ). The survey did demonstrate greater satisfaction in patients who used the smartphone application for ease of recording output ( $p < 0.01$ ). Regarding drain removal timing, there were no statistically significant differences in total drain indwelling time or when available, days with output less than 30 ml between the app and paper groups.

**Conclusion:** The utilization of smartphone applications for recording drain outputs may provide improved clinical information to guide surgeon decision making by offering greater patient convenience. However, our findings of similar drain removal timing



suggest further developments are needed for a clinically meaningful impact. Future applications should consider medical record integration that would allow providers to track output records in real time and thereby allow for more timely drain removal while balancing prevention of potential fluid collections and their associated complications.

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## Characterizing User Responses to Tanning Bed Content on TikTok

Abstract Presenter: Gabrielle Brite

Abstract Co-Author(s): Tara Huston MD, Hannah Agoglia, Diane Chernoff

**Purpose:** Social media platforms, such as TikTok, have great potential to influence a user's attitudes towards certain behaviors. The purpose of this study is to analyze TikTok users' reactions to content featuring tanning bed use. Videos that either promote or discourage the use of tanning beds were analyzed to see if users have an overall positive or negative response. Further, this study explores what specific content of these videos tends to garner a positive or negative reaction by commenters, such as photos of skin cancer lesions or glamorizing tan skin.

**Methods:** The hashtags #tanningbed and #sunbed were searched on TikTok. The top

first 100 videos for each of these hashtags were analyzed. Data for each video was collected, including engagement data (likes, comments, shares) and the content of the video (promoting tanning, against tanning, humor, fear, tanning beds, exposed skin). The first 500 comments per video were extracted to R using the TKCommentExport extension. A VADER sentiment analysis was performed on the comments, categorizing the overall user response to each video as positive, negative, or neutral. After eliminating stop words, the top 10 words among all comments posted on all videos were collected. Videos were analyzed to assess video characteristics, sentiments, and interactions (comments, views, likes and shares) to compare VADER scores and interactions in each category.

**Results:** Videos that showed active cancer lesions or a story about surviving skin cancer had greater numbers of likes and comments ( $p < 0.05$ ). Videos that instilled fear and humor both had higher viewer interaction than those that did not (both  $p < 0.05$ ). Videos where creators were against tanning had a higher number of comments, views, likes and shares as compared to creators disclosing positive opinions on tanning (all  $p < 0.05$  respectively). Whether the video was promoting or discouraging tanning bed use was not significantly associated with a positive or negative reaction in the comments by TikTok users (all  $p > 0.05$ ), however the most-viewed and most-liked videos were associated with negative comments ( $p = 0.001$ ,  $p = 0.02$ , respectively).

**Conclusion:** This information provides a better understanding of viewer interactions with tanning bed content on TikTok. The data can be applied to develop influential social media campaigns and public health initiatives better tailored to educate users on the risks of tanning beds use. The methods of this study can be expanded to analyze the efficacy and impact of other public health campaigns via TikTok. Also, as new machine learning technology develops, future studies can use natural language processing beyond sentiment analysis to characterize the reaction of social media users to social media content.

## **A Wearable Wireless Device Monitors Sacral Pressure During Operative Cases**

Abstract Presenter: Nicholas Fadell

Abstract Co-Author(s): Seonggwang Yoo, William Moritz MD, Joseph Ribaud, Ida Fox MD, John Rogers, Amanda Westman PhD

**PURPOSE:** Pressure ulcers are a frequent complication of surgeries and hospitalizations, becoming exceedingly costly and debilitating for both patients and

hospitals. Previous research has shown that the prevention of these ulcers is a much more effective solution than care after ulcer development. Current options available for ulcer prevention include many adjuvant pressure-offloading devices such as beds and mattress pads, but these expensive tools can be incredibly cost ineffective for prophylaxis: research has shown current risk stratification methods fail to detect 60% of patients who go on to develop an ulcer. A lower-cost option is the manual repositioning of patients at set time intervals but to do so efficiently would require a more accurate tool to objectively assess risk in each patient. The purpose of this study was to establish feasibility of the Mercury Patch: a cost-effective, wearable, wireless device for monitoring sacral pressure in a clinical setting.

**METHODS:** Patients scheduled to undergo surgery for at least 4 hours were approached for informed consent. The Mercury Patch is placed on top of an Allevyn foam dressing and held in place using Tegaderm. In the operating room, the Mercury Patch and dressing was applied to the sacral skin when patients were transferred to the operating table. An accelerometer was then placed on the side of the operating table in line with the sacrum to record changes in bed position. An iPhone was used to wirelessly record pressure and temperature data from the Mercury Patch as well as positional data from the accelerometer during the case. Patients' lower backs were photographed to document skin integrity prior to device placement, at the conclusion of the operative case when the device was removed, and at the participants' first postoperative clinic visit. The pressure and positional data during each case was subsequently plotted and analyzed.

**RESULTS:** The Mercury Patch was successfully utilized in 11 patients' surgeries, recording sacral pressure throughout the full duration of each case without disrupting the flow of clinical care. The average pressure across all sensors was 16.7 mm Hg for deep inferior epigastric perforator flap cases, 28.1 mm Hg for breast reductions, and 36.9 mm Hg for mastectomies. None of the 11 patients developed a sacral wound or pressure injury. The patch was also able to successfully record the minimization of pressure changes during microsurgery.

**CONCLUSIONS:** This study demonstrated the feasibility of the Mercury Patch for real-time monitoring of sacral interface pressure in a clinical setting. The device itself did not result in pressure injury. Further studies are needed in higher-risk patients in order to determine pressure values and durations that are concerning for pressure injury formation.

## **An Analysis of Emotional Intelligence, Stress, Anxiety, and Depression Between Resident Physicians of Multiple Specialties**

Abstract Presenter: Mason Horne

Abstract Co-Author(s): Dzifa Kpodzo MD, Benjamin Schalet MD, MS, Stephanie Bray MD, MS

**Background:** Becoming a physician can be a challenging and stress evoking journey and completing residency may be the most difficult portion. Emotional exhaustion is a well-documented challenge for residents. Compared to the public they frequently report higher levels of stress, anxiety, and depression. Poor resident well-being has also been linked with worse patient outcomes. For these reasons resident mental health is a vital concern. Emotional intelligence (EI) is a rapidly growing topic in the medical community because of the correlation with improved mental health. There are a limited number of studies assessing EI levels between residency specialties. Therefore, the aim of this study was to determine differences in EI between residency specialties and determine the correlation with stress, anxiety, and depression. A secondary aim of this study was to determine significant associations between resident demographic factors and EI, stress, anxiety, and depression.

**Methods:** A prospective survey study was performed. All residents from a single tertiary academic medical center were invited to participate in the study. In total the survey was 60 questions and consisted of resident demographic information, the Schutte self-report emotional intelligence test, the perceived stress scale, and the patient health questionnaire 4 (which screens for anxiety and depression). Resident work hours and time dedicated to work-related tasks at home were also included. Parametric comparison tests were used to assess differences in EI, stress, and anxiety/depression scores. Linear regression analysis was used to determine associations between demographic and work hour variables.

**Results:** There were 146 completed surveys with a response rate of 34%. Residents from 19 specialties responded with 35% being from a surgical specialty. The mean SSEIT score for the resident cohort was  $118.6 \pm 10.8$ . Overall, no between group differences were found, however when specialties were separated into upper, middle, and lower terciles a significant difference was found (123.8 vs 119.1 vs 115.0,  $P < .001$ ). No significant difference in EI was noted between surgical and non-surgical specialties, however surgical specialties reported higher perceived stress (22.7 vs 21.4,  $P = .006$ ). Residents further along in training were associated with higher EI scores ( $P = .024$ ). On linear regression analysis, EI was negatively correlated with anxiety/depression ( $r = -.32$ ,  $P < .001$ ), and weakly correlated with perceived stress ( $r = .17$ ,  $P = .042$ ). Higher resident working hours were associated with higher anxiety/depression scores ( $P < .001$ ).

**Conclusion:** At a single tertiary academic medical center, residency specialty was

found to be a significant factor in EI, stress, and anxiety/depression scores. Emotional intelligence was found to be protective against anxiety/depression. Residency specialties with lower levels EI should participate in EI training to decrease the risk of poor mental health and well-being. Higher reported residency work hours were a significant contributor to anxiety/depression, emphasizing the importance for programs to monitor and manage these hours to mitigate the associated risks that arise from these mental health issues.

## **Assessing the Value of Research in Plastic Surgery Residency Applications**

Abstract Presenter: Sai Pinni

Abstract Co-Author(s): David Chi MD PhD, Gary Skolnick MBA, Joani Christensen MD, Kelly Currie MD, Alison Snyder-Warwick MD, Justin Sacks MD, MBA

**Purpose:** Plastic and reconstructive surgery is one of the most competitive residency programs. According to the 2022 National Resident Matching Program (NRMP) data, applicants who matched into plastic surgery residency had the highest average total number (28.4) of research abstracts, presentations, and publications across all specialties. With other aspects of the application process (i.e., Step 1, preclinical grades, clinical grades) becoming pass/fail, higher expectations for research productivity when reviewing residency applications are a potential outcome. Thus, this study sought to characterize the value of research and different types of research publications in plastic surgery residency applications.

**Methods:** A Qualtrics survey was distributed to the American Council of Academic Plastic Surgeons (ACAPS) email listserv in September and November of 2023. Questions asked about study type, number of publications, authorship level, research presentations, research years, and factors contributing to publication value. Factors included research topic, study type, significance of results, publication journal, senior author(s), authorship level, and collaboration/multidisciplinary. The respective values of four components of residency applications (clinical/academic, letters of recommendation, research, and background) were also compared.

**Results:** Complete responses totaled 75. 52% of respondents were associated with top 40 NIH-funded medical schools, and 61% did clinical research. Chairs/chiefs comprised 19%, program directors/assistant program directors 32%, and residents 21%. For residency application scoring, on average, research received 17% weight, letters of recommendation 34%, clinical/academic 28%, and background 22%. Beyond a median of 10 (IQR: 5-15) total publications, or 5 (IQR: 3-9) first-author publications, respondents

reported that additional publications would add minimal value to a residency application. 48% of respondents selected the applicant's authorship level as the most important consideration in determining publication value. For ranking of first-author publications, highest or high value ratings were assigned 92% for prospective cohort studies, 77% for basic science/translational studies, 67% for systematic reviews/meta-analyses, 60% for retrospective chart reviews, 49% for surveys, 20% for case reports, and 5% for non-peer reviewed papers. Assigned values to second-author and middle-author publications were 71% (IQR: 60-80) and 51% (IQR: 40-69) the value of a first-author publication, respectively. However, first-author podiums and posters were worth 75% (IQR: 61-90) and 55% (IQR: 40-70), respectively. A submitted but not yet accepted first-author publication was considered to have half the value of a first author published paper. Compared to first-author publications in a plastic surgery journal, first-author publications in other surgical specialty and medical journals with the same impact factor were considered to have similar value: 100% (IQR: 86-100) and 95% (81-100), respectively. When asked about two applicants (one who had taken a research year and one who had not) with 8 similar publications, 58% of respondents said they would view the applicant who had not taken a research year more favorably. 31% said they would view both applicants similarly.

**Conclusions:** Our findings suggest that research may be worth almost one fifth of plastic surgery residency applications. The value of an applicant's research publications varies with study type and applicant authorship level. This data may facilitate residency application review and guide medical student research endeavors.

### **Topical Tacrolimus Application Frequency Does Not Affect Flap Necrosis Outcomes in an Ischemic Rodent Model**

Abstract Presenter: Matthew Liao

Abstract Co-Author(s): Isaiah Rhodes, Chase Alston, Ashley Zhang, Sophia Arbuiso, Samuel Medina, Seth Aschen MD, Albert Truong MD, Marcos Lu Wang MD, David Otterburn MD

**Purpose:** One common complication following mastectomy is skin necrosis (1). At our institution, we have begun administering topical tacrolimus to patients at high risk for the development of this complication. Clinically, topical tacrolimus is typically applied twice daily (BID) (2). The purpose of this study was to investigate the effect of different topical ointment dose regimens on the rate of skin flap necrosis in our rodent model.

**Methods:** Thirty-nine Sprague-Dawley rats were randomized to receive a 0.2g application of topical tacrolimus once daily (QD), BID, or once daily with a second application of 0.2g of topical nitroglycerin. Following one week of pre-treatment, a cranially based dorsal skin flap measuring 3×10cm was raised and reinset. Treatment continued for 7 days post-operatively, followed by sacrifice. Surface area of healthy, reversibly ischemic and full thickness necrotic skin was measured using Fiji software and tissue samples were analyzed by a trained pathologist under blinded conditions.

**Results:** The average necrotic area of the QD, BID and combined topical tacrolimus and topical nitroglycerin cohorts was 22.1%, 21.9% and 19.7%, respectively. Rates of healthy, ischemic and necrotic tissue were not statistically significant between any group (all p-values >0.05). Samples were indistinguishable on histologic analysis.

**Conclusions:** Our study on an ischemic rodent model identified QD dosing to be equivalent to more frequent ointment applications. Given the advent of topical tacrolimus use in mastectomy patients to reduce flap necrosis, and that simpler treatment regimens portend to greater patient compliance and decreased healthcare costs, our findings warrant further investigation.

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#### **Resident Perceptions on the Impact of Clinical Fellows on Integrated Plastic Surgery Residency Training**

Abstract Presenter: Tara Chadab MD

Abstract Co-Author(s): Sarah Diaddigo, Alexander Murphy MD, Sabrina Shih MD, Christine Rohde MD, MPH, Paul Asadourian MD

**Purpose:** Plastic surgery fellowship training programs are typically conducted at medical centers with existing integrated plastic surgery residency programs (1).

Establishing a fellowship can introduce resident concerns about their training in respect to caseload, educational opportunities, and preparation for future surgical skill. Although several studies in other surgical subspecialties have shown that the caseload of residents does not decrease with the presence of fellows, the authors of one such study hypothesized that residents may be less likely to be the "first assist" in their cases due to the accepted hierarchy of fellows and residents (2-4). This may cause residents to feel that fellows are encroaching on their educational opportunities. In this study, we surveyed integrated plastic surgery residents to better understand how a fellow's presence impacts the work-related dynamics of plastic surgery trainee education and may be different from a resident's perspective of their impact.

**Methods:** Following approval and sponsorship from the American Council of Academic Plastic Surgeons, a 32-question survey was sent to coordinators at all integrated plastic surgery programs in the United States for resident completion. Questions were presented in a Likert scale format, with responses varying from very negative (1) to very positive (5). Survey responses from residents with (RWF) and without fellows (RWO) were compared using the Student's T-test.

**Results:** There were 83 respondents representing all PGY levels, with 60.2% working alongside fellows in their programs. RWF were significantly more inclined towards pursuing a subspecialty fellowship (76.0% vs. 45.4%,  $p=0.0046$ ). More than half of RWF somewhat or strongly agreed that training with fellows increased their interest in those subspecialties (51.1%). However, RWF were more likely to view fellows as negatively impacting their opportunities to practice in those subspecialties after residency (26.67% versus 5.26%,  $p=0.002$ ).

Among RWF, 88% spend over 25% of their time in the operating room (OR) with fellows. Regarding case selection, 42.3% felt that fellows usually have first pick over residents. No significant differences were found between the RWF and RWO cohorts in opinions on fellows' impact on desired case volume ( $p=0.777$ ), case complexity ( $p=0.338$ ), or autonomy in the OR ( $p=0.757$ ). Among RWF, 61.70% indicated that fellows have a somewhat or very positive effect on the learning environment in the OR.

Responses differed significantly ( $p=0.025$ ) on whether fellows make inpatient volume more manageable, with 60.87% of RWF somewhat or strongly disagreeing, compared to 36.85% of RWO.

When comparing responses by PGY level, only opinions regarding whether fellows make inpatient volume more manageable differed significantly, with residents at higher PGY levels being less likely to agree.



**Conclusion:** This study reveals nuanced perceptions among integrated plastic surgery residents regarding the impact of fellows on their training. The findings may offer program directors insights into the resident perspective when considering establishing a fellowship program. This information is also beneficial for prospective residency applicants, informing their expectations of the training environment they may enter.

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## Nurture vs Nature? PRS Residency Programs Influence Career Specialization

Abstract Presenter: Gina Eggert

Abstract Co-Author(s): Mitchell Hanson, Bhagvat Maheta, Chandler Hinson, Kometh (Tony) Thawanyarat MD, Clifford Sheckter MD, Paige Fox MD, PhD, Rahim Nazerali MD

**Purpose:** Plastic surgeons may have entered residency intending to attain additional fellowship training in a specific subspecialty– nature, or their choice for future subspecialty may have been impacted by their experiences at their residency program– nurture. This study explores the relationship between the specialization of faculty members within an integrated plastic surgery residency program and its graduates' future career paths.

**Methods:** A retrospective study identified the number of graduates from integrated plastic and reconstructive surgery residency programs in the United States (2015-2022) with regard to their first job or fellowship type. Data concerning graduates pursuing fellowship were then stratified based on the subspecialty and the presence or lack thereof of faculty members of that same subspecialty type from their residency program.

Data was collected from residency programs' websites, and residency coordinators were contacted via email as needed. Data were categorized based on unique surgical specialties into: Aesthetic, Burn, Craniofacial, Gender Affirmation, Hand, and Microsurgery. For analysis, data were grouped into one of four categories: programs with faculty members of the specific subspecialty and graduates who pursued the same fellowship, programs with faculty members of the specific subspecialty and graduates who did not pursue the same fellowship, programs without faculty members of a specific subspecialty with graduates who pursued the fellowship, and programs without faculty members of the specific subspecialty and no graduates who pursued that fellowship.

**Results:** In total, 865 residents from 56 institutions were included in our study. There were 423 residents who completed an aesthetic fellowship, 175 for microsurgery fellowship, 86 for craniofacial fellowship, nine residents for burn fellowship, 166 for hand fellowship, and six residents completed a gender affirmation fellowship. The odds ratios were calculated to determine if the exposure to a subspecialty faculty member increased the odds of residents pursuing fellowship training in the same specialty. The results demonstrated the following odds: Aesthetic (OR 2.1, 95% CI: 0.08-51.1), Burn (OR 2.1, 95% CI: 0.37-11.5), Craniofacial (OR 0.8, 95% CI: 0.14-4.62), Gender Affirmation (OR 5.6, 95% CI: 0.58-53.9), Hand (OR 1.7, 95% CI: 0.06-45.5), Microsurgery (OR 0.52, 95% CI: 0.03-10.5). For all subspecialties combined (OR 4.34, 95% CI: 2.59-7.41,  $p < 0.0001$ ).

**Conclusion:** Individual subspecialties had varying results on faculty influence, but when considering all subspecialties combined, the exposure of residents to subspecialized faculty members was associated with an increased odds that their career choice was in the faculty's same field. This supports the idea that mentorship by faculty and residency programs plays a nurturing role in residents' career determination.

## **Understanding Frustrations with Post-Operative Drain Care and Identifying a Path for Improvement: A Mixed-Methods Study**

Abstract Presenter: Maheen Akhter MD

Abstract Co-Author(s): Kelsey Lipman MD, Daniel Najafali, Priscila Cevallos MD, Halley Darrach MD, Allison Hu MD, Rahim Nazerali MD

**Introduction:** Postoperative drains are used widely in plastic surgery (PS) and can help prevent several postoperative complications, such as infection and hematoma. Patients tasked with manual record-keeping of drain output and drain care at home tend to

experience increased anxiety. Providers also encounter frequent drain-related outpatient communication, as well as inaccurate output measurements, due to the lack of an easy-to-use drain management system.

**Methods:** Single-institution data from the PS Clinical Advice Services (CAS) help line was queried over a six-month period. Providers were surveyed on the frequency and nature of drain-related outpatient communication, as well as their experiences related to drain care management in the acute care setting. Survey data was analyzed and was then used to design a mobile application for electronic drain monitoring that facilitates drain care for patients, as well as remotely for providers.

**Results:** Over six months, 163 patients contacted CAS 223 times. 15% of calls were drain-related. 74% were escalated to the on-call resident, compared to 10% for drain-unrelated calls. Providers perceived that 58% of calls were potentially preventable. Providers estimated that 25% of patients forget to bring manual drain logs to clinic and, 21% of the time, providers are concerned about inaccurate record-keeping. 90% of providers agree that an electronic system would resolve such issues. A mobile application was then created, featuring a patient-friendly interface for record-keeping and easy-to-interpret 24-hour measurements for providers planning drain removal. Push notifications remind patients to empty their drains and a "frequently asked questions" section allows patients to triage drain-related issues at home.

**Conclusions:** Post-operative drain care is challenging for both patients and providers, leading to excessive outpatient communication that is potentially preventable. The advent of a drain management mobile application is intended to reduce providers' burdens related to drain management, as well as to reduce patient anxiety related to drain care at home. Further data will determine if electronic drain monitoring improves provider and patient satisfaction.

## **The Role of Antimicrobial Suture in the Incidence of Post-Operative Infection and Wound Healing Complications in Plastic Surgery**

Abstract Presenter: Omar Jean-Baptiste

Abstract Co-Author(s): Heather Faulkner MD, MPH, Makenna Ash, Michael Marchese MD

**Background:** Millions of patients worldwide are affected annually by surgical site infections (SSIs). Factors contributing to SSIs can be categorized into patient-related and intervention-related (surgical) aspects. One method of reducing SSI risk involves employing antibacterial substances on medical equipment, such as surgical sutures impregnated with triclosan. Triclosan is an antimicrobial agent added to products such as soap and toothpaste to reduce bacterial contamination. [1,2] While there are studies in the general surgery literature on these sutures showing SSI reduction, a limited number of studies exist on the use of antimicrobial sutures (AMS) in plastic surgery operations. [3-5] This study aims to determine whether AMS in plastic surgery operations affects the incidence of SSIs and wound healing complications.

**Methods:** A cohort of patients who underwent breast reduction, mastopexy, panniculectomy, or abdominoplasty by plastic surgeons at an academic institution and received incision closure with AMS from July 2017 to 2021 were compared with an equal number of patients from this period who underwent these same operations and received incision closure with standard sutures (SS). Patients under age 18 or who had no follow-up data available were excluded. Demographics, comorbidities, and the postoperative course were reviewed. The primary outcome variables were wound issue (e.g., dehiscence/healing issue/wound), suture abscess, spitting suture, hyperpigmentation, hypopigmentation, skin necrosis, seroma, keloid scar, post-operative wound infection requiring antibiotics, hematoma. For univariate comparison, a 2-sample test of proportions was used.

**Results:** No infections requiring hospital admission or reoperation were observed. When comparing all patient complications using AMS or SS for all procedures, a higher proportion of patients were prescribed oral antibiotics post-operatively for infection in the AMS cohort ( $p=0.030$ ). When stratifying patients by surgical site and comparing the suture cohorts, a higher proportion of breast cases in the AMS cohort had wound issues ( $p=0.014$ ), and a higher proportion of abdominal cases in the AMS cohort were prescribed post-operative oral antibiotics for infection ( $p=0.009$ ).

A single surgeon analysis was performed for the surgeon who used AMS in the largest number of cases. There were no significant differences between suture cohorts in the sub-group analysis. Stratifying patients by surgical site and comparing suture cohorts revealed abdominal cases in the AMS cohort had a higher proportion of post-operative antibiotic prescriptions for infection ( $p=0.0217$ ).

Co-morbidities and patient habits were explored to identify risk factors for infectious complications. A higher proportion of marijuana users received post-operative antibiotic prescriptions for infection compared to non-marijuana users ( $p=0.036$ ).

**Conclusions:** The use of AMS in plastic surgery operations of the breast or abdomen did not make a significant difference in rates of wound healing problems or infections, except for an increased incidence of breast healing issues in the AMS cohort (seen only in the all-surgeon group but then attenuated in the sub-group analysis). Limitations include a small sample size and documentation differences between surgeons, potentially affecting the ability to determine the true rate of complications. Additionally, marijuana may possess a mechanism for the development of post-operative wound infection. Future research is needed to determine if there is a difference in edible versus inhaled marijuana use.

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## **Three-Dimensional Surgical Planning In Microsurgery**

Abstract Presenter: Makenna Ash

Abstract Co-Author(s): Orr Shaul MD, Abdl-Rawf Al-Nowaylati MD

Three-dimensional printing (3DP) has been used in many surgical specialties for virtual surgical planning. A medical image is fed into modeling software, converted to a print file, and then printed from a variety of materials, usually soft or hard plastic. The result is a three-dimensional model of the original image that can be used to guide preoperative and intraoperative decision making. This technology is not currently used commonly for virtual surgical planning in microsurgery.

Virtual and 3D surgical planning strategies in head and neck reconstructive surgery have been shown to result in overall decreased intraoperative decision making, decreased procedure times, and improved microvascular ischemic time in free flaps. In microsurgery, CT-angiography is often used as a proxy to virtual surgical planning to identify major vessels capable of supporting axial flaps. Actual anatomy may differ from the CT-generated images, due to patient volume characteristic, timing of contrast, and operator ability, necessitating a change in intraoperative decision making. 3DP provides a unique opportunity to create accurate 3D replicas of abdominal vasculature for use in surgical planning. These replicas allow for the surgeons to analyze spatial relationships between various anatomical landmarks in ways that purely CTA surgical planning does not. In 2022 Ogunleye et. al demonstrated that 58 breast free flaps performed using 3D printed models as guidelines had no changes in intraoperative decision making, compared to a 24.1% change in operations using standard CTA for surgical planning (1). In addition, 3DP could play a role in mapping nerves in three-dimensional space allowing the surgeon to identify intraoperative landmarks for nerve preservation. 3DP and other methods of virtual surgical planning have already been used in skull base surgery and oral maxillofacial surgery to identify intraoperative landmarks for the purpose of nerve preservation with good success (2-4).

3DP has significant future applications in microsurgery. Implementation of 3DP could reduce intraoperative changes to preoperative plan, decrease overall procedure time, and assist in preserving sensation for patients.

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## **There's No Place Like Home: A Six-Year Analysis Discerning the Impact of the COVID-19 Pandemic and Virtual Interviews on the Integrated Plastic Surgery Match "Home Effect"**

Abstract Presenter: Hamid Alahmari

Abstract Co-Author(s): Alexander Comerci, Joseph Mocharnuk, Anne Glenney MD, Nicolas Kass, Angel Dixon, Jesse Goldstein MD

**Background:** Integrated plastic surgery (IPS) is one of the most competitive residency programs in the U.S. In the 2020 cycle, there were only 82 IPS programs that offered 180 training positions, while similarly competitive specialties such as neurological surgery had 118 programs with 232 positions available. [1]. Historically, matched applicants in IPS have reported one of the highest means of publications, research experiences, and USMLE Step 2 scores compared to their colleagues applying to other competitive specialties [2-3]. The COVID-19 pandemic had a significant impact on the IPS residency match, causing rotations to be suspended, and necessitating a shift from in-person to virtual interviews. This study seeks to evaluate whether the "home effect" persisted in the most recent match cycles and whether medical school ranking and geographical distribution have any bearing on match patterns to integrated plastic surgery in the three-year pre- and post-COVID periods.

**Methods:** Data were collected from a total of 86 IPS residency programs, excluding those offering solely the independent pathway, lacking sufficient information on residents' PGY, or featuring less than a 6-year dataset. Data encompassed the following variables: name, medical school, year of residency training, entry year to the residency program, plastic surgery pathway, medical school research ranking, matriculation year to medical school, medical school regional and state locations. Collection methods included residency program websites, supplemented by information from programs' Instagram pages and residents' LinkedIn profiles where program websites lacked data. Matriculation year to medical school determined the medical school research ranking of each resident, utilizing U.S. News & World Report's Rankings spanning 2013-2019. Historical data inaccessible via U.S. News & World Report were retrieved from the Internet Archive's Wayback Machine.

**Results:** In our analysis of 1,180 integrated plastic surgery resident profiles from 2018 to 2023, we found that the percentage of successful applicants from affiliated home medical schools increased from 16.9% to 19% in the pre- and post-pandemic eras, but this difference was statistically insignificant ( $p > 0.05$ ). Resident percentages from affiliated medical schools increased from 15% in 2020 to 23% in 2021, with marginal insignificance ( $p = 0.052$ ). However, in 2022, there was a significant 9% decrease

compared to 2021 ( $p = 0.041$ ). In the pre-COVID era, 13.47% of applicants were from Top-10 research-ranked medical schools, compared to 13.96% post-COVID. Applicants from medical schools ranked between 11-20 slightly decreased by 1.98% post-COVID. Medical schools ranked above 20 were represented by the majority of applicants in both pre- and post-COVID cycles, with 48.57% and 50.31%, respectively. The percentage of applicants from unranked medical schools was consistent in the two groups at around 25%. Our analysis did not reveal a significant association between an applicant's medical school USNWR research ranking and their likelihood of matching at an integrated plastic surgery residency program ( $p > 0.05$ ). Regarding regional trends, the percentage of applicants attending medical schools in the Northeast who matched with their home integrated plastic surgery program increased from 29.4% to 35% post-pandemic. In contrast, there was a 7% decrease for applicants from the South matching with their home program in the post-pandemic era. Importantly, no significant association was observed between the geographic region of medical schools and the integrated plastic surgery programs to which applicants matched ( $p > 0.05$ ).

**Conclusions:** Our analysis suggests that the rise in medical students matching into their home integrated plastic surgery programs from pre- to post-COVID was statistically insignificant. Furthermore, our research indicates that match rates in integrated plastic surgery residencies are not significantly influenced by applicants' medical school rankings or geographic regions. The smooth transition to virtual interviews, coupled with the adaptability demonstrated in the face of fluctuations, underscores the commitment of residency programs to providing all applicants with a fair chance of acceptance. The statistical insignificance in key metrics speaks to the successful navigation of challenges, ensuring the continued excellence and fairness of the integrated plastic surgery residency selection process.

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## **SHARE's (Surgeons in Humanitarian Alliance for Reconstruction, Research, and Education) Successful Development of a Research Curriculum for African Reconstructive Surgeons**

Abstract Presenter: Ashley Sun

Abstract Co-Author(s): Kathleen Johnson, Dominic Alessio, Thierry Cyuzuzo MD, Joyce McIntyre MD, Amanda Gosman MD, Andrea Pusic MD, MHS, FACS, FRCSC, Raj Vyas MD, Christine Rohde MD, MPH

**Background:** In recent years, there has been a marked increase in interest in global health, particularly in the realm of global surgery (1). Many studies are performed by physicians in high-income countries rather than those in low/middle income countries (LMICs) where many initiatives are actually implemented (2). This geographical imbalance highlights the pressing need for greater involvement of LMIC surgeons to lead locally based research efforts. For this to be realized, there must be a concerted effort to provide formal research training (3). Surgeons in Humanitarian Alliance for Research and Education (SHARE) is an innovative Plastic Surgery Foundation-based program that enhances collaboration between reconstructive surgeons in the US and Sub-Saharan Africa. This study describes the development and results of SHARE's pilot program on research development as an adjunct to the clinical curriculum.

**Methods:** The SHARE Research Club was designed to provide opportunities for LMIC Fellows to share research ideas, learn research methodology, and develop scientific writing skills. An initial needs assessment survey was distributed to assess need and desire for research training. Through the two-year fellowship program, bi-monthly virtual research sessions were held to provide Fellows with this training. Research micro-grants applications up to \$2000 were also available to Fellows. A Berlin test with 15 multiple choice questions was administered at the start and end of the program to assess understanding of research methods (4). Paired and unpaired t-tests were conducted to evaluate statistical significance ( $p\text{-value} < 0.05$ ) of the difference in pre- and post-test scores. Secondary outcomes included research productivity in terms of micro-grants awarded, publications, and abstract presentations.

**Results:** There was a total of 31 Fellows in the 2020-2022 cohort. Thirteen Fellows completed the initial survey, with 92.3% demonstrating interest in conducting research. Some of the most commonly sought skills were: choosing a research question (mean score 84.6%), designing a study (84.6%), data collection and analysis (92.3%). Nine Fellows completed the pre-test, 5 completed the post-test, with 4 of those completing both. The mean pre-test score was 5.7/15 and the mean post-test score was 8.0/15 with a mean improvement of 2.3 ( $p=0.095$ ). The mean difference for the 4 Fellows who

completed both tests was an improvement of 0.25 ( $p=0.89$ ). Five of 17 Fellows (29%) were awarded micro-grants from PSF, and fellows produced a total of 5 peer-reviewed publications.

**Conclusion:** This pilot program within SHARE demonstrates the initial efforts made to successfully integrate formal research training for surgeons in LMICs to bridge the research gap. The results of the program show an increase in research knowledge and productivity among the Fellows. While the Berlin test results were underpowered to detect significance, the overall progress indicates a positive trajectory in building research capacity in LMICs.

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## Reprocessing Capabilities of Newly Approved Devices for Use in Aesthetic and Reconstructive Plastic Surgery

Abstract Presenter: Kala Pham

Abstract Co-Author(s): Andrew Malek, Colby Hyland MD, Justin Broyles MD, Andrea Pusic MD, MHS, FACS, FRCSC

**Purpose:** Single-use medical devices commonly used in plastic surgery procedures can contribute to medical waste and increased costs. Reprocessing medical devices may reduce cost and environmental impact. However, the landscape of new devices approved for reprocessing in plastic surgery is less known. This study comprehensively

identifies the reprocessing capabilities of newly FDA-approved devices used in plastic surgery procedures.

**Methods:** Surgical medical devices and their design features were identified using the publicly available FDA Releasable 510(k) Database from January 2018 to April 2023 using the product codes laparoscopic instruments (GCJ), electrosurgical instruments (GEI), powered laser surgical instruments (GEX), and fat-reducing low-level laser (OLI). Only devices indicated as posing a high risk for infection in the FDA's Reprocessing Final Guidance Appendix E were required to include reprocessing validation information. Reprocessing capability was defined as inclusion of approved reprocessing procedures in device summaries. Single-use devices were those that included any single-use components and could not be reprocessed. Costs were obtained from medical device company websites. Common surgical tools were identified for the most common plastic and reconstructive surgery procedures.

**Results:** There were 638 510(k) premarket applications for surgical devices between 2018-2023, representing 3.8% (638/16723) of total applications. While laparoscopic techniques are uncommon in plastic surgery, 56% of laparoscopic devices and 38% of camera systems possessed reprocessing capabilities, representing the highest percentage of devices with reprocessing capabilities investigated. Among GEI devices, 7 (50%) laparoscopic devices and accessories and 5 (50%) cables/cord devices had reprocessing capabilities, making them the highest reprocessing categories. The most common reconstructive surgery is tumor removal and involves the use of such imaging modalities as well as specimen retrieval. Other commonly performed reconstructive procedures, including laceration repair and scar revision, involve the use of electrodes and tissue ablation which have the least reprocessing capabilities for GEI instruments, with 1 (9%) and 1 (5%) reprocessing devices, respectively.

For GEX and OLI devices, 1 (25%) UV-phototherapy device and 9 (16%) hair removal devices had reprocessing capabilities, making them the highest reprocessing categories. Despite laser resurfacing being the highest cosmetic procedure, laser filters and vein treatment had the least reprocessing capabilities, with 0 (0%) for both categories.

The average cost of GEI single-use devices (\$11314, \$8551) was slightly less than their reprocessed counterparts (\$16052, \$16134). The average cost of GEX and OLI single-use devices (\$35860) was greater than their reprocessed counterparts (\$26013). Reprocessing capabilities are lacking in medical devices used in the most commonly performed aesthetic and reconstructive surgery procedures.

**Conclusions:** The majority of reprocessing capabilities are focused on devices used outside of plastic surgery, including cameras and laparoscopes. Future efforts to build reprocessing capabilities in plastic surgery specific devices are therefore warranted. Surgical instruments have the least reprocessing potential, which is concerning given their use in common aesthetic and reconstructive surgeries. Plastic surgeons can consider vendors who incorporate reprocessing to reduce their utilization of single-use devices. Manufacturers should focus reprocessing and design efforts on device categories that currently lack reprocessing capabilities.

## **Empowering Plastic and Reconstructive Surgery Research with AI-Enabled Literature Analysis**

Abstract Presenter: Camryn Payne BA

Abstract Co-Author(s): Sara Kisiel, Mira Shoukry, Shelley Noland MD

**Purpose:** ChatGPT is an Artificial Intelligence (AI) tool that has potential utility in academic medicine, including assisting with research and literature review. However, concern has been raised regarding AI's ability to provide accurate literature review in academic medicine. This paper aims to assess the accuracy of plastic and reconstructive surgery (PRS) references provided by ChatGPT 3.5 and ChatGPT 4.0 to determine the viability of their use in academic medicine.

**Methods:** Twenty test queries in five different disciplines of PRS (Aesthetic, Breast reconstruction, Craniofacial, General Reconstruction, and Burn) were generated. Queries were submitted to both ChatGPT 3.5 and 4.0, and references were produced on these individual topics. The references produced by ChatGPT were then verified for authenticity utilizing the following: Pubmed, Google Scholar, Scopus, and Google. The articles were deemed true if the correct title, author, and Digital Object Identifier (DOI) were provided by ChatGPT, or false if the article was either not found, or if title, authors, or DOI were only partially matched to an existing article.

**Results:** The 20 queries yielded a total of 172 references from both ChatGPT 3.5 and 4.0. ChatGPT 3.5 delivered 146 references, with a median of 7 references per question. A median of 5 references per query were categorized as true and 2.5 were false. Of the 146 total references, 57 (39.0%) were classified as false. Subgroup analysis revealed no statistically significant difference among the different plastic surgery disciplines (Kruskal-Wallis' test,  $p = 0.124$ ). ChatGPT 4.0 generated 26 references, with a median of 1 reference per query. While about half of these references (11) were peer-reviewed

articles or book chapters, many were websites from medical centers or commercial medical groups. A Fisher's test revealed that ChatGPT 3.5 was significantly worse at providing accurate references than ChatGPT 4.0 ( $p = 0.0002$ ). ChatGPT 3.5 also generated significantly more references than ChatGPT 4.0 ( $p < 0.0001$ ).

**Conclusion:** ChatGPT 3.5 generates significantly more inaccurate references in response to clinical PRS queries than ChatGPT 4.0. This limitation is an important consideration for researchers attempting to employ AI in the literature review phases of their research. While ChatGPT 3.5 responded to test queries with a list of 6 to 8 references, ChatGPT 4.0 tended to provide more conversational, paragraph-style answers that encouraged readers to learn more utilizing the 1-3 references it provided. This tendency for ChatGPT 4.0 to provide more patient-centered responses with fewer references may reflect advancements in complexity and user-friendliness and indicates a need for further study into the optimal phrasing of questions to yield more valuable references for a literature review. This shift in response style from 3.5 to 4.0 also illuminates ways in which patients could use this technology to learn more about their clinical conditions. AI has the potential to play a helpful role in scientific writing, though future study is warranted to navigate its limitations.

## **Vanishing Visibility: Exploring the Impact of Shadow-Banning on the Social Media Presence of Plastic Surgeons**

Abstract Presenter: Benjamin Rahmani

Abstract Co-Author(s): Maria Escobar MD, Helen Xun MD, Iulianna Taritsa, Daniela Lee, Jerry Chidester MD, Steven Williams MD, Bernard Lee MD, MBA, MPH, Samuel Lin MD

**Background:** Plastic surgeons' presence on social media was as high as 61.9% in a recent ASPS survey, with Instagram being one of the primary tools used to reach a more expansive audience (1). Patients also routinely use these platforms to educate themselves, review before-and after-photographs, and discuss their experiences (2). Social media is utilized professionally as an emerging practice paradigm, but recent policy changes have negatively impacted surgeon users, resulting in "shadow-bans" or decreased visibility of surgeon accounts. This is the first known study to investigate awareness of plastic surgeons regarding Instagram's community guidelines and characterize the adverse effects of emerging policies on user experience and practice.

**Methods:** In February 2024, an IRB-approved survey was disseminated among plastic surgeons active on Instagram. The survey included questions about perceived shadow-banning, page utilization practices, observed decreases in account reach, and assessments of knowledge regarding permissible content. Univariate analysis incorporated t-tests and chi-squared tests, with comparisons based on board certification status and the presence of a secondary page to mitigate shadow-bans or page deletion. Statistical significance was established at  $p < 0.05$ .

**Results:** The survey consisted of 107 responses (88 board-certified plastic surgeons, 19 without board-certification); most respondents (72.90%) reported 1,001-50,000 followers. Respondents with a second Instagram page (30.80%) were statistically more likely to note decreased visibility over the last year (96.97% vs 79.73%,  $p=0.02$ ), more likely to make a broadcast channel (12.10% vs 0%,  $p=0.002$ ), and believe they have been shadow-banned (87.80% vs 59.50%,  $p=0.01$ ). Respondents demonstrated knowledge gaps in posting policies, such as being unaware that the current guidelines prohibit posting breasts, even with nipple covers. Most respondents (98.13%) reported that Meta's community posting content policies are not clear enough and board-certified plastic surgeons had significantly more knowledge on how to check if they were in violation of community guidelines (80.68% vs 57.89%,  $p=0.033$ ).

**Conclusions:** Plastic surgeons and Instagram have the potential for mutual beneficial relationships, yet recent content policies have limited the platform's effectiveness for practice. This study identified critical knowledge gaps in the community content posting policies, potentially contributing to increased rates of shadow-banning and subsequent frustrations with the platform. Board-certified plastic surgeons have greater understanding on how to determine their account status, and are potential resources as key opinion leaders, ambassadors, and educators for the emerging generation of users on the platform. Potential education points for a social media curriculum identified from this study includes posting policies, shadow-banned hashtags (many of which are related to the plastic surgery industry ie. #cancer, #thighs), and common misconceptions such as the benefits of a secondary Instagram page. Future directions include currently ongoing surveys to better inform inter-organizational discussions with Meta and social media platforms to facilitate positive and productive mutual outcomes.

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## **Ultrasound-Guided Maxillary Nerve Block Reduces Intraoperative Opioid Use and PACU Stay in Aesthetic and Functional Nasal Surgery**

Abstract Presenter: Sierra Willens

Abstract Co-Author(s): Cindy Vu, Leonardo Alaniz MD, Nikhil Shah MD, Raj Vyas MD, Miles Pfaff MD, MHS

**Introduction:** In response to the opioid crisis in the United States, there has been a growing interest in alternative pain management strategies. This retrospective study investigates the efficacy of suprazygomatic maxillary nerve blocks (SZM) in patients undergoing rhinoplasty or functional septorhinoplasty to find an optimal approach to postoperative pain management.

**Methods:** A multicenter retrospective analysis was conducted on patients who underwent functional nasal surgery and rhinoplasty at an adult and children's hospital between April 2021 and January 2024. The study evaluated the impact of SZM on intraoperative anesthetic and opioid use, postoperative pain as a proxy of PACU time to analgesia, and PACU length. All opioids were converted into morphine milligram equivalents (MME's). T-tests and Mann-Whitney U tests were conducted to assess the data.

**Results:** A total of 59 patients underwent rhinoplasty or septorhinoplasty. Twenty patients received a SZM before undergoing the procedure. The average age at the time of procedure was 28 (range 16-82). SZM significantly reduced the amount of intraoperative MME's used ( $p = 0.03$ ), including hydromorphone ( $p=0.02$ ). The use of SZM also significantly reduced post-anesthesia PACU stay ( $p = 0.003$ ).

**Conclusions:** Suprazygomatic maxillary nerve blocks provide a viable alternative to traditional opioid-based analgesia in nasal surgery. It is associated with decreased intraoperative opioid use and PACU stay. This study supports the shift towards optimizing pain management protocols in response to the opioid epidemic, prioritizing patient safety and recovery.

## **Evaluating the Efficacy of the Microsurgical Robot as a Teaching Tool: Perspectives from Faculty and Trainees**

Abstract Presenter: Maheen Akhter MD

Abstract Co-Author(s): Farrah Liu MD, Youssef Aref, Haripriya Ayyala MD, Michael Longaker MD, MBA, FACS, Rahim Nazerali MD, Gordon Lee MD

**Background:** Novel microsurgical techniques are redefining the field of reconstructive surgery, necessitating further incorporation of microsurgical training into the residency curriculum. Currently, the level of microsurgical exposure in plastic surgery residency is limited, especially in the operative setting. The steep learning curve for junior trainees is yet another barrier to developing proficient microsurgical skills. The advent of the microsurgical robot offers a promising solution, improving visualization, precision, and overall ease of operation for trainees in both practice and operative settings. We aim to understand the potential role of the microsurgery robot as an effective teaching tool for plastic surgery trainees.

**Methods:** Plastic surgery faculty and trainees at a single residency program participated in a two-day demonstration of the microsurgical robot, which entailed twenty-minute, hands-on practice sessions. Using the robot, participants were asked to create one anastomosis on a 2mm synthetic vessel, with the instructor coaching as needed. The instructor then graded participants on the quality of anastomosis using a modified MARS10 scale; suture and knot quality were assessed, but patency of anastomosis was not. Participants were then surveyed regarding their perceived skill level while using the robot, their opinions on routine use of the robot, and their perspectives on incorporating the robot into the training curriculum.

**Results:** There were 16 study participants, including eight trainees and eight faculty. Approximately 87.5% of faculty reported that using the robot was "very easy" or "somewhat easy," compared to 50% for trainees. None of the faculty or trainees believed the robot allowed them to create an anastomosis faster than when using the traditional microscope setup. Similarly, none of the faculty felt the robot allowed them to more effectively assist as a second surgeon, while 25% of trainees did believe so. When graded on the quality of anastomosis, faculty members scored  $89.1\% \pm 10.4\%$ , while trainees scored  $88.3\% \pm 9.7\%$ . With respect to including the robot in an educational setting, half of the faculty believed the robot could allow trainees to more effectively assist as a second surgeon in the operative setting. However, with regards to one-on-one teaching, only 25% of faculty preferred teaching trainees with the robot in a



practice setting, and only 12.5% preferred the robot to teach in an operative setting. Finally, 75% of faculty agreed that including the microsurgery robot would help trainees build skills more than the microscope, and 100% of trainees agreed with this statement.

**Conclusions:** Trainees were less confident in using the robot than faculty were, but trainees still performed nearly as well as experienced faculty when graded by the instructor. Faculty members did not believe that the robot would allow trainees to assist more effectively in the operating room and were overall reluctant about using the robot to teach trainees. In contrast, trainees were more enthusiastic about incorporating the microsurgical robot into their training curriculum than the faculty were. This was despite the fact that trainees believed the robot to be more difficult to use than the traditional microscope setup.

## **Protocol for the Mechanically Loaded, Human-like Hypertrophic Scarring Model in Mice**

Abstract Presenter: Jonathan Yasmeh

Abstract Co-Author(s): Hudson Kussie, Andrew Hostler, Maia Granoski, Katharina Fischer MD, Maria Gracia Mora Pinos, Geoffrey Gurtner MD, Kellen Chen PhD

**Purpose:** Hypertrophic scarring (HTS) is an abnormal process of wound healing that results in excessive scar tissue formation. Following cutaneous injury, healing tissue that is subject to tension is more prone to develop HTS. Chronic inflammation and dysregulated extracellular matrix formation have been proposed to mediate the process of HTS. In order to better understand HTS formation, our lab previously developed a murine model that mimics human-like HTS by applying mechanical strain across an incisional wound (Aarabi et al. 2007). Since the advent of the model, significant changes have been made to improve the HTS protocol to make it simple, standardizable, and replicable. Further, our previous understanding of HTS formation is limited to long term time points after the scar has already formed. Here, we present a detailed protocol and chronological progression of wounds for the human-like HTS in mice.

**Methods:** Approximately 2cm long full-thickness incisions were made on the dorsa of 12 15-week-old C57/BL6 mice and were closed using monofilament nylon 5-0 sutures. Mechanical loading devices were made from 13mm palatal expanders and molded using X7 NiTi Three Jaw Pliers. On post-incision day 4, sutures were removed, and mechanical loading devices were placed over the wounds secured using Vetbond and

Autoclip System surgical staples. Loading devices on 6 of the mice were expanded by 2mm every other day for 14 days total, thereby producing consistent tension across the wound (strain). The loading devices on 6 mice were not expanded and did not have tension across the wound (control). Scars were imaged at post-op day (POD) 4, 8, 14, and 18 to examine the progression of scar formation and analyzed using ImageJ.

**Results:** The control, non-strain group had average scar widths of 0.73mm, 0.63mm, 0.54mm, and 0.42mm at POD 4, 8, 14, and 18, respectively. At POD 4, prior to the initiation of mechanical strain, the strain group had similar average scar widths compared to controls (0.58mm,  $p=0.250$ ). However, after applying mechanical strain across the wound, scars were significantly thicker than controls and peaked in width at POD 8 with an average of 0.99mm ( $p=0.0450$ ). Scar widths remained significantly greater than controls at POD 14 (0.95mm,  $p=0.0429$ ) and POD 18 (0.78mm,  $p=0.0450$ ).

**Conclusion:** Since much remains unknown regarding the pathophysiology of HTS formation, it is imperative to create a reproducible murine model to investigate. Using our updated and refined human-like HTS murine model protocol, mechanical strain across a wound bed produced significantly larger scars at multiple time points. Scar formation seemed to plateau and then decrease over time but remained elevated compared to wounds with no strain across them. Understanding the progression of HTS formation can help direct both prevention and potential therapeutic interventions, especially in wound sites with high tension.

## **The Impact Level of Evidence has in Plastic Surgery**

Abstract Presenter: Jennifer Wang

Abstract Co-Author(s): Charles Schafer DO, Jeffrey Janis MD, Albert Losken MD

**Introduction:** The practice of evidence-based medicine in plastic surgery is essential to provide the optimal care to individual patients. Level of evidence (LOE) and number of citations are metrics used to gauge quality of research and impact within a field, respectively. The objective of this study was to determine an association between level of evidence and number of citations within recent articles published in Plastic and Reconstructive Surgery.

**Methods:** A review of original research articles published in Plastic and Reconstructive Surgery from January 2018 to June 2022 was performed to determine the relationship

of level of evidence to number of times an article was cited. Level of evidence was identified through the PRS website, and number of citations identified via PubMed. Articles were further divided into sections of their corresponding topic (breast, cosmetic, experimental, hand/peripheral nerve, pediatric/craniofacial, and reconstructive). Excluded from the study were animal studies, cadaver studies, basic science studies, review articles, instructional course lectures, CME articles, editorials, and correspondence articles.

**Results:** 965 articles were reviewed since January 2018, of which 21 (2.2%) were articles assigned level I evidence. There were 147 (15.2%) level II articles, 360 (37.3%) level III articles, 377 (39.1%) level IV articles, and 60 (6.2%) level V articles. Average number of citations per article was 2.72, and average level of evidence of all included articles was 3.31. Breast articles had the greatest average number of citations (3.81) while experimental articles had the greatest average level of evidence (4.18). Breast articles also had the greatest percentage of level I articles (38.1%) compared to other types of articles. Level I articles had an average of 4.95 citations, which is significantly more than the average number of citations for level II, III, IV, and V articles, individually. These findings conclude that level I articles are more likely to be cited compared to levels II-V articles.

**Conclusion:** Our data shows that articles assigned level I evidence in Plastic and Reconstructive Surgery yield a higher number of citations compared to articles assigned lower levels of evidence. Breast research is generally higher quality and has a greater impact in the field of plastic surgery compared to other types of PRS research. Since higher LOE correlates with a greater impact, these findings should encourage investigators to publish level I evidence research in order to have the greatest effect on the field.

## **Facial Aesthetics in Artificial Intelligence - comparing results in a generative AI study**

Abstract Presenter: Arsany Yassa

Abstract Co-Author(s): Arya Akhavan MD, Solina Ayad, Olivia Ayad, Kailash Kapadia MD, Anthony Colon MD, Ashley Ignatiuk MSc, MD, FRCSC

**Purpose:** Patients undergoing facial cosmetic surgery, such as rhinoplasty, genioplasty, otoplasty, and cervicoplasty, rely highly on surgeons' pre- and postoperative photos to

both gain an understanding of expected postoperative results, and to develop their perception of a physician's surgical skill. The development of readily accessible generative artificial intelligence models (AI) now allows patients to enter a free-text prompt and a preoperative image, and generate a potential postoperative outcome. However, AI training models vary widely and may not have appropriate surgical photography in the model training set. This may lead to inaccurate image generation, and to patients having unrealistic expectations of surgery. The authors therefore sought to evaluate the quality of these generated images.

**Methods:** Image Generation: The authors developed a series of initial prompts for the generation of pre- and postoperative images for rhinoplasty, genioplasty, otoplasty, and cervicoplasty. ChatGPT was then used to serially refine the prompts, emphasizing surgically relevant details while excluding information that would vary between patients. Final prompts for each procedure were kept consistent and fed into three unique combinations of generative adversarial networks (GANs) and other deep-learning frameworks, to produce 3 images per procedure.

#### Image Evaluation:

An 11-item assessment (scale 1-5) was generated using evaluation systems from other previously published relevant literature. Points of assessment included anatomical correctness, features of image realism, and relevance to the surgical procedure, among others. A panel of two fellowship-trained craniofacial surgeons, two board-certified general plastic surgeons, and two plastic surgery residents evaluated each image using the 11-item assessment, as well as via free text response. Results were characterized by ANOVA, Kruskal-Wallis H-test, and Mann-Whitney U-test when appropriate.

**Results:** Comparison of panelist responses showed no significant differences in scores on "Realism" metrics ( $F=2.85$ ,  $p=0.07$ ), indicating a consensus in anatomical accuracy, age simulation, color fidelity, and texture mapping. Significant variations, however, were found in the "Clinical Value" metrics of target feature recognition, postoperative result prediction, and surgical relevance ( $F=3.52$ ,  $p=0.04$ ). When comparing metrics, "Healing and Scarring Prediction" received significantly lower scores than "Size and Volume Accuracy" ( $p<0.001$ ), "Color Fidelity" ( $p<0.001$ ), and "Correct Simulation of Age" ( $p<0.001$ ) ( $H=53.00$ ,  $p<0.001$ ). When comparing the AI models, there was no significant differences in "Realism" ( $F\text{-value: } 1.444$ ,  $P\text{-value: } 0.269$ ) and "Clinical Value" ( $F\text{-value: } 2.661$ ,  $P\text{-value: } 0.114$ ). Panelists reported that several images demonstrated the "uncanny valley" effect.

**Conclusion:** When using AI to generate images for facial surgery, there was no best-

performing model. Evaluators agreed that the images did not score well on realism metrics but disagreed on whether or not the images were clinically valuable. Some images reasonably depicted the aesthetic deformity and a realistic expected postoperative result, while many images failed to appropriately predict a reasonable surgical result, had inappropriate skin color or texture, or were just unrealistic enough to trigger the uncanny valley effect. Further development is needed to produce AI models that will allow the generation of appropriate pre- and postoperative imagery; the authors plan additional study including use of 'live' preoperative imagery, as well as comparison of AI-generated vs true-to-life results.

## **A Meta-Analysis of Perfusion Parameters Affecting Success in Ex-Vivo Perfusion**

Abstract Presenter: Sean Frisbie

Abstract Co-Author(s): Fuad Abbas, Rommy Obeid, Adam Ghazoul, Ava Rezaee, Jack Sims, Antonio Rampazzo MD, Bahar Bassiri Gharb MD, PhD, Riley Marlar MD

**Purpose:** Vascularized composite allograft (VCA) transplantation represents a promising avenue in plastic surgery. Ex-vivo machine perfusion (EVMP) has emerged as a technique to extend the viability of donor organs, including VCA grafts. However, EVMP protocols vary widely, leading to inconsistent outcomes. Further refinement in these protocols is necessary, but research on this topic is limited. We hypothesize that specific parameters during EVMP significantly impact perfusion outcomes.

**Methods:** A meta-analysis of literature was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) Statement. The search encompassed articles published before July 25, 2023. PubMed, Embase, and CENTRAL were screened using search terms "ex-vivo", "ex-situ", "machine" and "perfusion". Weight gain was chosen as an outcome measure, as it is an indicator of organ viability, endothelial injury, interstitial swelling, and microthrombosis. Extracted variables included perfused organ, warm and cold ischemia time before perfusion, perfusion duration, perfusate flow, pressure, temperature, perfusate composition (presence of cellular or acellular oxygen carrier, colloids, other supplements) and percent weight change. In correlation analysis, Pearson's correlation coefficient was computed, and the results were reported as the beta coefficient ( $\beta$ ), correlation coefficient (R), and p-value (p). For continuous data, Student's t-tests or analysis of variance (ANOVA) with or without Welch modification, followed by Tukey post-hoc pairwise comparison, were performed as appropriate. Data analysis was conducted

using IBM SPSS Statistics version 26.0.0.0. P values <.05 were considered statistically significant.

**Results:** A total of 916 studies were retrieved. Forty-six papers were included. Red blood cell based perfusates resulted in significantly lower weight gain compared to acellular perfusates without oxygen carriers (11.3% vs. 27.0%,  $p<0.001$ ). Hemoglobin based oxygen carriers resulted in significantly lower weight gain compared to acellular perfusates (16.5% vs. 27%,  $p=0.006$ ). Normothermic perfusion led to the least weight gain (14.6%), significantly different from hypothermic (24.3%) and subnormothermic (25.0%) conditions ( $p<0.001$ ), with no significant difference between hypothermic and subnormothermic groups (24.3% vs. 25.0%,  $p=0.952$ ). Multivariable linear regression revealed negative correlation with hematocrit and weight gain (standardized beta coefficient=-0.642,  $p<0.05$ ).

**Conclusion:** This metanalysis shed light on several critical aspects influencing organ viability during ex-vivo perfusion. The ideal perfusate seems to consist of an oxygen carrier at normothermic temperatures. Perfusates can be supplemented with either hydroxyethyl starch, bovine serum albumin or human serum albumin without compromising outcomes. Warm ischemia time should be kept to a minimum, but cold ischemia time is permissible. Hematocrit within 12.5-32% can be successful. Flow rate should be kept between 0.075 and 0.25 mL/min/g per starting tissue weight. These findings offer opportunities for improving organ transplantation outcomes.

## **Cutting Remarks: A Cross-Sectional Overview of Harassment of Plastic Surgeons on Social Media**

Abstract Presenter: Kenneth Jordan

Abstract Co-Author(s): Ayesha Punjabi MD, Sarah Gubara, Alexander Chang, Daniel Najafali, Maria Gebreyesus, Sthefano Araya, Sameer Patel MD

**Introduction:** In the realm of contemporary medical practices, social media has emerged as an integral tool for plastic surgeons, serving as a strategic platform for professionals to cultivate their practice's brand identity, engage prospective patients, and contribute to public education within the field (1). As social media usage has surged, heightened ethical concerns have arisen regarding its impact and implications. However, data on its impact on their private life, safety, and business is limited. Thus, this study aimed to assess the prevalence and characterize the types of harassment

that plastic surgeons experience on social media.

**Methods:** This cross-sectional study involved a 30-question anonymous survey that was emailed to active members of the American Society of Plastic Surgeons (ASPS). The survey collected demographic data as well as social media usage, types of content, harassment experienced, and subsequent consequences. Analyses encompassed Chi-square test or Fisher's exact test for proportions with stratifications for gender, years in practice, race, length of time using accounts, followers, and type of content. Univariate analysis was performed to select variables included in the multivariate analysis for the outcome of any form of harassment.

**Results:** A total of 215/2093 ASPS members responded, with most being private practitioners (97%), male (67%), and white (81%). Instagram (95%) and Facebook (90%) were the most popular social media platforms utilized. Most respondents (57%) posted strictly professional content; most of whom identified as female (64.3% vs 44.3%,  $p=0.008$ ). Most respondents (58%) reported at least one experience of online harassment, mainly fake reviews (40%) and threatening messages (26%). Harassment led to patient loss (24%) and legal issues (4%). Female respondents experienced sexual harassment at a higher rate compared to males (13% vs. 2%,  $P=0.004$ ). Harassment was more strongly correlated with specific content, namely pre-and-post-operative patient photos.

**Conclusion:** Our study identified the most common forms of harassment, including fake negative reviews and threatening messages, emphasizing consequences such as patient loss and damage to professional partnerships. Furthermore, it underscores the presence of gender inequity that persists even in the realm of social media, as it pertains to sexual harassment, which has been observed across various medical specialties (2,3). By acknowledging the factors contributing to online harassment, practitioners can implement strategies to protect themselves while ensuring social media remains a constructive tool for professional growth and patient education. Future research should focus on exploring harassment prevalence among racially underrepresented in medicine (URiM) surgeons, a limitation of this study.

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## **In-Depth Assessment of the Changing Wound Microbiome Using Metagenomic Sequencing**

Abstract Presenter: Shannon Francis

Abstract Co-Author(s): Ayushi Sharma MD, Amar Singh, Reid Smith, Matthew Murphy MD, PhD, Paige Fox MD, PhD

**Background:** Chronic non-healing wounds significantly challenge healthcare, affecting patients' quality of life and function. The dynamics of the chronic wound microbiome, how it changes with time, and its influence on clinical outcomes are not well understood. This study aims to fill this gap by offering a detailed analysis of the microbiome in chronic wounds over time, paving the way for personalized, targeted topical antimicrobial treatments.

**Methods:** Seven Type II diabetic wounds were sampled monthly during standard wound debridements for three months. Metagenomic sequencing and diversity indices (Shannon Index for alpha diversity and Bray-Curtis Dissimilarity for beta diversity) were used to analyze microbiome diversity and behavior over time. Patient factors including HgbA1c, wound size, wound care and systemic antibiotic treatment were recorded.

**Results:** Wounds enlarging over time exhibited increased biodiversity, suggesting a shift towards a more polymicrobial state that was more difficult to treat. Systemic antibiotic treatment led to increased biodiversity in two of four patients, highlighting antibiotics' limited impact on microbial diversity. Over time, all wounds maintained a high Bray-Curtis Index, indicating consistent microbial dissimilarity irrespective of healing status or treatments.

**Conclusion:** These findings reveal the dynamic, polymicrobial nature of chronic wound biofilms over time. Systemic antibiotics may increase biodiversity counter to their intention to decrease bacterial load highlighting the importance of antibiotic stewardship. This study helps to define the true complexity and constant changing of the chronic wound microbiome using state of the art technology.



## **Implementing Autologous Skin Cell Suspension at an American Burn Association Burn Center: A Comparison of Operative Times, Efficiency, and Cost Analysis of Using RECELL Versus Standard Split Thickness Autografting**

Abstract Presenter: Danielle Mayorga-Young

Abstract Co-Author(s): Keith Sweitzer MD, Keith Sweitzer, Derek Bell MD, Kathryn Skibba MD

**Introduction:** The standard of care (SOC) for deep partial thickness or full thickness burns is autologous grafting, which is being challenged by new technologies. The RECELL® Autologous Cell Harvesting Device prepares a non-cultured autologous skin cell suspension for application to burn wounds. Epidermal autografting with RECELL® provides comparable results to SOC while reducing donor graft size and morbidity, making it ideal for patients with large total body surface area (TBSA) burns. It has been shown use of RECELL® is cost saving or cost neutral compared to SOC for overall hospital resource use per unit cost. This study aims to compare the size of burn wound coverage per operative minute for RECELL® autografting versus standard split thickness autografting (STSG). The authors hypothesize that utilizing RECELL® decreases the operative time for definitive coverage of large burn wounds thereby offsetting unit cost.

**Methods:** This is a case-control study of all adult surgical encounters for RECELL® epidermal autografting versus matched SOC STSG encounters performed by a single burn surgeon at a single ABA-verified burn center between April 2016 and January 2021. Patient demographics, burn characteristics, and surgical details were collected from electronic medical records (EMR). RECELL® patients were matched with STSG controls, prioritizing treated surface area and anatomic location, followed by burn etiology, patient age, and sex.

**Results:** Twenty RECELL® surgeries were performed on sixteen patients. These encounters were matched to twenty STSG surgeries performed in eighteen patients. The RECELL® and STSG groups were not significantly different regarding age, BMI, co-morbidities present, sex, and diversity of race. Between the two groups, most burns resulted from flame injury, and subjective analysis of graft adherence was comparable. Time to re-keratinization of the burn wound (20.4 vs 19.0 post-operative days; RECELL®, STSG) was similar.

Treated burn wounds were located on the lower extremity (81.3% vs 100%), upper extremity (68.8% vs 76.5%), and trunk (50.0% vs 64.7%) in RECELL® and STSG encounters, respectively. The average graft thickness harvested was similar between RECELL® encounters and matched controls (0.0063" vs 0.0056"). The average burn wound size and operative duration was 2824.4 cm<sup>2</sup> in 112.78 minutes for RECELL® and 2318.65 cm<sup>2</sup> in 104.6 minutes for STSG. As a result, RECELL® covered 25.0 cm<sup>2</sup> in comparison to SOC STSG coverage of 22.2 cm<sup>2</sup> per operative minute.

**Conclusions:** Patient demographics were comparable between the matched groups as well as surgical complications, time to definitive wound closure, and overall graft adherence.

Our data trends toward demonstrating that RECELL® autografting treats a larger wound size per operative minute compared to matched STSG controls. These results are likely restricted to large, as opposed to small, treatment areas. This increased operative productivity with RECELL® assists in offsetting the unit cost. This benefit is in addition to the previously published benefits of using RECELL® in large burns including decreased donor site size and morbidity. In conclusion, selective use of RECELL® can offset the unit cost through increased operative efficiency, lessen donor site morbidity, and produce similar results as SOC STSG.

### **Unemployment After Plastic, Reconstructive, or Burn Surgery: Highlighting the Importance of Return to Productivity After Surgery**

Abstract Presenter: Erin Ross

Abstract Co-Author(s): Laura Herrera Gomez MD, Haig Yenikomshian MD

**Purpose:** Although employment is a commonly evaluated outcome in burn populations, it is under-evaluated for other indications for plastic and reconstructive surgery. Many patients undergoing reconstructive surgery will require extensive physical or occupational therapy, and revisions or multi-stage procedures. Lower income individuals, who are more likely to work in manual labor settings, (1) may be especially vulnerable to the loss of wages associated with prolonged recoveries. Furthermore, with recent inflation, downstream effects of loss of wages may culminate in detrimental health effects, such as food insecurity. (2) Here we evaluated the employment status of patients who underwent plastic, reconstructive, or burn surgery within the past year to determine potential risk factors and sequelae of unemployment after surgery.

**Materials & Methods:** Patients attending post-op follow-up appointments at the outpatient plastic and reconstructive surgery and burn surgery clinics at a level one trauma center and regional burn center completed a survey including their current employment status (employed, unemployed, student, homemaker, retired) as well as the Household Food Security Survey Module (3) and whether they use food assistance resources (i.e. regional food bank, Supplemental Nutritional Assistance Program) between June 2023 and February 2024. Medical records were queried to collect demographics, surgery type, and number of operating room trips. Association of

unemployment with demographic and clinical characteristics were assessed via Chi-square test, or Fisher's Exact, or Mann-Whitney U test as appropriate.

**Results:** The final cohort of 86 participants was predominantly Hispanic or Latino (74%), and had Medicaid insurance (81%). More than half of post-op patients were unemployed at the time of survey (52%). Unemployment was more common in male patients (64% unemployed vs 39%,  $p=0.03$ ) and surgical management of trauma or burn injuries compared to oncologic or other indications (68% vs 41% vs 35%,  $p=0.02$ ). Unemployed patients also had more operating room trips ( $p<0.001$ ). Food insecurity was more common among unemployed patients compared to all other employment statuses (53% food insecure vs 22%,  $p=0.02$ ), and less than half (48%) of unemployed patients experiencing food insecurity were using any resources for food assistance.

**Conclusion:** Unemployment was highly prevalent among post-op patients, especially among traumatic and burn reconstruction patients. Undergoing multiple surgeries may be an additional risk factor for unemployment, and potential impacts on productivity should be considered during surgical planning. Vocational evaluation should be utilized to maximize return to work, and screening for potential sequelae of unemployment, such as food insecurity, may prevent development of negative health outcomes associated with loss of wages.

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## Investigating the relevance of cAMP response element-binding protein to the wound healing process: An in vivo study using photobiomodulation treatment

Abstract Presenter: Nam Kyu Lim

Abstract Co-Author: Sungyeon Kim MD, PhD

**Objectives:** Monitoring inflammatory cytokines is crucial for assessing healing process and photobiomodulation (PBM) enhances wound healing. Meanwhile, cAMP response element-binding protein (CREB) is a regulator of cellular metabolism and proliferation. This study explored potential links between inflammatory cytokines and the activity of CREB in PBM-treated wounds.

**Methods:** A total of 48 seven-week-old male SD rats were divided into four groups (wound location, skin or oral; treatment method, natural healing or PBM treatment). 6-mm-diameter round shape wounds were treated with 808 nm laser every other day for 5 times (total 60 J). The wound area was measured with a caliper and calculated using the elliptical formula. Histological analysis assessed epidermal regeneration and collagen expression of skin and oral tissue with H&E and Masson's trichrome staining. Pro-inflammatory (TNF- $\alpha$ ) and anti-inflammatory (TGF- $\beta$ ) cytokines were quantified by RT-PCR. The ratio of phosphorylated CREB (p-CREB) and unphosphorylated CREB was identified through Western blot.

**Results:** PBM treatment significantly reduced the size of the wounds on day 3 and day 7, particularly in the skin wound group ( $p < 0.05$  on day 3,  $p < 0.001$  on day 7). Collagen expression exhibited significantly higher density in the PBM treatment group (in skin wound,  $p < 0.05$  on day 3,  $p < 0.001$  on day 7, and  $p < 0.05$  on day 14; in oral wound,  $p < 0.01$  on day 7). The TGF- $\beta$ /TNF- $\alpha$  ratio and the p-CREB/CREB ratio showed parallel trend during wound healing.

**Conclusions:** Our findings suggested that the CREB has potential as a meaningful marker to track the wound healing process.

### **Assessment of fertility and obstetric outcomes and perceptions of resident, fellow, and attending physicians: Pilot data of physician experiences**

Abstract Presenter: Elizabeth O'Neill MD MPH

Abstract Co-Author(s): Aaron Hendizadeh, Wendy Chen MD, MS, Christina Tragos MD, David Kurlander MD, Deana Shenaq MD

**Background:** Most plastic surgeons are in training during the time of known fertility decline. The literature shows that among plastic surgeons, infertility is 7x higher and there are more than double the obstetric complications compared to the general population. In the general population, complications increase with standing >3 hours/day while working, as well as with physical effort and occupational fatigue. Here, we present pilot data highlighting general trends and complications related to working hours spent standing while pregnant. Our ultimate aim is to describe differences between the experiences of surgeons and non-surgeons.

**Methods:** An 11-item anonymous, IRB-exempt, pilot tested survey addressing experiences with pregnancy, obstetric outcomes and complications, and knowledge of and experiences around fertility and assisted reproductive technology (ART) was developed with a content and survey design expert. Our survey was based on similar surveys described in the plastic and general surgery literature. A series of four email invitations containing the survey link were distributed to all trainees and attendings. Data were analyzed using descriptive statistical methods and risk analysis on Microsoft Excel and SPSS.

**Results:** We had a 15.9% (106 women, 36 men/902) response rate; average age was 39 years and 74.6% were female. 55.1% were trainees. Of female respondents, 54.7% reported having ever been pregnant. Most respondents (42.1%) had their first child during training. Of the women who reported live births, 50% reported pregnancy or obstetric complications. There was a total of 160 pregnancies: 63.8% resulted in live births, 27.5% resulted in loss prior to 20 weeks, and 6.9% resulted in elective termination. Results were stratified by average weekly hours spent working on feet across pregnancies (>40 and <40). 48.5% vs. 50% reported complications and 42.9% vs. 20% of pregnancies resulted in loss prior to 20 weeks (OR 3.0, 95% CI [1.447, 6.219]) in the >40 vs. <40 groups, respectively. Of the 59% who reported having tried to conceive, 29.3% reported difficulty; of those, 58.3% reported utilizing ART. 68.8% of respondents reported no prior knowledge of or education about fertility or ART.

**Conclusions:** Our pilot data demonstrates high prevalence of pregnancy and obstetric complications as well as pregnancy loss, greater in those who stood >40 hours/week while working while pregnant. This may be a surrogate for surgeons, particularly plastic surgeons, who spend significant time standing. Next steps include expanded data collection, as well as exploration of free responses around experiences with fertility and fertility education, which will inform a structured didactic curriculum for plastic surgery residents to include information about specialty-specific data, insurance coverage, and cryopreservation. Female surgeons may be associated with better outcomes, and recruitment/retention of quality female plastic surgeons is critical to the advancement of the specialty. As more women continue to apply to plastic surgery residency, and as the age of trainees continues to rise, it is imperative that we offer formal education around these topics early in training. This may lead to greater physical and mental health among plastic surgeons, and thus higher satisfaction in the workplace and ultimately better patient care.

## **Comparative Analysis of Patient Satisfaction: Telemedicine vs. In-Person Encounters in Pediatric Plastic Surgery**

Abstract Presenter: Sarah Layon

Abstract Co-Author(s): Heather Burns MD, Michael Madueke, Daniel Wang, Matthew Parham, Shola Olorunnipa MD

**Background:** Telemedicine services experienced unprecedented growth during the COVID-19 pandemic, offering patients the convenience of seeking care remotely while reducing time and travel commitments. Our institution, home to one of the country's largest pediatric plastic surgery divisions, serves a prominent urban area and vast rural community. Given the adaptability of many encounters to telemedicine, this study aims to compare patient satisfaction in pediatric plastic surgery between telemedicine and in-person settings.

**Methods:** A retrospective analysis was conducted on Press Ganey surveys routinely collected at our institution from March 2020 to December 2022. Surveys were completed by parents or guardians of pediatric plastic surgery patients (aged 0-17 years) after in-person or telemedicine clinic encounters with a single surgeon. Thirteen of the 25 survey questions were relevant to both in-person and telemedicine encounters and were included for analysis. Top Box scores (indicating the percentage of most favorable responses) were recorded as frequencies with percentages and compared using Fisher's exact test.

**Results:** Verified surveys were available for both telemedicine and in-person encounters between June 2020 and November 2022. During this period, 738 encounters were conducted via telemedicine; 301 were new visits and 437 were return visits. Of the 223 surveys meeting inclusion criteria, 159 were from in-person encounters, and 64 were from telemedicine encounters. Telemedicine visits consistently had Top Box scores equal to or greater than in-person visits across all 13 survey questions. Statistically significant differences were observed for 2 questions: ease of contacting the practice ( $p = 0.002$ ) and ease of scheduling appointments ( $p < 0.0001$ ).

**Conclusions:** This study demonstrates comparable patient satisfaction in pediatric plastic surgery between telemedicine and in-person encounters with a single surgeon at our institution. These findings provide valuable objective data about the patient experience, highlighting the potential of telemedicine to optimize practice models and improve access to care in pediatric plastic surgery.

## **The Business of Plastic Surgery: A Machine Learning Model for wRVU Prediction and Salary Benchmarking of Pediatric Plastic Surgeons**

Abstract Presenter: Joseph Mocharnuk

Abstract Co-Author(s): Elizabeth Moroni MD, Joseph Losee MD

**Background/Purpose:** Craniofacial and pediatric plastic surgeons offer unique services that contribute value to their respective institutions. The goal of this study was to evaluate billing, collection, and compensation patterns in pediatric plastic surgery and to use machine learning models trained on data collected from our national survey to provide calibrated salary predictions and wRVU benchmarks.

**Methods:** A survey was distributed to 36 U.S. pediatric plastic surgery divisions/departments. Requested information included faculty salaries, relative value units, and distribution of clinical volume and non-surgical professional responsibilities. Data was collected over a six-month period and subsequently analyzed using R Studio (Version 1.3.1093). An interactive calculator was created in R Shiny to allow individual surgeons to predict their estimated compensation and wRVU targets.

**Results:** Of the 36 pediatric plastic surgery divisions surveyed, 27 programs responded with complete data. Complete responses were almost evenly distributed across most AAMC regions (27.3% each from the West Coast and South, 31.8% from the Midwest, and 13.6% from the Northeast). Most responding institutions were academic teaching hospitals (86.3%), representing a total of 91 pediatric (or partially pediatric) plastic surgeons. Over the past five years, five institutions (22.7%) had received funding from their associated medical schools, 15 (68.2%) had received financial support from their associated health system, and 14 (63.6%) reported having endowment funding. All institutions (100%) reported accepting some mixture of private and public insurance as well as uninsured and/or self-paying patients.

The average starting salary for a fellowship-trained pediatric plastic surgeon was \$385,476 (SD: \$74,915, Range: \$175,000-\$500,000). Across institutions, the average estimated starting wRVU benchmark for a full-time (1.0 FTE) clinical faculty member was 5,551 (SD: 1707, Range: 2,250-8,272).

Two variables were found to be highly statistically significant predictors of salary, namely the portion of practice comprised of craniofacial surgery (p-value = 0.005), a positive predictor, and the portion of practice in the outpatient clinic (p-value <0.001), a negative predictor. These and other stepwise-selected covariates were used to create an interactive salary and wRVU predictive calculator (Figure 1)

**Conclusions:** Our study provides baseline measures and standards for compensation

and wRVUs in pediatric plastic surgery. Using the largest ever survey of pediatric plastic surgeons, we were able to construct robust predictive models for compensation based on clinical and administrative responsibilities as well as a centralized user interface to predict pediatric plastic surgeon starting compensation based on fellowship training, years of clinical experience, proposed distribution of clinical responsibilities, and region of practice.

## **How Integrated is Plastic Surgery? A Cross-Country Curriculum Analysis of General Surgery Rotations**

Abstract Presenter: Zachary Koenig MD

Abstract Co-Author(s): Niki Patel MD, Luis Quiroga MD, Kerri Woodberry MD

**Introduction:** Plastic surgery training has continued to evolve over the past decade with a greater emphasis on the integrated model (1,2). As a result, it is crucial to reexamine the function and purpose of all general surgery rotations to ensure well-rounded training in plastic surgery. Guidelines for rotations are set forth by the American Board of Plastic Surgery (ABPS) (3). However, different programs continue to adopt unique curricula (4). A study by Rifkin et al in 2019 reported an average of  $12.8 \pm 4.7$  months of general surgery rotations (5). We hypothesize that there has been a gradual trend towards fewer general surgery months as the total number of integrated programs continues to increase.

**Methods:** Match data from 2012-2023 was obtained from the National Resident Matching Program website. The most current list of integrated plastic surgery programs was obtained from the American Council of Educators in Plastic Surgery (ACEPS) website. Rotation schedules for postgraduate years 1 through 6 were obtained through official program websites where available between January and February 2024. The numbers and types of general surgery months were recorded and compared between programs of various types and sizes. General surgery rotations included intensive care unit, surgical oncology, breast surgery, colorectal surgery, cardiothoracic surgery, acute care surgery, minimally invasive surgery, trauma surgery, vascular surgery, pediatric surgery, and transplant surgery.

**Results:** There are more integrated programs becoming available each year while independent programs continue to go downward. Rotation schedules were obtained for 66/89 (74.2%) programs. The average number of general surgery months was  $10.3 \pm 3.0$  months across all programs. Programs within departments have significantly fewer general surgery rotations than those within divisions ( $8.9 \pm 4.3$  months versus  $10.6 \pm 9.5$  months;  $P = 0.03$ ). However, association with both independent and integrated residencies versus integrated residency only ( $10.5 \pm 9.0$  months versus  $9.3 \pm 7.2$



months;  $P = 0.09$ ) and 1-2 residents per incoming class year versus 3-5 residents per incoming class per year demonstrated no significant differences ( $10.0 \pm 6.2$  months versus  $10.4 \pm 10.8$ ;  $P = 0.40$ ).

**Conclusions:** The number of integrated plastic surgery programs has increased by 68% over the decade while the number of independent programs has decreased by 33% over the same timeframe. Programs continue to change their rotation schedules, and over the 5 years, there has been a 20% decrease in the total number of months spent on general surgery rotations. As of 2024, plastic surgery programs associated with departments have fewer general surgery rotations than those associated with divisions which can be explained by greater autonomy. However, there was no significant differences in months of general surgery rotations when programs were stratified by size and association with an independent track. Despite this apparent overall decrease, the inter-program curricula largely vary. The ABPS and ACEPS must continue to re-evaluate required general surgery rotation exposure to ensure resident exposure to plastic surgery and clinical competency is optimized.

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## Is Metformin Protective Against the Development of Lymphedema?

Abstract Presenter: Jonathan Rubin

Abstract Co-Author(s): Babak Mehrara MD, Bracha Pollack, Lillian Boe, Arielle Roberts DO, MS, Elizabeth Smith-Montes, Michelle Coriddi MD, Janet Coleman-Belin, Adana Campbell MD

**Purpose:** To determine the efficacy of metformin to prevent Breast Cancer Related Lymphedema in patients with Diabetes Mellitus undergoing Axillary Lymph Node Dissection.

**Introduction:** Breast Cancer Related Lymphedema (BCRL) impacts patients' physical health, psychosocial wellbeing, and quality of life (1). Patients undergoing Axillary Lymph Node Dissection (ALND) are more than four times more likely to develop BCRL when compared with Sentinel Lymph Node Biopsy (SLNB) alone (2). Diabetes Mellitus (DM) has a profound impact on endothelial dysfunction, which, in turn, is associated with the pathogenesis of lymphedema. Metformin is a safe, widely used first line agent for the treatment of DM that has anti-inflammatory properties (3). A recent preclinical study showed that treatment with metformin was protective against the development of secondary lymphedema (4). We reviewed metformin use and lymphedema outcomes among patients with DM who underwent ALND at our center for the treatment of breast cancer over an 18-year period.

**Methods:** Patients who underwent ALND for breast cancer treatment and had a diagnosis of DM at the time of surgery between 2004 and 2022 were identified using our medical records. A detailed chart review was then performed to identify treatment regimens including metformin at the time of ALND. We used Kaplan-Meier plots with the log-rank test as well as Univariable and Multivariable Cox Regression Models to evaluate the association between metformin use and lymphedema development.

**Results:** A total of 414 patients with a diagnosis of DM at the time of ALND for breast cancer treatment were identified during the study period. Kaplan-Meier analyses and estimated cumulative incidences of lymphedema were lower in the metformin group across the entire follow-up period (24-month cumulative incidence 14% (95% CI, 10%, 19%) in the metformin group vs. 22% (95% CI, 16%, 29%) in the no metformin group), which was statistically significant (log-rank  $p = 0.026$ ). Univariable (HR = 0.67,  $p = 0.027$ ) and Multivariable (HR = 0.66,  $p = 0.027$ ) Cox Regression Models showed significantly decreased risk of lymphedema development in patients who were taking metformin at the time of ALND.

**Conclusions:** Metformin may be protective against the development of lymphedema in individuals with DM. Further research is needed to understand the molecular mechanisms and possible utility of metformin in patients without DM.

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## **Piezo inhibition prevents and rescues scarring by targeting the adipocyte to fibroblast transition**

Abstract Presenter: Michelle Griffin MD

Abstract Co-Author(s): Derrick Wan MD, Michael Longaker MD, MBA, FACS

**BACKGROUND:** While studies have suggested that plasticity exists between dermal fibroblast and adipocytes, it remains unknown whether fat contributes to fibrosis. We hypothesized that mature adipocytes directly participate in wound repair via conversion into fibroblasts, and that adipocyte-derived fibroblasts (ADFs) contribute to skin scarring.

**METHODS:** AdipoqCreERT transgenic driver mice were crossed to R26mTmG reporter mice to generate AdipoqCreERT;ROSA26mTmG mice to perform lineage tracing of mature adipocytes. To achieve local adipocyte ablation AdipoqCre;ROSA26mTmG;R26tm1(HBEGF)Awai mice were generated and wounded, and diphtheria toxin (DT) was injected into the wound base. DT- and vehicle control-treated wounds underwent histologic analysis. Lastly, we performed scRNAseq, Visium gene spatial analysis, and CODEX protein analysis on wounded and unwounded tissue to identify fibrotic ADF subpopulations.

**RESULTS:** Using our AdipoqCre;ROSA26mTmG adipocyte lineage-tracing model, we identified significantly greater number of adiponectin lineage-positive cells (GFP+) within wounds at post-operative day-14 (POD-14) compared to unwounded skin (\*P<0.05, n=12) (Fig.1A). Compared to typical subcutaneous adipocytes, the GFP+ cells exhibited upregulation of fibroblast markers and downregulation of adipocyte markers. FACS further confirmed that the GFP+ cells were fibroblasts and increased to 10% at POD-14(Fig.1B). DT-induced ablation of Adipoq lineage-positive cells (Fig.1C) exhibited reduced scar thickness (Fig.1c) and collagen deposition at POD-14 compared to control wounds (\*P<0.05, n=12) (Fig.1D). Using an in-vitro collagen gel system we establish that mechanics alone is sufficient to drive the adipocyte-to-fibroblast conversion.

scRNAseq and spatial gene and protein analysis revealed distinct mechanical sensitive subpopulations of ADFs expressing high levels of Piezo1 and Piezo2 (Fig.1E-F). We further show that Piezo1 or Piezo2 -inhibition yields regenerative healing by preventing adipocytes' activation to fibroblasts, in both mouse-wounds using small molecule Piezo inhibitors and Piezo1/Piezo2 genetic knockouts (Fig.1G-H). In addition, Piezo1 inhibition via P1i overcomes skin scarring in a novel human-xenograft-wound model. Lastly, we show that Piezo1 inhibition can was sufficient to induce near-complete wound regeneration of 1- month, 2.5 month and 4 month established mouse scars with return of hair follicles, including full recovery of unwounded-like extracellular architecture, compared to untreated wounds which remained scar-like on histology (n=30) (Fig.1I).

**CONCLUSIONS:** Our findings strongly suggest that mature adipocytes in the skin undergo conversion to pro-fibrotic fibroblasts in response to injury. Importantly, Piezo1 -inhibition induced wound regeneration even in pre-existing established scars, a finding that suggests a role for adipocyte-to-fibroblast transition in wound remodeling, the least-understood phase of wound healing.

## **Robotic-Assisted Approach to Post Deep Inferior Epigastric Perforator Flap Hernia Repair**

Abstract Presenter: Sneha Subramaniam MD

Abstract Co-Author(s): Katie An, Reid Smith, Mark Smith MD, FACS, Neil Tanna MD, MBA, Gainosuke Sugiyama

**Background:** Fascial bulging or hernias post deep inferior epigastric flap range from 3 to 7%, highlighting the possibility of developing disfiguring bulges in the DIEP population. These can range from full hernias where bowel may be involved to aesthetic bulges. Though a small percentage, such results can yield unaesthetic and negative functional results down the line and require further operative interventions. In this abstract, we offer an operative approach to repairing these post DIEP bulges using a robot-assisted, minimally invasive technique.

**Methods:** Patients are laid supine on the operating table. Access to the abdominal cavity is created using a Veress or Hassan technique with the placement of a 12mm port for the camera port peri umbilically. Pneumoperitoneum is established and two other 8mm robot ports are inserted using direct visualization. Trocars are placed about 10cm on either side of the camera port and 10cm from anterior superior iliac spine. 3

instruments are required: hot shears, Cadiere forceps and a large needle driver. Peritoneum is opened intra-abdominally to expose the hernia defect and the hernia sac and contact is carefully dissected out using a combination of sharp dissection and electrocautery. Once hernia sac is removed, fascia is intra-abdominally closed using a running V-lock PDS suture. Progrid mesh is placed to a size that overlies the closed defect, and the peritoneum is closed primarily with a running vicryl stitch. The abdomen is then desufflated and port sites are closed. Patients were reviewed from a single surgeon over one hospital system from 2020 to 2024 at our institution. Patient demographics, surgical characteristics, robot time, and complications were assessed.

**Results:** 10 patients were identified who met inclusion criteria for a case series evaluation. Mean time from original DIEP to hernia repair was 2.8 years. Mean age was 56.0 years at time of index case and 58.8 years at time of hernia repair. Mean BMI was 31.8. Defects ranged from 2-10cm, repaired mainly with Progrid Mesh that ranged from 12x8cm to 15x15cm in size. One patient had a Spigelian hernia repaired with a Ventralight ST mesh. Other incidental hernias (umbilical, inguinal, femoral) were found in three patients, which were also repaired at the time of surgery. Mean console time was 63 minutes and required three instruments to perform surgery. Most patients were discharged the same day, while two stayed for one post-operative day (post-operative nausea, 24 hours of IV antibiotics). There was a single recurrence of a DIEP hernia bulge, repaired via the open approach 1.7 years after the prior robotic repair.

**Conclusion:** We offer robot-assisted hernia repair as a safe, minimally invasive technique and approach for post-operative DIEP hernia bulges. These procedures are less morbid than some of the open techniques with aesthetically appealing results in an ambulatory setting with discharge on the same day.

## **Activation in Visual Cortex on Functional Magnetic Resonance Imaging Following the First Human Whole Eye Transplant**

Abstract Presenter: Alay Shah MD

Abstract Co-Author(s): Sachin Chinta, David Tran MD, Daniel Ceradini MD, Bruce Gelb, Eduardo Rodriguez MD

**Background:** Utilizing regional oxygenated blood-flow, functional magnetic resonance imaging (fMRI) demonstrates cortical activity in the brain. Activity in the visual

processing regions of the brain in response to visual stimulus can be demonstrated via increased activity in the occipital lobe on fMRI. Here, we present evidence of occipital lobe activation on fMRI to visual stimulus of the transplanted eye in the case of the first human whole eye transplant (WET).

**Methods:** A 46-year-old male underwent partial face and whole eye transplantation with donor-recipient optic nerve (ON) coaptation after high-voltage electrical injury. At post-operative months 3 and 6, the subject underwent fMRI, where various visual stimuli were presented to him and cortical activity was measured. Imaging was captured with both eyes closed, only native eye closed, only transplanted eye closed, and both eyes open. Various stimuli were presented, including complete darkness (no stimulus), flashing white light at 2Hz, at 4Hz, and object storytelling.

**Results:** The subject reports no vision from transplanted eye. However, during the 2Hz flashing light protocol, fMRI showed activity in the occipital lobe during visual stimulus to the transplanted eye that was comparable to that seen by visual stimulus to native eye. In the object storytelling protocol, less activity was noted with only the native eye covered than with only transplanted eye covered. The fMRI showed no occipital lobe activity with both eyes closed. These results remained consistent over the 3- month interval.

**Conclusion:** The subject demonstrates occipital lobe activity on fMRI upon exposure to visual stimulus after ON coaptation in the case of the world's first successful WET.

## **Smile Train: Barriers to Cleft Care Before, During, and After COVID-19**

Abstract Presenter: Ariel Figueroa MD

Abstract Co-Author(s): Hannah Soltani, Taylor Hallman, Umer Qureshi, Arun Gosain MD

**Background:** During the COVID-19 pandemic, elective procedures including cleft palate and/or lip repair were halted around the world. Smile Train, the largest cleft organization with partner hospitals across the world, is dedicated to providing discounted quality cleft care for all. This study investigated how barriers to cleft care changed before, during, and after the COVID-19 pandemic.

**Methods:** We obtained surveys from all Smile Train Hospitals who completed the

Barriers to Care Survey from 2018, 2020, and 2022. Responses were categorized by region: North Asia, Asia, Africa, and Americas & Europe. Barriers were categorized into themes including: lack of patient awareness, equipment, funds, operating room access, professionals, staff, supplies, and barriers in patient travel and health. Descriptive and statistical analyses were completed for differences.

**Results:** 664 survey responses were collected in 2018, 571 in 2020, and 563 in 2022, most often answered by a surgeon. Across all regions, survey responses indicating patient awareness as a barrier to cleft care decreased between 2018 and 2022 (41.42% in 2018, 37.83% in 2020, and 27.71% in 2022, p-value 0.018). In contrast, the proportion of patient health as a barrier increased between 2018 and 2022 (34.94% in 2018, 40.98% in 2020, and 46.36% in 2022). In Africa, patient health was reported as an increased barrier during the time of COVID (37.58% in 2018, 48.74% in 2020) and remained a barrier in 2022 (45.31%). While patient awareness in the Americas & Europe improved (18.02% in 2018, 4.20% in 2022), lack of professionals was reported as more of a barrier since 2018 (9.01% in 2018, 17.65% in 2022). In Asia, the proportion of patient awareness improved (46.72% in 2018, 32.57% in 2022), while the proportion of patient health worsened (44.16% in 2018, 59% in 2022). In North Asia, barriers including patient awareness, lack of equipment, funds (p-value <0.001), staff (p-value 0.042), and supplies decreased from 2018 to 2022.

**Conclusions:** Patient awareness and health seem to have been most impacted by the pandemic; yet regional disparities exist. Notably, North Asia had the most improvement in reported barriers to care which may demonstrate solution creativity amidst a crisis and/or increased aid provided to this region during the pandemic compared to others.

## **Investigating the Antigens Driving T-Cell Responses in Lymphedema: An Interrogation of Insulin and Insulin Receptor Signaling**

Abstract Presenter: Adana Campbell MD

Abstract Co-Author(s): Bracha Pollack, Gopika Ashokan, Jinyeon Shin, Arielle Roberts DO, MS, Jonathan Rubin, Hyeung Ju Park, Babak Mehrara MD

**Purpose:** Secondary lymphedema (LE) is a common complication of cancer treatment and is characterized by progressive fibrosis and inflammation. Using immunosequencing of CD4<sup>+</sup> T-cells in clinical lymphedema skin biopsies, we have discovered T-cell clones in lymphedematous tissues that recognize insulin (1). Other

studies have shown that diabetes is a significant clinical risk factor for lymphedema development and that insulin sensitizing medications improve lymphedema outcomes in preclinical mouse models (2, 3). Taken together, these studies suggest that insulin and insulin receptor (INS-R) signaling may play a role in the pathophysiology of LE. The purpose of this study was therefore to use mouse models of LE to investigate insulin resistance and insulin signaling in LE tissue.

**Methods:** Secondary lymphedema was induced in mice by tail lymphatic excision and compared with sham-operated animals (n= 8-10/group). Tail fluid was collected at 2 and 6-weeks following tail lymphatic ablation and insulin concentration was quantified using an insulin ELISA. Insulin tolerance test was performed in 4-hr fasted LE and control mice by serial blood glucose measurements following intraperitoneal insulin administration. Insulin signaling was compared between lymphedema and control mouse tail skin biopsy samples and in the gastrocnemius muscle after tissue harvest and ex-vivo stimulation with insulin (10nM).

**Results:** The concentration of insulin in lymph fluid was significantly increased 6 weeks after surgery compared with fluid collected 2 weeks post-op ( $p<0.05$ ). Fasting blood glucose levels and insulin resistance following an insulin bolus was modestly, though significantly increased in mice with lymphedema compared to sham controls ( $p<0.05$  for both). Insulin receptor expression was decreased in muscle biopsies and increased in tail skin biopsies collected from mice with lymphedema. The expression of insulin receptor adaptor proteins as well as insulin receptor substrates (IRS) 1 and 2 was markedly decreased in tail skin biopsies collected from mice with lymphedema; in contrast we found no differences in these proteins in muscle biopsies suggesting that lymphedema can alter insulin receptor signaling locally.

**Conclusion:** Our study suggests that lymphatic injury results in increased tissue levels of insulin, insulin resistance, and decreased insulin receptor signaling in lymphedematous tissues. Lymphatic injury also has mild effects on systemic glucose tolerance. Our findings are consistent with and provide a molecular mechanism for previous studies demonstrating a protective role for insulin-sensitizing drugs. Future studies are needed to understand the effects of insulin signaling on lymphatic endothelial dysfunction and inflammatory cell activation.

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## **Artificial Intelligence for Automated Classification of Indocyanine Green Lymphography Patterns**

Abstract Presenter: Berk Ozmen MD

Abstract Co-Author(s): Sonia Pandey MD, Graham Schwarz MD

**Purpose:** Lymphedema diagnosis relies on effective imaging of the lymphatic system. Indocyanine green (ICG) lymphography has become an essential diagnostic tool, but globally accepted protocols and objective analysis methods are lacking. In this study, we aim to investigate artificial intelligence (AI), specifically convolutional neural networks to categorize ICG lymphography images patterns into linear, reticular, splash, stardust and diffuse.

**Methods:** A data set comprised of 68 ICG lymphography images was compiled and labeled according to 5 recognized pattern types; linear, reticular, splash, stardust and diffuse. A convolutional neural network model, utilizing MobileNetV2 and TensorFlow, was developed and coded in Python for pattern classification.

**Results:** The AI model achieved 97.78% accuracy and 0.0678 loss in categorizing images into five ICG lymphography patterns, demonstrating high potential for enhancing ICG lymphography interpretation. The high level of accuracy with a low loss achieved by our model demonstrates its effectiveness in pattern recognition with a high degree of precision.

**Conclusion:** This is the very first study integrating AI technologies into ICG lymphography procedure. This study demonstrates that AI models can accurately classify ICG lymphography patterns and indicates potential for using AI to automate and standardize the interpretation of ICG lymphography imaging.

## **The Distribution of Age and Gender in Plastic and Reconstructive Surgery Leadership**

Abstract Presenter: Ariel Figueroa MD

Abstract Co-Author(s): Hannah Soltani, Taylor Hallman, Dana Shuaibi, Rachel Donaldson, Umer Qureshi, Arun Gosain MD

**Background:** The underrepresentation of women in leadership positions continues to be an issue within many surgical specialties, particularly within the field of plastic surgery. Understanding how the distribution of age and gender differs between ASPS and Academic leadership may shed light on patterns of plastic surgeons in leadership positions.

**Methods:** The total number of current ASPS members, ASPS leaders, Academic leaders, faculty, and their age and genders were collected. Descriptive statistics and statistical analysis was completed with the R program, comparing ASPS leaders and Academic leaders.

**Results:** Among ASPS leadership, 29.9% were female, and 70.1% males. Among Academic leadership, 25.3% were female and 74.7% male. Among ASPS members, women were more likely to be leaders (OR 1.68, p-value <0.001), and to be younger than men (48 vs. 51 years, p-value 0.043). Among Academic leadership, women were found to be younger than men (47 vs. 57 years, p-value <0.001). Among Academic leadership positions, men were more likely to be Chief/Chairs and women more likely to be Assistant Program Directors (OR 2.26, 3.5, p-value 0.01, <0.001 respectively). When comparing men versus women >50 and >60 years of age in Academic leadership, men were more likely to be found in leadership (OR 3.59, 3.86, p-value <0.001, 0.002, respectively).

**Conclusions:** Despite improvements in diversity among plastic surgery trainees and attendings, there remains a difference in age and gender among leaders in ASPS and in Academics. Increased support is needed for women in Academic leadership and to retain them in their positions like their male counterparts.

## **Leveraging Artificial Intelligence for Patient Education in Breast Reconstruction and Hand Surgery**

Abstract Presenter: SeungJu Oh MD

Abstract Co-Author(s): Heli Patel, Christian Palacios, Justin Camacho, Rahim Nazerali MD, Haripriya Ayyala MD

**Introduction:** Patient education is critical to optimizing surgical outcomes as it guides informed decision-making and peri-operative expectations. Traditionally, patient education has relied on face-to-face consultations with healthcare providers and the provision of written materials. The rise of artificial intelligence and natural language processing tools, however, has introduced new accessible avenues for patients to gather clinical information. This study examines the innovative use of ChatGPT-3, a free natural language processing tool, as an accessible alternative platform for patient education with a focus on deep inferior epigastric perforator (DIEP) flap reconstruction and carpal tunnel release (CTR), two commonly performed procedures within plastic and reconstructive surgery.

**Methods:** A set of six frequently asked questions (FAQs) on both DIEP flap reconstruction and CTR was derived from the American Society of Plastic Surgery (ASPS) website. Two plastic surgeons specializing in breast reconstruction and four plastic surgeons specializing in hand surgery systematically assessed ChatGPT's responses based on six criteria: clarity, relevance, reliability, validity, organization, and comprehensiveness using a 1-5 Likert scale (from poor to excellent). Inter-rater reliability was measured by Cohen's Kappa Score (for DIEP group) and Gwet's Agreement Coefficient Score (for CTR group).

**Results:** In both the DIEP and CTR groups, ChatGPT-3 generally received high scores in clarity and relevance (ranging from 4 to 5), demonstrating its ability to effectively convey understandable and pertinent information. However, the model scored lower in reliability (ranging from 3 to 4) and demonstrated significant range in validity (from 2 to 4), reflecting a variance in the alignment of ChatGPT-3's responses with the surgeons' expert knowledge. In addition, its organization and comprehensiveness of the responses received a mixed reception, with scores ranging from 1 to 5. The inter-rater analysis showed a Cohen's Kappa score of 0.5 (indicating moderate agreement beyond chance in the DIEP cohort) and a Gwet's Agreement Coefficient score of 0.507 (suggesting moderate to substantial agreement in the CTR cohort).

**Conclusion:** ChatGPT-3 demonstrates promise in delivering clear and relevant information for commonly performed reconstructive and hand surgeries such as DIEP flap reconstruction and CTR. Improvements in reliability, validity, organization, and comprehensiveness, however, will be critical for its adoption as a reliable patient education tool. The study also underscores the importance of precise and well-crafted prompts (i.e. Prompt Engineering) in order for patients to harness the full potential of ChatGPT-3.

## **Plastic Surgeons as Primary Surgical Educators: Building a Surgery Curriculum for Future Plastic Surgeons and Future PCPs Alike**

Abstract Presenter: Shruthi Deivasigamani MD

Abstract Co-Author(s): Aneri Patel, Jordan Fishman MD, MPH, Martha Matthews MD

**Background:** A medical student's experience during a core third-year clerkship serves two main roles: the first is to expose the student to a field to aid in specialty selection, and the second is to provide the student with foundational knowledge sufficient to pass USMLE examination, regardless of what field they ultimately pursue (1,2). Much has been written about educating students interested in plastic surgery about plastic surgery, but comparatively little has been written about educating students who are on a plastic surgery service during their surgery clerkship. While plastic surgery might be perceived as a niche subspecialty, its interaction with almost every anatomical region in the body can serve as a comprehensive setting for surgical education. We hypothesize that plastic surgeons are participating in primary surgical education more than they might realize and propose a surgery clerkship curriculum in line with the American College of Surgeons (ACS) Core Competencies (3) to guide plastic surgeons serving as primary surgical educators.

**Methods:** A cross-sectional study of surgery clerkship curricula was performed in August 2023. All accredited US allopathic medical schools and plastic surgery residencies were identified using the LCME and ACAPS directories respectively. Information about surgery clerkship curricula was gathered on individual medical school websites. If information was unavailable or incomplete after an Internet search, the school's surgery clerkship director was contacted directly. The following information was collected: total length of surgery clerkship, number and length of surgical rotations, and availability of plastic surgery as a clerkship service.

**Results:** Clerkship information was obtained for 71 out of 158 US allopathic medical schools (45%). Students spent a median of 8 weeks on their surgical clerkship (range: 4-12) and rotated through a median of 2 (range: 1-5) different services. Plastic surgery was offered as a clerkship rotation at 46 surveyed schools (65%). At institutions where plastic surgery was offered, students spent an average of 40% of their total surgery clerkship on the plastics service. At 7 of the 46 schools offering plastic surgery (15%), students only rotated on one surgical service; meaning at these institutions, a student may obtain their entire primary surgical education on the plastics service. Additionally, 100 independent and integrated plastic surgery programs were identified via the ACAPS directory, and 95% were found to have direct affiliations with medical schools. Thus, almost all plastic surgery residents and academic faculty operate in a setting where they

teach medical students.

**Conclusions:** While at first glance, plastic surgery might appear to be a highly specialized corner of medicine, its wide scope of practice and head-to-toe surgical breadth make it a hospitable learning environment for students with a wide array of interests. Moreover, many medical schools rely on plastic surgery services to host students on their surgery clerkships, with almost all academic plastic surgeons already participating in primary surgical education. We propose a curriculum of key skills obtainable on a plastic surgery rotation that fulfill the ACS Core Competencies, to ensure that plastic surgeons can provide students with a comprehensive undergraduate surgical education.

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## The Lived Experiences of Women Plastic Surgeons: A Qualitative Study

Abstract Presenter: Alexandra Luby MD

Abstract Co-Author(s): Noelle Thompson, Brigit Baglien MD, Paige Myers MD, Jennifer Waljee MD, Mary Byrnes PhD

**Background:** Gender-related inequities in the field of plastic surgery are well described. However, the mechanisms that underlie gender-related gaps in professional achievement and advancement as well as the impact on personal well being are poorly understood. Therefore, the objective of this study was to collect the narrative experiences of women plastic surgeons in practice navigating the workforce to further investigate the systemic and societal barriers and inequities women plastic surgeons face over the course of their personal and professional lives.

**Methods:** To understand and describe experiences of women in plastic surgery we designed an interpretive description, a non-categorical qualitative method that allows for the understanding of a group's experiences. One-on-one semi-structured interviews were conducted in person and virtually with women plastic surgeons in various practice types across the United States between October 2023 and January 2024. Participants were asked to share narratives of their experiences across different domains. Interviews were analyzed inductively to generate themes across narratives.

**Results:** Twenty-four women plastic surgeons were interviewed, with purposive sampling by race and ethnicity, years in practice, subspecialty, practice setting, and geographic location. Participants reported experiencing inequities navigating the work environment, which were categorized across three main themes: 1) Participants reported a lack of transparency particularly pertaining to contract negotiation, salary, and promotion. In some instances, women described "inappropriate" comments about deservedness: "...the first time I ever negotiated for a raise...My chief [said] 'Well, you know...'he has five kids. So I could see why he would want a raise...I'm really surprised you want a raise.' Because I'm a single woman...". 2) Participants reported a lack of inclusivity in traditional surgical culture. For example, one participant describes feeling like an outsider among her colleagues, "...the chairman was a total bro [and] had known one of [my partners] since he was a medical student...[so he] made sure...that [his] practice got busier...he totally drove it for [him]. Whereas the same chairman said to me when I wasn't making my salary, 'You know, if you were my daughter, I'd have you go interview with [name]...down there at [the hospital].' It's like, I'm not your daughter. I'm a surgeon-that you hired!" 3) Participants reported frequently navigating social gender "norms", describing different societal expectations and overcoming common female stereotypes. One participant recounts, "I have been told that I have high expectations [and there have been complaints that] I was aggressive...[but] I am [much] easier to work with on a daily basis than some of my [male] partners who also have high expectations...they are demanding and at times inappropriate in the operating room, and I know that because I was their resident a few years ago... I was never to behave in any of those ways...but they've never had those complaints."

**Conclusions:** While the number of women entering plastic surgery is rising, gender-related barriers continue to create inequity in professional advancement and career satisfaction. A deeper understanding of these phenomena is critical to develop effective strategies that systematically address and enhance the diversity, inclusion, and equity in plastic surgery.

## **Exploring the In Vivo Integration and Functionality of Engineered Vascularized Skin Constructs within Murine Models**

Abstract Presenter: Divleen Singh MD

Abstract Co-Author(s): Shi Fu, Huiting Luo, Kuan-Che Feng, Shiffoni Sukhlal, Brooklyn Ratel, Milana Stein, Marcia Simon, Miriam Rafailovich, Duc Bui MD, Alexander Dagum MD, Gurtej Singh

**PURPOSE:** Tissue engineering has made significant progress in generating skin constructs with diverse applications. However, inefficient vascularization and slow in-growth of new blood vessels are commonly cited issues contributing to construct failure (1). Incorporation of prefabricated blood vessels during the in vitro synthesis may circumvent this concern and improve construct integration and performance (2). We hypothesize that pre-vascularization will expedite the formation of anastomosis between host-recipient capillaries and enhance construct survival long-term in mice models.

**METHODS:** Our research team has previously developed non-vascularized tissue-engineered skin constructs, incorporating human epidermal keratinocytes and dermal fibroblasts in a rat tail collagen type I matrix. We aimed to enhance these constructs with vascularization, introducing a collagen-fibrin layer beneath the dermis-like layer, embedding enhanced Green Fluorescent Protein-labeled Human Umbilical Vein Endothelial Cells (eGFP-HUVECs) and Dental Pulp Stem Cells (DPSCs). Evaluating these constructs, we treated full-thickness wounds (diameter = 8 mm) on athymic mice (aged 10-11 weeks) with them, assessing healing at 1-, 4-, 7-, and 14-day intervals. Post-application, mice were euthanized for assessing integration, with excised areas analyzed via Hematoxylin & Eosin (H&E) and immunohistochemical staining, identifying human vascular networks using anti-GFP antibody (primary antibody) and fast red chromogen (secondary antibody).

**RESULTS:** Successful integration of the skin constructs into the wound bed was consistently observed across all examined time points via histological imaging. Initially, on Day 1, capillary networks were not visible; however, there was notable activity indicative of macrophages/cytokines migration from the wound site toward the construct's epidermis. By Day 4, the emergence of a few capillaries within the construct hinted at the onset of angiogenesis and anastomosis. By the 7th day, there was substantial healing and wound contraction, with an absence of scar tissue formation. The utilization of anti-GFP antibodies played a crucial role in demonstrating the successful integration of the tissue-engineered skin constructs with the mouse's wound bed. The observed lumens, filled with red blood cells, indicated effective blood flow

within the construct, and subsequent anti-GFP analysis confirmed the connection of human blood vessels containing mouse blood to the host's circulatory system. By Day 14, a decrease in the density of blood vessels was noted.

**CONCLUSION:** We have established the optimal culture conditions for the creation of pre-vascularized skin constructs that integrate seamlessly and form anastomoses with the recipient mice's blood vessels. Our ongoing research is dedicated to understanding the importance of pre-vascularization in improving the anastomotic process. Furthermore, we plan to evaluate similar parameters in decellularized versions of these pre-vascularized skin constructs, expanding our insights into their functionality and potential applications.

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## **Breast Surgeon Bots: The Utility of Guideline-Driven Chatbots to Deliver Patient-Centered Perioperative Recommendations for Breast Reconstruction**

Abstract Presenter: Ja'neil Humphrey

Abstract Co-Author(s): Subhas Gupta MD, PhD, FRCSC, FACS, Jennifer Smith MD

**Purpose:** To evaluate the utility of training ChatGPT chatbots on ASPS and ERAS guidelines to help provide sufficient perioperative patient-centered recommendations for breast reconstruction.

**Background and Rationale: Integrating** artificial intelligence (AI)-powered large language models and application-based programs into multiple surgical care pathways, including breast reconstruction, has improved efficiency at different checkpoints. This technological paradigm shift has prompted the integration of open source chatbots into breast reconstructive consultation, albeit without success [1].

Efficiency and accessibility are two critical aspects of post-mastectomy breast reconstruction. Guidelines released by the American Society of Plastic Surgeons



(ASPS) and the Enhanced Recovery After Surgery (ERAS) Society outline best practices for optimizing surgical outcomes in autologous and implant-based reconstruction [2-4]. They provide strong recommendations for preoperative optimization, chronic disease management, and perioperative pain control. Critical appraisals reveal improved postoperative outcomes and patient satisfaction when following these guidelines.

Despite evidence-based guidelines, patients defer to the Internet or AI chatbots for medical advice [5]. The delivery, quality, and accessibility of recommendations via AI chatbots remain potential barriers to evidence-based practice. However, training chatbots to deliver evidence-based guidelines may benefit patient education. Therefore, our study aims to evaluate how well ChatGPT, trained on current ERAS and ASPS guidelines, can deliver sufficient preoperative recommendations for breast reconstruction candidates.

**Methods:** Using a Large Language Model application builder, we created three custom ChatBots using current ASPS guidelines for expander- and implant-based breast reconstruction, ASPS guidelines for autologous flaps in breast reconstruction, and ERAS guidelines to simulate a standardized patient interview. A fourth non-trained chatbot served as a control.

Trainees and faculty at our institution simulated a fictional patient encounter with each chatbot. They completed a short survey evaluating the chatbot's knowledge of surgery type, lifestyle management, comorbidity management, preoperative optimization, and knowledge of ASPS and ERAS guidelines.

**Results:** Participants nearly unanimously agreed that all four chatbots adequately educated patients on chronic disease and lifestyle risk factors. All bots provided information that was helpful and factually correct. There was more heterogeneity between the chatbots when counseling patients on type of surgery and perioperative optimization. Additionally, not all bots acknowledged gaps in their knowledge.

A chi-square regression analysis was conducted using SPSS. Although this analysis did not yield statistically significant results, it provided valuable insights into which bots best delivered information concordant with guidelines. Overall, there was disagreement on its ability to counsel patients on optimization and type of surgery.

**Conclusion:** Our study indicates potential benefits and drawbacks of guideline-trained AI chatbots in educating patients on evidence-based breast reconstruction guidelines. As AI becomes more ubiquitous, further research, including expanding the respondent pool, is needed to comprehensively analyze its role in delivering patient recommendations. These data can refine the integration of guideline-driven chatbots into other plastic and reconstructive procedures. However, while AI may be helpful for some aspects of patient education regarding breast reconstruction, medical evaluation and recommendations from a plastic surgeon remain the gold standard.

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## Updated Indocyanine Green Applications in Reconstructive Plastic Surgery

Abstract Presenter: Kasha Chen BS

Abstract Co-Author(s): Youssef Aref, Victor Chien MD, Van Le

**Background:** Indocyanine green (ICG) helps preoperatively identify target organs and tumors. While research on ICG in trauma is still being explored, this project provides an opportunity to examine its utility in the reconstruction of traumatic defects. The most recent review on this topic was done in 2017, however, the rapid innovations in the field make an update necessary. This review is an update on recommendations and applications for ICG use in pre-, intra- and post- operative reconstructive plastic surgery (RPS) procedures.

**Methods:** A review was performed on Medline and PubMed for articles on recommendations for the use of ICG in RPS. Full text articles in English that analyzed ICG applications in PS procedures between Jan 2018 and Feb 2024 were included. This time period was selected following the most recent review published in 2017. Case reports, reviews, meta-analyses, and experimental studies were excluded during screening.

**Results:** 92 abstracts were reviewed and 10 full text articles that met criteria were included for full review. Updated applications of ICG use in RPS were identified in free flap perfusion assessment, treatment of secondary lymphedema, and sentinel lymph node biopsy in breast cancer. An additional clinical application microsurgery update was in the use of ICG with near infrared window II (NIR-II) compared to current standard

NIR-I.

**Conclusion:** ICG angiography continues to be highlighted as a valuable intraoperative tool to assess intra- and post-operative flap viability, neovascularization perfusion, and guide operative decision making in reconstructive plastic surgery (1). In the case of thin and superthin flaps, ICG is helpful in assessing location and patterns of pure skin perforators within superthin flaps and minimizing risk of facial nerve injury in temporoparietal fascia flap harvesting (2,3). ICG angiography can also be used to detect flap congestion after anastomosis and inset. In breast cancer related lymphedema, ICG lymphangiography (ICG-L) may be useful in preoperative staging to better stratify and select patients for microsurgical treatment (4). This may be useful to improve microsurgical outcomes such as in lymphovenous anastomosis for lymphedema treatment. In microsurgery, use of ICG with NIR-II (1,000-1700 nm) imaging is a promising new tool with advantages over other fluorescence imaging. ICG with NIR-II has real-time capturability with higher resolution in cutaneous microvasculature compared to NIR-I(5). Overall, there is potential ICG application in traumatic defect reconstruction which our institution is continuing to explore.

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## **Evaluating the Fate and Value of Submitted Publications in Plastic Surgery Residency Applications**

Abstract Presenter: Robert George MD

Abstract Co-Author(s): Caroline Bay, Sarah Thornton, Olivia Chao, Daniel Chu, Camille LaLiberte, Elif Kurt BS, Molly Winchenbach, Samuel Poore MD, PhD

**Background:** Securing a position in plastic and reconstructive surgery residency programs remains highly competitive. As applicants strive to enhance their profiles through various achievements such as Alpha Omega Alpha honor society membership, impactful letters of recommendation, and superior clerkship grades, research productivity has emerged as a critical differentiator. This importance has been magnified with the USMLE Step 1 exam's transition to a pass/fail system, leading to an increase in the average number of research publications cited in residency applications. However, less is known about publications that are listed as "submitted" to a journal on an application, rather than published or accepted. There is no way to truly verify the status or quality of publications that are listed as submitted on an applicant's record. Therefore, the purpose of this study was to investigate the fate of submitted publications and subsequently what value they possess for programs evaluating resident candidates.

**Materials & Methods:** This retrospective study included applications to an integrated plastic and reconstructive surgery residency between 2015-2023. Data on demographics and the number of submitted publications were collected. The publication status of each submitted paper was verified using PubMed and Web of Science. We compared the impact factor of the journals at submission against those of eventual publication using two-year impact factors corresponding to the submission year. Statistical analysis was conducted using univariate t-tests with an alpha threshold of 0.05.

**Results:** A total of 564 applications, encompassing 750 submitted papers, were evaluated. On average, applications featured 1.85 submitted papers (SD=3.03), with 67.7% (n=508) eventually published and 32.3% (n=242) remaining unverifiable. Papers were initially submitted to journals with an average impact factor of 3.501, which differed to a statistically significant extent from the 2.58 impact factor of journals where they were ultimately published (p=0.048). Notably, applicants were not a listed author on 2.13% (n=16) of submitted papers upon final publication.

**Conclusions:** This study found that the majority of submitted papers on applications are indeed published. However, given that the publication status of 32.3% of submitted papers was unverifiable, a significant amount of submitted papers never actually end up published. While the papers listed on the 2023 application cycle have had almost an entire year to be published, publication delay could partially explain these results. Furthermore, there was a statistically significant discrepancy between the original and final impact factors of the journals where papers were published. Additionally, authorship discrepancies in 2.13% of submitted papers call for cautious interpretation of submitted research's significance. Our paper concludes that while papers that are listed

as submitted at the time of application do indicate scholastic endeavors, they should be distinguished from published works in application evaluations. Further discussion during interviews may provide a more accurate assessment of their contribution to an applicant's scholarly profile.

### **Does the mitochondria-targeting antioxidant MitoQ reduces ischemia reperfusion injury in a rat hindlimb model?**

Abstract Presenter: Lioba Huelsboemer MD

Abstract Co-Author(s): Sam Boroumand, Jake Moscarelli, Viola Stoegner MD, Martin Kauke-Navarro MD, Bohdan Pomahac MD

**Purpose:** Procedures such as replantation and allotransplantation are limited by short muscle ischemia time and hereby resulting in ischemia reperfusion injury and mitochondrial dysfunction with the development of oxygen radicals. The effect of the mitochondria targeting antioxidant drug MitoQ has not been assessed in a rodent hindlimb model before.

**Materials & Methods:** Ischemia was induced through unilateral clamping of the iliac vessels in a rat. Two groups (A, B each n=5) received a MitoQ (4mg/kg) injection IV prior to or after 6 hours of ischemia. Ischemia was followed by 24 hours of reperfusion (endpoint of study). The uptake of MitoQ in the muscle, H/E staining of the muscle as well as blood levels of CK, CRP, WBC and release of mtDNA (via PCR) were assessed and compared to the untreated control group (C, n=5).

**Results:** Preliminary median CK level findings at baseline, 6 hours and 24 hours did not reveal any statistical significance but a trend towards lower CK level after treatment with MitoQ compared to the untreated group ( $p=0.11$ ,  $p=0.98$ ,  $p=0.30$ ). Preliminary mtDNA PCR results failed to show statistical significance ( $p=0.44$ ,  $p=0.45$ ,  $p=0.42$ ) but indicate through all assessed genes a trend towards lower mtDNA content in the treated groups A and B after six hours of ischemia and after six hours of ischemia followed by 24 hours of reperfusion compared to the untreated control group.

**Conclusion:** In summary, these preliminary results reveal a positive effect of MitoQ as compared to the untreated control group in terms of less muscle fiber disruption, lower mtDNA content and lower CK levels. Additional data and statistical tests may be needed

to reach statistical significance. These preliminary results serve as a basis for ongoing research and discussion of antioxidant treatment in elective transplant/vascular surgery or trauma settings.

## **A Novel Wound Care Dressing to Combat Hostile Wound Biofilm and Promote Functional Wound Closure**

Abstract Presenter: Mohamed El Masry MD, PhD

Abstract Co-Author(s): Sashwati Roy PhD, Sashwati Roy, CHANDAN K SEN

**Background:** Intervention to manage burn injuries and chronic wounds is a necessity. In these conditions, infection, especially from biofilm-forming bacteria, is a major challenge, because they are reluctant to respond to conventional therapeutic measures. Persister bacteria are antibiotic-tolerant bacterial cells. Mechanisms underlying biofilm formation of such subpopulation of bacteria are different from the general bacterial population. Extracellular DNA (eDNA) is a principal constituent within the biofilm matrix. DNase treatments can eradicate standard biofilms but not persister biofilms. We reported that a DNase resistant biofilm of *Pseudomonas aeruginosa* can be disrupted by aurine tricarboxylic acid (ATA), a chemical inhibitor of covalent binding between eDNA and protein<sup>1</sup>. In the current study, we incorporated ATA into a polymer-based gel (Elastogel) to develop a novel wound care dressing (GelATA) that was tested against polymicrobial persister biofilm infection in a preclinical porcine burn wound model.

**Methods:** Standardized burner<sup>2</sup> was used to create eight 2"x2" full thickness burn wounds on the dorsum of domestic white pigs (70-80lbs; n=5). The wounds were inoculated at day 3 post-burn with clinical isolates of persister biofilm strains of *P. Aeruginosa* (PAO1DwspF) and *S. Aureus* (SArexB) at 10<sup>8</sup> CFU/ml. Wounds were treated with either a standard-of-care dressing (SoC) or GelATA once weekly starting at day 7 post inoculation. On day 28 postburn, GelATA treated wounds was switched to Elastogel alone until day 56. Progression of burn wound healing was followed using; Digital images, Ultrasound Imaging, and measurement of Trans Epidermal Water Loss (TEWL). Histopathology and Scanning Electron Microscopy (SEM) of the tissues were performed on day 56.

**Results:** GelATA treated wounds showed disrupted biofilm formation in SEM images with limited bacterial colonization compared to SOC. Furthermore, GelATA significantly (p<0.05; n=5) enhanced the quality of healing that was evident from early wound closure and re-epithelialization of biofilm-infected wounds (p<0.05; n=5). Improved

wound healing with inhibition of biofilm formation resulted in functional healing which was evident by significant decrease in TEWL ( $p < 0.05$ ) signifying improved restoration of skin barrier function.

**Conclusion.** This work presents the first evidence for the efficacy of GelATA in disrupting persister biofilm and promoting functional wound closure in a pre-clinical porcine burn wound model.

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## **Development of a minimally invasive bone cutting tool for craniosynostosis surgery**

Abstract Presenter: Dale Podolsky MD, PhD, FRCSC

Abstract Co-Author: Jones Law

**Introduction:** There is an evolution towards minimally invasive surgery (mis) to treat patients with craniosynostosis with lower morbidity compared to open surgery [1]. These techniques involve suturectomy followed by helmeting or use of springs to mold the cranium. Although effective, certain types of patient presentations still require open surgery including those who present late and some surgeons reserving mis for single suture involvement. Helmet use can be burdensome to families [2] and springs require a second procedure for removal [3]. These limitations of mis approaches may be due to the less extensive osteotomies performed using currently available straight rigid tools with limited incisions. The objective of this research was to develop a novel articulating bone cutting tool that can perform extensive osteotomies along the cranium using a limited access approach, expanding the indications of mis to more patients with craniosynostosis without the need for a molding helmet or springs.

**Methods:** Computer-aided-design (CAD), three-dimensional (3D) printing and

machining was used to develop a prototype of an articulating bone cutting tool. A craniosynostosis simulator that comprises a 3D printed sagittal craniosynostosis skull and silicone scalp was developed to test the tool. A reachability analysis was performed on the simulator comparing the distance between the tool tip and skull along all areas of the skull between a conventional straight instrument and the new tool using a simulated single access incision at the vertex. The ability of the tool to perform osteotomies was tested using biomechanical polyurethane foam sheets with 2 levels of density (30 and 40 pounds-per-cube-foot (PCF), Sawbones) at 2 mm thickness.

**Results:** A physical prototype was successfully developed that comprises an articulating bending section, a multi-functional end-effector, endoscope and driving unit. The end-effector comprises a scalp retractor, dural protector-dissector, manual bone punch and endoscopic channel for visualization at the tool tip. Simulator testing demonstrated an average tooltip-to-skull distance of 6.04 mm for the straight tool in comparison to the new tool with a range of 6.25 to -14.44 mm passing through 0 mm for 96% of all points. The tool successfully cut the simulated bone at different bending angles (0, 22.5 and 45 degrees).

**Conclusions:** A novel articulating bone cutting tool was developed. Preliminary ex-vivo testing demonstrated the ability of the new tool to access all areas of the cranium using a single vertex incision as well as the ability to cut simulated bone. The tool represents a potential paradigm shift in the surgical treatment of craniosynostosis expanding the indications of mis surgery to more patients with the integration of surgical robotics and navigation.

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## **How A Combined Use Of Stem Cells And Laser Technologies For Face And Neck Rejuvenation Can Reduce Patients' Request For Surgical Correction**

Abstract Presenter: Elena Giardini MD

**Background:** The use of regenerative medicine-based approaches for non-surgical facial rejuvenation is an emergent trend and many autologous treatments have been proposed with different degrees of invasiveness and results (1,2)

Recently this author presented the first clinical report of a new concept for face and neck rejuvenation: a combined use of stem cells and two laser technologies, the wavelength 1450 nm for micro coagulation and the wavelength 980 for stimulation the production of neo-collagen and elastin (3)

**Objective:** Objective of this new report was to verify if the results obtained with this technique can modify patients' requests for additional surgical corrections.

**Methods:** We treated 450 patients with mild to high overall cutaneous photodamage and in particular with mild to severe degrees of upper eyelid dermatochalasis and of periorbital rhytides and with mild to severe skin laxity and horizontal skin wrinkles of the neck.

Patients received 4 successive laser treatments and stem cells applications at 3 weeks intervals. Clinical improvement of treatment areas was determined by comparative analysis of photographs at baseline and 1-, 6-, 12- and 24-months post treatment. At each time a specific skin software allows to evaluate wrinkles density, skin dark and light, spot density etc. Skin elasticity measurements were obtained with a cutometer and general patient satisfaction surveys were also obtained at each follow-up visit.

Further specific surveys were carried out at each time to monitor the patients' request for additional surgical correction.

**Results:** A greater than 85% clinical improvement in photodamage at different months follow-ups was achieved in nearly 95% patients, confirming previous data.

Patients also reported a statistically significant reduction of periocular wrinkles (85%) and dermatochalasis (80%), a statistically significant reduction of the horizontal neck wrinkles (90%) and an improvement of the skin laxity (80%) with stable results over time and a very high patient satisfaction rate.

The percentage of patients considering additional surgical correction dropped from 40 % pre treatment to 4 % post treatment.  
No down time and no side effects were reported.

**Conclusions:** This study confirmed the great effectiveness of this new regenerative medicine technique for the rejuvenation of face and the neck with a great patient satisfaction rate and a significant reduction in the patients' request for additional surgical correction.

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## Novel Noninvasive Hybrid Flap Preconditioning (HFP) Surpasses Surgical Delay in the Murine Model

Abstract Presenter: Chunjun Liu MD

Abstract Co-Author: Xingyi Du

**Background:** Ischemic necrosis in the distal portion of the flap is a challenging complication in plastic surgery. We hypothesize a novel hybrid flap preconditioning (HFP) device combining foam-mediated external suction and non-surgical delay can promote skin flap survival better than surgical delay.

**Method:** Twenty-eight mouse were divided into four groups. Control group: a 4\*1.5dorsal flap was made with no preconditioning. Surgical delay (SD) group: surgical delay was made 7 days before flap elevation. Foam-mediated external suction (FMES) group: foam-mediated external suction at -100mmHg was employed 5 hours per

day for 6 days, and the flap was elevated on the seventh day. Hybrid Flap Preconditioning (HFP) group: silicone strips were applied along the contour of the foam interface. Same negative pressure protocol was used as the FMES group. Seven days after flap elevation, macroscopic, histologic, and Western blot analyses were performed.

**Results:** The flap survival rate was 46.25% (8.12%) in the control group, 68.72% (7.00%) in the SD group, 57.03% (8.17%) in the FMES group and 80.66% (3.27%) in the HFP group. Immunohistologic analysis of CD 31+ cell in distal end of viable tissue procured seven days after flap elevation showed a significantly higher angiogenesis in SD group and HFP group. Western Blot results showed an increased expression of VEGF in SD group and HFP group.

**Conclusion:** We have developed and fabricated a novel hybrid flap precondition (HFP) device combining foam-mediated external suction and non-surgical delay. The concept of HFP is proved to promote flap survival better than surgical delay.

## **Transforming Plastic Surgery: The Pioneering Role of Micro-Autologous Fat Transplantation and Adipose-Derived Stem Cells in Regenerative Medicine**

Abstract Presenter: Tsai-Ming Lin MD. Ph.D.

**Introduction:** The last three decades have witnessed a monumental shift in regenerative medicine, with autologous fat grafting and adipose-derived stem cells (ASCs) at the forefront of transforming plastic surgery practices. This evolution is largely credited to the seminal contributions of Dr. Arnold Caplan in the field of mesenchymal stem cells (MSCs), which have bridged the gap between theoretical research and practical clinical application.

**Materials and Methods:** We introduce the micro-autologous fat transplantation (MAFT) technique, an innovative approach devised to minimize central necrosis in fat grafts. This technique allows for the precise and uniform delivery of fat parcels, effectively addressing the challenges of central necrosis and enhancing overall graft viability. Our analysis of over 6,000 cases, encompassing both aesthetic and reconstructive surgeries, sheds light on the clinical advantages, navigates the complexities encountered, and highlights the critical role of the transplantation process in improving long-term outcomes.

**Results:** The adoption of MAFT, coupled with the integration of ASCs and stromal vascular fractions (SVFs), has significantly elevated the success rate of fat grafting by promoting an environment favorable for neovascularization. Despite these

advancements, the journey towards widespread adoption is impeded by regulatory barriers, procedural complexities, and the necessity for standardization and specialized equipment.

**Conclusion:** Our findings advocate for a cutting-edge, integrated approach that merges the MAFT technique with compliant methods for SVF isolation to significantly advance regenerative outcomes in plastic surgery. This strategy not only highlights the synergy between volume restoration and cellular therapies but also establishes a new paradigm for achieving enduring and superior clinical results. Future research should focus on refining the MAFT technique to enhance graft survival and expand its application in diverse clinical scenarios. Embracing technologies such as artificial intelligence and 3D printing could further revolutionize the precision and outcomes of these procedures. Ongoing long-term and comparative studies are paramount in affirming MAFT's pivotal role in enriching aesthetic and regenerative surgery, ensuring safer, more efficient, and tailored patient care.

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## **Long-term effect of burns on mental health**

Abstract Presenter: Gabrielle Kang-Auger

Abstract Co-Author(s): Daniel Borsuk MD, MBA, FRCSC, FACS, Nancy Low, Aimina Ayoub, Nathalie Auger, Stephane Buteau

**Purpose:** Burns have considerable potential to impact mental health due to associated pain, scarring, and disability. However, the long-term impact of burns on mental health is understudied. Our purpose was to assess the association between burns and mental health hospitalization up to 30 years later.

**Methods:** Using a longitudinal cohort design, we compared 23,726 burn patients aged  $\geq 10$  years with 223,626 matched controls from Quebec, Canada, between 1989 and 2022. The main exposure was a burn severe enough to require hospital treatment. We identified future hospitalizations for psychiatric disorders, substance use disorders, and suicide attempts up to 30 years after the burn. We used adjusted Cox regression models to estimate hazard ratios (HR) with 95% confidence intervals (CI) for the association between burns and subsequent mental health hospitalization.

**Results:** Compared with controls, burn patients were 1.76 times more likely to be hospitalized for mental health disorders over time (95% CI 1.72-1.81). Burns covering  $\geq 50\%$  of the body (HR 3.29, 95% CI 2.61-4.15), third degree burns (HR 2.04, 95% CI 1.94-2.14), and burns requiring skin grafts (HR 2.00, 95% CI 1.90-2.10) were more strongly associated with mental health hospitalization. Compared with controls, burn patients were more than two times as likely to be hospitalized for eating disorders (HR 3.14, 95% CI 2.50-3.95), substance use disorders (HR 2.27, 95% CI 2.17-2.39), and suicide attempts (HR 2.42, 95% CI 2.23-2.62). Risks were highest in the first 5 years following a burn, but associations remained present up to 30 years later.

**Conclusions:** Burns are associated with the long-term risk of mental health hospitalization up to 30 years later, with more pronounced associations for patients with severe burns. Scarring, pain, and functional impairment may contribute to the impact that burns have on mental health. Involving mental healthcare teams early after a burn may prevent mental health complications over time.

## **Potential of Chitosan Oligosaccharide to Accelerate Wound Healing**

Abstract Presenter: Sik Namgoong MD, PhD

**Background:** Chitosan oligosaccharides (COS), derived from the natural polysaccharide chitin in crustacean shells, are known for their biocompatibility, angiogenetic, anti-bacterial and anti-inflammatory effects in vitro. However, the

intricacies of in vivo wound healing require further exploration. This study aimed to evaluate the effect of COS on wound healing and to assess their antimicrobial activity in vivo.

**Methods:** Two types of COS, namely COS-h from high-molecular weight chitosan hydrolysis and COS-w from water-soluble chitosan, were investigated for their antibacterial efficacy against methicillin-resistant *Staphylococcus aureus*. Subsequently, 48 full-thickness wounds were created in the BALB/c nude mice. The wounds were treated with COS-h, COS-w, or phosphate-buffered saline as controls. After two weeks, the healing progress was evaluated by measuring the unhealed wound areas. Collagen synthesis and the production of vascular endothelial growth factor and transforming growth factor- $\beta$  were quantified using enzyme-linked immunosorbent assays and immunohistochemistry.

**Results:** COS application markedly improved the wound healing parameters. Notably, COS-h treatment significantly reduced unhealed wound areas ( $P < 0.05$ ) and displayed potent antimicrobial activity. It also promoted higher collagen synthesis and more substantial wound contraction than COS-w.

**Conclusion:** COS-h may have the potential to accelerate wound healing by enhancing antimicrobial activity, collagen synthesis, and wound contraction.

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#### Conflict of Interest Statement

The authors declare no conflicts of interest regarding this study.

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## **Development of Artificial Dermis for Prevention of Scar Contracture and Favorable Wound Healing**

Abstract Presenter: Hiroko Ochiai MD, PhD

Abstract Co-Author(s): Shiho Watanabe, Asato Tonnegawa, Shunji Yunoki, AIKO OKA

**Purpose:** It is known that repeated deformation of skin tissue during the healing process, such as stretching and contraction, accelerates scar formation. Therefore, we conceived the idea of suppressing wound contraction by reinforcing the wound with a high-density collagen frame. We report the development of an artificial dermis with a reinforcing collagen frame (CF) that has an internal fixation effect on wounds and does not inhibit wound healing.

**Materials and methods:** Using only biodegradable collagen, we aimed to balance tissue replaceability and mechanical support. In this study, we created a Frame-reinforced Collagen Matrix (FCM) by incorporating a strengthened CF made using collagen densification technology as the skeletal structure within artificial dermis. The inhibitory effects of FCM on scar formation and scar contracture were evaluated through mouse experiments. FCM was implanted subcutaneously in ICR mice on their dorsal region, and histological changes were examined. Subsequently, 11 mm skin-defect wounds were created on the dorsal region of C57BL/6JJcl mice, and FCM along with full-thickness skin grafting was performed simultaneously. The engraftment, size, and histological changes of the grafts were examined at 7-, 14-, and 28-days post-transplantation, with existing artificial dermis and collagen without CF (CM) serving as the control group.

**Results:** We have successfully created porous artificial dermis by lyophilizing and cross-linking 3% and 20% collagen slurries (CM-3; density 30 mg/cm<sup>3</sup>, CM-20; density 200 mg/cm<sup>3</sup>). The incorporation of a high-density frame structure into a low-density

collagen matrix improved the overall mechanical strength and shrinkage resistance. In a subcutaneous transplantation experiment in the back of a mouse, CM-3 showed approximately 50% degradation and resorption only one week after implantation, and cell and tissue infiltration were observed. On the other hand, CM-20 maintained its shape almost completely even after 8 weeks. When FCM incorporating honeycomb-shaped CF was transplanted into the skin defect layer of mouse back skin, granulation tissue formation and vascular infiltration were observed preferentially in CM-3 (low-density collagen matrix), while the skeletal structure of CM-20 maintained its shape even after 2 weeks. and significantly reduced scar contracture compared to existing CM at 2 weeks.

**Conclusions:** We have devoted ourselves to the development of an artificial dermis using only collagen, with an emphasis on safety and feasibility. Our results suggest the possibility of combining two types of collagens with different densities to achieve both tissue replacement and mechanical support. In other words, it was shown that it is possible to induce granulation tissue formation while expecting scar contracture suppression. Future studies are aimed at collaborating with engineering researchers to explore the optimal volume occupancy of reinforced collagen frames, cellular dynamics, and their effect on wound healing, and to compare long-term outcomes.

## **Utilizing DNA Methylation Profiling to Determine Prognostic Markers and Recurrence Risks in Diabetic Foot Ulcer Patients**

Abstract Presenter: Sik Namgoong MD, PhD

**Background:** Diabetic foot ulcers (DFUs) are recalcitrant to healing. However, the molecular mechanism causing this dysfunction is not fully understood. DNA methylation profiles change during the proliferation, differentiation, and development of an organism, resulting in tissue or disease identification. To elucidate the biomarkers for DFU prognosis, we hypothesized that differences in DNA methylation patterns could provide important therapeutic targets in the treatment of DFUs.

**Methods:** We collected 48 blood samples from 36 DFU patients treated at Korea University Guro Hospital from October 2019 to November 2021. The Illumina MethylationEPIC (850k) DNA methylation microarray was used to determine the pattern between differentially methylated regions (DMRs) in DFU patients with good or poor prognoses. We then selected and visualized the DMRs in the form of heatmaps, and enriched terms associated with these DMRs were identified. By using the DMR list in



two processes, Kyoto Gene and Genome Encyclopedia (KEGG) and gene ontology (GO) analysis, gene-concept network, GSEA, and decision tree were performed.

**Results:** In total, 92 DMRs and 108 DMRs ( $|\text{Log}_2 \text{fold change}| > 0.1$  and  $P < 0.03$ ) were hypermethylated and hypomethylated, respectively. In the good prognosis sample, 69 and 156 DMRs were hypermethylated and hypomethylated, respectively. In the KEGG analysis, the MAPK signaling pathway was commonly detected as the highest pathway. In the decision tree, MORN1 hypomethylation and NCOR2 hypermethylation were crucial classifiers by recurrence.

**Conclusion:** Collectively, MORN1 and NCOR2 genes may be used as biomarkers for predicting the recurrences and prognosis in DFU patients. In DFUs, the clues of recurrence and prognosis prediction may be provided through DMRs and the molecular mechanisms related to inflammation.

### **Acknowledgments:**

This study was supported by grants from a National Research Foundation of Korea (NRF) grant funded by the Korean government (MSIT) (No. 2021R1C1C1008674) and Korea University Guro Hospital grant (KOREA RESEARCH-DRIVEN HOSPITAL) funded by Korea University Medicine (No. K2210441). The author discloses no other financial relationships related to this article.

### **Management of Facial Burn Scar using Repurposed FDA-Approved Drugs**

Abstract Presenter: Mohamed El Masry MD, PhD

Abstract Co-Author(s): Sashwati Roy PhD, Sashwati Roy, CHANDAN K SEN

**Background:** Facial burn injuries cause scars and contractures that are not only responsible for disfigurement but also severe functional impairment affecting quality of life. The patients will suffer permanent facial disfigurements even with multiple complex reconstructive surgeries. Conventional scar management has not worked for the management of face burn. We set up a pre-clinical face burn model. This was followed by genome wide sequencing studies which led to identification of novel molecular targets for intervention. FDA approved drugs were screened to identify two drugs (D1 & D2) for topical treatment during the early (day 14- 41) and late (day 42-84) post-burn phases.

**Methods:** White Yorkshire pigs (70-80lbs) were subjected to severe full thickness facial burn trauma (~50% face). Facial burn was treated with either a standard-of-care dressing (SoC) (n=5) or topical FDA repurposed drugs (n=5) twice weekly until d84. Progression of burn wound healing and scar formation was followed using a) digital photography b) laser speckle microperfusion imaging (LSI); c) Harmonic Ultrasound Imaging with Doppler (HUSD) for biomechanics; and d) CT for 3D reconstruction of the facial soft tissues and bone. Histopathological examination of the burn wounds and scar tissues was performed.

**Results:** Severe facial burn with bone involvement showed raised scars/contractures, cicatricial ectropion, eversion of the oral mucosa and lip (drooling), and orofacial contracture. Vascular and bone deficits (n=5) were characterized using LSI, HUSD and CT imaging. Objective scar analysis revealed a significant improvement in wound healing, reduced total scar areas and less skin contractures in drug-treated group compared to the control (n=5;  $p<0.01$ ). A significant reduction of cicatricial ectropion and oral eversion (improved oral competence) was observed in drug treated pigs. Tissue analyses revealed significant decrease in myofibroblast formation with normally distributed blood vessels in drug-treated group compared to the control (n=5;  $p<0.01$ ). Overall, the post-burn face appeared markedly better in response to treatment.

**Conclusion:** This work presents a highly relevant preclinical model to study severe facial scar contractures and related outcomes. Bioinformatic studies led to identification of candidate pathways for intervention which was followed by the successful repurposing use of FDA-approved drugs towards marked improvement of burn outcomes.

## **Reduced neutrophil response to acute wounding in STK25 deficient mice**

Abstract Presenter: Amanda Beneat MD

Abstract Co-Author(s): Bailey Roberts, Bharati Matta, Alisha Oropallo, Betsy Barnes

**Introduction:** Wound healing is marked by an initial stage of inflammation, in which immature myeloid cells and neutrophils migrate to tissues in response to cytokines and chemokines secreted by cells within the wound. The immature cells then undergo differentiation into mature myeloid cells and neutrophils become activated. Serine/Threonine Protein Kinase 25 (STK25) is a positive regulator of pro-inflammatory cytokine release and myeloid activation and has been linked to an attenuated inflammatory response in STK25-deficient mice (1) (2). Inversely, an overactive

neutrophil response can lead to prolonged inflammation and chronic wounds or scarring (3). While it is also thought to affect cell migration, this has not yet been proven.

**Methods:** STK25 deficient mice on a C57Bl/6 background, with corresponding, age- and sex-matched, wild-type littermate mice were wounded with two full-thickness punch biopsies. The wound area was calculated using the MolecuLight DX™ camera's wound measurement function. Wound healing was measured as wound area reduction at postoperative day 7. Wounds were collected en bloc on postoperative day 7 and then processed into a single cell suspension and stained for flow cytometry analysis.

**Results:** Wild-type mouse wounds were smaller in size on day 7 compared to STK25-deficient mice. Flow cytometry analysis revealed a significantly lower percentage of neutrophils in the STK25-deficient mice compared to wild-type mice. Absolute cell counts of macrophages, neutrophils, and inflammatory monocytes were decreased in STK25-deficient mice compared to wild-type mice.

**Conclusion:** Wound healing and the immune response are impaired in STK25-deficient mice compared to wild-type. Less immune cells had trafficked to the wound by day 7 with neutrophils appearing to be the most affected. While lack of initial neutrophil migration impairs wound healing, inhibition of neutrophils later in the wound healing process could be beneficial. Neutrophil apoptosis at the site of injury leads to the release of cytokines that further damage tissues and activate inflammatory cells (4). Inhibition of neutrophils in chronic wounds may therefore enable reprogramming of the wound to undergo healing, however, more study is needed.

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## **Mechanical Stimulation Improves Functional Recovery from Volumetric Muscle Loss Injury in Swine**

Abstract Presenter: Daniah Alnafisee MD

Abstract Co-Author(s): Ariana Fantakis Ettorre, Hiroshi Fujimaki MD, Mitchell Kennedy, Giorgio Giatsidis MD, PhD

**Introduction:** Severe volumetric muscle loss (VML) due to traumatic loss of skeletal muscle can result in permanent functional impairment and chronic disability in up to 65% of patients [1]. Therapies for muscle regeneration and functional recovery such as intensive physical therapy are limited in their effectiveness and clinical applicability in severe VML due to the polytraumatic nature of the injury [2]. Our prior work on rats demonstrated that mechanical stimulation of muscles promotes functional recovery (26% higher torque), improves angiogenesis, and decreases fibrosis following VML. Based on the outcomes obtained in the rodent study, we hypothesized that mechanical stimulation also improves recovery in a large animal model of VML.

**Materials and Methods:** Surgically induced injury to the left peroneus tertius muscle (PTM) in female (36-42 kg) Yucatan pigs (n=4) served as the model for VML. Post-injury, animals either received no treatment (n=2) or were subjected to mechanical stimulation of the PT muscle (n=2). To evaluate functional recovery, this study utilized measurements of pre-operative and post-treatment isometric tetanic torque and resistance to fatigue. Weekly assessments of gait were scored using the modified Tarlov scale, and the animal's level of activity was measured by recording daily number of steps using a pedometer for approximately 6-weeks post the acclimatization period of the pig. Samples of the injured PTM were collected and are being processed for histology (Masson) to measure myocyte/fibrosis percentage composition.

**Results:** On post-injury day (PID) 35, the isometric tetanic torque in the treated (mechanically stimulated) group had a significantly higher recovery compared to the control (23% +/- 0.1 of pre-injury baseline vs. 12% +/- 0.2, p=0.0004). The resistance to fatigue in the treated group was higher than in controls (37% of pre-injury baseline vs. 26%). In the treated group, the activity levels during and after treatment were significantly higher than the first 2-days post-VML injury (497 steps and 477 steps, respectively compared to 100 steps post-VML, p-value=0.005). There was no significant difference in the post-VML gait score between the treated and control groups (4.4 +/- 0.1 vs. 4.3 +/- 0.1, p=0.8).

**Conclusions:** Mechanical stimulation seems to promote functional recovery after VML injury in large animals. These outcomes should be validated in a larger cohort of animals, and in preliminary clinical trials.

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## **Comparison Of Quality, Accuracy, And Empathy Of Physician And AI Responses (PAIR) to Real Patient Questions: Physicians Vs. Various LLM**

Abstract Presenter: Haley Jeffers

Abstract Co-Author(s): Emma Sacks, Arjun Williams, Steven Williams MD, Justin Sacks MD, MBA, Lynn Jeffers MD, MBA, FACS

**Purpose:** to evaluate whether responses from ChatGPT and other LLMs could provide comparable quality, accuracy, and empathy to physician answers after controlling for potentially confounding variables such as the length of responses.

**Method:** This cross-sectional study used RealSelf.com, an online public platform where patients pose questions publicly, which are answered by verified physicians in non-anonymous accounts. Questions from the site were entered as prompts into ChatGPT and Bard and the responses were compared to the responses from physicians on RealSelf.com. Three blinded physicians evaluated matchups between different response pairs (i.e. RealSelf vs. ChatGPT, RealSelf vs. Bard, or ChatGPT vs. Bard). They chose "which response was better" and rated the quality, accuracy, and empathy of each response. The next generation generative AI bot, MedLM was also tested. MedLM was designed for healthcare and built on Med-PaLM2 that had previously scored an 85% on the USMLE.

**Results:** Initial data indicates that physician responses trended higher than ChatGPT scores, but did not show significant difference. Physician responses were significantly higher quality, more accurate, and more empathetic than Bard responses. However, ChatGPT responses, while trending higher than Bard responses, were not significantly higher. The proportion of responses with unacceptable quality, accuracy, and empathy was indistinguishable between physicians, ChatGPT and Bard. MedLM is currently being tested.

**Conclusions:** In this study, after accounting for verified physician responses and response length, ChatGPT and Bard generated acceptable quality, accurate and empathetic responses to patient questions posed in an online forum. However, overall, the physician answers were preferred over chatbot responses in 1:1 matchup.

## **The Role of Patient Reported Outcome Measures (PROMs) in The Diagnosis Of Cancer-related Lymphedema**

Abstract Presenter: Stav Brown MD

Abstract Co-Author(s): Babak Mehrara MD, Michelle Coriddi MD, Joseph Dayan MD

**Purpose:** Patient Reported Outcome Measures (PROMs) have shown high sensitivity in detecting lymphedema symptoms prior to current clinical metrics. However, a diagnostic threshold for lymphedema-specific PROMs has not been yet established. The purpose of this study was to suggest an optimal diagnostic cutoff and determine the sensitivity and specificity of lymphedema-specific PROMs in lymphedema diagnosis.

**Methods:** Between 2014 and 2024, we performed arm volume and bioimpedance measurements in patients at a tertiary cancer center. The Lymphedema Life Impact Scale (LLIS) and ULL27, validated lymphedema-specific questionnaires were administered during each visit. Survey scores were compared to volume measurements (volume differential=10%) and bioimpedance scores (LDEX=6.5) to generate receiver operator characteristic (ROC). Youden's method was used to determine the optimal cutoff scores and the sensitivity and specificity of LLIS for lymphedema diagnosis.

**Results:** 1482 patients were included. Using volume differential as diagnostic criteria, The LLIS was highly accurate (AUC=0.723, 95% CI 0.634-0.782,  $p<0.001$ ) in diagnosing lymphedema with a sensitivity of 67.2%, and specificity of 68.9% at a cutoff of LLIS=37.2% overall percent impairment score. The same cutoff of was determined

using bioimpedance scores as diagnostic criteria with high accuracy (AUC=0.782, 95% CI 0.673-0.799,  $p<0.001$ ), sensitivity of 64.2% and specificity of 77.8%. The ULL27 was less accurate compared to the LLIS (AUC=0.613, 95% CI 0.438-0.882,  $p<0.001$ ) with a sensitivity of 59.2%, and specificity of 62.9% at a cutoff of LLIS=32.1% physical impairment score. A slightly different cutoff was determined using bioimpedance scores as diagnostic criteria with similar accuracy (AUC=0.681, 95% CI 0.573-0.875,  $p<0.001$ ), sensitivity of 55.2% and specificity of 62.8%.

**Conclusion:** This is the largest study to date to provide a numeric diagnostic threshold for lymphedema-specific PROMs. Early-stage diagnosis by using PROMs prior to measurable volume changes would enable us to focus on secondary prevention efforts such as early referral to physical therapy and early surgical interventions.

## **Navigating Reapplication to Plastic Surgery**

Abstract Presenter: Robert George MD

Abstract Co-Author(s): Caroline Bay, Sarah Thornton, Tammy Zhong, Lauren Feeley, Alyssa Schappe, Aaron Dingle PhD, Samuel Poore MD, PhD

**Background:** Plastic and reconstructive surgery is one of the most competitive residency programs. This is exacerbated by the increasing number of applicants for a relatively stagnant number of residency positions. The rate of successfully matching has declined since 2018, with a match rate of ~55% in 2022. Two common strategies before reapplying are a preliminary year of residency (preliminary year) or a research fellowship. The purpose of this study was to investigate which option is more beneficial for reapplicants pursuing a successful match and to analyze the impact of research fellowship duration, location of preliminary year or research fellowship, and if there are any nuances for international medical graduate (IMG) reapplicants.

**Materials & Methods:** This retrospective study included all applicants to an integrated plastic and reconstructive surgery residency from 2015-2023. Two cohorts based on reapplication strategy (research fellowship or preliminary year) were created. Demographic, applicant, and match data were collected. Pearson's Chi-squared, Fisher's exact, and Wilcoxon rank sum testing were performed.

**Results:** 125 reapplicants were included. 71 (56.8%) reapplicants pursued a preliminary year, and 29 (23.2%) completed a research fellowship. There was no statistically significant difference in demographic data between cohorts. Research

fellowship reapplicants had a greater mean number of first author publications (8.8 vs 3.2,  $p < 0.001$ ), non-first author publications (11.3 vs 5.9,  $p = 0.021$ ), poster presentations (9.7 vs 6.0,  $p = 0.028$ ), and oral presentations (11.8 vs 6.4,  $p < 0.001$ ). There was no statistically significant difference between Step scores or number of application attempts between cohorts. Research fellowship reapplicants were more likely to match into plastic surgery than preliminary year reapplicants, with 72.4% ( $n = 21$ ) of research fellowship reapplicants matching into plastic surgery compared to 39.4% ( $n = 28$ ) of preliminary year reapplicants ( $p = 0.003$ ). There was no statistically significant difference between research fellowship reapplicants who did one research year compared to two years in terms of match success. When compared to preliminary year reapplicants, both one-year (68.4% vs 39.4%,  $p = 0.024$ ) and two-year (80.0% vs 39.4%,  $p = 0.020$ ) research year reapplicants matched at a greater rate to a statistically significant degree. When analyzing IMG reapplicants who matched into any specialty, 30.0% ( $n = 3$ ) of IMG preliminary reapplicants matched into plastic surgery compared to 100% ( $n = 6$ ) of IMG research fellowship reapplicants ( $p = 0.011$ ). All reapplicants were more likely to match at programs other than where they pursued either their preliminary year or research fellowship, as 71.4% ( $n = 35$ ) of matched reapplicants matched at other institutions ( $p = 0.002$ ).

**Conclusions:** Research fellowship reapplicants demonstrated greater research productivity and were almost twice as likely to match into plastic surgery compared to preliminary reapplicants. IMG research fellowship reapplicants also demonstrated increased match success compared to IMG preliminary year reapplicants. Simultaneously, the majority of reapplicants match at locations other than where they completed their research fellowship or preliminary year. Lastly, only one year of research appears necessary for reapplicants.

## **Trends in Minority Representation among the Independent Plastic Surgery Match Applicants**

Abstract Presenter: Maria Escobar MD

Abstract Co-Author(s): Iulianna Taritsa, Angelica Hernandez MD; Helen Xun MD; James Fanning; Jose Foppiani Mudr., Daniela Lee, Kirsten Schuster MD, JD, Samuel Lin MD, Bernard Lee MD, MBA, MPH

**Background:** Improving diversity within plastic and reconstructive surgery (PRS) trainees is a crucial step to reduce inequities at the provider level (1). Trends in minority representation among independent program match applicants are understudied. We



analyzed gender, racial, and ethnic trends among independent PRS match applicants across 2013 to 2023.

**Methods:** With the approval of the American Council of Educators in Plastic Surgery, the San Francisco Match provided data for the independent PRS match from 2013 to 2023. Trends in the independent PRS match were reviewed, and a Cochran–Armitage test was conducted to evaluate the significance of match trends in minority applicants (Female, non-White, Hispanic) over time.

**Results:** A total of 1000 applicants participated in the independent plastic surgery match from 2013 to 2023, of whom 735 matched. The number of independent PRS programs decreased from 54 to 37. The match rate decreased from 86% to 60%. For the years 2014, 2016, and 2018, the proportion of non-White applicants was significantly higher than matched participants of the same year ( $p=0.001$ ,  $p=0.027$ ,  $p=0.023$ ; respectively). The proportion of female applicants and Hispanic applicants correlated yearly to the number of matched females and Hispanics, respectively ( $p>0.05$ ). Cochran–Armitage tests showed significant differences in match trends among female ( $p=0.004$ ) participants over time.

**Conclusions:** We show a significant increase in female representation in the independent PRS match in the last decade. Non-White applicants remain underrepresented within the field. Ongoing efforts are needed to identify barriers and reduce inequities.

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#### **Development and Comparative Evaluation of Computer-based Assessment Tools for Manual and Robotic Microsurgery**

Abstract Presenter: Viola Stoegner MD

Abstract Co-Author(s): Kai Wessel, Catherine Yu, Sam Boroumand, Xinyi Xie, Hannah Ji, Alex Shi, Alex Wong, Lioba Huelsboemer MD, Bohdan Pomahac MD, Tobias Hirsch, Maximilian Kueckelhaus MD, Haripriya Ayyala MD

**Background:** Robot-assisted microsurgery is gaining increasing clinical importance as we push the boundaries of supermicrosurgery. With the ability to compensate for physiological limitations in microsurgical dexterity and potential to enable remote microsurgery in the future, robotics hold great promise to revolutionize the standards of microsurgery. However, successful clinical integration and optimization will strongly depend on specific user training and evaluation. This study aimed to develop and verify automated, practical tools that enable qualitative assessment of both manual and robotic microsurgical performance.

**Methods:** Two deep convolutional neural network-based computer algorithms were developed to facilitate computer-assisted 1. tracking of microsurgical instruments and 2. Evaluation of anastomosis quality. The first algorithm employed a combination of supervised and semi-supervised learning to train models to track both needle driver and forceps in recorded microsurgical videos. A trajectory was plotted based on the tracked area of interest and neighboring tracked points subsequently averaged to a smooth trajectory. Tremor-movements of both instruments at each instant in time were measured as the absolute deviation from the smooth trajectory. The second algorithm was trained to detect anastomosis stitches and tears as well as metrics of the stitches, while filtering out common nuisance variabilities, such as glares and noise, in images of the everted anastomoses. Both algorithms were used to verify 180 microvascular anastomoses (90 manual and 90 robot-assisted anastomoses) performed by participants with different levels of microsurgical experience in a two-center approach. For robot-assisted anastomoses the Symani surgical system (Medical Microinstruments Inc.) was used in combination with the RoboticScope (BHS Technologies).

**Results:** Both computer algorithms were successfully developed and verified, enabling both manual and robotic microsurgical self-assessment. Both models worked efficiently without the need for any tracking sensors or markers. Application of the microsurgical instrument tracking algorithm in our study population revealed a markedly higher overall degree of tremor in manually performed compared to robot-assisted anastomoses. The algorithm for anastomosis quality assessment allowed for reliable evaluation of 1) estimates of the anastomosis line, accounting for any disruptions, 2) distance between stitches, accounting for unequal distancing of sutures, 3) angles of each stitch, accounting for oblique stitches causing distortion, and 4) visible tears in vessel wall.

**Conclusion:** Microsurgical assessment is essential for microsurgical skill development, however, necessitates intensive time and personnel resources to be done effectively. Robotic microsurgery involves technology-related learning curves for surgeons of all experience levels, and thus requires time-efficient, practical, and accurate evaluation methods specific to robotic surgical paradigms. We established two completely

automated algorithms for reliable skill self-assessment applicable to both conventional and robotic microsurgery. These algorithms not only make microsurgical assessment much more accessible but can substantially accelerate the process of robotic training and evaluation, ultimately promoting their integration in clinical microsurgery.

### **Sub Normothermic Machine Perfusion (SNMP) Preservation in the Non-Human Primate forearm Model: a Preliminary Study**

Abstract Presenter: Haizam Oubari MD

Abstract Co-Author(s): Loic Van Dieren, Yanis Berkane MD, Msc, Jonathan Cornacchini, Curtis Cetrulo Jr., MD, FACS, Korkut Uygun, Alexandre Lellouch

**Introduction:** The gold standard for ex vivo preservation of vascularized composite allotransplants (VCAs) remains immersion in 4°C solutions. The muscular component of VCAs is highly susceptible to ischemic injury after a few hours. The use of subnormothermic perfusion machine (SNPM) is a promising approach for VCA preservation. Numerous studies have been conducted in rats and pigs. For the first time, we report the use of SNMP on the upper limbs of cynomolgus monkeys for 24 hours.

**Material and methods:** The forearms were harvested in non-human primates (NHPs) weighing between 5 and 8 kg. Two perfusion protocols were implemented. In the first group (n=6), a recirculating Steen perfusate was used for 24 hours, aiming at a stable pressure of 40mmHg. After an intermediate analysis, a second group (n=6) was perfused under a stable low-flow regimen with an enhanced oncotic pressure Steen+ solution that was exchanged at mid-perfusion. Experiments were conducted at room temperature for 24 hours. Pressure, flow, weight, and arterial and venous metabolic parameters (lactates, pH, glucose, O<sub>2</sub>, CO<sub>2</sub>, ions) were measured. VCA biopsies were performed before and after perfusion in both groups, and in group 2, response to neurostimulation was also investigated.

**Results:** The mean warm ischemia time (WIT) of the limbs was 3 hours. After 24 hours of continuous SNMP, mean weight gain was  $24,8 \pm 5,5$  % in group 1 and  $8,0 \pm 4,7$  % in group 2. Perfusion and metabolic parameters indicated the onset of compartment syndrome in group 1 with an increase in resistance, lactate and potassium production at mid-perfusion after a mean weight increase of 11.3%. In group 2, resistance, oxygen consumption, lactate and potassium production remained stable for 24 hours, consistent with a state of metabolic equilibrium. Histological analysis proved to be within the

normal range, with no difference before and after perfusion in group 2. In group 2, control limbs with only 3 hours of WIT didn't respond to median nerve stimulation, whereas all perfused limbs exhibited muscular contraction quantified at a mean  $2,4/5 \pm 0,89$  after 24 hours of SNMP.

**Conclusions:** We present the first application of continuous SNMP to the NHP forearm. These results contribute to a better understanding of the model's perfusion kinetics and physiology, showing promising outcomes in this clinically relevant experimental model. Limb preservation was achieved for 24 hours, and muscular contractility was restored by the SNMP.

### **Next Generation of Tissue Adhesive for Obliteration of Surgical Dead Space**

Abstract Presenter: Joseph Ribaudo

Abstract Co-Author(s): Xiaochao Xia, Connor Mullen MD, Sara Saffari MD, MSc, Daniel Colchado, Xiaowei Li, Justin Sacks MD, MBA

**Objectives:** Many plastic surgery procedures create large surgical dead spaces, which are prone to fluid accumulation leading to hematomas and seromas. Drains are used to prevent these complications, but they often cause patient discomfort and have potential for infection. Our objective is to develop a biodegradable tissue adhesive with strong adhesion and biocompatibility to obliterate surgical dead space without the drawbacks associated with traditional drainage methods.

**Methods:** We synthesized a hydrogel-based tissue adhesive with a polyester backbone brush polymers featuring carboxyl and N-hydroxysuccinimide (NHS) ester functional groups. The adhesive strength was evaluated using a universal testing machine. Peel and shear tests were conducted on rat subcutaneous tissue adhered to fat and fascia (n=3). We evaluated the heat release of our tissue adhesive when applied to rat rectus abdominus fascia (n=3), using a FLIR one thermal camera for measurement. For comparison, cyanoacrylate was used as a control due to its strong adhesion properties and known exothermic reaction. Cytocompatibility of our adhesives was tested at various concentrations (0, 7, 14, and 21 mg/mL) on human umbilical vein endothelial cells (HUVECs), using LIVE/DEAD staining and the alamarBlue assay to assess cell viability. Finally, to test tunable biodegradability, we varied the percentage of double bonds in our adhesive (100%, 40%, and 25%). Each was placed in PBS for four weeks and was weighed weekly.

**Results:** The peel tests demonstrated similar interfacial toughness between our tissue adhesive and cyanoacrylate when bonding subcutaneous tissue to fat (294.2 vs. 340.9 J/m<sup>2</sup>, p=0.69) and subcutaneous tissue to fascia (394.7 vs. 276.4 J/m<sup>2</sup>, p=0.65). In shear tests, our tissue adhesive demonstrated comparable shear strength to cyanoacrylate for subcutaneous tissue to fat (27.9 vs. 26.0 kPa, p=0.58) and subcutaneous tissue to fascia (28.7 vs. 25.0 kPa, p=0.76). Thermal analysis demonstrated that cyanoacrylate led to a peak tissue temperature of 29 °C, compared to 24.8 °C for our tissue adhesive. After 24 hours, there was no significant decrease in cell viability at any concentration of our tissue adhesive. Lastly, after four weeks, the 100% double bond adhesive retained nearly its original weight, the 40% double bond adhesive was about 60% of its original weight, and the 25% double bond adhesive was about 15% of its original weight.

**Conclusion:** Our novel tissue adhesive, with its polyester backbone, has demonstrated strong adhesion, tunable biodegradability, and biocompatibility. The adhesion strength tests, comparing our adhesive with cyanoacrylate, demonstrated similar strength in both peel and shear tests on tissues relevant to abdominoplasty. A notable advantage of our tissue adhesive is its minimal exothermic reaction, ensuring higher cell viability, which stands in contrast to cyanoacrylate. Furthermore, we demonstrated tunable biodegradability of our adhesive, which can be optimized for different surgical uses. We are currently optimizing our tissue adhesive to best suit abdominoplasty usage in a small animal model. Our adhesive's subcutaneous use has potential to provide a comfort and safety advantage compared to subcutaneous drains for many operations.

## **numeriFACE – A novel computational tool to quantify facial paralysis outcomes: a pilot study**

Abstract Presenter: Amjed Abu-Ghname MD

Abstract Co-Author(s): Raghav Upadhyaya, Basil Alias, James Zhang, Samuel Razmi, Alexa De La Fuente Hagopian MD, Amy Xue MD, Michael Klebuc MD

**Background:** The subjective nature of outcomes analysis in facial paralysis makes it challenging to disseminate data accurately and universally about these injuries. Due to the paucity of reliable and quantitative tools to accurately analyze pre- and post-operative facial function, providers resort to subjective surveys, photograph comparisons, and gross physical examination. Prior methods utilizing Emotrics and

eFACE software lack automatic point registration and depth-field characterization. The authors in this study describe the creation and implementation of an open-source, electronic, quantitative facial function tool, numeriFACE, that provides clinicians with patient tailored numerical data and interactive facial mapping that allows tracking postoperative outcomes, assessing interventions efficacy, and utilizing objective data universally.

**Methods:** numeriFACE can be use both prospectively through three-dimensional (3D) patient images or live video as well as retrospectively using two-dimensional images. numeriFACE was applied retrospectively to 10 patients' facial photographs while performing facial expressions both pre- and post-operatively with varying facial features. 732 points of interest were extracted, and 3D comparison maps were created. Point by point analysis was performed to create 3D deformation maps visualizing and quantifying the changes in: commissure excursion, lower lip depression and upper lip deviation.

**Results:** numeriFACE novelly illustrated depth of change in facial expression as well as registered global changes seen in cases of synkinesis. Focusing on perioral data, postoperatively patients left and commissure excursion (CE) improved 9.9% and 7.9% respectively, while upper and lower lip symmetry improved by 51% and 58%.

**Conclusion:** numeriFACE is a novel, reliable, standardized, and patient-specific clinical tool to quantify, monitor and assess facial function and recovery in facial paralysis patients.

## **Inhibiting Yes-associated protein prevents scarring and promotes regeneration in a large animal model of wound repair**

Abstract Presenter: Michelle Griffin MD

Abstract Co-Author(s): H. Peter Lorenz MD, Derrick Wan MD, Michael Longaker MD, MBA, FACS

**Introduction:** We recently showed that inhibiting mechanotransduction (Yes-associated protein [YAP]) in mouse wounds yields regeneration without scarring. However, rodents are loose-skinned and fail to recapitulate key aspects of human wound repair. We sought to elucidate the effects of YAP inhibition in red Duroc pig wounds, the most human-like model of scarring.

**Methods:** Full-thickness excisional wounds (2x5cm hexagons) were produced on the

dorsum of adult pigs. Wounds received intradermal verteporfin (YAP inhibitor; 2mg/mL) or vehicle control (PBS) followed by primary repair with 3-0 Vicryl deep dermal and 3-0 Monocryl running subcuticular sutures. Cutometer measurements were obtained to assess tissue stiffness every two weeks. Wounds and unwounded skin were harvested after 2, 4, 8, and 16 weeks for histologic (hematoxylin and eosin staining), mechanical (Instron strength testing), scRNA-seq (10X Chromium) analyses and CODEX protein spatial analyses.

**Results:** Grossly and histologically, verteporfin treatment significantly reduced scarring and promoted skin regeneration, including recovery of hair follicles/glands (Figure 1A-B). Verteporfin-treated wounds were both significantly less stiff (Figure 1C) and stronger (Figure 1D) than PBS-treated wounds, with mechanical properties similar to those of unwounded skin. scRNA-seq identified two novel fibroblast subpopulations, one enriched in regenerating (verteporfin) wounds and unwounded skin, the other enriched in scarring (PBS) wounds (Figure 1E-F; clusters 1 and 4, respectively). Pseudotime trajectory constructs demonstrated putative state transitions between these two populations, which were supported by prospective FACS isolation and force manipulation in a 3D culture system. CODEX protein spatial analysis further supported the fibroblast dynamics among treatment groups as that observed by scRNAseq. CODEX spatial protein expression analysis confirmed that fibrotic and regenerative fibroblast subtype markers identified by scRNA-seq at the protein level, with differential distribution and cell-cell interactions in PBS-versus YAPi-treated wounds.

**Conclusion:** One-time local administration of verteporfin following injury significantly reduces scarring and induces regenerative healing in a large animal model. Collectively, our findings provide critical support for the future translation of local mechanotransduction inhibitors to prevent human skin scarring.

## **Current Trends in Healthcare Technology Consulting Among Academic Plastic Surgeons**

Abstract Presenter: Brody King MD

Abstract Co-Author(s): Kala Pham, Aaron Chen, Ricardo Alfaro Zeledon, Taegen Senawong

**Purpose:** Medical device companies rely on the input of plastic surgeons to develop safe and effective products for our patients, often recruiting experienced surgeons as

paid consultants. In response to prior controversies related to inappropriate prescribing patterns and financial relationships between physicians and private industry, the Open Payments database was created to reduce bias and promote transparency (1). It is not well understood how educational background, clinical training, and research experience influence consulting payments made to academic plastic surgeons.

**Methods:** Open payment data for all surgeons affiliated with independent and integrated plastic surgery programs were collected for 2022. Additional data, including each surgeon's educational background, years of clinical experience, and the number of peer-reviewed publications were collected from program websites, LinkedIn, and PubMed.

**Results:** A total of 969 academic plastic surgeons within 94 institutions were included. A total of \$2.15M in consulting payments were made to 107 (11%) surgeons across 54 institutions (57.5%), which represents 16% of the total \$12.94M in general payments made to all academic plastic surgeons. Among surgeons who received consulting payments, 21 (19.4%) held additional graduate degrees, 77 (71.3%) completed fellowship training after residency, the average number of peer-reviewed publications per surgeon was 80 (std dev = 74) and the average length of time in practice was 16 years (std dev = 9.2 yrs). Consulting payments ranged from \$25 to \$59,5158 with an average of \$19,920, standard deviation of \$6,1716, and median of \$6950. The top 20% of surgeons received 76.2% of all consulting payments, and the top 3% received 43% of all payments. Surgeons received consulting payments from an average of 4.42 companies. Additional graduate degrees ( $p=0.8$ ), fellowship training ( $p=0.9$ ), number of publications ( $p=0.85$ ), and years of experience ( $p=0.5$ ) did not have a significant influence on total consulting payments made to individual academic surgeons. Among the 54 programs with consulting payments, an average of 9.7% of faculty members per institution engaged in consulting work. Food/beverage payments were the only payment type of payment for 680 (70.1%) of surgeons, and no payments of any kind were reported for 81 (8.4%) of surgeons.

**Conclusion:** Consulting with the medical device industry is relatively uncommon among academic plastic surgeons, with high variability in payments made between plastic surgeons. Surprisingly, the total consulting payments made to academic surgeons do not appear to be significantly influenced by additional graduate or fellowship training, years of clinical experience, or the number of peer-reviewed publications. This variability may be partially explained by differing levels of availability, personal interest, connections to industry partners, and institutional policies that limit certain relationships with private industry. Further studies are needed to understand attitudes towards consulting among academic plastic surgeons and institutional safeguards to further



promote ethical and transparent relationships.

### **Citations:**

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## **Predictors of the Integrated Plastic Surgery Applicant Success using the Texas STAR Database**

Abstract Presenter: Maria Escobar MD

Abstract Co-Author(s): Benjamin Rahmani, James Fanning, John Park PharmD, Valeria Bustos Hemer MD, MS, MPH, Angelica Hernandez MD, Jose Foppiani Mudr., Daniela Lee, Samuel Lin MD, Bernard Lee MD, MBA, MPH

**Background:** The plastic surgery residency match is one of the most competitive in the field of medicine (1). Applicants typically are among the most qualified in terms of research productivity, honor society status, and standardized board scores, yet this field has the lowest match rates amongst all specialties (2,3). Understanding the extent to which each application component plays a role in successfully matching is critical to guiding applicants, especially with USMLE Step 1 transitioning to a pass/fail evaluation (4). The purpose of this study was to evaluate several applicant characteristics associated with a successful outcome in recent years for the integrated plastic surgery residency match.

**Method:** A retrospective evaluation of the 2017-2023 Texas STAR (Seeking Transparency in Application to Residency) database was conducted. Characteristics and predictors were compared based on applicants' match status. Group differences were assessed using unpaired t-tests, chi-square, and Fisher's exact tests. Logistic regression models were conducted to identify significant predictors associated with matching. A Cochrane-Armitage test was performed to evaluate the significance of trends on applicant connections with programs over time.

**Results:** A total of 381 applicants for integrated plastic surgery residency were included. Of those, 295 (77.4%) matched and 86 (22.6%) did not match. Matched applicants had a significantly higher mean USMLE Step 2 CK score (256 vs 253;  $p=0.006$ ) and mean honored clerkships (4.4 vs 3.6;  $p=0.009$ ) compared to unmatched

applicants. Additionally, significantly higher rates of AOA (45.1% vs. 29.1%;  $p=0.009$ ) and MD applicants (100% vs. 97.7%;  $p=0.009$ ) were observed in the matched group compared to unmatched applicants. Matched applicants applied to significantly more programs (72 vs. 63;  $p=0.002$ ) and attended more interviews (14 vs. 10;  $p<0.001$ ). There were no significant differences in mean number of research experiences ( $p=0.199$ ), abstracts, presentations, and posters ( $p=0.072$ ), peer-reviewed publications ( $p=0.318$ ), volunteer experiences ( $p=0.965$ ) or leadership positions ( $p=0.432$ ) among groups. Receiving honors in 4 or more clerkships was identified as a significant predictor of a successful match (OR 1.51, 95% CI 1.025-2.227;  $p=0.037$ ). Most applicants (75.9%) were matched at a program where they either did an away rotation, had a personal geographic connection, or attended medical school in the same geographic region. A significant increase in trends was observed in an applicant having a personal geographic connection over time ( $p=0.005$ ).

**Conclusions:** Our findings suggest that excelling on clinical rotations and USMLE Step 2 CK appears to be a strong predictor of successfully matching into integrated plastic surgery residency. Increased trends of applicant connections with programs over time underscore the growing relevance of these aspects among successful applicants.

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## **Craniomaxillofacial bone regeneration with attenuated early inflammatory response by sustained-release of BMP-2 using peptide amphiphile nanofibers**

Abstract Presenter: Nathan Sigel

Abstract Co-Author(s): Zachary Brooks, Taro Inagaki, Reza Jarrahy MD, Akishige Hokugo, Satomi Arimoto

**Background:** Bone morphogenic proteins (BMPs) have numerous applications in craniomaxillofacial surgery and play a central role in the development of regenerative therapies for bone reconstruction. The broad applications of BMPs are limited by its side effect profile, such as severe edema and local inflammation. Nanoscale peptide amphiphiles (PAs) are a novel biomaterial that self-assemble into nanofibers. These PA gels have demonstrated the ability to function as a sustained-release carrier of biological molecules and support tissue regeneration. In this study, we examined the effect of PA gels on in vitro osteogenic differentiation of bone marrow stromal cells (BMSCs) and in vivo bone repair and its associated inflammatory response in craniomaxillofacial bone defect models.

**Methods:** BMP2 release from PA gels was examined. Human BMSCs were cultured and treated either with growth medium or media with BMP-2 and PAs. Quantitative RT-PCR of genes specifically related to osteogenesis was used to assess for osteogenic differentiation in vitro. Craniomaxillofacial bone defects were created in rabbit calvaria and rat maxilla according to the established method. The defect was treated with collagen material containing BMP2 with or without PA gels. A control group with only collagen material was also designed. After 8 or 12 weeks, the bone tissue including defect was harvested for radiographic analysis with micro-computed tomography and for histology to assess bone repair. Moreover, soft tissue around the defect was harvested and expression of inflammation-related genes were evaluated. The specimens were also subjected to immunohistochemical (IHC) staining to observe the inflammatory response between groups.

**Results:** BMP2 was released from PA gels in a sustained-release manner. Osteogenic activity on BMSCs under the PA gel incorporating BMP2 was significantly increased compared with control. In the craniofacial bone defect model, collagen with low-dose BMP2 incorporating PA gel showed robust bone regeneration on radiographic and histologic analyses comparable with collagen with high dose BMP2. The expressions of IL6, TNF- $\alpha$ , and Cox2 was increased in the defect with the high dose BMP2 group and normalized in the collagen with high or low dose BMP2 incorporating PAs similar to the collagen with PAs group. IHC staining was consistent with this gene expression result.

**Conclusions:** This study may represent the use of PAs with low dose BMP2 as a viable alternative to current uses of clinical BMP2 in craniofacial surgery. Sustained-release of

BMP-2 from PA gels can reduce the inflammatory response to BMP2 without impairing bone regeneration in the craniomaxillofacial area.

## **Artificial Intelligence in Plastic Surgery: Comparing Responses to Patient Questions in Plastic Surgery**

Abstract Presenter: Helen Xun MD

Abstract Co-Author(s): Benjamin Rahmani, Daniela Lee, Alexander Sun MD, Maria Escobar MD, James Fanning, Samuel Lin MD, Bernard Lee MD, MBA, MPH

**Background:** Publicly accessible large language model (LLM) chatbots (ChatGPT and Google Gemini) have evolved significantly, including recent adaptations for clinical settings, called medAPIs (medical application programming interfaces) (1). Patients and health care professionals who previously used traditional plastic surgery expert opinion platforms (ie. RealSelf.com) may now utilize these chatbots due to ease of access, instant responses, and privacy. However, given the novelty, little is known on the accuracy and satisfaction of these chatbots versus plastic surgeon expert opinions, and consequent utility in practice integration. Doximity, an online networking service for medical professionals, has recently launched their medAPI, DoximityGPT. As 80% of US physicians are registered on Doximity and have access to DoximityGPT, it is important to study how healthcare specific chatbots compare to traditional ones. This study characterized and compared the accuracy, comprehensiveness, and readability of traditional chatbot- and medAPI-generated responses for common plastic surgery questions, compared to plastic surgery expert opinion (RealSelf).

**Methods:** The most popular reconstructive and aesthetic procedures on RealSelf.com were identified, including the corresponding top two questions and top two expert provided answers; questions with photographs were excluded. These questions were then queried to healthcare chatbots (DoximityGPT, DrGupta.AI) and traditional chatbots (ChatGPT, Gemini). Three expert evaluators blindly evaluated all chatbot and RealSelf answers on a previously published and validated scale on accuracy (1-6), comprehensiveness (1-3), and recommendation based on answer. Readability scores of answers were calculated (Flesch-Kincaid Grade Level, Gunning Fog Index, Coleman-Liau Index, Simple Measure of Gobbledygook [SMOG] Index, and Automated Readability Index). All readability scores estimate the U.S. academic grade level to comprehend written content. Statistical analysis was conducted with Dunnett's, chi-squared, and ANOVA, with a p-value < 0.05 used for statistical significance.

**Results:** Evaluators were least likely to recommend an answer from a plastic surgeon on RealSelf (50.95%), and most likely to recommend a response from DoximityGPT or ChatGPT (77.01%, 72.41%,  $p<0.001$ ). Significant differences were observed in the accuracy rates across all responses. RealSelf had the lowest accuracy score (4.09, SD 1.05) compared to DoximityGPT (4.61, SD 1.08,  $p<0.001$ ). Similarly, RealSelf had significantly lower scores on how complete the response was (1.63, SD 0.66) across all groups, with DoximityGPT showing the highest score (2.30, SD 0.70,  $p<0.001$ ). Readability score was significantly higher for all chatbots compared to surgeon answers (10.99, SD 2.72,  $p<0.001$ ); traditional chatbot reading levels were lower than healthcare chatbots ( $p<0.001$ ).

**Conclusions:** Healthcare chatbots provided the most accurate and comprehensive responses to common patient questions, followed by traditional chatbots and RealSelf surgeon answers. However, reading level scores of chatbots were higher, and should be adjusted in the future for all patient reading levels. Future directions will account for empathy level of responses, different languages, safety of responses, and chatbot generated referrals to a board-certified plastic surgeon or other specialties.

## **References:**

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## **Controlling Coagulopathy: Enoxaparin Titration for the Burn Injured Patient**

Abstract Presenter: Kevin Vega MD

Abstract Co-Author(s): Morgan Palumbo, Ke Cheng, Huaqing Zhao, Jeffrey Anderson

**Introduction:** Burn-injured patients develop altered metabolic processes that place them at increased risk of developing venous thromboembolism (VTE) (1). A protocol for enoxaparin titration in the trauma patient has previously been established (2). However, the benefit and safety of enoxaparin titration for prevention of VTE in burn-injured patients has yet to be thoroughly explored. We hypothesized that titration of enoxaparin for VTE prevention in burn patients would be feasible and safe.

**Methods:** We performed a single center retrospective study of burn injured patients admitted to our American Burn Association verified burn center from January 2021 to June 2023. In May 2022, our burn center adopted the American Association for Surgeons in Trauma protocol for enoxaparin dosing. This includes twice daily administration of enoxaparin, followed by measurement of anti-Xa levels prior to administration of the fourth dose. We had previously been administering a standard dose of 30mg twice daily. Anti-Xa levels were used to guide enoxaparin dose adjustments to remain within prophylactic range. Demographic information, burn characteristics, and hospital data were collected and univariate and multivariable analyses were performed. Patients hospitalized for under 48 hours, with chronic kidney disease, and with multiple missed enoxaparin doses were excluded.

**Results:** 239 patients were included. When focusing on VTE, there were five incidences recorded of which four occurred in the non-titrated group ( $p = 0.40$ ). The presence of VTE was associated with increased mortality ( $p < 0.0001$ ), yet did not correlate with burn TBSA% ( $p = 0.50$ ) or length of hospitalization ( $p = 0.96$ ). Of note, mean burn TBSA % did not significantly differ between titrated and non-titrated groups ( $p = 0.20$ ). When focusing on bleeding, fourteen patients required post-operative intervention for hemostasis. Half occurred in each group, and this was not associated with enoxaparin titration ( $p = 0.21$ ), TBSA % ( $p = 0.22$ ), inhalation injury ( $p = 0.61$ ), length of hospitalization ( $p = 0.60$ ), or change in mortality ( $p = 0.72$ ).

**Conclusion:** Enoxaparin titration is a safe and feasible practice for the prevention of VTE in burn-injured patients. Larger studies are needed to determine its effect on VTE prevention.

#### **Citations:**

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## **Evaluation of Cellular Inflammatory and Stress Response Pathways Conferring Protection Against Compartment Syndrome in Reperfusion of Machine Perfused and Cold Storage Control Limbs**

Abstract Presenter: Abigail Meyers MD

Abstract Co-Author(s): Mazen Al-Malak MD, Jacob Lammers MD, Jesse Zhan, Ying Ku DO, Lianne Mulvihill MD, Antonio Rampazzo MD, Bahar Bassiri Gharb MD, PhD

**Purpose:** This study aimed to identify transcriptomes predictive of clinical outcomes during ex vivo normothermic limb perfusion (EVNLP) and reperfusion. We hypothesized that minimal muscle injury observed following (associated with <5% weight gain) 24 hours EVNLP limbs would be associated with a transcriptomic profile indicative of clinical condition.

**Methods:** Bilateral porcine forelimbs were procured and randomly allocated to 24h EVNLP (n=4) or SCS (n=4) followed by 3h reperfusion. The perfusate consisted of porcine blood. Limb weight, contractility, hemodynamic parameters, perfusate electrolytes, metabolites, and gases were recorded. Skeletal muscle specimens were collected before limb procurement, every 6h for 24h, then every 30m of reperfusion.

For gene expression analysis, reads were aligned to the sus scrofa genome build using salmon 0.14.1 to quantify transcript abundance in transcripts per million (TPM) values. Transcripts were summarized as gene-level TPM abundances via tximport. A gene with TPM > 1 was considered expressed. Differential expression analysis was then performed using DESEQ2. Pathway analysis was performed using Panther Classification System. Significant genes were called based on p-adj and fold change values.

**Results:** The median weight change throughout EVLP was -4.55% [-5.5- -0.86%] and for -0.4 [-7.2- -0.2%] for SCS limbs p=0.72. Throughout 2h reperfusion, there was significant weight gain associated with compartmental edema in the SCS group 22.4% [20.6-20.42%] compared to EVNLP 0.7% [0.45-2.85%] (p=0.009).

Along with weight gain after 2h reperfusion, SCS limbs exhibited significantly higher compartment pressures than those of EVNLP limbs: anterior 143±8mmHg vs. 51±7mmHg (p=0.0001); posterior 85±11.3mmHg vs. 29±1mmHg (p=0.001).

Between EVNLP and SCS, a total of 3,940 genes were differentially expressed (p<0.05). The top five differentially expressed pathways were upregulated in EVNLP:

intracellular protein transport, cytokine signaling, regulation of cellular response to stress, protein modification, and growth regulation.

Major upregulation was detected as early as 6h: 2,697 differentially expressed genes (DEGs) in EVNLP versus 42 in SCS ( $p < 0.05$ ). By 12h there were 3,414 DEGs ( $p < 0.05$ ); fold change 1.13. At 18h, the most genes (3,379) were significantly differentially expressed ( $p < 0.05$ ); fold change 1.22. By 24h perfusion end, 3,246 were differentially expressed ( $p < 0.05$ ) compared to baseline; fold change 1.19.

During reperfusion, EVNLP limbs had 1,855 DEGs ( $p < 0.05$ ); fold change 1.15 from baseline. However, there were 182 significantly differently expressed genes for SCS limbs during reperfusion compared to baseline ( $p < 0.05$ ); fold change 0.68. When directly comparing expression during reperfusion between the two groups, there were only 41 DEGs ( $p < 0.05$ ); fold change 0.637.

**Conclusions:** EVNLP significantly upregulates immune and cellular stress pathways compared to baseline and SCS limbs as early as 6h. Interestingly, we found that reperfusion after 24 hours of cold storage does not induce the same level of gene expression as immediate perfusion. Cold storage was associated with halted transcription that does not return with reperfusion, suggesting that limbs stored on ice cannot benefit from reperfusion after a certain timepoint. The clinical weight gain exhibited during reperfusion and evidence of compartment syndrome was not reflected transcriptionally in SCS limbs, presumably due to diminished metabolic activity.

## **Animal Experimental Study on Fibrosis and Inflammatory Reactions According to the Hardness of Nasal Silicone Implants**

Abstract Presenter: Da Woon Lee MD

**Background:** Silicone nasal implants have long been widely utilized in primary rhinoplasty for many years. However, persistent complications such as contracture and calcification have been consistently reported, suggesting associations with excessive mechanical or chemical stress on the tissue, such as friction force and chronic inflammatory responses. Furthermore, it is believed that silicone materials with higher hardness may contribute to complications like continuous stimulation on the nasal envelope, leading to calcification and contracture. Currently, there is a lack of research investigating whether the hardness of nasal implants correlates with the reduction of fibrosis and inflammation. Therefore, this study aims to prospectively explore the



relationship between the hardness of silicone implants and fibrosis and inflammation through animal experiments.

**Methods:** Three types of nasal silicone implants with identical sizes but varying hardness levels were employed. The hardness of the silicone implants was measured on the Shore A scale and designated as 23, 41, and 45, respectively. Subsequently, implants were placed bilateral on the back and head of 15 ten-week-old female Wistar rats, specifically beneath the panniculus carnosus layer, which closely resembles the human SMAS (Figure 1). The size of the silicone implants matched those commonly used in human procedures. After a lapse of 10 weeks post-implantation, clinical aspects such as differences in immune reactions and the formation of peri-implant capsules are analyzed within the host's body.

The host's intra-tissue response was assessed through RT-PCR, utilizing 11 markers. Furthermore, specific markers were investigated through Immunohistochemistry staining. Histological analysis of capsule samples was performed by a pathologist to investigate vascular congestion, acute and chronic inflammation, and fibrosis in the tissues surrounding the implant material [1]. Quantification and statistical analysis of these parameters were conducted to derive scores for inter-group comparisons.

**Results:** Using three different implants, a total of 45 peri-implant capsules were obtained. Histological analysis of the peri-implant capsules revealed lower levels of vascular congestion, fibrosis, acute, or chronic inflammation in the group with lower hardness. The histological analysis indicated lower scores in the group with lower hardness ( $p$ -value < 0.05). Significant differences were observed in four RT-PCR markers (IL-4, tumor necrosis factor- $\alpha$ ,  $\alpha$ -smooth muscle actin, and TGF $\beta$ 2). Masson trichrome staining for collagen fiber within the capsule showed that the group with lower hardness exhibited fewer collagen layers. These data suggest that lower hardness values, indicating softer silicone material, demonstrate superior anti-inflammatory properties and form thinner and weaker tissue capsules.

**Conclusions:** In summary, when silicone implants are stably positioned within the host, lower hardness silicone implants result in fewer side effects related to inflammation induction or spherical capsule formation. These findings contribute to our understanding of how alloplastic materials behave in the nasal dorsum and their impact on the skin and soft tissue envelope.

## **References:**

[1] Cingi C et al. Two new polymers as candidates for rhinoplasty allografts: an experimental study in a rabbit model. *Ann Otol Rhinol Laryngol.* 2013 Jul;122(7):474-9.