performed with free unilateral DIEP (10/18), pedicled SIEA+DIEP (3/18), pedicled SIEA+DIEP with supercharged/turbocharged SIEA+DIEP (2/18), free bilateral turbocharged DIEP (1/18), free bilateral supercharged DIEP (1/18), flow-through KISS flap (1/18). Of 18, 8 had a flap-site complication: minor wound dehiscence (6/18), infection (3/18) and marginal

flap necrosis (<5 mm; 2/18). There were no cases of partial/total flap loss, no take backs, and no hernias/bulges. **Conclusions:** Abdominal-based flaps should be considered the workhorse cutaneous flaps for most large oncologic defects. **Learning Objectives:** Participants will learn about reconstructing massive defects utilizing variations in abdominal-based cutaneous flaps.

Canadian Society of Plastic Surgeons/Société Canadienne Des Chirugiens Plasticiens 71st Annual Meeting/71e Réunion annuelle June 21-24, 2017

CSPS President/Président SCCP: Peter Lennox, MD, FRCSC

**CSPS Vice-President & Scientific Program Chair/Vice-Président SCCP & Président
du Comité de programme: Gorman Louie, MD, FRCSC**

**Annual Meeting Host Committee Chairs/Co-Présidents du Comité d'accueil:
Jennifer Giuffre, MD, FRCSC and Tom Hayakawa, MD, FRCSC**

C001 - Eye Opener

Diabetic Foot Disease

Umraz Khan, MBBS, BSC, FRCS, FRCS

Consultant Plastic Surgeon, Westbury-on-Trym, United Kingdom

Using clinical cases, the global burden of this condition and types of presentations made to plastic surgeons will be outlined.

Learning Objectives

- (1) Bring participants up-to-date knowledge and principles of modern management of this condition.
- (2) Participants will understand the current literature on this subject.
- (3) Participants will understand the care necessary for healing these patients' open wounds.

GENERAL SESSION

01 - Paravertebral Blocks Associated With Improved Pain Control, Decreased Narcotic Usage, Earlier Discharge From PACU, and Increased Cost Savings Compared to General Anesthesia Alone in Immediate Breast Reconstruction Following Mastectomy

M. Stein*, D. Waltho, T. Ramsey, A. Arnaout, and J. Zhang
Ottawa, Ontario, Canada

Purpose: The use of paravertebral nerve blocks (PVB) in breast surgery has proved to be a promising adjunct to standard

analgesic protocols. Reducing postoperative pain, nausea, and vomiting can have a significant impact on improving patient satisfaction and reducing hospital stay. The present study is the largest retrospective cohort study to date evaluating the impact and cost of paravertebral blocks in immediate breast reconstruction following mastectomy. **Methods:** A retrospective cohort study (REB# 20160428-01H) identified 312 patients who underwent immediate breast reconstruction following mastectomy, 119 (38%) who underwent standard analgesic protocols alone and 193 (62%) who underwent preoperative PVBs in addition to standard analgesic protocols. Electronic medical records were analyzed for patient demographics, type, indication and laterality of mastectomy, cancer type, adjuvant chemotherapy/radiation use, PVB use, postoperative narcotic and antiemetic use, serial pain scores, and length of stay in PACU. Primary outcomes were oral morphine equivalent use, length of stay in PACU, and self-reported pain scores. Direct (materials/staff) and indirect (space/operational) costs were incorporated into an economic analysis for performing PVB in breast surgery patients. **Results:** There were no significant differences in age, body mass index, procedure type, or cancer diagnosis between the 2 groups. Patients in the PVB group had statistically significant reductions in postoperative pain and opiate usage compared to patients having general anesthesia alone. Patients who received the PVB also required a shorter stay in PACU, which was associated with significant cost savings for the hospital. **Conclusions:** The use of paravertebral blocks in immediate breast reconstruction is associated with reductions in narcotic usage, patient-reported pain scores, and length of stay in PACU. Expedited discharge from the PACU results in cost savings for the hospital. **Learning Objectives:** Participants will be able to appreciate the clinical and economic

impact of using paravertebral blocks in immediate breast reconstruction following mastectomy.

02 - Examining revisionary surgery rates of breast cancer patients in Alberta who have undergone breast conserving surgery

C Wilkes*, K Donaldson, A Bennett, L Korus Edmonton, AB

Purpose: Breast cancer is the most common cancer affecting Canadian women. Select breast cancer patients have the option of receiving breast conserving surgery (BCS) as opposed to a mastectomy with the intention of preserving an aesthetic breast. However, minimal literature exists examining the rates of non-oncologic revisionary surgery post-lumpectomy. Our study aims to determine the rate of revision surgery after BCS, and whether there are factors that influence the likelihood of needing reconstruction. **Methods:** Female breast cancer patients were identified through the Alberta Cancer Registry from 2002-2015. Data on women treated with BCS was obtained including age, tumor stage, postal code and co-morbidities. These patients were cross-referenced with inpatient and outpatient databases to identify which women underwent further revisionary surgery. The data was stratified to account for factors impacting the overall likelihood of undergoing breast reconstruction and then analyzed to identify factors that could be correlated with an increased likelihood of non-oncologic revisionary surgery after BCS. **Results:** 13,622 women in Alberta underwent a lumpectomy between 2002-2015. 645 of these women had further revisionary surgery. The three most common procedures were contralateral breast reduction, ipsilateral implantation of prosthesis, and ipsilateral implantation with autograft. Tumor stage was significantly different between groups ($p = 0.022$) with the reconstructed group having a higher mean (1.78) than the non-reconstructed group (1.67). The mean age in the reconstructed group (50.3) was less than the non-reconstructed group (60). **Conclusions:** The majority of women in Alberta undergoing lumpectomy for breast cancer are not receiving further revisionary surgery. Women with more advanced tumor stage were more likely to undergo revisionary surgery, compared to those with smaller tumors. Such data could be useful in pre-operative counselling regarding BCS. Our results suggest that younger women are more likely to undergo revisionary surgery, which is in keeping with factors known to influence overall breast reconstruction rates. **Learning Objectives:** 1) The majority of breast cancer patients in Alberta do not undergo revisionary surgery after BCS; 2) The three most common revisionary surgeries post-BCS were contralateral breast reduction, ipsilateral implantation of prosthesis, and ipsilateral implantation with autograft; 3) Younger women are more likely to have revisionary surgery after BCS.

03 - To Examine the Mechanisms Through Which Adipose-Derived Stem Cells Affect Healthy and Malignant Breast Epithelial Cell Proliferation

A. Berdnikov*, S. Chatterjee, E. Buchel, A. Raouf, J. Safneck, and V. Lee-Wing

Winnipeg, Manitoba, Canada

Purpose: Autologous fat grafting routinely used postmastectomy reconstruction. The stromal vascular fraction (SVF) from centrifuged abdominal fat is often utilized to supplement fat grafts. Little is known about the interaction of SVF with residual cancer cells as well as surrounding breast tissue. This study investigates if secreted factors from the SVF cells affect proliferation of residual breast cancer cells and surrounding breast cells. **Methods:** The effects of patient-derived SVF samples on the proliferation of estrogen receptor positive (ER+) MCF-7 breast cancer cells, tissue adjacent to ER+ breast tumors (TAT), and healthy breast cells from reduction mammoplasty samples (RM) were examined. The secretion profile of 41 different cytokines in the conditioned media (CM) of SVF samples grown in cocultures with the MCF-7, TAT, or RM cells was compared to the CM of unicell cultures. **Results:** Placing MCF-7 cells in cocultures with SVF cells increased their proliferation by 53% ($P < .005$). Interestingly, CM from SVF and MCF-7 cells also increased MCF-7 cell proliferation by 50% ($P < .05$). This indicates that SVF secreted factors into the CM that have proliferative properties on cancer cells. From the cytokine array data, we identified IL-1 β , MDC, and RANTES cytokines as SVF-secreted cytokines that increase MCF-7 cell proliferation independently. **Conclusion:** Secreted factors from SVF+MCF-7 cocultures have proliferative effects on MCF-7 cells. This study is a proof of concept that examining secretion profiles of SVF co-cultures can lead to the discovery of cytokines that modulate breast cancer cell proliferation and enhance risk of locoregional tumor recurrence. **Learning Objectives:** At the end of this presentation, the learner should be able to (1) identify mechanisms by which SVF modulates malignant breast cell proliferation and (2) appreciate how this research effort can be translatable to in vivo models of breast cancer to control the progression of the disease and to decrease tumor recurrence.

Canadian Expert

03A - Correction of Pectus Excavatum by Custom-Made Silicone Implants: Contribution of Computer-Aided Design Reconstruction: A Visit to Toulouse University Hospital With Dr Jean-Pierre Chavoin by A. Danino, MD, PhD

A. Danino

Montréal, Quebec, Canada

Background: In the absence of demonstrable functional impairment, pectus excavatum is merely a congenital

deformity, albeit with a marked psychological impact. Many patients do not wish to undergo thoracic remodeling operations, which are invasive and do not clearly result in respiratory or cardiac improvement. **Methods:** I spent 5 days in Toulouse with Dr Chavoin, following the training and had the opportunity to follow him in pectus clinic and in the operative room for several surgeries. Then I had the opportunity to visit the laboratory and have several discussion with the team. From 1993 to 2015, the authors designed 401 custom-made silicone implants to treat funnel chests. Before 2007, implants were made from plaster chest molds. Beginning in 2007, 3-dimensional reconstructions were made from computed tomographic scans by computer-aided design. The authors prospectively recorded all assessments and follow-up data since 1993. Preoperative and postoperative photographs of 2 random groups of 50 patients were analyzed, in a blinded manner, by 2 surgeons independently. Intraoperative and postoperative complications, clinical outcomes, patient satisfaction, and quality of life were evaluated. **Results:** One infection and 3 hematomas were recorded. Periprosthetic seroma was evident in all cases. Patients rated the cosmetic outcomes of computer-aided design implants significantly higher than those of the earlier implants made using plaster molds ($P = .030$). Malformations were better corrected in the computer-aided design group (86%) than in the plaster group (72%; $P = .038$). Patient satisfaction was higher in the former group ($P = .011$). Medical Outcomes Study 36-Item Short-Form Health Survey scores revealed significant improvements, both socially and emotionally. **Conclusions:** Correction of pectus excavatum using a computer-aided design silicone implant fulfills aesthetic and psychological demands. The technique is simple and reliable and yields high-quality results. In the medium term, the approach may render invasive techniques obsolete. The aim is to discuss potential application in our Canadian reality. **Learning Objectives:** Participants will be able to (1) identify at least 3 techniques of pectus correction; (2) describe the custom-made silicone implant technique; and (3) describe the advantages and drawbacks of computer-aided design reconstruction.

04 - Anabolic–Androgenic Steroid Use Among Gynecomastia Patients: Prevalence and Relevance to Surgical Management

F. Z. Xu*, R. Cai, M. Vojvodic, and C. Fielding

Toronto, Ontario, Canada

Purpose: Anabolic–androgenic steroids (AAS) are widely implicated medications in gynecomastia development. Surgery is the definitive treatment for cases persisting beyond cessation of steroid use. Currently, the relevance of AAS use to the surgical approach of gynecomastia is not well explored. This study aims to compare the patient characteristics and variations in the surgical management of gynecomastia for AAS and non-AAS users. **Methods:** A retrospective analysis was performed for patients who underwent bilateral gynecomastia surgery

between January 2005 and August 2015. Demographics data, AAS usage details, clinical and operative parameters, and minimum 1-year follow-up outcomes were statistically compared. **Results:** A total of 967 gynecomastia surgical cases were reviewed; 10.7% ($n = 105$) had a history of AAS use and 45.7% of AAS group used postcycle therapy. In comparing AAS to non-AAS users ($n = 862$), the 2 groups differed significantly ($P < .003$) in age at time of surgery (29 vs 27 years), BMI (27.7 vs 26.2 kg/m²), bodybuilding status (40% vs 22%), and age of gynecomastia onset (18 vs 14 years). No difference was found with respect to excised mastectomy specimen volume (67.9 vs 60.3 g, $P = .60$). AAS users had significantly less supernatant fat (305 vs 375 cm³, $P = .02$) aspirated with liposuction. While the groups had comparable total complications ($P = .08$) and revision surgery rates ($P = 1.00$), AAS users had significantly more hematomas (11.4% vs 5.6%, $P = .03$) and revision surgery for gland removal (3.8% vs 1.2%, $P = .03$). **Conclusions:** The higher glandular to fatty tissue ratio among AAS users necessitates a surgical approach with meticulous intraoperative hemostasis and greater care in glandular excision. Attention to the unique breast composition can help surgeons circumvent potential complications and achieve pleasing results for patients with AAS use. **Learning Objectives:** Understanding the relevance of AAS use to the surgical management of gynecomastia.

05 - Do Pediatric Patients With Gynecomastia Require Evaluation By Endocrinology Preoperatively?

A. Malhotra, S. Amed, M. Bucevska, K. Bush, and J. Arneja*

Vancouver, British Columbia, Canada

Purpose: Gynecomastia is benign proliferation of glandular breast tissue affecting about 65% of adolescent males. Patients are often referred to plastic surgery via endocrinology after excluding medical etiology. The objective herein was to assess the yield of endocrinological investigations in the evaluation of pediatric gynecomastia. **Method:** A 25-year retrospective review was conducted. Data collection included patients with gynecomastia presenting to pediatric endocrinology at a quaternary hospital with a catchment area of 4 million. Clinical metrics, endocrinological results, treatments, and costs were reviewed. **Results:** One hundred ninety-seven patients met inclusion criteria. Ninety-eight (50%) were overweight or obese and 29 (15%) had a positive family history. The median age of onset was 11.5; 25 (13%) cases were prepubertal. A total of 15 patients (7.6%) were diagnosed with secondary gynecomastia (10 related to exogenous substance usage). Endocrine investigations were performed in 173 (87%) patients with positive findings in 3 (1.7%) cases. One hundred one patients were observed with a median age at resolution of 14.6; 86 patients received surgery at a median age of 16.5. The case cost of endocrine evaluation was \$461. **Conclusions:** The endocrinological workup identified secondary gynecomastia in 7.6% of

patients, of which only 1.7% were evident on blood work. This workup is associated with an avoidable case cost burden (\$461) to the health-care system and largely unnecessary testing for the child. Since a majority of secondary gynecomastia cases (67%) were drug induced, we do not suggest routine endocrinology workup, as it adds little value. Referral for surgery is warranted if gynecomastia persists beyond 14.5 years of age. **Learning Objectives:** (1) The participants will be able to understand the role of routine endocrinology workup in pediatric gynecomastia. (2) The participants will be able to consider evidence-based practices when ordering routine endocrinological investigations in pediatric gynecomastia.

06 - Does Ketorolac Increase the Risk of Bleeding After Breast Reduction? A Retrospective Case-Control Study

J. Barkho*, E. Duku, and A. Thoma

Hamilton, Ontario, Canada

Purpose: Our purpose is to examine the association between ketorolac exposure and hematoma complication after breast reduction surgery using a case-control study design. **Method:** All breast reduction surgeries complicated by hematoma (cases) were retrieved at our university-based hospitals and matched with controls (1:1 ratio) based on 4 criteria: age, BMI, institution, and preexisting hypertension. Patients were excluded if they had preexisting coagulopathy, concomitant surgeries, and NSAID allergy. Charts were retrospectively reviewed to compare the cases and controls exposed to ketorolac on matching variables using paired Student *t* test. **Results:** Twenty-eight cases were matched with 28 controls from 2002 to 2014. Mean age was not significantly different between cases and controls ($P = .85$). BMI trended toward being significantly higher in controls (30.4 vs 28.8 kg/m², $P = .05$). There were equal numbers of cases and controls with hypertension, and ASA scores were similar ($P = .45$). There was no significant difference in perioperative ketorolac exposure between cases and controls (OR: 2.0, 95% CI: 0.7-5.7). **Conclusions:** Based on this level 3 evidence, there is no association between perioperative ketorolac exposure and developing hematoma after breast reduction surgery. **Learning Objectives:** The audience will appreciate the role of case-control study design when investigating both harmful and rare outcomes.

07 - The McGill Augmentation Mammoplasty Operation (MAMO) Simulator: Validation Study

R. Kazan*, A. Viesel-Mathieu, S. Cyr, T. Hemmeling, and M. Gilardino

Montreal, Quebec, Canada

Purpose: To complete face, content, and construct validations of the MAMO simulator as a training and an assessment tool

for subpectoral breast augmentation. **Method:** The simulator represents the external features of a female chest and incorporates the essential anatomical structures relevant to such procedure. Using an electromagnetic tracking system, an assessment tool was developed and incorporated into the simulator to objectively assess subpectoral pocket dissection. Plastic surgeons and residents were recruited to perform a mammoplasty procedure on the simulator. Following an instructional video, participants completed the essential steps of the procedure, then experts evaluated its different parameters and their overall experience. Video recordings of participants' performance were blindly reviewed and assessed by an expert using 3 scales: modified OSATS score, surgery-specific score, and a checklist. Data will be presented as mean (SD). **Results:** Preliminary results including 6 participants (3 residents and 3 experts) has shown an average OSATS score of 22.3 (5) versus 38 (1.7), an average surgery-specific score of 30.3 (2.1) versus 41.7 (2.5), and an average checklist score of 11 (1.7) versus 12.7 (1.2) between residents and experts, respectively. The average time to complete the procedure was 20.5 (3.2) minutes for residents and 17 (2.7) minutes for experts. Face and content validations results showed excellent results among parameters evaluated, with an overall mean score of 4.8 (0.3) on 5 (96%). **Conclusions:** The MAMO simulator has shown upon preliminary results to be an excellent assessment tool of novices' performance and has the potential to become a standard method to determine residents' competence in a competency-based educational system. **Learning Objectives:** Following the current presentation, the audience will be informed of (1) the establishment of a validated tool to assess surgical competence of trainees in mammoplasty procedures and (2) the validation of a surgery-specific scale and a checklist for a mammoplasty procedure.

08 - Aesthetic Considerations in Autologous Breast Reconstruction

O. Lerman, W. Jalil*, I. Karanetz, and B. Bassiri

New York, New York, USA

Purpose: Microsurgical breast reconstruction has become a routine option for woman after mastectomy. The biggest challenge is no longer technical success. Instead, achieving optimal aesthetics is becoming the paramount objective for patients and surgeons. Revision surgery to achieve these optimal aesthetic results is often required. The authors aim to investigate the role and incidence of second-stage procedures or revisions for aesthetic refinements following autologous microsurgical breast reconstruction. **Methods:** A retrospective review of all consecutive patients undergoing autologous breast reconstruction at a single institution during a 6-year period was performed. Patient demographic data, number of additional operations, revision techniques, perioperative details, and complications were evaluated. **Results:** During the study period, 311 microvascular breast reconstructions were performed in 196 patients (160 immediate, 36 delayed). The mean age of patients was 51.4

(SD: 4.9) with a mean BMI of 26.1. The majority of patients underwent reconstruction with DIEP flaps ($n = 177$). There was 1 flap loss. A total of 144 (73.4%) patients underwent at least 1 additional revision surgery following initial reconstruction with a median time to procedure of 5.5 months. Procedures for aesthetic refinements included those performed on the reconstructed breast, contralateral breast, or abdominal donor site. These include breast mound revisions with liposuction, fat grafting, skin envelope refinements with mastopexy or reduction techniques, implant placement, nipple-areola reconstruction, contralateral symmetrizing surgery, and abdominal dog-ear correction. **Conclusions:** Achieving optimal aesthetic results in autologous breast reconstruction will usually require second-stage revision surgery. Autologous breast reconstruction should no longer be thought of as a single-stage procedure. Although many of these refinements can be performed at the same time as nipple-areola reconstruction, even patients who have had nipple areola sparing mastectomy undergo second-stage refinement. For success in revision surgery, one needs to start planning at the preoperative stage of the initial reconstruction and utilize all the tools of cosmetic breast enhancement to achieve the aesthetic goals that patients expect.

09 - Celebrating the Past 35 Years of the Canadian Society of Plastic Surgery: A Historical Video Project

Y. Sardiwalla, J. Oore, J. Taylor, and S. Morris*

Halifax, Nova Scotia, Canada

Purpose: Building on Leith Douglas' famous history of the CSPS from 1947 to 1982, this contemporary work aims to showcase the highlights of the society's history from 1983 to 2017. The project profiles pioneering surgeons and innovative breakthroughs by CSPS members in the past 35 years. **Method:** Canadian plastic surgeons were nominated by their colleagues to offer perspectives on the development of the field. The nominees were then interviewed. These interviews explored insights into contributions and changes that have affected the practice of plastic surgery. The interviews facilitate an inside look at both famous and sometimes untold stories from the pioneers who shaped Canadian plastic surgery. An open, semi-structured interview format was used. **Results:** Personal stories recounting the career evolution of 22 plastic surgeons were recorded and transcribed. The videos describe significant moments in CSPS history through unique, personal perspectives. Twenty-two interviews, approximately 45 minutes each, of surgeons geographically located between Ontario and PEI were archived. Stories describing the establishment of regional plastic centers were captured. The 4-minute video trailer presented today reflects a sampling of key moments captured thus far. **Conclusions:** This project initiated the process of documenting important changes to the CSPS, using a contemporary medium for recording. A

unifying feature of these interviews was a shared outlook of overwhelming passion and fulfillment upon reflection of their career. The semi-structured interview designed was conducive to discovering key insights and diverse backgrounds the project sought to capture. More interviews are needed to add to the comprehensiveness of the project. **Teaching Objectives:** (1) Reflecting on and acknowledging historical milestones help clinicians appreciate; (2) their current understanding and refine future work; and (3) the annals of plastic surgery are filled with rich stories that should be remembered and archived.

09A - Canadian Expert

Global Surgery Advocacy and Outreach

Yvonne Ying

Ottawa, Ontario, Canada

Learning Objectives: (1) Participants will be able to define Global Surgery. (2) Participants will be able to describe how some determinants of health affect surgical care access. (3) Participants will be able to identify ways to incorporate advocacy and outreach into their practice.

09B - Canadian Expert

Facial Fat Grafting

Damir Matic

London, Ontario, Canada

Learning Objectives: At the end of this lecture, participants will be able to (1) identify clinical factors that affect both short- and long-term survival of fat transplanted to the head and neck region, (2) describe the process by which successful fat grafting can be achieved within the head and neck region, and (3) list the different types of patients who can benefit from fat transplanted to the head and neck region.

10 - Effect of Compound 21, a Selective Angiotensin II Type 2 Receptor Agonist, in a Murine Xenograft Model of Dupuytren Disease

J. Chisholm, M. Bezuhly, T. LeVatte, A. Gareau, and S. Byun*

Halifax, Nova Scotia, Canada

Background: Although surgical excision and intralesional collagenase injection are mainstays in the treatment of Dupuytren disease, no effective medical therapy exists for recurrent disease. Compound 21 (C21), a selective agonist of the angiotensin II type 2 receptor, has been shown to protect against fibrosis

in models of myocardial infarction and stroke. The authors investigated the potential use of C21 in the treatment of Dupuytren disease. **Methods:** Human dermal fibroblasts (HDFs) were treated in vitro with C21 and assessed for viability using an MTT assay, migration via scratch assay, and profibrotic gene transcription via quantitative reverse transcription polymerase chain reaction. C21 effects in vivo were assessed using a xenograft model. Dupuytren disease cord specimens from patients undergoing open partial fasciectomy were divided into 2 segments. Segments were implanted under the dorsal skin of nude mouse pairs. Beginning on day 5, 1 mouse from each pair received daily intraperitoneal injections of C21 (10 µg/kg/d), the other vehicle. On day 10, segments were explanted and submitted for immunohistochemistry. **Results:** Human dermal fibroblasts treated with C21 displayed decreased migration and decreased gene expression of connective tissue growth factor (CTGF), fibroblast specific protein-1 (FSP-1), transforming growth factor-β1, Smad3, and Smad4. Dupuytren disease segments from C21-treated mice demonstrated significantly reduced alpha-smooth muscle actin (α-SMA) and Ki67 staining, with increased density of CD31+ staining vessels. **Conclusion:** C21 significantly decreases expression of profibrotic genes and decreases myofibroblast proliferation as indicated by reduced Ki67 and α-SMA expression. These findings support C21 as a potential novel treatment modality for Dupuytren disease. **Learning Objectives:** (1) Acquire an understanding of the role of angiotensin II signaling in fibrosis. (2) Understand the potential use of compound 21 in reducing Dupuytren contracture. (3) Gain an appreciation of the use of a xenograft mouse model of assessing compound 21's activity in vivo.

11 - Trends in the Usage of Collagenase *Clostridium Histolyticum* for Dupuytren's Contracture in Ontario

M. McIntosh*, S. Brogly, M. Green, K. Lajkosz, and D. McKay

Kingston, Ontario, Canada

Purpose: To determine and compare rates of (1) open partial fasciectomy, (2) needle aponeurotomy, and (3) the use of collagenase *Clostridium histolyticum* (CCH) for Ontario patients with Dupuytren's contracture from 2005 to 2015. Secondary analyses of patient and provider demographics and short-term outcomes were performed. **Methods:** The provincial health databases managed by the Institute for Clinical Evaluative Sciences (ICES) were used for this study. Rates of open partial fasciectomy and needle aponeurotomy were obtained directly from billing and procedure codes; CCH rates were calculated indirectly by linking intradermal injection with closed fasciotomy occurring within 7 days. Select outcomes were analyzed for a 90-day period following an intervention. **Results:** Between 2005 and 2014, a total of 25 005 open partial fasciectomies, 1977 needle aponeurotomies, and

616 CCH procedures were performed. Yearly rates of Dupuytren's contracture repair increased from 3001 in 2005 and stabilized to an average of 3862 (3777-4021) per year between 2009 and 2014. Open partial fasciectomies accounted for 98% of all repairs in 2005, decreasing to 80.4% in 2014. By 2014, needle aponeurotomy accounted for 13.3% of all repairs, while CCH represented 6.3%. Between 2012 and 2015, there were no deaths or amputations in the CCH group in the 90-day follow-up period. The number of physician encounters was significantly lower in the CCH and needle aponeurotomy groups compared to open partial fasciectomy ($P < .001$). **Conclusions:** This study demonstrates the increasing incidence of nonoperative management for Dupuytren's contracture in Ontario with a corresponding decrease in traditional surgical methods. **Learning Objectives:** Participants will be able to (1) better understand trends in the treatment of Dupuytren's contracture; (2) better understand the impact of Dupuytren's treatment selection on total health-care encounters; and (3) better inform patients about aftercare expectations based on treatment type.

12 - The Submental Versus Groin Vascularized Lymph Node Transfer Flaps: A Head-to-Head Comparison of Surgical Outcomes Following Treatment for Upper Limb Lymphedema

O. A. Ho*, C. Y. Lin, K. M. Patel, and M. H. Cheng

Taiwan

Purpose: Growing experience in lymphatic microsurgery, particularly vascularized lymph node (VLN) transfer, has allowed for the discovery and utilization of new lymph node sources. The groin (VGLN) and submental (VSLN) lymph node flaps have been described as valuable options in the treatment of upper limb lymphedema. Although published reports have shown success with each of these options, there has not been a comparative evaluation performed of these 2 valuable lymph node flaps. Therefore, we performed a comparative analysis following submental and groin VLN transfers in the setting of upper limb lymphedema. **Methods:** A prospectively maintained database of patients who received microsurgical treatment for lymphedema using either submental or groin VLN transfer for upper limb lymphedema was reviewed. Patient measurements were obtained at the same follow-up evaluation in both cohorts. Patient characteristics and demographics were compared. Outcomes of interest included flap characteristics, intraoperative and postoperative complications, and limb circumference changes at the designated follow-up following reconstruction. Statistical analysis was performed using chi-square and Mann-Whitney U tests. **Results:** Forty-three patients were identified and met inclusion criteria. More identified patients underwent VGLN (30.2%) as compared to VSLN (69.8%) flaps for upper limb lymphedema. Patient age and BMI were similar between cohorts ($P = .8$; $P = .7$,

respectively). However, symptom duration was statistically different between the 2 groups ($P = .04$). On evaluating flap characteristics, similar vein diameter (2.6 vs 3.2 mm; $P = .3$) and artery diameter (2.1 vs 2.8 mm; $P = .3$) were found between VGLN and VSLN cohorts, respectively. Similar lymph node numbers were found between flaps, respectively (3 vs 4; $P = 0.4$). Circumference reduction rate was higher in the VSLN cohort (55.5%) when compared to the VGLN cohort (48.4%) during the study period and was statistically significant ($P = .04$). Complication rates between VSLN and VGLN were statistically significantly higher when comparing intraoperative and postoperative incidence independently. The rate of not needing salvage was also significant between the 2 groups. However, the total number of complications (38.5% vs 16.7%; $P = .06$) and whether the need for salvage was an arterial or venous reason ($P = .5$, $P = .6$) were not significant. The need for suture removal was statistically significant (61.5% vs 50%; $P = .04$). **Conclusion:** Both vascularized groin and submental lymph node flaps are valuable surgical options in treating upper limb lymphedema. Flap characteristics are similar between VLN flap options. Similar improvements in limb circumference may be expected with both VLN flaps, albeit with an increased complication rate with the VGLN flap. **Learning Objectives:** Participants will gain an understanding of VSLN versus VGLN flap outcomes and be able to make informed decisions in choosing between these donor sites for their lymphedema patients.

13 - Analysis of Pediatric Hand Fractures Failing Initial Closed Reduction in the Emergency Department

M. Market*, K. Cheung, and M. Bhatt

Ottawa, Ontario, Canada

Purpose: Unnecessary repeat procedures should be avoided in children. Certain pediatric hand injuries may be more difficult to treat by emergency physicians, requiring repeat closed reduction by a plastic surgeon. Determining which injuries more commonly require additional care may allow for focused education to reduce repeat procedures. **Method:** A retrospective study was performed of patients with hand fractures or dislocations that were treated with closed reduction by emergency physicians in a tertiary pediatric hospital. Patients requiring operative fixation were excluded. Potential factors such as fracture/dislocation pattern, patient demographics, anesthesia, emergency physician experience, time of day, comorbidities, and previous injuries were considered. **Results:** Over a 2-year period, 126 pediatric hand fractures were treated with closed reduction by emergency department physicians. Of these, 7% failed initial reduction requiring repeat closed reduction without fixation by a plastic surgeon. Boxer's fractures and metacarpophalangeal (MCP)

dislocations were the most common injuries requiring reduction in the emergency department. By fracture pattern, 30% of MCP dislocations, 10% of metacarpal shaft fractures, 8% of Boxer's fractures, and 5% of proximal interphalangeal (PIP) dislocations and proximal phalanx Salter-Harris II fractures were inadequately reduced and required repeat closed reduction. **Conclusions:** Certain types of pediatric hand injuries are more commonly inadequately reduced by emergency physicians and require repeat closed reduction. The most difficult fracture to reduce is a Boxer's fracture (right fifth metacarpal neck fracture). The most difficult dislocation to treat is an MCP dislocation. Additional training focused on how to effectively treat these hand injuries may be of benefit to reduce the need for repeat procedures. **Learning Objectives:** (1) Recognize the importance of avoiding repeat procedures in children and (2) learn the most common pediatric hand fractures failing initial reduction in the emergency department.

14 - A Comparison of Conservative and Operative Management of Thumb Ulnar Collateral Ligament Avulsion Fractures in Children

M. Huynh*, and K. Cheung

Ottawa, Ontario, Canada

Purpose: The management of pediatric thumb ulnar collateral ligament (UCL) avulsion fractures remains poorly defined. This study will elucidate which avulsion fractures can be treated with surgery versus immobilization alone. **Methods:** A retrospective cohort study was performed of all patients presenting to a tertiary pediatric hand surgery clinic with an acute thumb UCL avulsion fracture. Patients were grouped by their initial management (immobilization vs surgery). The primary outcome was the need for additional immobilization or surgery. Fracture patterns were analyzed for presence of open physes, percentage of articular surface involvement, and displacement. **Results:** Thirty-three patients were identified with thumb UCL avulsion fractures. Patient age ranged from 2 to 17 years (mean: 14.2 years). Five patients underwent surgery as initial treatment; all healed without complication. Twenty-eight patients were initially treated conservatively with immobilization. Of these, 10 fractures were undisplaced, and all healed with immobilization. The remaining 18 patients had a displaced avulsion fracture >0.5 mm: 14 (78%) healed with immobilization, while 4 (22%) required conversion to surgical treatment. Mean fracture displacement was significantly different between groups. Fractures successfully treated with immobilization alone were displaced by 1.3 ± 1.22 mm ($n = 24$) compared to those failing immobilization and later requiring surgery (2.5 ± 1.6 mm; $n = 4$) and those initially treated

with surgery (4.9 ± 3.2 mm; $n = 5$), $P < .05$. **Conclusion:** Conservative immobilization was an effective treatment for nondisplaced and minimally displaced thumb UCL avulsion fractures. Surgical management of displaced fractures had good results and low rates of complication. Patients (22%) who required surgical treatment after being treated conservatively had a delay in return to full activity. It is, therefore, important to accurately identify patients who require surgery at initial presentation. **Learning Objective:** (1) Understand the management options for pediatric thumb UCL avulsion fractures and (2) recognize the avulsion fracture patterns that may be treated with surgery versus immobilization alone.

15 - Morbidity Following a Modified Sural Nerve Harvesting Procedure in Pediatric Patients

M. Shafarenko*, J. Catapano, E. Ho, R. M. Zuker, and G. H. Borschel

Toronto, Ontario, Canada

Purpose: While sural nerve harvest is common for reconstruction of peripheral nerve injuries, only one study describes sensory deficits following this procedure in children. The patients in this study underwent bilateral sural harvest in the neonatal period and this study does not accurately describe the sensory deficits expected in patients following unilateral harvest at an older age. At SickKids Hospital, we use a modified sural nerve harvest technique intended to decrease sensory morbidity by harvesting the peroneal contribution to the sural nerve, while leaving the tibial component intact. The purpose of this study is to provide the first analysis of sensory outcomes following this modified technique of unilateral sural nerve harvest in a pediatric population. **Methods:** A prospective case series was conducted on pediatric patients older than 6 years of age who had undergone unilateral sural nerve harvest. Patients were recruited during routine clinic visits at a minimum follow-up of 6 months. The contralateral foot served as a control. Sensory threshold testing was conducted on both feet using Semmes Weinstein monofilaments. Patients also completed a sensory function and pain questionnaire. **Results:** Sensory outcomes were evaluated for 11 patients. Mean age at operation was 10.01 ± 4.20 years with a mean follow up time of 2.01 ± 1.50 years. Significant sensory deficits were found at all 4 predetermined locations on the lateral aspect of the foot ($P < .05$). The questionnaire revealed that only 2 patients expressed concerns about foot functionality, both in relation to physical activity. **Conclusions:** A modified sural nerve harvesting procedure in an adolescent population results in measurable sensory deficits, which are larger than expected based on a previous study. This can be attributed to older patient age and the presence of one normal sural nerve that is used as a source of comparison. **Learning Objectives:** (1) Understand a new sural nerve harvesting procedure and better inform patients of outcomes.

TIPS & PEARLS

TP01 - Making Your Delayed Latissimus Breast Reconstruction Look Like an Immediate

J. Wolfli

Edmonton, Alberta, Canada

Delayed breast reconstruction with a latissimus flap and tissue expander is a commonly performed technique. Although this method can give excellent shape, the elliptical skin flap is often visually conspicuous. This presentation discusses a method of hyperexpansion, followed by resection of the flap skin paddle, to create a breast with an immediate reconstruction appearance and shape.

TP02 - A Simple Teaching Model and Pearls for Syndactyly Release

K. Slater* and C. Verchere

Vancouver, British Columbia, Canada

Flap design for syndactyly release can be challenging for junior trainees. We describe a simple syndactyly release teaching model utilizing disposable gloves and surgical marking pens, affording a 3-D representation of the requisite flaps. Pearls accumulated throughout the senior author's career are also reviewed.

TP03 - Complications Following Alloplastic Nipple Reconstruction in Breast Reconstruction

Z. Zhang* and K. Boyd

Ottawa, Ontario, Canada

The use of alloplastic materials for reconstruction of the nipple-areolar complex (NAC) has been frequently described. The use of Medpor should be cautioned against in the setting of implant-based reconstruction due to the risk of Medpor migration through tissue planes, abrasion against breast implant, and infection.

TP04 - Concealed Stealth Costochondral Scar for Microtia Reconstruction—Aesthetic Unit Concept: Technical Description

L. Lessard, C. Aubin-Lemay*, and É. Bougie-Richardson

Montréal, Quebec, Canada

Autologous reconstruction using costochondral cartilage remains the standard of care for patient with microtia. The harvest site leaves a scar that can be unsightly to the patient specially in female teenager. We are proposing a different incision design with a strategic placement.

TP05 - Transnasal Wiring for the Management of Nondisplaced Type I NOE Fractures

R. Chambers* and J. Fialkov

Toronto, Ontario, Canada

Transnasal wiring can be used to treat nondisplaced type I NOE fractures when there is a need to surgically address other midface fractures. This avoids the morbidity of a bicoronal incision as well as stripping of the soft tissues in the medial canthal region. Method and 2 cases presented.

I5B - CSPA Guest Speaker

Burnout Proof Live Workshop

Dike Drummond, MD

Seattle, Washington, USA

Lower stress, build life balance, and a more ideal practice. An interactive, high-energy live workshop teaches how to recognize and prevent burnout, lower stress, and build a more balanced life using insights from Dr Drummond's 2000+ hours of one-on-one physician coaching.

Learning Objectives: At the end of this training, the learner will be able to: (1) understand the difference between stress and burnout; (2) recognize the 3 main symptoms of burnout and how they differ in men and women; (3) recognize burnout in themselves and others; (4) understand burnout's pathophysiology, effects, complications, and 5 main causes; (5) understand the 4 methods of burnout prevention for physicians; (6) build their personal burnout prevention strategy using 3 stress reduction tools proven effective for physicians.

I5C - Eye Opener

Social Media in Plastic Surgery and Protection of Your Online Reputation

Almin Kassamali

Stylelabs Inc.

Calgary, Alberta, Canada

RESIDENTS CORNER

I6 - Corneal Neurotization Improves Corneal Healing in a Novel Rat Model of Neurotrophic Keratopathy

J. Catapano*, K. Antonyshyn, J. J. Zhang, and G. H. Borschel

Toronto, Ontario, Canada

Purpose: Corneal sensation is necessary to protect the cornea from injury and maintain vision. Patients with absent sensation

are susceptible to corneal injury, scarring, and blindness. Corneal neurotization, which reinnervates the cornea using functioning sensory nerves from elsewhere on the face, restores sensation but it remains unknown whether neurotization provides the cornea with neuromediators that are needed to support corneal maintenance and repair. Further investigation requires an animal model to investigate how neurotization influences corneal health. **Method:** Thyl1-GFP+ rats, which express green fluorescent protein in axons, were used to develop a model of neurotrophic keratopathy and corneal neurotization. The corneal innervation was ablated with stereotactic electrocautery of CNV. Neurotization was performed using nerve grafts coapted to the contralateral infraorbital nerve (ION). Corneal axon density, number of neurons innervating the cornea, and healing after injury were compared between uninjured, denervated, and neurotized rats using immunohistochemistry and a corneal healing assay. **Results:** Denervated corneas demonstrated minimal reinnervation 4 weeks after ablation ($2301 \pm 1347 \mu\text{m}/\text{mm}^2$), with reinnervation restricted to the periphery. Neurotized corneas exhibited significantly greater nerve density ($62\,872 \pm 12\,400 \mu\text{m}/\text{mm}^2$; $P < .01$), which extended to the central cornea and was comparable to uninjured controls ($46\,165 \pm 3965 \mu\text{m}/\text{mm}^2$). Retrograde labeling of neurotized corneas demonstrated 206 ± 82 neurons in the contralateral trigeminal ganglion (TG) with no labeled neurons in the ipsilateral TG, confirming reinnervation from the contralateral face. Neurotization significantly improved healing after corneal injury in comparison to denervated controls ($P < .01$). **Conclusions:** Corneal neurotization reinnervates the cornea with axons from the contralateral face and significantly improves corneal healing. This model can be used to further investigate how donor axons influence corneal epithelial maintenance and repair. **Learning Objectives:** Understand how animal models can be used to complement clinical research. Describe a novel surgical procedure to treat neurotrophic keratopathy.

I7 - The Promotion of Adipogenesis in a Rat Model of Radiation-Induced Fibrosis of the Mammary Fat Pad

J. Truong*, E. Wong, E. Turley, and A. Yazdani

London, Ontario, Canada

Purpose: Radiofibrosis of breast tissue ultimately compromises breast reconstruction by interfering with tissue viability and healing. Autologous fat transfer has recently been shown to reduce radiotherapy-related tissue injury, which is thought to be attributed to the presence of adipose-derived pluripotent stem cells. We have identified a novel gene HMMR/RHAMM, whose expression decreases adipogenesis and increases fibrosis. Our team has developed RHAMM peptide mimetics (NP-110) to block RHAMM signaling, and it is thought that the injection of such a peptide will promote adipogenesis and decrease fibrosis in mammary tissue in rats. **Method:** High-

frequency ultrasound was used to assess the primary outcome, volume, through thickness measurements and 3-D reconstruction of mammary fat pads in 20 retired breeder female rats that were nonirradiated or irradiated, treated or not treated with peptide NP-110 at days 0, 7, 14, and 21. Rats were euthanized at day 21, and mammary fat pad tissues were processed for expression of fibrotic and adipogenetic markers using real-time polymerase chain reaction and immunohistochemistry in the 4 treatment groups. **Results:** Volume estimates of fat pad and expression of fibrotic markers such as collagen 1, collagen 3, and TGF- β 1, and adipogenetic markers such as PPAR γ , adiponectin, and perilipin were ameliorated by peptide NP-110 and radiotherapy when quantified with qPCR and immunohistochemistry. **Conclusions:** Results from this study may aid in therapies in the human patient population which decrease the significant morbidity associated with a very challenging and common clinical problem—reconstruction in previously radiated beds in general and breast cancer specifically. **Learning Objectives:** Participants will learn about a novel peptide that is involved in the adipogenetic and fibrotic pathway and its role as a potential adjunct to breast cancer reconstruction in patients who have undergone radiation therapy.

18 - The Effect of nAG (a Salamander-Derived Protein) on Fibrosis in Scleroderma Fibroblasts

A. Al-Qattan*, L. Lessard, and A. Philip

Montréal, Québec, Canada

Purpose: Salamanders have the amazing ability to regenerate their limbs within 30 days when amputated. The key protein responsible for this regeneration is the nAG protein, which stands for newt anterior gradient. In previous studies, an nAG gene was designed that was suitable for human use that demonstrated that the expression of nAG in human primary fibroblasts was able to suppress collagen. The aim of this study is to examine the antifibrotic effects the nAG protein will have on scleroderma fibroblasts to potentially be a new method of treatment. **Methods:** Fibroblasts from lesional scleroderma patient skin will be treated with nAG protein (1-100 nmol/L) for 24 hours and will then be left untreated or treated with 20 pmol/L of TGF- β . The inhibition of TGF- β -mediated profibrotic responses will be determined by measuring ECM (collagen III, alpha smooth muscle actin [α -SMA], connective tissue growth factor [CTGF], and fibronectin) protein production by Western blot as well as immunofluorescence. Activation of the TGF- β -ALK5-Smad2/3 pathway will be determined by measuring phosphorylated and total Smad2/3 levels by using Western blot and immunofluorescence. **Results:** Both the Western Blot and the immunofluorescence results revealed that the application of the nAG protein to human scleroderma fibroblasts in the presence of TGF- β successfully inhibited the fibrotic response shown by a decrease in the fibrotic factors

such as collagen III, α -SMA, CTGF, and fibronectin. In addition, immunofluorescence after 1 hour of treatment with nAG revealed a significant decrease in phosphorylated Smad2 (pSmad2). **Conclusion:** Fibrosis in scleroderma fibroblasts was effectively inhibited when treated with nAG protein, demonstrated by the decrease in ECM using Western blot and immunofluorescence. Although much about the mechanism of the nAG protein is still unknown, the decrease in pSmad2 after treatment suggests that nAG blocks the canonical TGF- β pathway. **Learning Objectives:** (1) To identify the antifibrotic effects of nAG protein on human scleroderma fibroblasts. (2) To explain the possible mechanism of how the nAG protein inhibits fibrosis.

19 - Safety of Fleur-De-Lis Abdominoplasty in Patients With a Previous Subcostal Scar

J. DeSerres*, T. Quaife, E. Fung, and J. Toy

Edmonton, Alberta, Canada

Purpose: The increase in bariatric surgery has led to an abundance of patients seeking body-contouring procedures. The Fleur-de-lis (FDL) abdominoplasty addresses excess tissue in both vertical and transverse dimensions, including excess soft tissue in the upper abdomen. Complications are common in body contouring after massive weight loss, with some studies showing complication rates approaching 50%. Although a prior subcostal scar is considered a risk factor for complications following FDL abdominoplasty, the specific risk has not been well defined in the literature. The authors sought to evaluate the risk of complications in patients with a prior subcostal scar undergoing FDL abdominoplasty and determine other risk factors for abdominal wound complications. **Methods:** A retrospective chart review was performed looking at a single surgeon's body contouring cases from 2010 to 2016. All patients undergoing FDL abdominoplasty were included. Demographics were collected and complications reviewed. Risk factors for complications were identified using logistic regression and *t* tests. **Results:** One hundred eleven consecutive patients undergoing FDL abdominoplasty were identified, 106 of which were female. Average age was 43.5 years, with an average BMI of 31.0 and average change in BMI of 22.3. The overall abdominal complication rate was 40.5%, with a 7.2% rate of major complications. The most common complication was minor skin necrosis that resolved without operative intervention (46.7%). Eleven patients had previous subcostal scars, which was not found to be a risk factor for development of a complication ($P = .100$). Risk factors for complications included diabetes ($P = .022$), higher BMI ($P = .037$), and greater weight loss ($P = .026$). **Conclusions:** Previous subcostal scar is not a risk factor for complications following FDL abdominoplasty. Complications are common; however, the majority are minor and resolve without need for operative intervention. **Learning Objectives:** (1) Risk stratification of

patients seeking FDL abdominoplasty. (2) How to decrease the rate of major complications and managing complications should they occur.

20 - 3D Imaging and Breast Measurements: How Predictable Are We?

K. Steen*, K. Isaac, B. Murphy, B. Beber, and M. Brown
Toronto, Ontario, Canada

Purpose: Patient outcomes in aesthetic breast surgery are highly dependent on preoperative breast measurements. The accuracy of 3-D imaging in measuring critical landmarks in breast augmentation surgery has not yet been described. We aimed to determine the predictability of 3-D imaging software compared to direct measurements. **Method:** Two raters measured the breasts of 28 women using 4 anthropometric measurements: sternal notch to nipple distance (Sn-N), nipple to midline (N-M), nipple to inframammary-fold distance under maximal stretch (N-IMF), and breast base width (BW). Measurements were obtained using 2 methods: direct anthropometric with tape measure and caliper or indirect measurement using 3-D imaging software. Statistical analysis was completed with Bland-Altman plots. **Results:** The Sn-N measurement had a 0.05 cm difference in the mean values obtained (SD 0.65), and N-M had a mean difference of 0.20 cm (SD 0.62). The difference in the BW mean values was 1.26 cm (SD 0.69 cm), and N-IMF showed a mean difference of 1.22 cm (SD 0.74 cm). Indirect measurements overreported the measure for Sn-N, N-M and BW, while it underreported N-IMF. **Conclusions:** 3-D imaging has good utility for preoperative planning in breast surgery. It is most accurate for Sn-N and N-M measurements, which require simple frontal imaging of a standing patient without need for repositioning. BW and N-IMF are less accurate due to obscured landmarks on frontal imaging. The medial and lateral aspects of the breast may be obscured when measuring BW on 3-D imaging, which may explain this difference. N-IMF is a dynamic measurement, and it's not surprising that 3-D imaging had limited ability to measure accuracy. Overall, 3-D imaging continues to prove its utility. **Learning Objectives:** (1) To highlight the importance of accurate measurements in preoperative planning in aesthetic breast surgery. (2) To understand the predictability of 3-D topographic measurements compared to direct measurements. (3) To appreciate the utility of 3-D imaging.

21 - Perioperative Plastic Surgery Patients Are Malnourished

M. Roy*, P. Hunter, J. Perry, and K. Cross
Toronto, Ontario, Canada

Purpose: A quarter of plastic surgery patients have been determined to be at malnutrition risk. Malnutrition leads to longer length of stays and increased postoperative complications and mortality rates. Optimization and recognition of risk helps to

improve patient outcomes. We aimed to identify which kind of patients may be malnourished prior to or following a plastic surgery procedure and to classify the degree of malnutrition with the SGA (Subjective Global Assessment). **Method:** This REB-approved, cross-sectional study was performed at a Toronto tertiary care center from October to December 2016. All plastic surgery clinic outpatients were screened with the Canadian Nutritional Screening Tool (CNST), a 2-question validated tool used to determine malnutrition risk. Participants identified as being at nutritional risk were then assessed with the SGA to determine macronutrient malnutrition classification. **Results:** We recruited 111 patients with a mean age of 49 years (SD 17.1) with almost equal numbers of men and women. According to the CNST, 15.3% (n = 17) were at nutritional risk and had a wide range of diagnoses. Of those, 12 (70.6%) had a diagnosis involving a surgical procedure, 6 (35.3%) had a previous nutritional assessment, and average BMI was 24.2 kg/m² (SD 4.7). Of the 17 patients, 13 were confirmed to be malnourished by the SGA: 10 moderately (class B), 3 severely malnourished (class C). **Conclusions:** These results suggest that the CNST overpredicts nutritional risk in 18.8% of cases but is generally an accurate predictor of macronutrient deficiency in a diverse plastic surgery patient population. The malnourished patients identified would have benefited from preoperative screening and nutritional optimization. Based on these findings, our hospital is transitioning to universal nutritional screening, implementing the CNST. **Learning Objectives:** (1) Review the importance of and how to recognize malnutrition in plastic surgery. (2) Describe the plastic surgery patient population at risk of malnutrition.

22 - National Multidisciplinary Survey of Regional Anesthetic Availability and Preferences in Breast Reconstruction

L. Head*, A. Lui, E. Cordeiro, and K. U. Boyd
Ottawa, Ontario, Canada

Purpose: To determine the availability and regional anesthetic preferences of plastic surgeons (PS) and anesthesiologists (A) involved in breast reconstruction in Canada. **Methods:** Online surveys were sent to practicing members of the Canadian Society of Plastic Surgeons (CSPS) and the Canadian Anesthesiologists Society (CAS). The primary outcome was regional anesthetic preference in breast reconstruction (delayed, immediate, alloplastic, autologous). Secondary outcomes included the availability and influence of specialty and academic status on preferences. Statistical analysis used Pearson's chi-square. **Results:** Responses from CSPS and CAS totaled 141 (rate = 30%) and 217 (rate = 14%), respectively. Physicians from academic centers made up 64% of respondents. Overall, 52% of respondents indicated regional blocks were available for breast reconstruction at their centers. Compared with nonacademic centers (NAC), academic centers (AC) had significantly greater access to (AC = 60%, NAC = 39%, $P = .001$) and

preferred to use regional anesthetic more often (AC = 36%, NAC = 10%, $P < .001$). For immediate and delayed alloplastic reconstruction, 40% (PS = 32%, A = 44%, $P = .081$) and 23% (PS = 24%, A = 22%, $P = .821$) of practitioners preferred regional blocks, respectively. For immediate and delayed autologous reconstruction, 34% (PS = 18%, A = 41%, $P < .001$) and 19% (PS = 13%, A = 21%, $P = .195$) of practitioners preferred regional blocks, respectively. Remaining respondents preferred no adjuncts or local anesthetic alone. Regional anesthetic preferences were significantly different between plastic surgeons and anesthesiologists ($P < .001$)—anesthesiologists favored paravertebral blocks for all reconstructions, while plastic surgeons favored pectoral blocks for immediate alloplastic reconstruction and intercostal blocks for all other reconstructions. **Conclusions:** Regional anesthetic is preferred in a minority of breast reconstructions. Academic institutions have greater access to regional blocks and prefer to use them more often. Anesthesiologists and plastic surgeons have different regional anesthetic preferences across all types of breast reconstruction. **Learning Objective:** Participants will understand regional anesthetic preferences of plastic surgeons and anesthesiologists involved in breast reconstruction in Canada.

23 - Wide Awake Gynecomastia Correction Surgery: A Comparison of General and Regional Anesthesia for Subcutaneous Mastectomy and Subcutaneous Mastectomy With Liposuction

M. Vojvodic*, F. Z. Xu, R. Cai, S. Dreckmann, and C. Fielding

Toronto, Ontario, Canada

Purpose: Surgical correction of gynecomastia with simple mastectomy (SM) or SM with liposuction (SML) is typically performed under general anesthesia (GA). Growing interest in utilizing regional anesthesia (RA) for “wide awake” surgery is driven by the risk profile of general anesthetics and patients’ desire to expedite postoperative recovery. This study is the first to compare the surgical outcomes of gynecomastia correction surgery using RA and GA. **Method:** A 5-year retrospective analysis was performed on 585 patients with bilateral gynecomastia who underwent SM or SML under standard GA conditions or wide awake with RA using local and tumescent field infiltration with lidocaine. Patient demographics, clinical and surgical parameters, and outcomes were statistically compared. A postoperative satisfaction survey was administered to consenting patients. **Results:** A total of 131 cases were completed wide awake with RA and 454 with GA. The GA group had a higher mean BMI (RA: 24.3 kg/m², GA: 26.8 kg/m², $P < .001$) and mean excised mastectomy specimen volume (GA: 121.7 cm³, RA: 46.2 cm³, $P < .001$). No significant differences were found in intra- or postoperative complications between the RA and GA groups, including skin infection (RA: 0%, GA: 0.2%, $P = .56$), hematoma (RA: 7.6%, GA: 3.1%, $P = .06$), and

seroma (RA: 0.8%, GA: 0.4%, $P = .56$). Total OR time was lower in the RA group (1:04 ± 0:18 hours) compared to GA group (1:19 ± 0:17 hours; $P < .001$). Requirement for revision surgery was equivalent between RA and GA groups (RA: 1.5%, GA: 2.2%, $P = .26$). Both groups reported high satisfaction with breast shape, scars and overall surgical outcome ($P = .16$ to 0.68). **Conclusions:** Gynecomastia reduction surgery with SM or SML may be performed safely and efficiently wide awake using RA in healthy, motivated patients with moderate breast volumes. With appropriate patient selection, this approach allows for shorter total OR time with comparably high patient satisfaction outcomes. **Learning Objectives:** Understanding the role of wide awake surgery in gynecomastia correction.

24 - Female-to-Male Gender Affirming Top Surgery: A Single Surgeon’s 15-Year Retrospective Review and Treatment Algorithm

G. McEvenue*, F. Z. Xu, R. Cai, and H. McLean

Toronto, Ontario, Canada

Background: Mastectomy, referred to here as “Top Surgery”, is an important surgical step for female-to-male (FTM) transgender patients. The goal is to excise breast tissue and create a masculine chest contour. Despite the rising demand for Top Surgery, debate still exists regarding how to select the most appropriate surgical technique to optimize aesthetic outcomes safely. As the largest series of mastectomies in FTM patients to date, we describe one surgeon’s 15-year experience and surgical algorithm. **Methods:** A retrospective chart review was performed on 679 FTM patients (1358 mastectomies) undergoing Top Surgery from October 2001 to July 2016. The author’s Top Surgery algorithm utilizes 2 techniques, “Keyhole” and “Double Incision Free Nipple Graft (DIFNG)”, based on breast ptosis, inferior vertical skin pinch, and skin elasticity. Demographic data, operative details, complications, and reoperations along with their reasons were collected and analyzed. **Results:** Of the 679 patients, 15.3% underwent Keyhole and the remaining 84.7% underwent DIFNG procedure. The total complication rate was 18.1% and the total reoperation rate was 11.2% and these rates were shown to decrease over time. The 2 techniques differed significantly ($P < .001$) in operating time (136 vs 102 minutes), breast weight excised (215 vs 638 g), and complication rate (33 vs 16%). The aesthetic rating of results was 4.6/5 for Keyhole and 3.7/5 for DIFNG. **Conclusions:** Safe and aesthetically pleasing results were achieved using this simplified algorithm. Experience with FTM techniques can decrease complication and reoperation rates over time. **Learning Objectives:** (1) Participants will be able to define the terms FTM, Top Surgery, and Transgender. (2) Participants will be familiar with FTM Top Surgery techniques. (3) Participants will be able to describe a surgical algorithm for FTM Top Surgery technique selection.

25 - A Further Look Into Alberta Breast Reconstruction Wait Times: Influences of Cancer Staging and Radiation Therapy on Delayed Breast Reconstruction

J. Stone*, J. Bu, D. Dumestre, L. Shack, L. Huang, and C. Temple-Oberle

Calgary, Alberta, Canada

Purpose: The aim of this study is to determine what patient and treatment factors are contributing to the lengthy waits for delayed breast reconstruction (DBR) in the province of Alberta. **Method:** Eligible patients included those with diagnoses of in situ and invasive breast cancers between 2005 and 2014. The Alberta Cancer Registry was linked to the National Ambulatory Care Reporting System and the Discharge Abstract Database following identification of relevant Canadian Classification of Health Intervention codes. An analyst used SAS coding to query the databases for patient demographics, American Joint Committee on Cancer (AJCC) staging, radiation therapy (RT), and surgical details for women undergoing (DBR). **Results:** Five hundred twenty women had DBR following RT and waited on average 31.8 months for their reconstruction. A comparison group undergoing DBR who did not require RT ($n = 1047$) had shorter wait times (average 24.3 months, $P < .001$). Node-negative Stage 0/DCIS ($n = 146$) and I ($n = 293$) cancer patients represent a subgroup of individuals who do not typically receive RT. Despite this, wait times for these women were long, 20.1 and 23.2 months respectively. Patients receiving RT had higher rates of flap-based reconstruction compared to implant (66% vs 44%, $P < .001$), while non-RT patients had more implant-based reconstructions (64%, vs 36%, $P < .001$). Reconstruction type did not impact average delay to reconstruction in the nonradiated (x vs y , $P = .4$) or radiated (x vs y , $P = .6$). **Conclusions:** Node-negative early stage breast cancer patients are waiting nearly 2 years for DBR despite no indications for adjuvant RT. Women receiving RT further face another 8 months of wait beyond their non-radiated peers. **Learning Objectives:** To appreciate how RT and cancer staging affect women's breast reconstruction choices and timing.

26 - Function-Sparing "Split" Latissimus Dorsi Flap in Breast Reconstruction

M. Evans*, T. Omeis, E. Kwong, and S. Valnicek

Vancouver, British Columbia, Canada

Purpose: The traditional latissimus dorsi (LD) flap has potential drawbacks when used for breast reconstruction including loss of muscle function, adhesion of skin to the chest wall at the donor site, seroma formation, and the need to reposition patients during flap harvest. A muscle-sparing "split" LD flap has potential advantages, including minimal functional deficit, low rate of seroma, an aesthetically appealing scar, and no

patient repositioning is required for flap harvest. We reviewed our local experience with the "split" LD flap, which has become the go-to variant of the LD flap for breast reconstruction in our area. **Methods:** A retrospective review was conducted involving patients who underwent breast reconstruction with function-sparing "split" LD flaps. This included patients from 4 surgeons' practices. Variables collected included patient age, unilateral or bilateral flap use, radiation status, smoking status, and complications. **Results:** Patients that received breast reconstruction with "split" LD flaps involved a combination of unilateral and bilateral cases. A total of 41 flaps were performed. All patients had rapid recovery of shoulder movement, no seroma formation, no complaints of unusual animation, and acceptably hidden scars. Adverse outcomes were few, but included, flap tip necrosis, hypertrophic scar formation, and tissue expander exposure. **Conclusion and Applicability of Research to Practice:** The function-sparing "split" LD flap is a simple, reliable, and effective tool for the majority of LD flap breast reconstruction cases in the setting of radiation or smoking, providing minimal donor site morbidity and rapid return to pre-surgical functional status compared to traditional LD flaps without the need for patient repositioning during surgery. **Learning Objectives:** (1) To review the anatomy of the "split" latissimus dorsi myocutaneous flap. (2) To review the advantages and disadvantages of the "split" LD flap in breast reconstruction.

27 - Surgical Treatment of Upper Extremity Lymphedema After Breast Cancer: A Meta-Analysis and Systematic Review

J. I. Efanov*, A. M. Danino, S. Moran, and A. Izadpanah

Montréal, Québec, Canada

Purpose: With lymphedema, secondary to oncologic breast surgery, the increase in volume and the propensity for recurrent infections can substantially disable afflicted patients. Despite the high prevalence, there are no studies demonstrating superiority of one treatment over another. Thus, we sought to perform a systematic review and meta-analysis of the literature to determine and compare the long-term effects of different surgical treatments. **Method:** A literature review of all published data on surgical management of upper extremity lymphedema after breast cancer from 1965 to 2016 was performed with PubMed/Medline, Cochrane Review, National Library of Medicine, and Google Scholar. Only case controls, prospective cohorts and randomized controlled trials with control groups were included. Comparison between groups of treatment was performed using contingency tables and chi-square tests, followed by a meta-analysis based on treatment modality. **Results:** Two hundred ninety-seven patients with upper extremity lymphedema after breast cancer removal were included with a mean follow-up of 3 years. Patients were equally distributed between intervention and control groups (147 vs 150 respectively). Treatment with lymphaticovenular anastomosis

demonstrated the largest reduction of circumference at 53.9%, which was statistically significant when compared with conservative measures ($P < .0001$). Liposuction, lymph node transfers, lasers and transplantations resulted in reduction of circumference of 33%, 13%, 31% and 27% respectively. **Conclusions:** Surgical management of lymphedema in the upper extremity after breast cancer surgery demonstrates promising long-term results in reduction of circumference of the affected arm. Lymphaticovenular bypass seems to generate the most significant reduction, while other surgical modalities produce positive outcomes at a lower rate. **Learning Objectives:** Participants will be able to compare surgical treatments offered for upper extremity lymphedema secondary to oncologic breast surgery.

28 - Development of a Breast Reconstruction Training Environment

A. Viezel-Mathieu*, R. Kazan, S. Cyr, T. Hemmerling, and M. Gilardino

Montréal, Québec, Canada

Purpose: Breast reconstruction following mastectomy remains an essential component of the holistic approach to treating women affected with breast cancer. The training of plastic surgery residents in this domain can prove to be challenging due to limited access to nonpatient models. Advanced and increased simulation-based training is one way to teach residents necessary skills, improve outcome of surgery and create a dynamic teaching environment. **Method:** A modified Delphi technique was used to survey plastics surgeons with an expertise in breast reconstruction from 6 university centers with plastic surgery residency programs across Canada. A list of the most challenging steps in teaching alloplastic breast reconstruction was obtained. Using various silicon materials, a bench-top postmastectomy breast reconstruction simulator was created. Senior plastic surgeons with an expertise in breast reconstruction were recruited and asked to perform a subpectoral, implant based breast reconstruction on the simulator. Following the procedure, participants were asked to complete a survey and grade the simulator on its physical attributes, realism of experience, realism of material and overall experience. **Results:** Six relevant anatomical components were successfully included in the simulator. The simulator was designed to be completely reusable with no disposable components necessary for each use. Preliminary face and content validation results based on the evaluations performed by expert plastic surgeons showed excellent results among parameters evaluated, with an overall mean score of 4.52 on 5 (90.4%). **Conclusion:** Given the realism offered by the simulator as well as its reusability, we believe that this project has the potential to revolutionize the way in which breast reconstruction is taught and mastered by plastic surgery residents with the goal to improve patient outcomes and ensure patient safety. **Learning Objectives:** Participants will learn about a novel breast

reconstruction training tool and the importance of simulation in the training of plastic surgery residents.

29 - Development and Evaluation of a High-Fidelity Cleft Palate Simulator for Surgeon Training and for Development of a Robotic Approach to Infant Cleft Palate Surgery

D. J. Podolsky*, D. M. Fisher, K. Wong, T. Looi, J. M. Drake, and C. R. Forrest

Toronto, Ontario, Canada

Purpose: To develop and evaluate a cleft palate simulator to enhance training in cleft palate surgery and to act as a test bed for the development of a novel robotic instrument specifically designed for infant cleft palate surgery. **Method:** A high-fidelity cleft palate simulator was developed from patient imaging, 3D printing, polymer and adhesive techniques. The simulator was evaluated by having 3 residents perform 5 and 1 resident perform 9 endoscopic video recorded cleft palate repairs. Two experts assessed the videos using a newly developed cleft palate specific technical assessment tool and global rating scale. The simulator workspace guided development of a novel robotic instrument wrist that couples to the da Vinci surgical system. A friction testing rig was used to determine the increased cable tension due to the wrists novel cable guide channels. **Results:** The average performance of the residents increased logarithmically (cleft specific scale, $R^2 = .9925$, $P = .000$; global scale, $R^2 = .982$, $P = .000$) after each successive simulation session. Reliability of the cleft specific assessment tool amongst the raters was high (average item ICC = 0.85 ± 0.093 , Cron $\alpha = 0.86 \pm 0.086$). The novel robotic instrument has more compact articulation within the infant oral cavity compared to existing da Vinci instruments. However, the guide channels introduce up to 40% more cable tension at a wrist pitch angle of 90° . The increased cable tension is sensitive to the cable groove pattern and the groove perimeter angle. **Conclusions:** A new cleft palate specific technical assessment tool was validated. Technical proficiency improves with repetitive use of the cleft palate simulator. The novel robotic instrument facilitates more compact articulation within the infant oral cavity at the expense of increased cable tension. **Learning Objectives:** Participants will gain an understanding of the methods of evaluating surgical simulators and the development and testing of a novel robotic instrument for infant cleft palate surgery.

30 - Performance of Pediatric Core Procedural Competencies Among Canadian Plastic Surgery Residents

A. Knox*, J. Shih, D. Courtemanche, J. Fish, and M. Brown

Vancouver, British Columbia, Canada

Purpose: Graduating residents feel less comfortable in the domain of pediatric plastic surgery and advocate for more

exposure during training. The purpose of this study was to determine if residents are being exposed to and performing core competencies in pediatric Plastic Surgery. **Methods:** Graduating residents ($n = 55$) with complete case log data (PGY1 through 5) were identified. Case logs were reviewed for case log volume, operative role, and personal competency scores in pediatric core competencies ($n = 8$) previously identified through a national Delphi consensus exercise. **Results:** Half of the core competencies (syndactyly release, polydactyly reconstruction, dermoid cyst excision, congenital melanocytic nevi excision) had $>10\%$ residents logging zero cases during residency. The mode for procedures ranged from 0 for polydactyly reconstruction to 12 for cleft palate repair. Mean procedure numbers tend to be inflated by outliers with high procedural volume. The most commonly reported role was surgeon or co-surgeon for all competencies except cleft lip and palate, which was first assistant. Personal competence scores were highest for excision of lesions (AVM, dermoid, congenital melanocytic lesion) and lower for cleft lip repair, cleft palate repair, and syndactyly reconstruction. **Conclusions:** Our data suggest a proportion of graduates lack exposure to core pediatric competencies during residency. Furthermore, despite frequent exposure to other core pediatric competencies (eg, cleft surgery) residents may not be performing these operations independently and report lower personal competence scores. As we transition to Competency by Design, these areas are logical targets for instruction and assessment efforts and should be prioritized to provide increased exposure, increased learner involvement, and increased personal competency scores. **Learning Objectives:** (1) List the core competencies for pediatric plastic surgery; (2) appreciate limitations with using mean number of cases as a surrogate for individual operative experience and competence; and (3) identify core competencies requiring prioritization to increase exposure and learner involvement.

31 - 3D-Printed Surgical Simulator for Kirschner Wire Placement in Hand Fractures

M. Brichacek, J. Diaz-Abele*, S. Shiga, and C. Petropolis
Winnipeg, Manitoba, Canada

Purpose: Surgical simulation provides resident physicians the opportunity to improve their operative skills in a safe environment. Placement of Kirschner wires for hand fractures is a deceptively difficult technique which requires significant experience to master. A simulator to aid in visualizing the anatomy would help trainees more rapidly advance their skills. We describe the design, creation, and preliminary validation of a 3D-printed hand simulator for Kirschner wire placement. **Methods:** Computer-aided design (CAD) software was used to create a hand model based on anatomic measurements. 3-D printing was used to manufacture the separate components. Simulated bones were created from polyurethane, with imbedded graphite to render them radiopaque. The overlying soft tissues were made from silicone. Both a transparent and opaque soft tissue envelope were created. Resident physicians and staff both evaluated the model, and then a semi-structured

questionnaire was used to assess their experiences. **Results:** An anatomically correct model was manufactured with multiple metacarpal and phalangeal fractures. Articulations at the interphalangeal joints were mobile within normal limits. Two variations in the model were created: one with transparent skin allowing visualization of the underlying bones and one with opaque skin. This transparency allowed for a graded difficulty for novice surgeons, and correlation between tactile and visual feedback. Visualization under fluoroscopic C-arm demonstrated visible discernment of the bones. Five residents and 5 staff evaluated the models. Experiences analyzed included: simulation realism, educational utility, and overall reaction. Responses in all domains were favorable, suggesting the positive utility of this model. **Conclusions:** Using 3D printing, we developed an anatomically correct and realistic simulator for Kirschner wire placement in hand fractures. Initial feedback has been favorable, suggesting its potential as an effective educational tool. **Learning Objectives:** Participants will learn how 3D printing can be used to create a realistic simulator for Kirschner wire placement in hand fractures.

32 - Feasibility of Using Optical Sensing to Measure Bore Depth in Surgical Bone Drilling

D. Demsey*, J. P. G. Arrunategui, N. Carr, and A. Hodgson

Vancouver, British Columbia, Canada

Purpose: To develop a device that determines depth of drilled bore in bone automatically based on measurement of drill movement, capable of replacing the existing depth gauge. **Methods:** Focus group sessions and interviews with practicing surgeons in multiple disciplines, as well as literature review, identified the depth gauge as an area requiring improvement. We developed a proof of concept prototype consisting of an optical displacement sensor mounted on a Conmed/Linvatec MPower2 surgical drill outputting a signal to a microprocessor (Arduino DUE). The signal is interpreted using Matlab (MATHEMATICS). Characteristic velocity and acceleration spikes associated with breach of cortical bone are used to calculate drilled bore depth. **Results:** We conducted experiments in multiple porcine surgical models. Experiments involved drilling bicortical holes in porcine bones and comparing measurements obtained using our prototype and the conventional depth gauge. Under controlled conditions our prototype demonstrated greater bias (2.05 vs 0.67 mm, $P < .05$, t test) but superior lack of variability (SD 0.67 vs 1.55 mm, $P < .05$, F test) when compared with the conventional depth gauge, taking digital caliper measurements as gold standard. In more realistic animal models, we have not yet been able to reproduce these results. **Conclusion:** A device consisting of a drill-mounted optical displacement sensor has the potential to replace the existing depth gauge in measuring drilled bore depth in surgery, however refinements must be made before the device is ready for clinical use. **Learning Objectives:** The audience will (1) understand the process of applying

engineering design to surgical challenges and (2) identify areas in their practice that may benefit from engineering design solutions.

33 - Cost-Effective 3-Dimensional Models for Surgical Planning in Head and Neck Reconstruction

I. Ratanshi, C. Petropolis, E. Buchel, T. Hayakawa, and D. Rickey*

Winnipeg, Manitoba, Canada

Purpose: Three-dimensional (3D) printing has revolutionized surgical planning for bony reconstruction in the head and neck. The use of precise, patient-specific 3D models designed using computerized tomography (CT) image data enables safe and efficient bone flap harvest as well as precise inset with minimal bone gaps. Models may also be used as a template for pre-operative bending of reconstruction plates to better match facial contours and to assist the design of flaps for wounds with complex geometries. At present, most North American institutions rely on high fidelity industry-made models. We hypothesize that widespread use of 3D model-guided surgery has been limited by a technological learning curve and high manufacturing costs. We present representative cases of our center's experience with successful bony reconstruction for craniofacial deficits using low-cost, highly accurate 3D printing. **Methods:** A retrospective chart review was undertaken including all adult patients requiring preoperative plate contouring and/or bone flap reconstruction for craniomaxillofacial reconstruction. In-house models were fabricated using either a fused deposition modelling printer or a stereolithography printer. Free fibula flaps were utilized in all cases of bony deficit. Where required, cutting guides for the bony tumor resection and fibula harvest were designed in close consultation with the resecting oncologic surgeon. **Results:** Models were fabricated for oncologic deficits ($n = 10$ cases) or trauma ($n = 30$ cases). All oncologic deficits involved the mandible and achieved bony union. The disposable cost per model was approximately \$20 (Canadian Dollars). **Conclusions:** Successful craniomaxillofacial reconstruction can be achieved using very low-cost 3D models fabricated "in house". This will improve widespread accessibility to computer-guided model surgery. **Learning Objective:** Discuss the use of low-cost manufacturing of 3D printed models for use in trauma and oncologic craniomaxillofacial reconstruction.

34 - Utility of Assessment Using MRI, CT, and Ultrasound for Wrist Pain

S. Dreckmann, H. von Schroeder, J. Shafin, and H. Baltzer*

Toronto, Ontario, Canada

Purpose: Individuals with wrist pain often undergo specialized diagnostic imaging (magnetic resonance imaging [MRI],

computed tomography [CT] scan, or ultrasound) prior to being assessed by a hand specialist. The purpose of this study was to investigate whether these pre-emptive investigations have an impact on final diagnosis and management. **Method:** 115 patients were included based on the following criteria: referred to a tertiary level hand center for subacute/chronic wrist pain and assessed by a fellowship-trained hand surgeon (January 2015 to October 2016). Data collection included patient demographics and referral diagnosis/specialty. At initial consultation, examination findings, final clinical diagnosis, and additional imaging requirements (beyond routine X-rays) were recorded. Previously performed MRI, CT, and/or US results were reviewed. The final clinical diagnosis given to the patient by the blinded hand specialist was compared to the initial referral diagnosis. Pre-consultation imaging was categorized as (1) no value for diagnosis/management (2) some value, or (3) high value. **Results:** Eighty patients had additional imaging completed prior to referral (69 MRIs, 11 CTs, and 14 ultrasounds). Seventy-seven percent of the MRIs performed were deemed non-contributory to final diagnosis or management (eg, de Quervain's tenosynovitis). Of the 11 CT scans performed, 18% were deemed highly valuable. None of the ultrasounds performed provided any additional value in diagnosis or treatment. Of all the additional imaging performed, 2 CT scans were thought to be highly valuable aids in clinical management (scaphoid nonunion detail). The majority of additional imaging (72%) was classified as unnecessary. Six patients required further imaging after consultation. **Conclusions/Learning Objectives:** Clinical assessment and X-rays alone are usually sufficient to arrive at a diagnosis. Few patients require additional imaging with MRI, CT scan, or ultrasound. Future studies and education can be directed at referring physicians to identify how imaging can be used effectively to decrease utilization of this resource.

35 - Can We Identify a Threshold for Acceptable Radiographic Parameters of Distal Radius Fractures in Patients Over 65 Years Old?

C. Symonette, J. MacDermid, and R. Grewal*

London, Ontario, Canada

Purpose: Distal radius fractures are common in the older adults. Evidence supports that in patients over 65 years old, malalignment on imaging does not necessarily translate into poor outcomes. Older patients, as a group, appear to tolerate a greater degree of anatomic deformity than their younger counterparts. The purpose of this study was to identify the acceptable threshold for radiographic parameters following distal radius fractures (DRF) in patients over 65 years old according to a patient-rated pain and disability outcome measure. **Methods:** A prospective cohort of 190 older adults (>65 years old) with DRF were recruited from a tertiary care referral center. The influence of specific radiographic parameters

(ulnar variance (UV), radial inclination (RI), and volar/dorsal tilt) on 1 year Patient-Rated Wrist Evaluation (PRWE) scores was investigated. The odds ratio (OR) of a poor PRWE outcome at various alignment thresholds was calculated with 95% confidence intervals. **Results:** The majority of the cohort ($n = 158$, 83%) had a good PRWE outcome (14.4 ± 19.5 , mean $\pm$ SD) despite malalignment on radiographs. Average radiographic parameters for our cohort were an UV of 1.9 ± 1.9 mm ($\pm$ SD), RI of $18.7^\circ \pm 5.9^\circ$ ($\pm$ SD), and dorsal tilt of $4.5^\circ \pm 11.9^\circ$ ($\pm$ SD). The OR of a poor PRWE outcome was not significant for UV. The OR of a poor outcome was significant for RI 20° (OR 3.6, 95% CI 1.5-8.7) and dorsal tilt = 15° (OR 5.3, 95% CI 1.0-27.8). **Conclusion:** Our study provides new discrete thresholds for acceptable radiographic parameters following DRF in a cohort >65 years old according to a validated patient-rated outcome measure. This information can be used to counsel older patients on their increased likelihood of a poor outcome with RI 20° or a dorsal tilt = 15° . Further research is required to elucidate factors contributing to a poor outcome in the elderly. **Learning Objectives:** (1) Offer radiographic thresholds contributing to a poor outcome in distal radius fractures in patients >65 years old.

36 - A Novel Device for the Measurement of Intrinsic Strength

A. Kim*, C. Doherty, S. Chinchalkar, and L. Ferreira

London, Ontario, Canada

Introduction: In the clinical evaluation and research of patients with ulnar nerve neuropathy, muscle strength measurements are currently based on manual muscle strength testing (MMST) or grip strength and pinch strength dynamometry. MMST is variable between clinicians and lacks sensitivity. An intrinsic dynamometer was developed to measure abduction/adduction forces of all fingers requiring minimal involvement from the clinician. This study aims to examine the reliability and validity of the device. **Methods:** The intrinsic dynamometer is a stationary device consisting of a force sensor (load cell) that connects to an amplifier, calibrated by applying known forces against the active prong of the apparatus. Volunteers were recruited from students and staff at Western University and St. Joseph's Hospital. Conventional measurements of intrinsic strength were recorded (grip strength, key pinch and tripod) as well as repeated measurements of abduction and adduction in all digits. **Results:** Twenty healthy participants were recruited (ten males and ten females, age range 20-65 years). Test-retest reliability was found to be high for the device (Pearson coefficient 0.80-0.91, $P < .05$). A weak but positive correlation was found between conventional methods of measuring grip strength to intrinsic strength measurements. Normative data show increasing strength of abduction/adduction towards the radial digits. No difference was found in intrinsic strength of dominant vs non-dominant hands. Average strength of first dorsal interossei and abductor digiti minimi was determined in males and females. **Discussion:** For clinical

evaluation and research methodologies that include patients with ulnar neuropathy, we developed a device that addresses previous limitations in other devices by isolating intrinsic finger movements. This has found to be reliable and valid in healthy individuals. This device may prove to be a valuable adjunct to following and further modifying treatment options for patients with ulnar neuropathy. **Learning Objectives:** (1) Participants will be able to identify specific outcome measures available in hand surgery and their limitations. (2) Participants will be able to discuss principles of reliability and validity of assessment instruments.

37 - Predicting Which Pediatric Hand Fractures Require Specialized Care

R. Hartley*, C. A. Kinlin, K. Hulin-Poli, C. Temple-Oberle, R. Harrop, and F. Fraulin

Calgary, Alberta, Canada

Purpose: To determine which pediatric hand fracture require specialized care by a hand surgeon as part of a clinical prediction tool to improve triage practices. **Methods:** Retrospective data of all pediatric hand fractures referred to plastic surgery at a single tertiary center was collected over one year. Medical charts and radiographs were reviewed and data was separated into 2 groups: metacarpal (MC) and phalangeal. Univariate analysis ($P < 0.1$) then logistic regression ($P < .05$) was performed using fracture characteristics as the predictor variables and "needed specialized care" (defined as surgery, closed reduction, or more than 3 follow-up visits by a plastic surgeon) as the outcome variable. **Results:** For 2013 there were 559 fractures, 185 MC (33.1%) and 374 phalangeal (66.9%). Most patients were referred by emergency physicians (473, 92%). Management by plastic surgery included: immobilization alone (480, 85.9%), initial closed reduction and immobilization (18, 3.2%), repeat closed reduction and immobilization (8, 1.4%), and surgical intervention in the operating room (53, 9.5%). Twenty-four predictor variables were included in the statistical analysis. The significant predictor variables for MC fractures were displacement over 2 millimeters ($P = .016$) or clinical malrotation ($P = .012$). Thirty (16.2%) MC fractures required specialized care. The significant predictor variables for phalangeal fractures were condylar involvement ($P = .016$), displacement over 2 millimeters ($P = .042$) or angulation over 15 degrees on anterior-posterior radiograph ($P = .012$) or lateral radiograph ($P = .036$). Sixty-9 (18.4%) phalangeal fractures required specialized care. **Conclusion:** Relatively few variables predict which pediatric hand fractures need specialized care by a hand surgeon and most pediatric hand fractures can be treated non-operatively. Knowledge of these variables is an essential first step in developing a pediatric hand fracture clinical prediction tool and management pathway. **Learning Objectives:** (1) List the characteristics that predict which pediatric hand fracture need specialized care by a hand surgeon.

38 - Infantile Hemangiomas of the Lip: Which Lesions are Associated With Complications and Surgical Intervention?

T. Cawthorn*, A. MacRobie, F. Fraulin, and R. Harrop
Calgary, Alberta, Canada

Purpose: Infantile hemangiomas of the lips can lead to significant complications including ulceration, feeding difficulties, and lip contour distortion. The objective of this review was to identify patient and lesion characteristics associated with complications and the need for surgical intervention. **Methods:** A retrospective chart review of children with focal lip hemangiomas treated at our institution between January 2000 and December 2016 was conducted. Patient demographics, lesion characteristics, complications, treatments, and outcomes were collected. Lesions were classified based upon depth (superficial, deep, or mixed depth), vermilion border involvement, and location. **Results:** One hundred two patients with focal lip hemangiomas were identified; 45.1% were managed expectantly, 43.1% were treated medically (including 35 patients treated with propranolol), and 18.6% required surgery. There was no difference in complication or surgery rate based on treatment with propranolol. **Complications:** Ulceration during the proliferation phase was the most common complication, reported in 14.7% of patients. All ulcerations occurred in lesions with a superficial component and were usually identified at time of initial presentation. **Surgery:** Surgical debulking to improve lip contour and symmetry was typically done during the involution phase (median age: 52 months, range 18-150 months). None of the patients with superficial lesions underwent surgery; however, 27.1% of patients with deep or mixed depth hemangiomas required surgical treatment ($\chi^2 = 10.7$, $P = .001$). No other lesion or patient characteristics were associated with need for surgery. **Conclusions:** Ulceration occurs most frequently in mixed depth hemangiomas during the early proliferative phase, and very rarely in lesions without a superficial component. However, presence of a deep component is the primary factor in predicting the need for surgical debulking during the involution phase. **Learning Objectives:** (1) Describe the clinical patterns and complications of lip hemangiomas. (2) Identify lesion characteristics associated with complications and need for surgical management.

39 - Low Apgar Score as an Indicator for Prompt Referral to a Specialized Multidisciplinary Team in the Nonoperative Treatment of Obstetrical Brachial Plexus Injuries

A. Azzi*, C. Aubin-Lemay, J. Kvann, and T. Zadeh
Montréal, Québec, Canada

Purpose: Prompt physical and occupational therapy is crucial in managing non-surgical candidates with Obstetrical Brachial

Plexus Injuries (OBPI). The objective of our study was to identify newborns suffering from nonoperative OPBI in need of a “fast-track” evaluation by our multidiscipline team. **Methods:** Retrospective chart review of single surgeon’s experience of OBPI from June 1995 to June 2015. All nonsurgical candidates (Narakas class 1) were included in the study. The Gilbert score and the Medical Research Council grading system were used to measure shoulder and elbow outcomes, respectively. Multiple subgroups analyses were performed to study the impact of time-delay on shoulder and elbow function. The ANOVA test and Welch’s test were used for statistical analysis. **Results:** A total of 168 patients were included in this study. Mean follow-up time was 103 weeks (min: 5; max: 1072; IQR: 70.9). Time delay between birth and the first consult to our clinic significantly correlated with shoulder outcome in the subgroup of newborns with Apgar scores <7 at 5 minutes. The following subgroups did not have a clinically significant association between shoulder outcome and time delay to consult: maternal diabetes, birth weight >4 kg, use of forceps, asphyxia, multiple comorbidities, and Apgar score at 1 minute. Elbow outcomes remained unaffected by time delay in the total population and in all subgroups. **Conclusion:** The subgroup of newborns with an Apgar score <7 at 5 minutes shows improved long-term shoulder outcome when promptly examined by an OBPI clinic. We recommend that that this “time-sensitive” population should be recognized and assessed by a multidisciplinary team before 12 weeks of age. **Learning Objectives:** (1) Participants will be able to identify risk factors for an expedited consult to an obstetrical brachial plexus clinic. (2) Participants will be able to improve patient care by identifying a subgroup of newborns in the nonoperative patient population who would benefit from an earlier referral to a specialized team.

40 - Outpatient Burn Care at BC Children’s Hospital Burn Treatment Room: A 3-year Review

R. Chan, A. Van Slyke*, M. Bucevska, and C. Verchere
Vancouver, British Columbia, Canada

Purpose: The Burn Treatment Room (BTR) at BC Children’s Hospital (BCCH) is run by a multidisciplinary team, providing sedation to burn patients undergoing dressing changes in a monitored setting outside the operating room. There is little literature on the safety, efficacy and logistics of treating outpatient pediatric burn patients in this manner. Here, we review the safety and efficacy of the BTR in conjunction with a qualitative analysis of staff experience. **Methods:** We conducted a retrospective chart review of all patients treated in the BTR from 2013 to 2015. Patient demographics, burn etiology, TBSA, burn depth, sedation, and complications were recorded. Data were analyzed using descriptive statistics. Qualitative interviews with BTR staff were transcribed and common themes were extracted. **Results:** 59 patients with a total of 216 BTR visits (average visit time 64.75 minutes)

were included. Scald burns were the most common mechanism of injury (76%). Most burns were superficial dermal (54%) and initially estimated at 5-10% TBSA (57%). The majority (72%) of patients required intravenous sedation during dressing changes, and propofol was the most common medication used (83%). Nine patients were converted from oral to IV sedation, 2 had short apnea periods that recovered spontaneously, and 2 had prolonged sedation. Overall, no major sedation-related complications occurred. Interviews with 19 staff members revealed an overall positive experience with few safety concerns; areas of improvement using the BTR model were identified. **Conclusion:** The BTR at BCCH is a safe and effective way to treat burn patients in an outpatient setting, preventing what would historically require inpatient management. **Learning Objectives:** Participants will be able to (1) identify which pediatric burn patients can be safely treated as an outpatient using the BTR model and (2) identify weaknesses using the BTR model and apply this knowledge to improve outpatient pediatric burn care at their own institution.

41 - A Prospective Review of 2-Dimensional Methods Versus Three-Dimensional Scanning Systems in the Assessment of Total Body Surface Area Estimation in Burn Patients

H. Retrouvey*, J. Chan, and S. Shahrokhi

Toronto, Ontario, Canada

Purpose: Accurate measurement of total body surface area (TBSA) is crucial in the management of burn patients for determining the need to transfer and fluid resuscitation. TBSA can be estimated using many methods, all of which are fairly inaccurate. Three-dimensional (3D) systems have been developed to improve TBSA estimation and consequently optimize clinical decision-making. The objective of this study was to compare the accuracy of TBSA estimation by conventional methods against novel 3D methods. **Methods:** This prospective study included all acute burn patients admitted in 2016. The staff burn surgeon determined TBSA using conventional methods. In parallel, a researcher determined 3D TBSA using the Burn Case 3D program. Demographic data and injury characteristics were also collected. T-test was used to determine differences between each measure of TBSA, with assessment of the influence of body mass index (BMI) and gender on accuracy. **Results:** Thirty-five patients were included in the study (6 female and 29 male). Average age was 47.5 years, with a mean BMI of 28.2 kg/m². The *t*-test showed that TBSA determined by Burn Case 3D Program was statistically significantly different from conventional TBSA assessment ($P = .0103$). Paired *t*-test demonstrates that the TBSA measured using Burn Case 3D was significantly lower than the TBSA determined using conventional means by 2.55% (95% CI = -0.60 to 5.6). BMI and gender did not impact TBSA accuracy. **Conclusion:** Burn Case

3D underestimated TBSA by 2.55%. This may be due to the difficulty capturing the entirety of the burned area with photography. Although statistically significant, this difference is likely nonclinically significant. 3D TBSA evaluation systems should therefore be considered to improve TBSA estimation, which may ultimately prevent inappropriate transfers and allow for improved burn resuscitation. **Learning Objectives:** (1) Discuss the importance of accurate TBSA evaluation and (2) discuss the role of 3D scanning systems in the evaluation of TBSA.

42 - SCAR-Q Kids: Developing a Patient-Reported Outcome Instrument for the Pediatric Burn, Traumatic, and Surgical Scar Populations

N. Ziolkowski*, A. Klassen, L. Mundy, and J. Fish, A. Pusic

Toronto, Ontario, Canada

Purpose: Children develop scars from burns, surgical interventions, and trauma. Scars may impact psychosocial and physical functioning, and quality of life. Patient-reported outcomes (PROs), such as these, can be reliably evaluated with PRO instruments. The objective of this study is to develop a new PRO instrument specifically designed to assess children's perceptions of scars. **Methodology:** A preliminary PRO instrument (SCAR-Q) was developed from 274 interviews (pediatric and adult) among patients with scars. To ensure the new scales would be appropriate for pediatric patients, we performed a series of cognitive debriefing interviews. To ensure the instrument is clinically relevant, expert opinion was obtained from focus groups and a survey of allied health professionals. **Results:** Three rounds of cognitive interviews were completed from March to December 2016 (mean 7 patients/round, range 4-10) in the pediatric population with all scar etiologies (age at time of scar 0-17 years). Six items were revised, 3 items removed, and 6 items added to the 2 scar-specific scales. A Psychological Distress Scale was added due to feedback from interviews. Seventy experts were contacted worldwide (response rate 33%). For the focus groups, 1 item was added to the Symptom scale and the remaining confirmed changes completed by the survey. **Conclusions:** As evaluations of healthcare outcomes become increasingly patient-centered, a PRO instrument specifically designed to evaluate the impact of scars among children will be needed to assess scar management. We anticipate that SCAR-Q Kids will be used to determine optimal timing of scar modulation, evaluate outcomes in scar therapies, aid in clinical trials, and be part of quality improvement initiatives. As a next step, SCAR-Q Kids will be tested psychometrically a large heterogeneous population of children with scars internationally. **Learning Objectives:** (1) To describe a preliminary PRO instrument for the pediatric scar population and (2) discuss steps involved in developing a PRO instrument for this population

43 - Staged Margin-Controlled Excision Technique for Lentigo Maligna, a Modification of the Spaghetti Technique

J. Beveridge*, M. Taher, J. Zhu, and T. Salopek

Edmonton, Alberta, Canada

Purpose: Lentigo maligna (LM) accounts for 79% to 83% of all melanoma in situ (MIS), and currently no consensus exists on the best therapeutic management. LM commonly presents in cosmetically sensitive locations, thus, requires tissue-sparing excision. Outlining the peripheral margins of LM is challenging as it is characterized by a horizontal growth phase that extends beyond visible margins. Consequently, surgeons often choose between wide margins and preserving function and/or aesthetics. The Staged Margin Controlled Excision (SMEX) technique, a modification of the Spaghetti technique, eliminates this decision allowing surgeons to minimize margins and ensure complete excision of LM. The details of the modification, clinical outcomes, and a comparison of these outcomes to alternative excision techniques in the literature will be described. **Methods:** Retrospective chart review of twenty-four adult patients with a primary LM who underwent SMEX treatment between 2009 and 2015. The primary outcome examined was MIS recurrence rate. Secondary outcomes studied included closure techniques, number of staged procedures required, LM location, and final lesion pathology. **Results:** There were no recurrences of LM treated by the SMEX technique in the studied population, with a mean post-operative surveillance of eighteen months. The pre-operative diagnosis corresponded with a post-operative diagnosis in 100% of cases. **Conclusions:** Excision of LM by the SMEX technique offers a reliable surgical method that ensures complete excision of the lesion while creating the smallest possible tissue defect, thus, facilitating the most aesthetic closure. The recurrence rates associated with this technique are comparable to, if not better than, alternative excision techniques for MIS in the literature. This study validates a modification of the Spaghetti technique in a North American setting. **Learning Objectives:** (1) Describe the Staged Margin Controlled Excision technique. (2) Discuss the recurrence rates of Lentigo Maligna post SMEX treatment, and compare the results to techniques detailed in the literature.

44 - Functional Outcomes After Tibial to Peroneal Nerve Transfer in Footdrop Patients

M. Curran*, J. DeSerres, M. Morhart, and J. Olson, M. Chan

Edmonton, Alberta, Canada

Purpose: Due to coactivation of antagonistic muscles during gait, functional outcomes following tibial nerve transfer to the tibialis anterior muscle in patients with peroneal nerve injury

are poor. The purpose of this study was to examine the effects of gait training on functional performance of patients who demonstrated successful reinnervation to the tibialis anterior muscle. **Methods:** Using a prospective study design, a consecutive series of patients who underwent tibial nerve transfer to the tibialis anterior muscle were recruited. Once reinnervation was confirmed, the patients either underwent rehab gait training with biofeedback without bracing or used ankle foot orthosis full time. After a minimum of 12-month follow up, differences in volitional control of ankle dorsiflexion was measured by Stanmore Questionnaire, a functional assessment that includes MRC. Differences between the 2 groups were compared with nonparametric statistics. **Results:** Of the 16 patients who underwent tibial nerve transfer, EMG studies revealed successful reinnervation in 8 (6 males; 36 [22 to 40] years, median [IQR]). Six were due to trauma and 2 from oncologic resection. The 5 patients in the rehab training group demonstrated significantly better functional ability as measured by Stanmore (90 [65 to 90] vs 30 [24 to 35]; $P = .03$) compared to 3 in the control group. **Conclusions:** Overall the outcomes are mixed. Only 50% of patients had meaningful reinnervation of the tibialis anterior muscle following transfer. In those patients with successful reinnervation, prolonged rehab training significantly improved outcomes. **Learning Objectives:** (1) The results of the tibial to peroneal nerve transfer are variable. (2) Rehab gait training improves functional outcomes in patients with successful reinnervation.

45 - The Misconception of Case-Control Studies in the Plastic Surgery Literature: A Literature Audit

A. Hatchell*, F. Farrokhyar, and M. Choi

Hamilton, Ontario, Canada

Purpose: Case-control study designs are commonly used. However, many published case-control studies are not true case-controls and are in fact mislabeled. The purpose of our study was to identify all case-control studies published in the top 3 plastic surgery journals over the last 10 years, assess which were truly case-control studies, clarify the actual design of the articles, and address common misconceptions. **Method:** Medline, Embase, and Web of Science databases were searched for case-control studies in the 3 highest impact factor plastic surgery journals (2005-2015). Two independent reviewers screened the resulting titles, abstracts, and methods, if applicable, to identify articles labeled as case-control studies. These articles were appraised and classified as true case-control studies or non-case-control studies. **Results:** We found 28 articles labeled as case-control studies. However, only 6 (21%) of these articles were truly case-control designs. Of the 22 incorrectly labeled studies, 1 (5%) was a randomized controlled trial, 3 (14%) were nonrandomized trials, 2 (9%) were prospective comparative cohort designs, 14 (64%) were retrospective comparative cohort designs, and 2 (9%) were

cross-sectional designs. The mislabeling was worse in recent years, despite increases in evidence-based medicine awareness. **Conclusions:** The majority of published case-control studies are not in fact case-control studies. This misunderstanding is worsening with time. Most of these studies are actually comparative cohort designs. However, some studies are truly clinical trials and thus a higher level of evidence than originally proposed. **Learning Objectives:** At the end of this presentation, learners will be able to (a) describe key features of common study designs, (b) identify misconceptions of this study designs, and (c) differentiate between the different types of research study designs.

46 - Preoperative Angiography for Free Fibula Flap Harvest: Is It Necessary?

N. Alolabi*, H. Augustine, L. Dickson, and C. Levis

Hamilton, Ontario, Canada

Purpose: To determine if preoperative angiography of the lower extremity is necessary to detect abnormalities that may alter operative planning prior to harvest of a free fibula flap. The secondary objective is to determine whether conducting a physical examination alone is sufficient to predict such abnormalities. **Methods:** A retrospective review of a single surgeon's experience with harvesting free fibula flaps in patients with preoperative lower extremity angiography was performed. Patients assessed for free vascularized bony reconstruction over a 12-year period (November 2004 to July 2016) were screened for inclusion and exclusion criteria. Outcomes of interest included preoperative physical examination and angiography findings, changes in operative plan, and perioperative complications including flap failure and limb ischemia. Level of agreement between physical examination and angiography findings were compared. **Results:** Seventy-eight consecutive patients were assessed for free vascularized bony reconstruction, of which 59 met the inclusion criteria and were included in the final analysis. Mean age was 60.6 years old. All patients underwent conventional aortic angiogram runoff, except 2 were investigated with computed tomography angiography. The surgical plan was altered based on angiography findings in 13.6% (8/59) of cases; 87.5% (7/8) of cases requiring change in operative plan had normal physical examination findings. A further 10.2% (6/59) had physical examination findings precluding the use of a free fibula flap, whereas imaging demonstrated the contrary. There were no limb ischemia complications. **Conclusions:** This study suggests a necessity for routine preoperative angiography of the lower extremity for all patients being evaluated for free fibula flaps. Physical examination alone is not sufficient in detecting vascular abnormalities that may result in limb compromise or an inability to harvest a free fibula flap. **Learning Objectives:** Participants will learn the role of preoperative clinical examination and lower extremity imaging in free fibula flaps and review the evidence surrounding this topic.

47 - Pediatric Hepatic Artery Microvascular Anastomosis in Living Donor Liver Transplantation: 73 Consecutive Cases by a Single Surgeon

K. Zuo*, A. Draginov, A. Panossian, A. Fecteau, E. Ho, and R. Zucker

Toronto, Ontario, Canada

Purpose: Living donor liver transplantation (LDLT) is a reliable technique for pediatric patients with end stage liver disease. However, LDLT has high rates of hepatic artery thrombosis (HAT), which is associated with graft loss and up to 50% mortality. Microsurgical techniques have demonstrated lower rates of HAT. We reviewed one of the largest single surgeon experiences in pediatric LDLT microvascular hepatic artery anastomosis to determine the incidence of HAT and to assess long term patient survival. **Methods:** A retrospective review was undertaken of children who underwent LDLT with microvascular hepatic artery anastomosis. Data was collected on patient demographics, etiology of liver failure, graft donor, vessel caliber, vessel anastomosis, arterial complications, and long term follow up. **Results:** Between 2000 and 2014, 73 children (mean age 3.1 years) underwent LDLT with microvascular hepatic artery anastomosis. The most common liver failure etiologies were biliary atresia (n = 46) and inherited metabolic disorders (n = 7). Segmental living donor allografts were procured from 58 related donors (79%), 12 unrelated donors (16%), and 3 unknown donors (4%). The left lateral segment of the donor liver was transplanted in 56 cases (77%). 81 end to end hepatic artery anastomoses were completed with mean donor and recipient vessel diameters of 2.1 mm. Hepatic artery complications occurred in 3 cases (4%), including HAT identified and repaired intra- operatively, a kinked hepatic artery that was re-anastomosed without consequence, and HAT with systemic thrombophilia resulting in patient death. At mean follow-up of 6.1 years, overall patient survival was 93%. **Conclusions:** Microvascular hepatic artery anastomosis in pediatric patients undergoing LDLT is associated with a low hepatic artery complication rate and excellent long term liver graft function. Collaboration between microsurgeons and transplant surgeons can significantly reduce technical complications and optimize patient outcomes. **Learning Objectives:** (1) State the challenges of pediatric liver transplantation. (2) Explain the role of microvascular techniques in pediatric liver transplantation.

48 - Facial Transplantation Outcomes: Comprehensive Analysis of Risks and Benefits

M. Alhefzi*, M. Aycart, H. Kiwanuka, N. Krezdorn, E. Bueno, and B. Pomahac

Hamilton, Ontario, Canada

Introduction: Face transplantation represents a state of art modality to restore the aesthetic and functional integrity of

many disfigured patient. The purpose of this study is to perform a comprehensive risks and benefits analysis of various outcomes of FT. **Method:** Seven patients underwent full ($n = 4$) and partial ($n = 3$) FT at our institution after participating in the FT clinical trial (NCT01281267). We conducted a prospective analysis of motor and sensory recovery, functional outcomes, acute rejection, surgical and infections complication. **Results:** Median follow up time was 5 years (range 1.5-7). Median length of stay was 17 days (range 11-42) for the index admission. Early Surgical complication occurs in 3 patients in form of local fluid collection ($n = 3$) and hematoma ($n = 1$). Two patients developed pneumonia during early posttransplant that was treated successfully. After the first month, the majority of infection was localized infection (Cellulitis $n = 5$, superficial fungal infection $n = 3$ [all in one patient], Herpes simplex virus $n = 2$, conjunctivitis $n = 1$, erysipelas $n = 1$). Other more severe infections include *C difficile*-associated diarrhea $n=2$, CMV disease $n=3$, polymicrobial bacteremia $n = 1$ and HCV $n = 1$. Total of 31 rejection episodes were diagnosed, grade II $n = 7$ (22.5%), grade III $n = 23$ (74.1%) and 1 (3.2%) as antibody mediated rejection. All were successfully treated with Intravenous Steroid $n = 20$ (64.5%), dose adjustment of immunosuppression with or without topical agents $n = 8$ (25.8%) or other modalities $n = 3$ (9.6%). Allograft and patient survival was 100%. At most recent follow up, all patients showed a near-normal motor and sensory function. Speech was largely intelligible as evident by improvement in speech intelligibility tests. Regarding swallowing function, most patients demonstrated unrestricted diet with using of minimal compensatory strategies. **Conclusion:** In this study, we observe that the functional outcomes of FT overcome the few risks associated it. **Learning Objective:** To discuss the risks and benefits associated with Face transplantation

48A - A. W. Farmer Lecture

Using Perforators and Supermicrosurgery to Expand the Horizon of Lower Extremity Reconstruction

Joon-Pio Hong, MD, PhD, MMM

Seoul, Korea

Reconstruction of the lower extremity using free flaps remains difficult. Although limb salvage rates have greatly improved over the past 20 to 30 years, major hurdles regarding single artery limb, atherosclerosis involvement of hardware, frequent spasm, chronic infections, edema, complexity of lower limb trauma and diabetes still makes it very challenging even for experienced surgeons. In this age of reconstruction, we are faced not only to achieve successful soft tissue coverage but functional recovery, chronic infected wound control, and cosmetic improvement. Evolutions in microsurgery have been noted from the days of experimental surgery, finger replantation and now to perforator flaps and supermicrosurgery and it has

allowed achieving complex goals. These evolution aims for better results and to minimize complications despite the innate risks of lower extremity soft tissue reconstruction. The use of perforator flaps allows to expand our choices for local flaps and perforator to perforator supermicrosurgery has may help in selecting the right recipient in high risk lower extremity reconstruction. The supermicrosurgery technique is defined as microsurgical manipulation of vessels with diameter less than 0.8 mm. This technique, although reported frequently on lymphaticovenous shunting to treat lymphedema and sporadically in soft tissue reconstruction with specific indications, have not been analyzed in detail for the soft tissue reconstruction of lower extremity. The supermicrosurgery defined as anastomosis of vessels of less than 0.8 mm. limits the anastomosis of recipient and donor vessels to perforator level or anastomosis of donor vessels as end to side to a vessel larger than 0.8 mm. In this review, we will limit the evaluation to perforator to perforator anastomosis supermicrosurgery. The introduction of free style flaps has shown that any perforator can be a pedicle for a given skin territory around the perforator. The hypothesis that a given recipient perforator can act in the same manner in providing sufficient blood flow with perfusion is an extension of idea from the free style free flap concept and thus been named free style reconstruction. The use of supermicrosurgery in the lower extremity allows the recognition of free style flaps. Furthermore, the recipient pedicle may no longer require any predictable vessels other than a Doppler traceable perforator with an adequate caliber. Adapting to the idea of "free-style", this can be termed as "free-style reconstruction". As shown in this study, the supermicrosurgery technique is feasible in the lower extremity and may be efficient in the hands of a skilled surgeon. **Goals And Objectives:** At the end of this lecture the learner will be able to understand (1) the concept of supermicrosurgery in flap reconstruction; (2) the concept of using perforators as recipient vessels (perforator to perforator supermicrosurgery) in lower extremity; and (3) a new paradigm of lower extremity reconstruction using perforator concepts.

GENERAL SESSION

48B - PANEL

Blepharoplasty

Moderator: Richard Warren (Vancouver, British Columbia, Canada)

Panelists: Derek Ford (Toronto, Ontario, Canada)

Blepharoplasty is a common aesthetic procedure for which there are a number of different techniques available. This panel will concentrate on the aesthetic assessment of the blepharoplasty patient and the necessary decisions made in determining the most appropriate surgical approach. For the upper lids, issues include how to determine the amount of tissue to be removed (if any), when a brow lift is indicated and when upper lid sulcus grafting is indicated. For the lower lids, issues include

determining the correct method to treat the tear trough deformity and identifying those cases requiring a lower lid support procedure. **Learning Objectives:** At the completion of this panel, attendees will be able to: (1) Identify patients presenting for blepharoplasty who would benefit from browlift surgery; (2) distinguish patients who are candidates for upper lid sulcus fat grafting; (3) list 3 methods to surgically manage the tear trough deformity; and (4) determine those patients having lower lid blepharoplasty who require a lower lid support procedure

48C - Panel

Mastopexy

Moderator: Brian Peterson (Kelowna, British Columbia, Canada):

Panelists: Nancy Van Laeken (Vancouver, British Columbia, Canada)

48D - Panel

Basilar joint arthritis of the thumb

Moderator: Michael Morhart (Edmonton, Alberta, Canada)

Panelists: Paul Binhammer (Toronto, Ontario, Canada)

Learning Objectives: (1) Review basic anatomy of the basilar joint and loading characteristics; (2) appreciate the pathophysiology of the evolution OF basilar joint OA; (3) to understand role of conservative treatment options; (4) to familiarize one with surgical options, including suspensionplasty, hematoma distraction, implant arthroplasty and cmc arthrodesis.; and (5) recognize and manage common surgical complications

48E - Panel

Facial Re-animation

Moderator: Damir Matic (London, Ontario, Canada)

Panelists: Nancy Van Laeken (Vancouver, British Columbia, Canada)

Learning Objectives: At the end of this panel, participants will be able to (1) describe the different treatment modalities and options available to achieve facial re-animation in patients with facial nerve dysfunction; (2) identify the challenges in achieving facial re-animation in patients with facial paralysis; and (3) list the different types of patients with facial nerve dysfunction that would benefit from facial reanimation.

49 - Corneal Neurotization in Adults

F. Yau*, A. Rubinov, A. Al-Ghoul, and E. Weis

Calgary, Alberta, Canada

Purpose: To assess the efficacy of corneal neurotization for vision restoration in adults, using sural nerve grafts from the

supraorbital/supratrochlear nerves via a minimally invasive approach. **Method:** This is a prospective consecutive case series of 6 patients with neurotrophic keratitis. All patients were on maximal medical treatment at the time of recruitment and had signs of ocular surface compromise with vision deterioration. The surgical technique involved harvest of the sural nerve and passage of the nerve through an upper eyelid incision to the superior conjunctival fornix of the affected eye. The graft was separated into fascicles and placed around the cornea via perilimbal incisions deep to Tenon's capsule. The proximal end of the nerve graft was coapted to either the ipsilateral or the contralateral supraorbital/supratrochlear nerve. Demographic data was compiled. Pre-operative and post-operative vision and corneal sensation was measured with between 6 and 16 months of follow-up. **Results:** There were 5 male patients and 1 female patient. Mean age was 57. Mean denervation time was 45 months. The etiology of the neurotrophic keratitis was herpes zoster in 2 patients, acoustic neuroma surgery in 2 patients and ocular trauma in 2 patients. All patients had absent corneal sensation pre-operatively and regained it postoperatively. All patients showed improved visual acuity with the exception of 1 patient who is now a candidate for corneal transplant and is awaiting surgery. **Conclusions:** Corneal neurotization with nerve transfers from the supraorbital/supratrochlear nerves is a promising treatment modality for neurotrophic keratitis and this is the first reported case series of the procedure in adults. **Learning Objectives:** (1) To identify the various etiologies and existing treatment options for neurotrophic keratitis. (2) To describe the surgical technique of corneal neurotization using sural nerve grafts from the supraorbital and/or supratrochlear nerves as a potential option for restoration of corneal sensation.

50 - 30-Day Outcomes Following Surgical Decompression of Neurogenic Thoracic Outlet Syndrome

T. Maqbool*, C. B. Novak, T. Jackson, and H. Baltzer

Toronto, Ontario, Canada

Purpose: The purpose of this study was to evaluate early post-operative outcomes following brachial plexus surgical decompression in the thoracic inlet to relieve symptoms of neurogenic thoracic outlet syndrome (nTOS). We hypothesized that first and/or cervical rib resection would be associated with increased 30-day complications and healthcare utilization. **Methods:** The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database for all cases of surgical decompression from 2005 to 2013 was reviewed. **Results:** There were 225 eligible patients (females: 68.4%; mean age: 36.4 years $\pm$ 12.1; BMI $\geq$ 30: 25.8%). Two hundred five (91.1%) patients underwent first and/or cervical BMI > rib resection (+/- scalenectomy), and the remaining 20 (8.9%) underwent rib-sparing scalenectomy. First and/or cervical rib resection was associated with longer operative time (mean = 221.7 minutes vs 154.1 minutes, $P = .000$), and with longer hospital stays (mean =

4.2 days vs 2.9 days, $P = .000$), compared with rib-sparing scalenectomy. Overall, 8 (3.6%) patients developed 10 complications in the 30-day postoperative period, 9 (90% of complications) occurred in 7 rib resection patients (87.5% of patients with complications). Furthermore, there were 10 (4.4%) patients that required return to the operating room, all of whom had rib resection (100%). Nine patients were re-admitted (14.3%), all of whom had rib resection (100%). No significant associations were found between rib resection, and these complications and return to care. **Conclusion:** First and/or cervical rib resection is associated with longer surgical times and hospital stays. Additionally, there may be a relationship between rib resection and post-operative complications and return to care. These data highlight the importance of pre-operative evaluation in determining the location of the brachial plexus compression to direct surgical management that reduces morbidity for patients and utilization of limited healthcare resources. **Learning Objective:** To consider differences in outcome following surgical decompression of nTOS with or without rib resection.

51 - Intralesional Therapy With Interleukin 2 for In-Transit Melanoma

B. Lopez-Obregon*, M. Barreto, A. Fyfe, G. McKinnon, and C. Temple-Oberle

Calgary, Alberta, Canada

Purpose: Intralesional Interleukin-2 treatment for in-transit melanoma has been previously trialed in 2 Canadian Centers with variable complete response rates (32-51%). The aim of this phase II study is to review the results of intralesional IL-2 therapy in our Centre. **Methods:** We performed a retrospective chart review of prospectively collected patients with in-transit melanoma that were treated with intralesional interleukin-2 in a single Institution from 2010 to 2016. Response evaluation was performed by 2 independent reviewers, one prospectively and one retrospectively, using RECIST criteria. Presence or absence of TILs (tumor infiltrating lymphocytes) was correlated with the degree of response. **Results:** 47 patients were identified. Mean age at primary tumor diagnosis was 65.5 years (18-91). Average Breslow thickness was 3.56 mm (0.6-6.5). Mean time to development of in-transit melanoma was 17.3 months (1-70). The average number of treatments received per patient was 4. The evaluation of the response was available in 46 patients. Overall response by patient was 74% (CR 46% and PR 28%) and no response (PD + SD) was observed in 26% of the patients. 60% of the lesions treated had a complete response. When TILs were present in the primary tumor, 82% of the cases responded to the treatment, versus 60% when TILs were absent ($P = 0.11$). Main side effects associated with the treatment were discomfort with the injections (100%) and limited flu-like symptoms after the injections (53%). **Conclusions:** Intralesional IL-2 is confirmed to be a safe and effective treatment at another Canadian Centre. The presence of TILs in the primary tumor may predict better response to IL-2. **Learning Objectives:** (1) Describe the intralesional Interleukin-2 injection

technique and treatment protocol for in-transit melanoma. (2) Evaluate the response to the treatment and its potential association with melanoma's histopathological features.

52 - Tissue Expansion for Equinus Deformity: A 16-Year Review

K. Nickel*, A. Van Slyke, A. Knos, K. Wing, and N. Wells
Vancouver, British Columbia, Canada

Purpose: Tissue expansion in the lower extremity is controversial, with studies reporting a complication rate as high as 83%. In the few studies that have looked at tissue expansion prior to equinus deformity correction, rates of wound complications in children are unacceptably high and there are no adult cases published to date. Here we report the largest case series on the use of tissue expanders prior to the reconstruction of equinus deformity, and the only report in adults. **Methods:** This is a retrospective chart review of the senior author's practice over a 16-year study period. All patients over 18 years of age who underwent tissue expansion prior to definitive orthopedic correction of equinus deformity were included. Patient demographics, etiology of equinus deformity, rate of expansion, and complications were recorded. Major complications were defined as a premature loss of expander leading to a delay in, or abortion of, orthopedic correction. Data was analyzed using descriptive statistics. **Results:** 19 cases were performed on 16 patients. Our overall complication rate was 31.6% (6/19), with major complications occurring in 21.1% (4/19) of cases, and minor complications occurring in 10.5% (2/19) of cases. Despite this, 89.5% (17/19) of cases went on to receive definitive orthopedic correction after tissue expansion. **Conclusions:** Here we present the first report of tissue expansion for correction of equinus deformity in the adult population. Our overall complication rate of 31.6% compares favorably to that reported in the literature, and did not pose an obstacle to successful reconstruction in nearly 90% of cases. **Learning Objectives:** Participants will be able to (1) describe the risks associated with lower extremity tissue expansion for equinus deformity in the adult population and (2) Appreciate that lower extremity tissue expansion is a useful technique to minimize wound complications for orthopedic correction of equinus deformity in the adult population.

52A - A. Ross Tile Lecture

Kevin Cheung

Ottawa, Ontario, Canada

53 - Anatomic Predictors Associated With Velopharyngeal Insufficiency (VPI) Following Primary Cleft Palate Repair

D. Matic* and D. J. Lee

London, Ontario, Canada

Purpose: To assess the incidence of velopharyngeal insufficiency (VPI) requiring secondary surgery following cleft palate repair in a single surgeon's practice and to identify contributing and/or predictive factors associated with the development of VPI. **Methods:** Data were prospectively collected for all non-syndromic patients undergoing primary cleft palate repair by a single surgeon between 2002 and 2016. Standardized pre- and post-operative measurements including cleft palate width, length, and postoperative lengthening were recorded. Cleft classification, Type of repair, presence of fistula, and VPI requiring surgery were also recorded. Statistical analysis using paired t-test was used. **Results:** 249 patients (131 female) were identified. Mean age at primary surgery was 11.9 months. Mean palatal width was 9.8 mm (range, 0-18 mm). Cleft of the primary and secondary palate was associated with a wider mean palatal width than an isolated cleft of the secondary palate. In patients with both pre- and post-operative palatal length measurements, 65 had a Furlow and 57 had a von Langenbeck repair. There were no significant differences in post-op palatal length between groups. Post-operative fistula was observed in 4 (1.6%) patients, with only 1 (0.4%) requiring surgical intervention. Twenty-one of 172 patients required secondary surgery for VPI (12.2%). In this group, VPI was associated with increased palatal width ($P = .028$) but not with post-op palatal lengthening ($P = .996$). Also, no difference ($P = .099$) was found in preoperative palatal length measurements between groups. **Conclusions:** In this study of 249 patients, the incidence of VPI requiring secondary surgery was 12.2%. VPI was associated with increased pre-op palatal width but not with changes in palatal length, type of repair, or presence of fistula. **Learning Objectives:** (1) Understand the pre-operative factors that contribute to the development of VPI. (2) Understand how palatal cleft width compared to length plays a role in cleft palate repair.

54 - Acellular Dermal Matrix in Primary Palatoplasty: A Prospective Trial

A. Govshievich, S. Aldekhayel, and M. Gilardino*

Montréal, Quebec, Canada

Purpose: Palatal fistula remains one of the most cumbersome complications of primary palatoplasty. The objective of the current study is to determine whether routine use of ADM in primary palatoplasty would lower the incidence of palatal fistula. **Method:** A prospective trial was conducted and compared to a historical control group. The prospective group (#1) included cases where use of ADM was routine (2012-2016). Group 2 (2009-2012) included cases where use of ADM was selective, namely for clefts >15 mm or as an augmentation to a tenuous nasal mucosal repair. In total, 129 consecutive patients were included (65 in group 1, 64 in group 2). Children with Veau II-IV clefts, aged 3 months to 3 years who underwent primary cleft palate repair with either an intravelar veloplasty (IVVP) or a Furlow palatoplasty were included. Extracted data included age at operation, gender, adoption, associated

syndromes, Veau class, surgical technique, use of ADM, fistula, and hospital stay. (ClinicalTrials.gov - NCT01867632).

Result: The distribution of patients among Veau classes was similar (II:35, III:18, and IV:12 in group 1 and II:30, III:22, IV:12 in group 2, $P = 0.7$). The Furlow technique was used in 34 and 31 patients in Group 1 and 2, respectively. IVVP was used in 33 and 31 patients in Group 1 and 2, respectively ($P = .9$). ADM was used in 34% of patients in Group 2 ($P = 0.000$). All other variables were comparable between both groups. Incidence of fistula was 1.5% in Group 1 and 14.1% in Group 2 ($P = .007$). There was no difference in the incidence of fistula between surgical techniques ($P = .8$). **Conclusion:** The routine use of ADM in this study has been shown to reduce the incidence of postoperative fistula following primary palatoplasty. **Learning Objectives:** (1) To understand the surgical technique involved in ADM-augmented cleft palate repair. (2) To understand the effect of ADM on fistula formation.

55 - Comparison Between Oximetry and Polysomnography in Identifying Airway Obstruction in Infants With Robin Sequence

R. Galli*, M. Gilardino, L. Lessard, and A. Côté

Montréal, Quebec, Canada

Purpose: Polysomnography is the gold standard for the diagnosis of obstructive apnea in infants with Robin Sequence. However, its routine use is limited by cost and availability. The purpose of our study was to determine whether night-time pulse oximetry (oximetry), an inexpensive and widely available technology, could be used as a surrogate for polysomnography in identifying obstructive apnea in infants with Robin Sequence. **Methods:** We reviewed all polysomnography done in infants with Robin Sequence treated at the Montreal Children's Hospital. We extracted the following standard data: Central Apnea Index and Mixed Obstructive Apnea Hypopnea Index (MOAHI) from polysomnography data and Desaturation Index (drops $\geq 4\%$ /hour, DI4%) from the oximetry done at the time of polysomnography. Symptoms of obstructive apnea were assessed with a standard questionnaire. A MOAHI ≤ 5 was used to separate infants with no/mild obstruction from those with moderate/severe obstruction (MOAHI > 5). **Results:** We reviewed 39 polysomnographies (26 infants, age: 12.2 ± 4.8 months). Central apnea with a mild decrease in oxygenation was a frequent occurrence. All infants with a DI4% < 7 events/hour (22 studies) and no significant snoring had no or mild obstructive apnea on polysomnography. In patients with DI4% > 7 events/hour, 53% had moderate or severe obstruction. In the remaining infants, central events with desaturation predominated. **Conclusion:** In Robin Sequence, oximetry can identify those infants with no or mild obstructive apnea thereby decreasing the demand for polysomnography. With a DI4% > 7 events/hour, polysomnography is required to differentiate between obstructive and central events. **Learning Objectives:** Learners will (1) evaluate the usefulness of different tests in the

diagnosis of apnea in infants with Robin Sequence and (2) identify parameters of importance in polysomnography and pulse oximetry as it relates to obstructive sleep apnea in infants.

56 - Assessing Attentional Bias in Secondary Cleft Lip Deformities: An Eye-Tracking Study

A. Morzycki*, A. Wong, P. Hong, and M. Bezuhly

Halifax, Nova Scotia, Canada

Purpose: When observing new faces, most people focus their attention on the central portion, notably the eyes. When viewing faces with secondary cleft lip deformities, however, observers may divert their attention from the eyes and spend more time focusing on the mouth. The authors aimed to determine whether there was an objective attentional bias to secondary cleft lip deformities in comparison to non-cleft faces, and, furthermore, whether differences existed between different deformity types. **Methods:** Forty-six naïve adults (25 male; mean age 25.5 years) viewed a series of 19 images of a child digitally modified to include different secondary unilateral cleft lip deformities (long lip, short lip, white roll/vermilion dysjunction and vermilion excess), a lip scar with no secondary deformity, or a normal lip. Eye movements were recorded using the EyeLink 1000, a table-mounted eye-tracking device. Dwell times for 6 facial regions (eyes, nose, mouth, left ear, right ear, scar) were compared. **Results:** Participants spent significantly more time focused on the upper lip regions in patients with secondary deformities relative to those who did not ($P < .005$). Short lip deformities resulted in longer fixation times than long lips ($P < .0083$), an effect that was more evident with greater severity of each deformity type ($P < .05$). Participants also spent less time focused on the eye region in the presence of a secondary lip deformity ($P < .005$). There was no difference in dwell time for ear and nose regions between photos with secondary deformities and those without. **Conclusions:** This study presents objective data to support the idea that observers show varying degrees of attentional bias to the lip region when viewing faces of children with different types of secondary cleft lip deformities. **Learning Objective:** Following this presentation, the audience will be able to describe attentional bias as it relates to assessment of the severity of different types of secondary cleft lip deformities.

57 - Cost Analysis of Distraction Osteogenesis Versus Conventional Surgery in Le Fort III Surgery in Syndromic Craniosynostosis

A. Mosa*, E. Zellner, E. Ho, J. Philips, and C. Forrest

Toronto, Ontario, Canada

Purpose: Midface hypoplasia can be treated using a Le Fort III osteotomy, either via conventional surgery with immediate advancement or distraction osteogenesis to gradually advance the midface. Economic analyses are reported in as few as

0.6 percent of outcome studies in plastic surgery. There is currently no cost-effectiveness data comparing these 2 modalities in the literature. This study analyzes cost differences between Le Fort III conventional surgery and distraction osteogenesis among pediatric patients with syndromic craniosynostosis. **Method:** Hospital cost-accounting databases were queried for patients undergoing single-stage advancement or distraction osteogenesis from 2007 to 2016. Nominal cost data was adjusted using the Bank of Canada Consumer Price Index. Reported costs represented the full length of stay for all utilization per patient except for anesthesia and surgeon costs (which were equivalent between groups). Parametric and non-parametric tests were used to analyze data. **Results:** Total costs for single-stage ($n = 8$) were higher than distraction ($n = 6$; mean \$57 825 versus \$38 268, $P < .05$). ICU costs for single-stage were significantly higher than distraction (mean, \$17 746 versus \$5585, $P < .005$). Distraction cases had higher OR costs than single stage but the difference was not significant (mean \$12 540 versus \$9696). Length of stay was significantly longer for single-stage patients (mean, 11 days versus 7 days, $P < .05$). **Conclusions:** This single-institution retrospective economic analysis indicates conventional Le Fort III is more costly than distraction osteogenesis. Despite higher operating room costs, recovery time led to this cost discrepancy, which is consistent with the theoretical benefits of gradual bony movements being less traumatic. The cost effectiveness ratio adds to comparative analysis of quality outcomes in existing literature and suggests distraction may provide equal clinical outcome for lower cost. **Learning Objectives:** This lecture will present cost data, and cost-effectiveness ratios as a value dimension in surgical techniques.

58 - Sagittal Craniosynostosis: A Utility Outcomes Study

V. Kuta*, P. D. McNeely, S. Walling, and M. Bezuhly

Halifax, Nova Scotia, Canada

Purpose: Sagittal craniosynostosis results in a characteristic scaphocephalic head shape that is typically corrected surgically during the first year of life. The authors' objective was to determine the potential impact of being born with sagittal craniosynostosis by using validated health state utility assessment measures. **Methods:** An online utility assessment was used to generate health utility scores for scaphocephaly, monocular blindness, and binocular blindness using standardized utility assessment tools, namely visual analogue scale (VAS), standard gamble (SG) and time trade-off (TTO) tests. Utility scores were compared between health states using Wilcoxon and Kruskal-Wallis tests. Univariate regression was performed using age, gender, income, and education as independent predictors of utility scores. **Results:** Over a 2-month enrollment period, 118 participants were included in the analysis. Participants rated scaphocephaly secondary to sagittal craniosynostosis (VAS: median 0.85, interquartile range [0.76- 0.95]; SG:0.92 [0.84-0.98]; TTO:0.91 [0.84-0.95]) with significantly

higher ($P < .01$) utility scores than both monocular blindness (VAS:0.60 [0.50-0.70]; SG:0.84 [0.68-0.94]; TTO:0.84 [0.67-0.91]) and binocular blindness (VAS:0.25 [0.20-0.40]; SG:0.51 [0.18-0.79]; TTO: 0.55 [0.36-0.76]). No differences were noted in utility scores based on participant age, gender, income or education. **Conclusions:** Using objective health state utility scores, the current study demonstrates that the perceived burden of scaphocephaly preoperatively in the first year of life is less than monocular blindness. These relatively high utility scores for scaphocephaly suggest that the burden of disease as perceived by the general population is low and should inform surgeons' discussions when offering morbid corrective surgery in the first year of life, particularly when driven by aesthetic concerns. **Learning Objectives:** (1) Identify 3 utility assessment tools to generate health utility scores. (2) Describe the health burden of uncorrected scaphocephaly as perceived by the general public. (3) Recognize decisional conflict faced by families when offered corrective surgery for sagittal craniosynostosis.

59 - Comparing Cephalic Index and Mid-Sagittal Vector Analysis in Assessing Morphology in Sagittal Synostosis

B. Y. Hong*, E. Zellner, E. Ho, J. Phillips, and C. Forrest
Ottawa, Ontario, Canada

Purpose: Many argue that cephalic index (CI) is too simplistic. Although mid-sagittal vector analysis (MSVA) was developed to improve on CI, no studies have validated CI and MSVA together in patients with sagittal synostosis. The objective of this study was to assess discriminant and construct validity of CI and MSVA measured from computed tomography (CT). **Methods:** Patients with nonsyndromic isolated sagittal synostosis with complete preoperative ($n = 30$) and postoperative ($n = 13$) CT data were included. The control group ($n = 24$) comprised of normocephalic patients who underwent CT imaging for trauma. Retrospective CT evaluation of CI and MSVA was conducted and correlated with dysmorphism numeric rating scale (D-NRS) that measured surgeon-rated severity of sagittal synostosis. Responsiveness of CI and MSVA was evaluated using dysmorphism global rating of change (D-GRC). **Results:** 30 patients with sagittal synostosis demographically similar to 24 normocephalic patients were compared. The difference in CI and MSVA was statistically significant between normocephalic and scaphocephalic patients. CI had a good correlation ($r = -.665$, $\rho = -0.667$) and MSVA had a poor correlation with D-NRS ($r = .250$, $\rho = 0.203$). Change in CI ($r = .738$, $\rho = 0.657$) was well correlated with D-GRC but not with MSVA ($r = -.409$, $\rho = -0.301$). **Conclusion:** CI is a simple craniometric tool that quantifies overall severity of sagittal synostosis better than MSVA. CI also has better responsiveness than MSVA to measure a reduction in severity of disease, however MSVA is a better descriptive craniometric measurement. MSVA was able to quantify the shift in morphology in sagittal synostosis.

Learning Objectives: By the end of this session, participants will be able to (1) understand how to quantify the severity of sagittal synostosis, (2) recognize the importance of validating measurement techniques in craniosynostosis research, and (3) appreciate the benefits and limitations of CI and MSVA.

60 - Repair of Calvarial Defects With a Novel Method of Monetite-Induced Bone Growth

M. Abdulla*, M. Gilardino, and J. Barralet
Montreal, Québec, Canada

Purpose: Reconstruction of craniofacial skeletal defects represents a significant biomedical burden. This study investigates the use of monetite, a calcium phosphate bioceramic, to induce and augment bone growth elsewhere on the skull, which can then be excised and transplanted into a skull defect. **Methods:** Twenty adult male Wistar rats are divided into 4 groups. In the Transplant-Onlay (TO) group, the monetite implant is fixed to the skull for 8 weeks. It is then excised and transplanted into a defect, where it is kept for 8 weeks. In the Direct Placement (DP) group, the implant is placed directly into a defect and kept for 8 weeks. The remaining 2 groups consist of negative and positive controls respectively, using animals with empty skull defects, and animals with skull defects treated with calvarial autografts. New bone growth is assessed with micro CT and histology. Mechanical testing is performed to assess load-bearing strength. **Results:** Direct placement implants and transplanted onlays showed comparable bone-implant interface by micro-CT imaging. However, histological analysis showed significantly superior bone formation in the transplanted onlays. Furthermore, samples in this group were mechanically more robust. **Conclusion:** Our data show that we can successfully induce bone growth into a monetite onlay using an innovative technique, without the use of growth factors or genetic manipulation. This excess bone can be excised, fashioned as needed, and used as "customized" autologous transplants to treat critical-size skull defects. **Learning Objectives:** (1) The importance of finding a practical alternative for autologous bone grafts in the treatment of skull defects. (2) The concept of bone induction, and how the use of calcium phosphate onlay grafting can induce growth of new bone that can be used to repair skull defects.

61 - A Retrospective Analysis of Hospital Costs Associated With 5 Methods of Cranial Vault Repair

P. Binhammer, A. Binhammer*, and O. Antonyshyn
Toronto, Ontario, Canada

Purpose: The purpose of this study was to determine the hospital costs associated with different types of cranioplasty at a single center undertaken by a single surgeon over a 15-year period. **Methods:** The study population consisted of a

consecutive series of all patients undergoing cranial vault reconstruction by 1 surgeon (OA) at Sunnybrook Health Sciences Centre January 2001 to December 2015. Data collected included OR time, patient ward and ICU stay, and complications including reoperations. Patients were excluded from analysis if undergoing primary trauma skull reconstruction, hydroxy appetite use, associated procedures (free flaps, frozen section and tumor resection) and absent data. Standardized costs of operating room time per minute for cranioplasty and ICU and ward stay were acquired from hospital administration and applied to all cases and complications. Case-specific costs were acquired from hospital administration for implants. A bivariate and multivariate analysis was carried out. **Results:** 96 cases were identified; 25 noncustom titanium mesh, 21 custom titanium mesh, 26 PMMA, 13 autogenous, and 11 PEEK cases between 2001 and 2016. Autogenous reconstruction had significantly longer operative time ($P < .0001$). A bivariate analysis of the data revealed a significant relationship between implant type and total costs ($P < .0001$) as well as implant type and operation duration ($P < .0001$). An age-controlled multivariate analysis found the differences in average total costs to be significantly higher in PEEK (\$27 379.81) and PMMA (\$18 540.00), than autogenous (\$14 290.72) and noncustom titanium (\$14 625.66). Custom titanium implants (\$17 535.65) did not have a significantly higher average total cost than either autogenous bone or non-custom titanium. **Conclusions:** This study reviews 4 materials employed for cranioplasty. Autogenous bone had the longest duration of surgery but the significantly lower costs than PEEK and PMMA. Additional multicenter studies would clarify the generalizability of these results.

62 - Cephalometric Analysis in Rabbits: An Animal Model for Future Craniofacial Research

M. Mojtahed Jaberi*, A. Amani, H. Shash, and M. Gilardino

Montréal, Quebec Canada

Purpose: The rabbit animal model has been extensively used to investigate the effects of various surgical procedures on craniofacial growth. The cephalometric analysis is performed using anatomical landmarks and numerous distances or angles. Each author has defined their own landmarks and cephalometric parameters based on their experimental protocol. This study aims to propose a unified cephalometric analysis model to standardize literature on craniofacial research on rabbit model. **Method:** Review of literature using EMBASE, MEDLINE Ovid, and Web of Science databases identified 74 relevant articles from inception until April 2015. Studies that only used radiographic analysis were excluded. Studies with direct cephalometric or 3D-CT analysis were included ($N = 23$) and reviewed to identify landmarks, distances and angles that were frequently reported. Two of the authors carried out

the screening and inclusion/exclusion processes separately. Any disagreement was solved through discussion until consensus was reached. **Results:** We found 86 unique anatomical landmarks and 171 of unique measurements. The frequency of each parameter used was analyzed to identify commonly reported parameters. Less frequent parameters were reviewed individually and excluded if considered to be redundant or poorly defined. The final proposed model consists of 27 landmarks (6 mandibular, 12 mid-face, 2 mid-face/cranial, and 7 cranial) and 35 distances (13 mandibular, 10 mid-face, 5 cranial, and 7 global). **Conclusions:** The cephalometric analysis of the rabbit animal model needs to be standardized in the literature in order to draw conclusions when comparing studies. We attempted to perform a comprehensive review of the literature and identify the key parameters. We propose a unified balanced framework for cephalometric analysis in the rabbit animal model for future craniofacial research. **Learning Objectives:** Participants will be able to explain the applications of cephalometric analysis and the importance of utilizing a unified model in craniofacial research.

ePOSTERS

P01 - Direct Neurotization of a Decellularized Muscle Matrix Leads to Improved Muscle Regeneration and Neural Tissue Ingrowth

H. Iyer*, S. Lanier, E. Friedrich, and R. Galiano

Chicago, Illinois, USA

Trauma to the face and limbs and associated muscle loss can lead to functional deficits but therapeutic options remain limited. Decellularized extracellular matrix derived from skeletal muscle is a promising candidate for the induction of skeletal muscle regeneration. Functionalization of such regenerated muscle, however, is dependent on motor innervation and nerve-specific growth factors are known to have myotrophic effects. We studied the myogenic and neurogenic effects of direct neurotization of a decellularized muscle matrix. Ongoing long term studies will assess muscle function. Rats underwent surgery to create bilateral latissimus dorsi defects. Both defects were implanted with decellularized rat muscle (DCM) matrix, prepared from fresh rat tissue using an optimized SDS protocol. A panniculus carnosus flap was raised unilaterally so as to expose the motor nerves innervating this muscle layer. Nerves were microsurgically dissected free and severed distally to allow transposition into the ipsilateral DCM implant. As many nerves as anatomically feasible were transposed. Specimens were harvested at 30 days postoperatively and assessed by immunofluorescence for nerve ingrowth and myogenesis. Ninety-day experimental animals will undergo EMG testing and tissue explants will be cleared using iDISCO to permit whole-nerve visualization. Neurotized DCM implants demonstrated greater colonization by

mature myocytes as determined by MHC immunofluorescence than non neurotized control implants. Immunofluorescence with a pan-neuronal antibody revealed presence of neural tissue in neurotized DCM, in contrast to non neurotized controls. Direct neurotization of decellularized muscle matrix in a model of volumetric muscle loss leads to an increase in myogenesis within the matrix and evidence of ingrowth of nervous tissue. **Learning Objectives:** The audience will gain a new appreciation for developing therapies for volumetric muscle loss (VML) and the importance of neurotization strategies in those therapies; they will also learn about strategies for in vivo evaluation of recovery from VML, including histological markers and other techniques.

P02 - The Canadian Plastic Surgery Workforce: A National Survey of Residents and Surgeons

The Canadian Plastic Surgery Research Collaborative Organization (A. Morzycki)

Halifax, Nova Scotia, Canada

Purpose: Projecting the demand for plastic surgeons has become increasingly important in a climate of scarce public resource. The goal of this study is to provide a comprehensive workforce update and describe the perceptions of the workforce among Canadian plastic surgery residents and surgeons. **Method:** Two questionnaires were developed by a national task-force of plastic surgery trainees. The surveys were distributed to residents and practicing surgeons, respectively. **Results:** Of the 215 surgeons (49%) who responded, 47% were between the ages of 50 to 69 years, with a male predominance of 78%; 33% had been in practice for 25 years or greater. Half of respondents were practicing in a large urban center; 59% believed their group was going to hire in the next 2-3 years. When asked about retirement, 50% wished to retire between the ages of 60 to 69. In 10 years, we predict the surgeons-to-population ratio to be 1.6:100 000. Eighty-six (59%) residents responded. Most were very satisfied with their training (61%) and operative experience (90%). Ninety percent of respondents planned to pursue additional training after residency, with 71% stating that the current job market was contributing to their decision; 74% stated they were concerned with the job market. **Conclusions:** The results of this study predict an adequate number of plastic surgeons in the next 10 years, however, there is a shortage practicing in rural areas. Many trainees worry about the availability of jobs despite evidence of active recruitment. The workforce may benefit from structured career mentorship in residency and improved transparency in hiring practices, particularly to attract young surgeons to smaller communities. **Learning Objectives:** (1) The participant will gain a better understanding of the current Canadian plastic surgery workforce. (2) The participant will be able to use the results of this study to predict the future supply of plastic surgeons in Canada.

P03 - A Practical and Novel Speech Scoring Tool for VPI

S. Filson, S. Fischback, P. Klaiman, and D. Fisher*

Toronto, Ontario, Canada

Introduction: Several perceptual speech systems have been standardized to assess VPI, however, they are either too complex for clinical usage or too simple to attain the nuances of speech pathology. We developed a novel and practical speech scoring tool for clinical usage and intercenter audit of speech outcomes. The tool scores hypernasality on a 5-point scale (0-4). A binary system was used for the absence or presence of Nasal Air Emissions (NAE) scored either 0 or 0.5, and for the absence or presence of Compensatory Articulations (CA) scored either 0 or 0.25. Acceptability was scored in a system where + speech is always acceptable, ++ mostly acceptable, +++ rarely + acceptable, ++++ never acceptable. The score therefore provides all the relevant clinical information i.e. a 2.75+++ patient has speech with a hypernasality score of 2, nasal air emissions (0.5), compensatory articulations (0.25) and is rarely acceptable. **Methods:** The inter- and intrarater reliability of the new tool was assessed by 5 independent, blinded, experienced Speech/Language Pathologists on 18, 2-minute speech samples, on 2 separate occasions. ICC/Kappa analyses were performed. **Results:** After ICC analysis intra-rater reliability = 0.875. ICC analysis for hypernasality and acceptability, interrater reliability = .59 and .585, respectively. After Kappa analysis for CA and NAE, interrater reliability was .65. All raters reported the tool would be of excellent practical clinical use. **Conclusion:** A novel, validated, and practical speech scoring tool has been developed. We will present the tool and discuss its application/advantages. **Learning Objectives:** (1) Participants will be able to understand about the current available cleft speech scoring systems. (2) Participants will be able to understand the new and interesting speech score developed at the Sick Kids Hospital. (3) Participants will be able to understand the process of validating the speech score.

P04 - Does Custom Modeling of Orbital Floor Implants Improve Conformance Relative to Prefabricated Implants: A Cadaveric Study

R. Chambers and O. Antonyshyn*

Toronto, Ontario, Canada

Purpose: Orbital floor fractures represent a significant portion of craniofacial trauma. Traditional reconstruction has involved the use of bone or alloplastic implants which are shaped intra-operatively based on the preoperative CT as well as visual examination of the defect. The orbital floor, however, has non-linear topography which is extremely challenging to reproduce. This can lead to poor implant conformance and possible globe malposition post-operatively. Here we looked to compare outcomes for simulated orbital floor

reconstruction in cadaveric specimens using the standard approach of manually fashioning a pre-fabricated implant versus molding an implant based on a 3D stereolithographic model. **Methods:** Three cadaveric heads, representing 6 orbital floor defects were used. High resolution scans of the orbits were obtained at baseline, after creation of bilateral defects, post reconstruction using standard methods and finally after reconstruction with custom molded implants. Custom implants were rapidly prototyped intra-operatively using a pre-fabricated model in a tool and die fashion. Surgeon 1 created all the defects and surgeon 2 perform all secondary reconstructions. Obtained CT data was then analyzed using modeling software to assess for pre/postoperative orbital volume as well as plate conformance. Direct comparison of the 2 reconstructive methods was then performed. **Results/Conclusion:** There was a higher degree of conformance using custom fabricated implants when compared to intraoperative bending. This was likely in part due to reproduction of native anatomy as well as greater ease, and as such more accurate, implant placement. **Learning Objectives:** At the end of the talk the learner should (1) have a better understanding of current implant technology in orbital floor reconstruction; (2) have a better understanding of a new method of rapid intra-operative implant fabrication, and (3) have a better understanding of the goals of orbital floor reconstruction

P05 - The Utility and Efficiency of a Resident Hand Clinic for Management of Acute Hand Trauma at the University of Alberta

E. Robertson, C. Budden, A. Schmidt, B. Ball, and A. Ladak*

Edmonton, Alberta, Canada

Purpose: Enhancing clinical exposure while adhering to resident work hour restrictions can be challenging. The University of Alberta established a resident run hand clinic in 2005. The purpose of this study was to examine the clinical volume and types of cases that residents assess and treat in the hand clinic as well as gauge patient satisfaction with care received in the clinic. **Method:** A retrospective chart review and patient satisfaction questionnaire were conducted for patients seen in hand clinic in 2015 to 2016. Demographic data, reason and time for referral, treatment, and wait time were recorded. Patients also completed a satisfaction survey at the end of their visit. **Results:** A total of 1022 patient charts were reviewed. The most common reason for referral was a fracture or dislocation (57%), followed by tendon injury (18%). The average wait time to be seen in clinic was 2.97 ± 2.13 days in the winter and 4.12 ± 2.14 days in the summer. There was a statistically significant difference between the seasons ($P < .0001$); 47% of patients required occupational therapy for splinting, 17% required a procedure in clinic, and 21% of patients were referred for surgery. Patient satisfaction on

average was 9.29 on a satisfaction scale of 10. **Conclusions:** In a 6-month period, residents attending the hand clinic assessed and treated 1022 patients, the majority being fractures and tendon injuries. Overall patients are very satisfied with their experience. A resident-run hand clinic is an effective model to decrease hours residents spend assessing non-emergent hand trauma. **Learning Objectives:** (1) Gain an understanding of alternative models for resident consults as a method to lessen work hour demands for residents. (2) Understand how resident run clinics lead to a large volume of case exposure for trainees.

P06 – Presenteeism in the Hand Patient Population: Understanding the Impact of Hand Pathologies in the Workplace

M. Shafarenko, M. Vojvodic, M. Roy, C. Novak, and S. McCabe*

Toronto, Ontario, Canada

Purpose: Presenteeism is the practice of working while actively ill or injured. It accounts for greater productivity loss than absenteeism and can lead to increased future illness and disability. The burden of presenteeism following traumas and degenerative diseases of the hand is unknown. This study provides the first measurement of presenteeism in the employed hand patient population and seeks to describe patient, employment and disease variables that associate with impaired labor engagement and performance. **Method:** A cross-sectional study was conducted on outpatients receiving treatment at a tertiary hand center for acute and chronic hand conditions. The Stanford Presenteeism Scale and Work Limitations Questionnaire were administered to patients working with an active hand morbidity. Sociodemographic data, clinical parameters, and treatment modalities were associated with presenteeism scores and limitations across workers' physical, interpersonal, time management, and output domains. **Results:** Among 201 patients, 39% reported limitations in the workplace that met the cutoff for presenteeism. Patient age and chronicity of hand pathologies were not associated with presenteeism. Patients were least disrupted in the mental-interpersonal components of work performance and reported greater impediment in physical demands and time management domains. Workers' compensation and union representation at work did not significantly impact on-the-job productivity. The mean total loss in productivity across all groups was 8%, with a maximum of 23%. Self-reported patient insight into activity limitations and disability associated with workplace presenteeism ($P < .05$). **Conclusions:** Patients struggle with physical and output demands in the workplace when working with hand impairments, irrespective of etiology or chronicity. Surgeons play a central role in determining the return-to-work sequence for hand patients and must be aware of the presenteeism phenomenon in the working population. **Learning**

Objectives: (1) Understanding the impact of presenteeism in the hand patient population. (2) Identifying patient, employment, and disease variables that associate with reduced productivity.

P07 - Let's Reconstruct Global Surgery: Multidisciplinary Breakdown of Plastic Surgery NGOs

L. Christopherson, K. Chung, K. Desai, S. Xue Jiang, P. Patel, M. Shafarenko, F. Xu, and L. Kasrai*

Toronto, Ontario, Canada

Since the inception of the Lancet Commission in 2013 international surgical outreach efforts have increased and become more synergistic. The goal of this study is to provide a unified source of all non-governmental organizations (NGOs) that offer plastic and reconstructive surgical care. A systematic search was conducted using: published lists of surgical NGOs (Ng-Kamstra et al. 2016; Mock et al. 2007; Wyszynski, D. F., 2002), Plastic Surgery Foundation, Hand Surgery and Smile Train website, a listing of cleft palate and lip NGOs on Wikipedia, a literature review on summer camps for burns patients (Maslow and Lobato, 2010), and Google. Websites of each organization were reviewed, and NGOs were categorized by specialty: burns, cleft palate and/or lip (CLP), craniofacial, disaster relief, and general (more than 1 specialty). A secondary review was conducted for data. A total of 173 NGOs were found, of which 2 were excluded due to inactive websites. Of the 171 NGOs, 71% provide more than 1 type of plastic surgical care (121), 16% (27) provide CLP surgery, 7% (13) craniofacial surgery, 3% (5) burns surgery and disaster relief, each. 91% (156) are multidisciplinary, 52% (89) provide services in more than 1 country, 70% (120) collaborate with a host institution, and 32% (54) are IRB approved. NGO structures ranged from diagonal (32%, 55), vertical 1-way (44%, 76) vertical 2-way (2%, 3), and horizontal (22%, 37). 22% (35) had religious affiliations. Only 1 NGO had gender specifications for volunteers. To our knowledge, this is the most complete directory of Plastic surgery NGOs. Use of this database can facilitate global collaboration, increase access, and improve sustainability of plastics and reconstructive surgical care globally. At the end of this presentation, the learner will become aware of all NGOs in plastic surgery.

P08 - Let's Reconstruct Global Surgery: Cleft Lip and Palate Charity Database

P. Patel, K. Chung, and L. Kasrai*

Hamilton, Ontario, Canada

Purpose: There is an emerging interest in global surgery. The Lancet Commission on Global Surgery recognizes the important role that surgical volunteer programs play in the delivery of cleft lip and/or palate (CLP) surgeries. In order to allocate resources appropriately, the commissioners propose the use of a

centralized registry to maximize coordination of global surgical volunteerism efforts (Meara et al., 2015). Descriptions of CLP surgical volunteer programs are not currently provided in the literature. This study aims to create a comprehensive database of CLP surgical volunteer programs. **Methods:** A systematic search of the following resources were conducted: The Plastic Surgery Foundation, Smile Train, Wikipedia, Google, and published lists of surgical non-government organizations (NGOs) (Ng-Kamstra et al., 2016; Wyszynski, D. F., 2002). A secondary review of each organization's website was performed to verify inclusion criteria and to extract data. **Results:** Thirty-four organizations were reviewed, with 27 that met inclusion criteria. 96% of these CLP surgical volunteer programs use a diagonal approach of international outreach and the remainder, a traditional vertical model. Their offices are distributed across North America (33%), Asia (33%), Europe (26%), and Australia (7%). 48% of the organizations provide CLP surgeries in more than 1 country; all do so with a multidisciplinary team. A majority (93%) of the organizations established collaborations with host institutions. None of the organizations hold religious affiliations or restrict CLP surgical care based on gender. **Conclusion:** To our best knowledge, this database includes the largest collection of CLP organizations. This list will be made publicly available to promote collaboration between organizations, national health systems, and global health policymakers. **Learning Objectives:** This presentation aims to (1) summarize all NGOs providing CLP surgeries, (2) describe their models of international outreach, and (3) locations of outreach.

P09 - Acellular Dermal Matrix and Radiation in Immediate Breast Reconstruction

A. M. Chung, A. Ghumman, M. Stein, and J. Zhang*

Ottawa, Ontario, Canada

Purpose: Implant-based breast reconstruction combined with acellular dermal matrix (ADM) appears to be associated with a lower incidence of capsular contracture compared with standard reconstruction. Patients with advanced breast cancer often undergo adjuvant radiation, which is associated with high complication rates. The aim of this study was to assess the performance of ADM in the setting of radiation associated with immediate breast reconstruction. **Methods:** A retrospective chart review of 334 patients undergoing immediate implant-based reconstruction from 2010 to 2016 was undertaken to identify patients who underwent either pre- or postreconstruction radiation. Demographic data, comorbidities, radiation delivery and surgery details were recorded. Reconstructions with and without ADM were compared for complications including seroma, hematoma, surgical site infection, skin necrosis, Grade III/IV capsule contracture, malposition, and explantation. Statistical analyses were performed using cross-tabs, t-test and Chi-Squared analysis with results considered significant at $P < .05$. **Results:** The total complication rate for reconstruction with prior radiation between the ADM (9/19, 47%) and non-ADM group (4/14, 29%) showed no significant

difference ($P = .275$). There was no significant difference in those receiving radiation post reconstruction in the ADM (14/36, 39%) and non-ADM (11/23, 48%) groups ($P = .498$). Similarly, there was no significant difference in reconstruction failure for both pre-(ADM 16%, non-ADM 0%, $P = .119$) and post-(ADM 19%, non-ADM 13%, $P = .523$) reconstruction radiation. **Conclusions:** No significant difference of complication rates was found between reconstructions with and without ADM in patients who underwent radiation therapy. This suggests that although use of ADM did not increase risk of complication, it did not appear to lower radiation associated adverse events in the setting of immediate breast reconstruction. **Learning Objectives:** The participant will (1) appreciate the challenges present in reconstructing irradiated breasts and (2) learn about complication rates in breasts reconstructed with or without ADM under these circumstances.

P10 - Postoperative Pain Control Following Alloplastic Breast Reconstruction With Muscle Relaxer: A Randomized Controlled Trial

H. Alnaeem, M. N. Al Yafi*, M. L. Ma, L. Xu, and O. Foudaneel

Montréal, Quebec, Canada

Purpose: Patients suffer significant pain following mastectomy and prosthetic reconstruction routinely mandating high oral opioid dose following hospital discharge. The purpose of this study is to evaluate the influence of muscle relaxers on pain control following alloplastic breast reconstruction in addition to the use of oral opioids prescribed following hospital discharge. **Methods:** Randomized controlled trial comparing pain control following alloplastic breast reconstruction with muscle relaxer Cyclobenzaprine (Flexiril; intervention group) versus pain control without muscle relaxer (control group). Patients met inclusion criteria and agreed to participate were included, and randomly assigned to either group. Outcomes measured include, patient reported visual analog scale (VAS) pain scores day 1, 2 and 3, and the total amount of narcotic pills taken within the first 3 days at home following discharge from hospital were recorded and subjected to the mean and standard deviation. Student T test was used for comparison; multiple and single linear regression was used to assess different factors on the outcome. A P value $<.05$ is considered statistically significant. **Results:** No significant difference has been noted. For the intervention group, mean pain score for 3 days after discharge was 5.70 (SD 2.84), while the control group had a mean of 5.74 (SD 2.09; $P = .98$). As for the number of pills, for the intervention group mean was 9.56 (SD 4.22), while the control group had a mean of 9.67 (SD 7.59; $P = .97$). **Conclusion:** There is no significance in pain score and number of narcotic pills when using the muscle relaxer flexeril as an adjunct for pain control following alloplastic breast reconstruction. **Learning Objective:** Participants will recognize risks that influence pain

following alloplastic breast reconstruction and the effect of oral muscle relaxers as a pain reliever.

P11 - Risk Factors for Titanium Mesh Implant Exposure Following Cranioplasty

T. Maqbool*, A. Binhammer, P. Binhammer, and O. Antonyshyn

Toronto, Ontario, Canada

Purpose: Titanium mesh (Ti-mesh) is an alloplastic implant that is often used in cranial vault reconstruction. Though it is generally well-tolerated, erosion of the overlying soft tissue with exposure of the implant is a late complication that adversely affects patient outcomes. The purpose of this study is to investigate potential risk factors of Ti-mesh exposure. **Method:** The study series comprises all consecutive patients who underwent Ti-mesh cranioplasty by 1 surgeon at 1 institution between January 2000 and July 2016. A retrospective chart review was conducted to extract data describing demographics, defect characteristics, details of surgery and perioperative radiotherapy. The latest post-operative computerized tomography (CT) scans were reviewed in each case to document the thickness of soft tissue coverage over Ti-mesh and the depth of extradural dead space deep to the implant. **Results:** Fifty patients had Ti-mesh cranioplasty, and 8 (16%) developed implant exposure (complete = 6, threatened = 2). Age, sex, defect size, etiology or anatomical site were not significant risk factors for exposure complication. In the exposure group, 4 (50%) underwent a free flap tissue transfer for implant coverage [non-exposure: 5 (11.9%) patients, $P = .03$], and 4 (50%) received pre-operative radiotherapy [non-exposure: 3 (7.1%), $P = .009$]. There were no significant associations between the use of transposition/rotation flap (37.5% in exposure group vs 19%, $P = .35$) and post-operative radiotherapy (0% vs 14.3%, $P = .57$), and exposure. Postoperative CT scans revealed significant thinning of soft tissues over mesh in 7 (87.5%) exposure patients [non-exposure: 15 (35.7%), $P = .007$]. No significant association was found between exposure and presence of dead space (62.5% vs 42.9%, $P = .44$). **Conclusion:** Preoperative radiotherapy, free flap coverage, and soft tissue atrophy are significant risk factors for titanium mesh exposure. Future studies should characterize the mechanistic relationship between identified risk factors and exposure. **Learning Objective:** (1) To identify and discuss risk factors for titanium mesh exposure in cranioplasty patients.

P12 - Rotator Cuff Tears and Concomitant Nerve Injury: Prevalence and Management

M. Curran*, M. Morhart, J. Olson, F. Ramazani, and M. Chan

Edmonton, Alberta, Canada

Purpose: Concomitant rotator cuff tears can have major functional impact in patients with upper extremity nerve injury. The

purpose of this study is to determine the prevalence of rotator cuff tears in all patients with upper extremity nerve injury. Additionally, we also examine how these injuries are managed at present as delayed rotator cuff repair are associated with poor functional outcomes. **Methods:** Patients referred to Central and Northern Alberta Peripheral Nerve Injury Program with traumatic brachial plexus, suprascapular or axillary nerve injuries between 2000 and 2016 were reviewed. Data on demographics, clinical diagnosis, severity and management of the rotator cuff tears were analyzed. **Results:** Out of a total of 111 patients with nerve injuries in the upper limb, 100 were due to trauma. Patients were predominantly male (85%). Twenty-nine percent ($n = 29$) had concomitant rotator cuff injury. Of these, 41% ($n = 12$) were full thickness and 31% required repair. Time to repair was highly variable [116 ± 115 days (mean $\pm$ SD)]. This was most frequently due to delays in diagnosis of tendon tear. **Conclusions:** The prevalence of coexisting rotator cuff tears in our population of upper extremity nerve injury patients is higher than previously reported. Approximately one-third of these patients required rotator cuff repair but the timing of surgery was highly variable. To avoid delays and prevent poor outcomes, a high index of suspicion of concomitant rotator cuff tear and early imaging are needed. **Learning Objectives:** Determine the prevalence and management of concomitant upper extremity nerve injuries and rotator cuff tears

P13 - Surgical Classification of Gynecomastia: Systematic Review and Novel Classification System

D. Waltho*, A. Hatchell, and A. Thoma

Ottawa, Ontario, Canada

Purpose: The purpose of this systematic review was to identify all classification systems for the surgical management of gynecomastia, and determine the adequacy of these classification systems to appropriately categorize the condition for surgical decision-making. **Methods:** A systematic review was performed using a standard search strategy on publications from the earliest entries to June 2015, from both published and unpublished sources. Data extraction, critical appraisal, and synthesis were conducted therein. **Results:** The search yielded 1012 articles and 11 articles were included in the review. Eleven classification systems in total were ascertained and a total of 10 unique features were identified: (1) breast size, (2) skin redundancy, (3) breast ptosis, (4) tissue predominance (glandular, fibrous, fatty, and connective tissue), (5) upper abdominal laxity, (6) breast tuberosity, (7) nipple malposition, (8) chest shape, (9) absence of sternal notch, and (10) breast skin elasticity. Breast size and ptosis were the most commonly included features. On average, classification systems included 2 to 3 of these features. **Conclusion:** There are several classification systems available for surgeons when assessing gynecomastia. Based upon our review of the current classification systems, we believe that the ideal classification system should include universal characteristics; a

comprehensive description of gynecomastia; clinically appropriate and surgically useful features; and ease of use. Based on our review, none of the current classification systems fulfill all of the aforementioned criteria. Therefore, we propose a new classification system based on the results of the systematic review and considerations from the authors. **Learning Objectives:** Participants will become familiar with the current classification systems available for surgical management of gynecomastia and the shortcomings of each system. Participants will be introduced to a new classification system that seeks to optimally address the condition from a plastic surgeon's perspective.

P14 - Evaluating the Implementation Strategy of Trainee-Led Research in Canada

The Canadian Plastic Surgery Research Collaborative Organization (M. Al Taha)

Halifax, Nova Scotia, Canada

Purpose: Trainee-led research collaborative were implemented to improve the level of evidence in the surgical fields by facilitating multicenter trials. We sought to evaluate the implementation strategy of The Canadian Plastic Surgery Research Collaborative (CPSRC) in Canada using the PARiHS (Promoting Action on Research Implementation in Health Services) framework. **Methods:** Two reviewers applied the PARiHS framework to analyze the implementation strategy of the CPSRC in its first year of operation. The review focused on the 3 core elements of this framework: the level and nature of the evidence, the context including the organizational culture and climate, and the facilitation methods. **Results:** Evidence in the form of systemic reviews indicate a paucity of high quality level I evidence in the plastic surgery literature. Furthermore, studies indicate that trainee-led research collaboratives are effective systems to conduct large, multicenter trials. The context is the Canadian research environment in the field of plastic and reconstructive surgery. The CPSRC is comprised of 13 plastic surgery academic centers across Canada, with a horizontal governing structure of 22 resident and student members, and 5 staff attending mentors. Facilitation of this organization is through monthly online meetings. Multicenter research is facilitated by site leads who sit on the national steering committee and coordinate research efforts locally. After 1 year of implementation, success benchmarks include trainee involvement, research development, and publication output. **Conclusions:** The CPSRC is an innovative model in Canada for conducting multicenter research. Challenges in the first year of implementation have included research ethics processes, adapting projects to local contexts, and coordinating large teams. Based on the PARiHS framework, successful implementation of the CPSRC can continue by improving facilitation and organizational components. **Learning Objectives:** (1) Attendees will gain insight into the framework and organization of the national trainee-led research collaborative serving the plastic and reconstructive surgery specialty.

P15 - Transgender Preferences in Gender-Affirming Surgical Care: A Cross-Sectional Study

E. Zellner*, J. Persing, and D. Steinbacher

Toronto, Ontario, Canada

Background: Increased awareness for transgender individuals may lead to increased demand for surgical interventions in gender-affirming care. However, little is published about transgender preferences and experiences with medical/surgical care. Our objective was to characterize medical/surgical care sought by transgender individuals and patients' surgical preferences, motivations and barriers to care. **Methods:** An online questionnaire about personal experiences with and opinions regarding medical/surgical care during gender transition was crafted following input from clinicians and transgender individuals, made available on the internet and publicized on transgender online communities. **Results:** Overall, there were 313 responses. Participants were 96% male gender at birth, with current gender identity 62% male to female transgender and 23% gender non-conforming. Forty-four percent met with a physician to discuss their transition. Of these, 23% met with a surgeon. The most common surgeon met was a plastic surgeon (66%). Surgeons were most commonly seen in US private practices (78%), specialized overseas practices (18%), and least commonly in a major academic center (4%). Sixty-nine percent supported no minimum age to begin transitioning. Sixty-four percent supported a minimum age (average 18 years) for gender affirming surgery (GAS). Seventy-four percent supported prerequisites to undergoing GAS, including a mental health evaluation and minimum time lived as preferred gender (average 14 months). Medical and surgical experiences and preferences are also reported. **Conclusions:** Trans/GNC individuals lack medical support for gender transition. Perspectives on GAS preparation are consistent with current guidelines, and priority for GAS types varied. Knowledge of trans/GNC experiences and preferences can help providers tailor gender-affirming care. **Learning Objectives:** This lecture will review transgender surgical experiences, opinions and preferences.

P16 - What are the Provincial College of Physicians and Surgeons' Guidelines on Smartphone Clinical Photography?

M. Heyns*, A. Steve, D. Dumestre, F. Fraulin, and J. Yeung

Calgary, Alberta, Canada

Purpose: The purpose of this review was to evaluate the completeness and accessibility of existing College of Physicians and Surgeons guidelines for use of smartphones to store and transmit patient information. **Methods:** Two independent reviewers assessed the guidelines around using a smartphone for clinical photography available on the 13 regulatory College

of Physicians and Surgeons websites. Each college was scored using a previously determined ranking system on 6 specific categories: consent, transmission, storage, auditing capability, retention period and breach of information. Where no information was available on the website, each college was contacted individually by email and phone to further inquire about existing policies. Scoring system: 2 Information complete on website; 1 Information incomplete on website or only available by phone or email; 0 Information not available. Accessibility to the information was evaluated based on number of documents required to deliver the 6 categories of information. A multi-disciplinary group of experts was assembled to synthesize a comprehensive set of recommendations based on the review. **Results:** Existing Canadian College guidelines on clinical photography with a smartphone were difficult to access and incomplete for the majority of topics (5/6), with retention period having the most complete relevant information. Ten regulatory colleges contained some relevant information on their website. Only 1 college had guidelines available for all 6 categories. Seven colleges were missing guidelines on more than half of the 6 categories. An average of 2.4 documents per college (maximum 6) needed to be accessed in order to find the recommendations. **Conclusion:** Colleges across the country lack complete and readily accessible information to guide smartphone use for clinical photography. National concise guidelines need to be implemented. **Learning Objective:** To learn about 6 key categories important to guide smartphone use for clinical photography and how the Colleges of Physicians and Surgeons address them.

P17 - Tissue-Engineered Nasal Cartilage: Preliminary Data Comparing Digestion versus Outgrowth Cell Isolation Techniques in Pediatric and Adult Nasal Chondrocytes

A. Burbank*, Y. Liang, Mulet-Sierra, Aillette, J. Olson, A. Szojka, and A. Adesida

Edmonton, Alberta, Canada

Purpose: Currently, pediatric patients in need of cartilaginous facial reconstructive surgery (eg, cleft nasal repair or ear reconstruction) must wait until their ribs develop sufficiently before they can be used as an autograft ($\geq$ age 9). Cell-based cartilage tissue engineering (CCTE) has successfully produced in vitro autografts from nasal septum biopsies to repair cartilaginous defects in humans. We sought to characterize 2 methods of cell isolation for the generation of a pediatric tissue-engineered nasal cartilage autograft. **Method:** We obtained human nasal cartilage ($n = 3$, males, 6-40 years old) after approval of institutional ethics committee. Chondrocytes were isolated from tissues by (1) digestion with 0.15% (w/v) type II collagenase, (2) cellular outgrowth for ~ 2 weeks, or (3) collagenase digestion of residual cartilage after outgrowth. We expanded cells until passage 2 in hypoxia (3% O₂), media containing 10% (v/v) fetal bovine serum, $\pm$ transforming growth factor beta-

1 (TGF- β 1)/ basic fibroblast growth factor (FGF-2). We cultured expanded cells on type I collagen scaffolds in serum-free chondrogenic media containing TGF- β 3 for 21 days. We calculated population doublings and performed histochemical analysis for glycosaminoglycans (GAG) and proteoglycan deposition. **Results:** TGF- β 1/FGF-2 stimulation increased cumulative population doublings for adult nasal chondrocytes in digestion and outgrowth groups (1.2-fold increase over control for both), but had minimal effects on pediatric chondrocytes. TGF- β 1/FGF-2 expansion enhanced GAG deposition by pediatric outgrowth chondrocytes (a 12.4-fold increase over control), corroborated by intense safranin-O staining of proteoglycans in engineered grafts. **Conclusions:** Nasal chondrocytes isolated by outgrowth and digestion may differ. Pediatric chondrocytes may respond differently to CCTE techniques and should be included in CCTE research. **Learning Objectives:** (1) Describe CCTE techniques; (2) describe state-of-the-art clinical application of CCTE autografts; and (3) describe current barriers in CCTE.

P18 - An Epidemiological Review of Panfacial Fractures at a Tertiary Trauma Center

S. Goekjian*, J. Hu, A. Nelson, and M. J. Cooper

Hamilton, Ontario, Canada

Purpose: Panfacial fracture is a constellation of fractures involving at least 3 of the 4 facial segments: frontal, upper midface, lower midface, and mandible. They often result from high-energy trauma and can have associated concomitant injuries. There is a relative paucity of studies on this topic due to the low incidence. Our epidemiological retrospective cohort study aims to review the relevant clinical features of panfacial fractures in order to better facilitate the decision-making process in management, recognize pitfalls, and determine prognosis. **Methods:** A 5-year retrospective review of all consecutive patients with panfacial fractures under the care of 1 surgeon at our tertiary trauma center was conducted. Patient demographics, clinical course, concomitant injuries, and Facial Injury Severity Score (FISS) were collected. Correlations between tracheostomy, concomitant injuries and various clinical features were examined with 2-tailed t-test. In addition, the etiology of injury was correlated with clinical characteristics using 1-way ANOVA and Fisher's exact test. **Results:** Twenty-three patients were reviewed; all were male with an average age of 39 years. The most common mechanisms of injury were motor vehicle collisions (MVC) and falls. Every patient had nasal and orbital floor fractures, and 22 patients had at least a hemi LeFort I fracture. The average FISS was 11.87. The average length of stay (LOS) was 19.81 days. FISS was moderately correlated with LOS. Eighteen patients sustained concomitant injuries. The most common injuries were intracranial bleeds and upper extremity fractures. These patients had a higher FISS and LOS compared to those without concomitant injuries. Fourteen patients required tracheostomy, and a FISS of 9.7 or greater is correlated with tracheostomy ($P = .03$). **Conclusions:** Panfacial fractures are a

heterogenous class of injuries in both the facial bones affected and the mechanism of injury. Our study provides information on the features and clinical course of panfacial fractures. **Learning Objectives:** (1) Understand the epidemiologic factors associated with panfacial fractures and (2) Identify the relevant features that help to determine the clinical course of panfacial fractures.

P19 - Imaging Trends for the Evaluation of Suspected Pediatric Facial Fractures

A. L. Wang*, M. Bhatt, and K. Cheung

Ottawa, Ontario, Canada

Purpose: Computed tomography (CT) is recommended as the first line imaging in suspected pediatric facial fractures. There may be reluctance to ordering CT scans; however, due to the relative rarity of facial fractures in children, concerns of radiation exposure, and misconceptions about accuracy of other imaging modalities. Understanding the trends in imaging choice may identify opportunities for further education and development of guidelines for managing children with suspected facial fractures. **Methods:** Patients seen in the emergency department or plastic surgery clinic of a tertiary pediatric hospital were retrospectively reviewed for the diagnosis of facial fracture. Isolated mandible, dental, and nasal fractures were excluded. Patient characteristics, presenting symptoms, clinical exam findings, imaging modalities, and management plans were analyzed. **Results:** 106 pediatric patients met selection criteria, of which 84 (79.2%) eventually underwent CT head imaging, 12 (11.3%) had plain films only of the face, and 8 (7.5%) had no imaging. Plain films were the initial imaging modality of choice in 38 (35.8%) patients. Twenty patients (18.9%) required surgical management of their fractures. Those who required surgery are more likely to demonstrate periorbital numbness (50.0% vs 41.8%), decreased consciousness (20% vs 7%) and bony step-off (20% vs 5%). **Conclusions:** While CT scans are the preferred imaging modality in suspected pediatric facial fractures, a significant proportion of patients had plain films as their initial imaging modality. A better understanding of the rationale for this choice of initial imaging may be warranted. **Learning Objectives:** (1) Understand the trends in imaging of suspected pediatric facial fractures and (2) Recognize the presentation of pediatric facial fractures.

P20 - Reporting Complications in Plastic Surgery: A Systematic Review of Randomized Controlled Trials

A. Hudson*, A. Morzycki, O. Samargandi, and J. Williams

Halifax, Nova Scotia, Canada

Purpose: Accurate knowledge of the nature and frequency of complications is critical for evaluation of the safety and efficacy of surgical interventions. Historically, complications in

surgical trials have been poorly reported. This investigation aimed to systematically evaluate the reporting of complications in the plastic surgery (PS) literature. **Method:** Two independent reviewers conducted a systematic search using the electronic databases MEDLINE, EMBASE, and SCOPUS. The search was limited to the top 7 plastic surgery journals with the highest impact factors. Randomized controlled trials (RCTs), describing a potentially invasive treatment, in any domain of PS, published between 2012 and 2016, were included. **Results:** One hundred and forty-five RCTs met our inclusion criteria, of which 30% were registered. Anticipated complications were clearly defined in only 15% of studies, and in 70% of studies it was not clear who would be documenting the complications that arose. Furthermore, only 72% of studies reported the occurrence of complications, of which 61% did not discuss events occurring in the intra-interventional period. Of the studies not documenting a complication, two-thirds included a statement declaring that no complications had occurred. Pain was the most common intra- and postinterventional complication. Binary logistic regression revealed that after controlling for potential confounders, funded RCTs were nearly 4 times more likely to report complications (95% CI 1.41-10.83, $P = .009$). **Conclusions:** Reporting of complications in the PS literature remains heterogeneous. Improved transparency and evaluation of complications will strengthen evidenced-based practice and improve patient outcomes. We propose a standardization tool for assessing and reporting complications in PS trials. **Learning Objectives:** (1) Participant will gain a better understanding of the lack of rigor regarding complication reporting in plastic surgery randomized controlled trials. (2) Participants will gain a better appreciation of the importance of defining and reporting complications in clinical trials.

P21 - The Diagnosis and Management of the Spitz Nevus in Children: A Systematic Review, Meta-Analysis, and Review of Canadian Practice

M. Stein, J. Abboud, A. Bahubeshi, M. Ramien, and C. Malic*

Ottawa, Ontario, Canada

Purpose: To date, there exists no guidelines for the management of Spitz Nevus in children (Typical-TSN or Atypical-ASN). Due to their low incidence, the diagnosis and management of such tumors, especially ASN, lack consensus among plastic surgeons, dermatologists, and pathologists. The objective of this study was to perform a systematic review and meta-analysis of existing literature and to evaluate current management protocols among plastic surgeons and dermatologists across Canada. **Methods:** Ethics approval (CHEO#17/13X) was granted for an electronic search from inception to December 2016 as per PROSPERO guidelines. An 11-question, scenario-based survey was distributed to plastic surgeons and dermatologists

across Canada to appreciate current practices. **Results:** Of 630 studies screened, 135 were considered for review. The cumulative data from 3803 TSN and 579 ASN demonstrates similar body distribution, pigmentation and mortality rates but an appreciable increase in both diameter and elevation for ASN. ASN are also more likely to have epidermal invasion, ulceration, atypical mitosis, higher Clark level, and increased recurrence after excision. The pan-Canadian survey ($N = 90$) demonstrates that plastic surgeons tend to excise TSN while dermatologists tend to observe conservatively. Both groups agreed that age was the main determinant directing intervention, with 11-12 being the threshold age where management transitioned from conservative to surgical. If a histopathologic diagnosis of an ASN was made, there is agreement to re-excise the scar with >2 mm margins, even if <11 years old. **Conclusions:** This study offers the most comprehensive review of Spitz Nevus in the pediatric population to date. Contrasting the clinical, histopathologic, and dermoscopic features of all published TSN and ASN is essential to inform a diagnosis and management approach. This study will assist in the development of a diagnostic and treatment algorithm. **Learning Objectives:** Participants will be able to identify clinical/histological/dermoscopic features of typical and atypical Spitz Nevus and propose an appropriate management plan.

RESIDENT ePOSTER COMPETITION

RP01 - Visual Estimation of Dupuytren's Flexion Contractures: A Prospective Comparative Trial

J. P. Corkum, J. A. Gillis, and D. T. Tang*

Halifax, Nova Scotia, Canada

Purpose: Surgeons and resident physicians in a clinic setting often visually estimate Dupuytren's flexion contractures of the hand to follow disease progression and decide on management. No previous study has compared visual estimates with a standardized instrument to ensure measurement reliability. **Methods:** Consecutive patients consulted for Dupuytren's flexion contractures of the hand had individual joint contractures estimated in degrees by both a resident physician and staff surgeon. Estimates were compared with goniometer measurements to generate intraclass correlation coefficients (ICC), and residents and surgeons were compared based on their accuracy. **Results:** Twenty-eight patients enrolled in this study, which provided a total of eighty hand joints for analysis. Resident physicians achieved an ICC of 0.42, which indicates poor reliability. The hand surgeon achieved an ICC of 0.86, which indicates high reliability. The surgeon had better accuracy than the residents ($P < .001$). **Conclusion:** Hand surgeons should be mindful of the limitations of visual estimates of Dupuytren's flexion contractures, particularly when conducted by trainees. **Learning Objective:** The limitations

of hand joint flexion contracture estimates made by surgeons and trainees.

RP02 - Documentation of Corneal Reinnervation and Investigation of Improved Ocular Surface Health After Corneal Neurotization in Patients With Neurotrophic Keratopathy

J. Catapano, S. S. M. Fung, C. Jobst, R. M. Zuker, A. Ali, and G. H. Borschel*

Toronto, Ontario, Canada

Purpose: Patients with absent corneal sensation develop neurotrophic keratopathy, characterized by occult corneal injury, scarring and vision loss. Corneal neurotization improves corneal sensation, but there remains no definitive documentation of corneal reinnervation after neurotization, and it is unknown whether neurotization improves corneal health and vision. **Methods:** Fifteen patients receiving corneal neurotization were followed prospectively, documenting corneal sensation, ocular surface health, and visual acuity. Sensation was assessed using Cochet-Bonnet esthesiometry and visual acuity as best spectacle corrected visual acuity (BSCVA). Immunohistochemical (IHC) analysis was performed on 3 corneal specimens from patients undergoing corneal transplantation after neurotization to identify nerves. Comparison was made to normal controls and 1 patient with explanted corneal tissue prior to neurotization. To determine the origin of reinnervation, magnetoencephalography (MEG) recordings were conducted in an adult patient prior to corneal neurotization and 8 months afterward. **Results:** Mean follow-up was 20.4 months. Corneal sensation improved from 0.9 (± 2.6) mm pre-operatively to 42.9 mm (± 20.7) postoperatively ($P < .001$). BSCVA was not significantly different prior to surgery and at final post-operative visit ($P = .895$). Postneurotisation, patients experienced fewer persistent epithelial defects (PEDs). Corneal transplantation to correct pre-existing corneal scarring was uncomplicated in 2 of 3 patients at a median of 30 months (range, 24-33). IHC examination of explanted corneal tissue confirmed abundant neurofilament-positive axon profiles after neurotization. Analysis of MEG data identified an absence of evoked response in the anesthetic cornea preoperatively, but a detectable response in the ipsilateral sensory cortex postneurotization. **Conclusions:** IHC and MEG analysis confirms corneal neurotization reinnervates the cornea using axons from the contralateral face. Minimal further decline in vision, fewer PEDs postoperatively, as well as successful corneal transplantation, suggest corneal neurotization improves ocular surface health in patients with neurotrophic keratopathy. **Learning Objectives:** Describe a novel surgical technique to treat neurotrophic keratopathy.

RP03 - Barriers to Immediate Breast Reconstruction and Guideline Implementation: A Provincial Survey

C. J. Coroneos, K. Roth-Albin, S. H. Voineskos, M. C. Brouwers, R. Avram, and B. Heller*

Hamilton, Ontario, Canada

Purpose: The purpose of this study was to characterize beliefs and practice patterns for breast cancer reconstruction among physicians who treat patients with breast cancer in order to delineate current clinical practice. This survey was administered prior to Cancer Care Ontario guideline publication. **Method:** Survey questions addressed 4 domains: survival, delayed or obscured recurrence detection, delayed adjuvant therapy, and aesthetics. The survey was administered to 1160 Ontario plastic and general surgeons and radiation and medical oncologists. Data were compared to published guidelines. **Results:** The overall response rate was 48%, with 57% of respondents treating breast cancer. Of those treating breast cancer, 75% are affiliated with an academic center. Immediate breast reconstruction (IBR) is not available to 28%. Autologous reconstruction is thought to interfere with recurrence detection by 23% (oncologists 30%, surgeons 19%, $P = .04$). For patients not expected to require radiation therapy, IBR is not supported by 30%. Autologous IBR is believed to delay delivery of adjuvant chemotherapy by 45% (oncologists 55%, surgeons 41%, $P = .02$). Up to 42% of respondents believe delays in adjuvant therapy delivery following IBR are due to insufficient health care resources (ie, coordinating an oncologic and reconstructive surgeon). Radiation therapy following reconstruction is believed to have negative aesthetic outcomes, and increase the need for revision surgery. **Conclusions:** Unfavorable beliefs about certain clinical actions do not align with recent provincial guideline recommendations. Insufficient healthcare resources are perceived to be a significant barrier to IBR and timely care. **Learning Objectives:** (1) Participants will recognize the impact of resources on practice patterns and guideline implementation.

RP04 - Dorsal Scapula Nerve Transfer for Obstetrical Brachial Plexus Injury: Case Series

H. Augustine, C. Coroneos, M. Choi, and J. Bain*

Hamilton, Ontario, Canada

Purpose: To describe shoulder function in patients with obstetrical brachial plexus injury (OBPI) undergoing suprascapular nerve reconstruction with dorsal scapular nerve transfer. **Method:** A retrospective case series was performed on all infants referred to McMaster Children's Hospital for OBPI between 1999 and 2012. Patients were included if they received suprascapular nerve reconstruction with dorsal scapular nerve transfer and functional

outcomes were recorded. **Results:** 18 patients met inclusion criteria. Indications for surgery included limited shoulder external rotation and abduction against gravity that did not improve by 3 months of age. Post-operatively, abduction was measured using the active movement scale as 4.9 of 7 at 12 months and 6.2 of 7 at 26 months postoperatively. External rotation was 4.4 of 7 and 5.8 of 7 at 12 and 26 months respectively. Total arm length difference was 0.5 cm at 2 years. Composite Mallet scores were 18 of 25 at 3 years. Secondary surgery was not required in any case. There were no cases of functional donor site morbidity with scapular winging. **Conclusions:** This case series demonstrates an alternative surgical approach to suprascapular nerve reconstruction in OBPI. Successful results were achieved, thus warranting consideration in clinical practice as well as further study and comparison with conventional techniques using an accessory nerve transfer or grafting. **Learning Objectives:** Through this presentation the audience will gain an understanding of the surgical technique of dorsal scapular nerve transfer to the suprascapular nerve in patients with OBPI. It will also be an opportunity to discuss indications for this type of nerve transfer under circumstances where the accessory nerve is unavailable, damaged, or otherwise suboptimal and review outcomes of this technique.

RP05 - Are We Headed for a Shortage of Burn Care in Canada?

S. Q. Vrouwe*, M. G. Jeschke, and J. S. Fish

Toronto, Ontario, Canada

Purpose: Specialized burn care is categorized as an essential component in the criteria for provincial and regional trauma systems. Studies in the United States, Australia and New Zealand have found a need for more burn surgeons and anticipated a severe shortage in the future. The purpose of this study is to describe the current active workforce of burn surgeons in Canada and forecast any perceived shortages in the future. **Methods:** Burn care providers were identified from each metropolitan area across Canada. A survey was modified from an American study (Faucher 2004) and distributed electronically via SurveyMonkey to representatives from 26 centers. **Results:** Twenty-six centers responded to the questionnaire (response rate = 100%). Four of these centers self-identified as providing dedicated burn care, 19 identified themselves as being integrated into surgical programs at their institution, and 2 stated they no longer treated burn injuries. The mean number of acute burn admissions per year was 67.2 (range 2-290). Of the centers admitting over 75 burns per year, 44% (4/9) are currently looking for a surgeon, 56% (5/9) will be looking for another surgeon in 5 years, and 44% (4/9) are having or feel they will have trouble finding a surgeon to manage burns. **Conclusions:** Canada is facing a shortage of burn care specialists similar to other developed nations. Active mentorship of both undergraduate and postgraduate trainees is essential to maintain the delivery of high quality of burn care in Canada. **Learning Objectives:** (1) To describe the current physician workforce managing burn injuries in Canada. (2) To describe the barriers to delivering burn care in Canadian

centers. (3) To understand the current and anticipated need for burn care specialists in Canada.

RP06 - A New Limited Submuscular Direct-to-Implant Technique Utilizing Acellular Dermal Matrix

M. Brichacek*, K. Dalke, E. Buchel, and T. Hayakawa

Winnipeg, Manitoba, Canada

Purpose: In retropectoral direct-to-implant techniques utilizing a single sheet of ADM, the pectoralis covers the majority of the implant resulting in reduced projection and implant animation. Subcutaneous direct-to-implant techniques can reduce animation but can result in more implant visibility, rippling and higher rates of implant loss. We describe a limited submuscular direct-to-implant technique utilizing ADM, where only the upper few centimeters of the implant is covered by the pectoralis. The majority of the implant, including the middle and lower poles, are covered by ADM. This technique maximizes implant projection and minimizes pectoralis action on the implant, reducing animation. Upper implant muscle coverage reduces rippling visibility and also provides a suitable bed for fat grafting if required. **Methods:** The pectoralis muscle is released off its inferior and inferior-medial origins allowing it to retract superiorly. Two sheets of AlloMax (6 × 16 cm) are sutured together and secured to the inframammary fold, serratus fascia and the superiorly retracted pectoralis. 37 breasts in 19 consecutive patients with 6-month follow-up were reviewed. **Results:** 19 consecutive patients with 37 reconstructed breasts were studied. Average age was 50 years, average BMI was 24.3. Ptosis ranged from grade 0-III, average cup size was B (range A-DDD). Early minor complications included: 1 seroma, 3 minor post-operative hematomas managed conservatively, and 3 minor wound healing problems. Three breasts experienced mastectomy skin flap necrosis and were managed with local excision. There were no post-operative infections, no cases of red breast, no grade III/IV capsular contractures, and no implant losses. One patient complained of animation post-operatively. One patient desired fat grafting for rippling. **Conclusion:** A limited submuscular direct-to-implant technique utilizing ADM appears to be safe with a low complication rate. It offers several advantages over other Direct-to-Implant techniques. **Learning Objectives:** Participants will learn a new limited submuscular direct-to-implant technique.

RP07 - The Weakness of Power Assessment: Influence of Medical Specialty and Level of Training on Interrater Reliability of the Medical Research Council Scale for Muscle Strength

K. Sawa*, C. Doherty, D. Ross, T. Miller, and K. Sequiera

London, Ontario, Canada

Purpose: Since 1943 the Medical Research Council (MRC) scale for muscle strength has been widely accepted as the

standard clinical motor power grading system. Despite common use in peripheral nerve assessment, little is known of its reliability. The objective of this study was to assess the influence of medical specialty and level of training on inter-rater reliability of the modified MRC scale for muscle strength. **Method:** All patients seen in the multidisciplinary peripheral nerve clinic at our institution between March and May of 2016 were included in the study. Muscle strength assessments were performed and Modified MRC grades recorded by all physicians in the clinic. Raters were blind to each other's assessment. Inter-rater agreement of modified MRC grades obtained from plastic surgeons, physiatrists, fellows and residents were assessed using Cohen's kappa coefficients. **Results:** MRC power assessments from one hundred fifty-five motor groups (47 patients) were reviewed. All rater agreement was 28.4%. Agreement and inter-rater reliability was highest between physiatrist and physiatry fellow at 52.4% and $\kappa = 0.464$, respectively. Agreement and inter-rater reliability was lowest between plastic surgeons at 29.0% and $\kappa = 0.204$, respectively. **Conclusions:** The MRC scale for muscle strength has poor inter-rater reliability regardless of medical specialty and level of training. This suggests the need for an alternative muscle strength grading scale with greater reliability. **Learning Objectives:**

RP08 - Canadian Trends in Carpal Tunnel Surgery

B. Peters* and J. Giuffre

Winnipeg, Manitoba, Canada

Purpose: A recent paper published in the Journal of Hand Surgery assessed current treatment patterns of carpal tunnel surgery by members of the ASSH. A large number of cases were performed under local anesthetic with sedation or a Bier block, many times in a general operating room. Most often, patients were sent home on hydrocodone. As the majority of carpal tunnel surgery at our center is done under local anesthetic in an office setting, we aimed to conduct a similar study to assess current trends across Canada. **Methods:** An online survey consisting of 10 questions was sent electronically to attending surgeons of the CSPS (N = 400). The results were anonymously entered into an online survey and data was analyzed using descriptive statistics. **Results:** 183 surgeons (46%) responded. 92% of releases were performed in a local procedure room or office and only 8% were done in a general OR. 54% of surgeons used subcutaneous local anesthetic only (no nerve block), 37% used a median nerve block, 3% did a full wrist block, 3% used local with IV sedation, 2% used a Bier block and 0.5% of surgeons had patients under a general anesthetic. 57% of the time a standard open technique was used. 38% used a mini open and 5% performed an endoscopic release. For analgesia, 38% used codeine, 27% plain tylenol, 12.5% NSAIDs, 11% tramadol and 11.5% a stronger narcotic.

Conclusions: Unlike the United States, the majority of carpal tunnel releases in Canada are done at an outpatient center under local anesthetic only. Instead of strong narcotics like hydrocodone, most patients in Canada are treated post-operatively with plain tylenol or codeine. **Learning Objectives:** To learn about current trends in carpal tunnel surgery throughout Canada and how they differ from practices in the United States.

RP09 - Repair of Primary Cleft Palate and Oronasal Fistula With Acellular Dermal Matrix: Systematic Review and Survey

A. Simpson*, O. Samargandi, A. Wong, and M. Bezuhly

Halifax, Nova Scotia, Canada

Objective: The current review and survey aim to assess the effectiveness of ADM in the repair of cleft palate and oronasal fistula and to evaluate current trends of ADM use in palate surgery. **Design:** A systematic review of English articles using MEDLINE (1960 to July 1, 2016), the Cochrane Controlled Trials Register (1960 to July 1, 2016) and EMBASE (1991 to July 1, 2016). Additional studies were identified through a review of references cited in initially identified articles. Search terms included cleft palate, palatal, oronasal fistula, acellular dermal matrix and Alloderm®. An online survey was disseminated to members of the American Cleft Palate-Craniofacial Association to assess current trends in ADM use in palate surgery. **Study Selection:** All studies evaluating the outcome of primary palate repair or repair of oronasal fistula with the use of acellular dermal matrix products were included in the review. **Results:** Twelve studies met inclusion criteria for review. Studies were generally of low quality, as indicated by MINORS scores ranging from 7-14. The pooled estimate for fistula formation after primary palatoplasty following ADM use was 7.1%. The pooled estimate for recurrence of fistula after attempted repair using ADM was 11%. Thirty-six cleft surgeons responded to the online survey study. Of these, 45% used ADM in primary cleft palate repair, while 67% used ADM for repair of oronasal fistulae. **Conclusion:** Use of ADM products is commonplace in palate surgery. Despite this, there is a paucity of high-quality data demonstrating benefit. Further randomized controlled trials examining ADM in palate surgery are required to help develop structured guidelines and improve care. **Learning Objectives:** (1) At the end of this presentation, the learner will be able to describe the current uses for acellular dermal matrix in cleft surgery. (2) At the end of this presentation, the learner will be able to identify the current trends in ADM use among cleft surgeons. (3) At the end of this presentation, the learner will be able to describe the current level of evidence for benefit in using ADM products in primary palatoplasty and oronasal fistula.

RP10 - An Evaluation of Diagnostic Imaging Versus Pathological Diagnosis of Peripheral Nerve Tumors: A 10-Year Retrospective Review of One Surgeon's Clinical Practice

C. Nicholas

Toronto, Ontario, Canada

Purpose: Peripheral nerve tumors are rare in clinical practice, and therefore extensive data does not exist in the literature. MRI is thought to be an excellent imaging modality for the workup of suspected peripheral nerve tumors, particularly in establishing extrinsic vs intrinsic location. The purpose of this study was to assess the imaging versus pathological diagnosis of suspected peripheral nerve tumors in one surgeon's practice. Additionally, a retrospective descriptive review was also carried out. **Methods:** Over a 10 year period from 2006-2016, one peripheral nerve surgeon's operative schedules were reviewed. All cases that involved exploration of a nerve were reviewed and those that involved suspected or pathologically confirmed peripheral nerve tumors were included. Imaging results were compared to pathology reports. **Results:** 39 cases were included. The majority of these suspected tumors had MRIs performed in their workup. The most common peripheral nerve tumor present was a schwannoma, which a majority of the time was identified as schwannoma or neurofibroma by MRI. Interestingly, there were several cases where no intraneural lesion was identified on imaging. These tended to correspond to intraneural ganglions. There were also several cases of extremely rare peripheral nerve neoplasms, including aggressive malignancies. **Conclusions:** As expected, MRI is an excellent imaging modality for diagnosing the presence of a peripheral nerve tumor. However, the clinician should not rely on imaging to rule out intraneural involvement or the absence of malignancy. **Learning Objectives:** (1) The learner will understand the importance of imaging in the diagnosis of peripheral nerve tumors. (2) The learner will understand the limitation of imaging

RP11 - Thermal Imaging in Free Flap Surgery

A. Fitzpatrick, M. McRae, and R. Avram*

Hamilton, Ontario, Canada

Purpose: Thermal imaging has previously been reported in the literature as a tool for preoperative perforator mapping; however, the high cost of technology has limited widespread adoption into practice. New smartphone compatible thermal cameras are now making this technology much more accessible. We aim to demonstrate the potential usability of thermal images in free flap surgery. **Methods:** This is an exploratory, observational study of adult patients undergoing free flap surgery for any indication, most commonly oncologic or traumatic defects. SEEK camera thermal images were captured

within the normal care pathway. Routine management was not altered by participation. Images were captured pre-operatively to map potential perforators, which were then compared to intraoperative surgical anatomy. Intraoperative video was captured of the reperfusion of the flap upon anastomosis. Finally, postoperative appearance of the flap was captured. **Results:** Preoperative mapping of perforators correlated well with intraoperative surgical dissections. The warmest skin areas were adjacent to larger perforators. This was true for both DIEP and ALT flaps. However, reperfusion of the flap upon anastomosis was not captured well on video mode. Users reported reasonable ease of use of the camera and accompanying phone application. Noted areas requiring improvement included overlay of thermal and non-thermal pictures and ease of changing camera modes within the application. **Conclusions:** SEEK thermal has shown itself to be a feasible method of capturing preoperative, intraoperative and postoperative data within a typical free flap surgical pathway. This proof of concept data has highlighted promising areas for further research. Particularly, the efficacy of preoperative perforator marking. Hardware and software has proven feasible in clinical use, however there is for improvement, particularly the overlay of dual image modalities. **Learning Objectives:** The participant will understand characteristics of an ideal technological adjunct to free flap surgery and how thermal imaging could potentially fill this role.

RP12 - Complication and Reoperation Rates of Pedicled Gracilis Flap and Vertical Rectus Abdominis Myocutaneous Flap for the Reconstruction of Perineal Defects

A. Fitzpatrick, P. Patel, M. Ramji, F. Farrokhyar, J. Bain, and R. Avram*

Hamilton, Ontario, Canada

Purpose: The anatomy of the perineum, and patient and disease factors, create a hostile wound healing environment for reconstructed perineal defects. Previous studies have compared the vertical rectus abdominal myocutaneous (VRAM) flap to the gracilis flap with conflicting results. Our primary research question is to determine the rate of reoperation, requiring an alternate salvage flap, following perineal reconstruction with VRAM versus gracilis flap. **Methods:** A retrospective chart review was performed on patients who underwent gracilis (n = 14) or VRAM (n = 31) for perineal reconstruction following genitourinary or colorectal cancer resection. Operative data from 2 surgeons from 2000 until present was collected. Patient demographics, indications for resection, and comorbidities were described, followed by comparison of complications and types of reoperation performed. Odds ratios with 95% confidence intervals were reported. **Results:** No significant differences were found in patient demographics or comorbidities. One gracilis (7%) and 4 VRAM (13%) had significant

flap loss requiring a salvage flap reconstruction (OR = 0.6; 0.05-5.1). Three gracilis (21%) and 5 VRAM (16%) required a secondary operative procedure of any nature (OR = 1.4; 0.3- 7.0). Generally, these were debridement of a necrotic or dehiscent area of flap. Finally, no gracilis and 4 VRAM (13%) suffered complete skin paddle necrosis (OR = 0.2; 0.01-4.2). **Conclusion:** Flaps in our series suffered minor dehiscence and wound healing issues common to this population. However, more flaps in the VRAM group suffered complete skin paddle necrosis requiring a new flap reconstruction. This is a potential complication of the VRAM flap that has not been elucidated in previous studies comparing gracilis and VRAM. Although this did not reach statistical significance, the reconstructive surgeon should be aware of this potential pitfall and take it into consideration when choosing the most optimal reconstructive option post-APR. **Learning Objective:** Participants will have additional information to aid in flap selection for perineal reconstruction post-APR.

RP13 - How do Physician Attributes Influence Breast Reconstruction Decision-Making: A Semistructured Interview Qualitative Study

M. Yu*, A. Gagliardi, N. Baxter, and M. Musgrave

Toronto, Ontario, Canada

Purpose: Canada has low rates of post mastectomy breast reconstruction (PMBR). The purpose of this study was to further understand how referring physician attitudes, knowledge and beliefs could impact access to PMBR. **Methods:** Medical, radiation and surgical oncologists with a primary commitment to breast cancer across Canada were invited to participate in a semi-structured telephone interview. Participants were categorized by specialty, hospital type, geographical region, and years in practice. Open-ended questions were used to capture knowledge, attitudes, and beliefs of the primary referring physicians around several aspects of PMBR. Interview audio was recorded and transcribed into text by a transcriptionist. Responses were analyzed by at least 2 reviewers using qualitative methods to identify themes until saturation was achieved. **Results:** Participants were interviewed between 2014 and 2017 and included surgical oncologists, medical oncologists, and radiation oncologists. They included participants from 6 provinces with both academic and non-academic institutions being included. Some recurrent themes included: (1) the belief that PMBR is beneficial to patients' quality of life and should be offered to all; (2) burden of referral should lie mostly with the surgical oncologists; and (3) access as well as long wait times for PMBR are perceived to be the largest barriers. Themes were similar across different specialties and regions. **Conclusions:** Beliefs about referral responsibility and limited access to plastic surgeons were expressed by primary referring specialists. Whether these beliefs represent the reality of PMBR in Canada is not known. The perception of referral responsibility and surgical access

as barriers are issues which can be addressed at an institutional and regional level through education. **Learning Objectives:** (1) To explore referring physician knowledge, attitudes and beliefs regarding PMBR. (2) To understand common physician beliefs which may impact referral for PMBR. (3) To focus on local regional physician barriers to improve access to PMBR.

RP14 - Wound Complications Following Simultaneous Extensor and Flexor Tenolysis of the Digits

R. Strazar*, E. Ambrose, M. Abrams, and A. Islur

Winnipeg, Manitoba, Canada

Purpose: Most hand literature suggests that digital extensor and flexor tenolysis be performed in a staged fashion rather than during the same operation to avoid complications thought to be related to a compromise in digital blood supply (delayed healing, partial skin flap necrosis, or digital ischemia). The purpose of this study was to retrospectively review all wound healing complications following simultaneous digital extensor and flexor tenolysis and describe the approach utilized. **Methods:** A retrospective chart review of all patients undergoing simultaneous flexor and extensor tenolysis between 2010 and 2016 in a single surgeon's practice was performed. Surgical approach performed in the following order: (1) extensor tenolysis via dorsal lazy-S incision, (2) Open PIP arthrolysis through a partial collateral ligament release, and (3) Flexor tenolysis via modified Brunner. Patients underwent release of the A1 pulley and exploration of the flexor tendons. If proximal FDS/FDP tendon pull did not result in PIP/DIP ROM a formal flexor tenolysis was performed throughout zones 1/2/3. Patients undergoing only an exploration at the A1 pulley were excluded from the study. Physiotherapy/Occupational Therapy and surgeons' notes were reviewed for findings of wound healing complications. **Results:** Twenty-six patients (30 fingers) underwent simultaneous digital extensor and flexor tenolysis between 2010 and 2016. Postoperatively there were eighteen cases of acute digital swelling with only 1 case of prolonged digital swelling, 2 cases of paresthesia, 1 case of tendon rupture, and 1 case of hematoma. No cases of partial or complete skin flap necrosis occurred. There were no cases of digital ischemia. **Conclusion:** (1) Simultaneous digital extensor and flexor tenolysis can be safely performed and must be considered in patients with severe stiffness. (2) Due to almost universal swelling in these patients, initiation of formal ROM by physiotherapy may be delayed for 1 week post-operatively. (3) When performed appropriately, there is little threat to the skin flaps or digital vascular supply. **Learning Objectives:** (1) Indications for performing simultaneous flexor and extensor tenolysis in the digits. (2) Surgical technique for a systematic progression to simultaneous flexor and extensor tenolysis. (3) Most common complications of the combined tenolysis.

RP15 - Outcomes in Adult Cleft Lip Patients Following Single-Staged Septorhinoplasty and Lip Revision

E. Liu* and D. Matic

London, Ontario, Canada

Purpose: Definitive septorhinoplasty and cleft lip revision is performed when facial growth nears maturation. These procedures are typically performed sequentially, and single-staged septorhinoplasty with total lip take-down has not been previously described in the literature. The purpose of this study is to evaluate the outcomes of adult patients who have undergone single-staged septorhinoplasty and lip revision. **Method:** A single surgeon's complete series of single-staged septorhinoplasty with complete lip take-down was evaluated. All patients had a minimum of 6 months of follow-up. A retrospective chart review was conducted to collect demographic data and assess secondary outcomes including complications and need for corrective procedures. The 3D postoperative photographs were mirrored to calculate the root mean square (RMS) error values between the cleft and noncleft sides. These values were compared to a convenience sample of 10 normal participants. **Results:** Twenty-nine patients underwent single-staged septorhinoplasty and total lip take-down. Postoperative photographs were obtained for 11 patients of which 8 had preoperative photographs for comparison. Postoperatively, 13 (38%) patients described concerns with ongoing lip and nose deformity. Six went on to have revision procedures (22%). There was a statistically significant reduction from preoperative to postoperative asymmetry values, with mean RMS scores decreasing from 2.24 to 1.07 ($P = .015$). Postoperative cleft patients continued to have higher asymmetry values (RMS = 1.12) compared to normal controls (RMS = 0.60). **Conclusions:** Single-staged septorhinoplasty with total lip take down is an effective surgery for improving facial symmetry in adults with unilateral cleft lip and is a novel way of managing residual cleft lip and nose deformity. **Learning Objectives:** Participants will be able to explain the use of RMS calculation for analysis of symmetry. Participants will be able to identify single-staged septorhinoplasty and lip revision as an effective method for managing adult cleft lip and nose deformity.

RP16 - Morbidity of Kirschner Wires Versus Internal Fixation Devices for Partial Wrist Fusion

V. Hayward*, T. Maqbool, H. Baltzer, and H. von Schroeder

Toronto, Ontario, Canada

Purpose: We hypothesize that there would be a higher 30-day morbidity of PWFs performed with k-wires versus internal fixation especially with regards to infection rate and

readmission. Long-term data comparing the morbidity of these 2 techniques was also compared. **Method:** A retrospective study of all patients that underwent PWFs at a single institution from 1999 to July 2011 was performed. Data on demographics, method of fixation, 30-day morbidity and healthcare utilization, and long-term outcomes was extracted. Mann-Whitney U, Chi-squared and Fischer's exact tests were performed to compare 30-day and long-term outcomes between fixation groups ($P < .05$, a priori). **Results:** 150 PWFs were analyzed and there was no significant differences in operative time, 30-day post-operative emergency and unscheduled clinic visits ($P = .452$, $P = .089$, $P = 1.000$). In the K-wire group, 3 (4.3%) patients had infections ($P = .095$), with 2 requiring re-admissions and one requiring a return to the operating room. Six (7.4%) patients with internal fixation had persistent carpal tunnel symptoms ultimately requiring median nerve decompression ($P = .031$). Looking at long-term data, the internal fixation group had a higher incidence of hardware irritation/impingement ($P = .003$) and nonunion ($P = .048$). They required a greater number of revision surgeries (0.000), including revision PWFs ($P = .007$), total wrist fusion ($P = .001$), and hardware removal due to irritation/impingement ($P = .007$). **Conclusion:** Patients undergoing arthrodesis with internal fixation devices versus k-wire were more likely to have persistent carpal tunnel symptoms and a higher incidence of hardware complications and revision surgery. Although not statistically significant, the k-wire group had a higher incidence of infection within 30 days. **Learning Objectives:** Participants will be able to understand and compare the short-term and long-term morbidity of using k-wires versus internal fixation devices for PWFs.

RP17 - Fixation of Ulnar Nerve Using a Slip of Medial Head of Triceps: A Novel Technique to Treat Ulnar Nerve Subluxation

J. Vorstenbosch*, C. Nguyen, K. Murray, and A. Iskur

Winnipeg, Manitoba, Canada

Purpose: General consensus on the treatment of dynamic ulnar nerve subluxation and chronic ulnar nerve subluxation does not exist. We present a novel technique using a slip of medial head of triceps to secure the ulnar nerve in situ during cubital tunnel release. **Methods:** Preoperative chronic ulnar nerve subluxation or intraoperative findings of dynamic ulnar nerve subluxation during cubital tunnel release were treated by harvesting a slip of medial head of triceps and securing it to joint capsule over the medial epicondyle. A retrospective chart review of all patients undergoing this procedure was performed to evaluate post-operative outcomes. **Results:** Seventy-five patients underwent this procedure between 2005 and 2016 by 2 surgeons. Ten patients had preexisting chronic ulnar nerve subluxation, 2 patients had recurrent ulnar nerve compression despite anterior transposition, and 63 patients had findings of dynamic ulnar nerve subluxation following standard in-situ cubital

tunnel release. Mean follow-up with 3 months to 1 year. All patients had clinical resolution or improvement of the ulnar nerve compression neuropathy. There was no recurrence of ulnar nerve subluxation, no exacerbation of ulnar neuropathy, and no triceps weakness or pain with elbow extension at last follow-up appointment. **Conclusions:** Fixation of the ulnar nerve in situ with a slip of the medial head of triceps is a safe and effective procedure for eliminating and treating ulnar nerve subluxation over the medial epicondyle. A short surgical video illustrating this procedure will be included in the presentation.

Learning Objectives: (1) Participants will be able to offer patients an alternative surgical option for prevention of ulnar nerve subluxation at the elbow. (2) Participants will learn the surgical technique for fixation of the ulnar nerve with a slip of medial head of triceps.

RP18 - Lipomatosis of Nerve in the Upper Extremity: A Continuum of Disease

M. Saheb-Al-Zamani, L. Wehrli, M. Khanna, M. Lax, and D. Anastakis*

Toronto, Ontario, Canada

Purpose: Lipomatosis of nerve (LON) is a rare, ill-defined, fibro-fatty tumor intermingled with nerve fascicles. Classically, LON presents as a focal distal lesion involving the median nerve at the wrist. The purpose of this study was to determine the extent of proximal disease involvement in cases of upper extremity LON using magnetic resonance imaging. **Methods:** Twelve patients treated between 1998 and 2016 for upper extremity LON were studied. Ten patients underwent MRI of the entire upper extremity for a total of 11 limbs scanned (1 bilateral case). Additional images of the spinal cord and brain were obtained in patients with positive findings of LON at the brachial plexus to evaluate for central nervous system involvement.

Results: Five (of 13) limbs had LON involvement of the median nerve at wrist level as classically described. More commonly, LON extended proximally to at least the level of the upper arm (7 of 13 limbs). Five (of 11 complete upper extremity scanned) limbs also showed disease involvement of the lower roots of the brachial plexus. In all patients with LON of brachial plexus, the ulnar nerve was also affected. One patient with LON at level of brachial plexus also had a Chiari II malformation. **Conclusions:** LON is more than a focal distal disease. More likely, it is a continuum of disease with potential to involve the entire peripheral nerve, proximally extending to the level of the nerve roots. MRI of the entire upper extremity should therefore be considered in patients with LON, especially when the ulnar nerve is affected. **Learning Objectives:** (1) To recognize various presentations of LON in the upper extremity, including proximal extension of lesion to brachial plexus. (2) To understand role of complete upper extremity MRI in management of LON.

RP19 - Outcome of Diplopia in Delayed Enophthalmos Repair

E. Liu, Z. Najarali, F. Farrokhyar, and M. McRae*

Hamilton, Ontario, Canada

Introduction: Post-traumatic enophthalmos due to isolated or complex orbital fractures can contribute to diplopia. Current evidence recommends early repair. However, little is known about the outcome of enophthalmos correction when repair occurs beyond 30 days after trauma. In this systematic review, we aim to evaluate the current evidence on functional outcomes after delayed repair of posttraumatic Enophthalmos. **Methods:** Two independent assessors undertook a systematic review of the literature using multiple databases. Our inclusion criteria identified studies involving patients aged 14 or greater who had surgical correction of persistent enophthalmos 30 days after initial trauma. Each eligible paper was included after critical appraisal using validated guidelines. Data on pre-operative and post-operative enophthalmos and diplopia in each study was extracted. The pattern of fracture was also noted. **Results:** Our search of the medical databases yielded 1053 articles, of which 6 eligible papers were included. In patients with complex fractures, diplopia resolution ranged from 23% to 100%, and enophthalmos was corrected in 73% to 100%. On the other hand, in patients with isolated fractures, 75-100% had resolution of their diplopia, and enophthalmos was corrected in 71% to 100%. One additional study showed from aggregate data that 91% of their patients had correction of enophthalmos with delayed repair, while only 47% had resolution of their diplopia. **Conclusions:** Enophthalmos can be corrected to within 2 mm of contralateral in both isolated and complex orbital fractures in those that present 30 days or greater after injury. There is variation in reported outcomes between studies reviewed. However, higher success rate is seen in patients with diplopia and enophthalmos from isolated fracture pattern. **Learning Objectives:** At the end of this lecture, the learner will be able to Describe the pathophysiology of post-traumatic enophthalmos and its contribution to diplopia. Evaluate current evidence on delayed correction of enophthalmos and its outcomes.

RP20 - Educational Interventions in Postgraduate Plastic Surgery Education: A Systematic Review of the Literature

B. Al-Halabi, E. Bilgic, M. Vassiliou, and M. Gilardino*

Montréal, Quebec, Canada

Purpose: Current time-based training models in plastic surgery result in a variability in exposure among trainees and low confidence levels among graduates due to private nature of cosmetic procedures and variability in opportunities available to residents. These issues require a simultaneous understanding of interventions in plastic surgery education literature to identify existing gaps and guide creation of interventions that demonstrate competence among graduates. **Methods:** A systematic

search was conducted. Following 3 filter cycles, full texts were retrieved for all included articles that underwent further filtering. Data extracted were related to intervention design and execution, involvement of competency assessment, and educational objectives and alignment to ACGME competencies and RCSPC CanMED roles. Quality assessment involved Kirkpatrick's levels of learning evaluation, demonstration of evidence of validity, and the Medical Education Research Study Quality Instrument (MERSQI) score. **Results:** 36 interventions met the inclusion criteria and were reviewed for data and quality assessment. Overall, a scarcity in interventions was noted that variably targeted learning domains with 29 (63.9%) of interventions targeting a mix of learning domains. In terms of competency assessment, 20% of the interventions involved no assessment, whereas most displayed assessment of competency at level of design as opposed to final outcomes. Quality assessment revealed low levels of learning evaluation and evidence of validity; the average MERSQI score was 10.9/18. **Conclusion:** Overall, the reviewed literature was of average quality and limited involvement of competency assessment. This calls for improvement in conducted educational research in this field, and the need for an increased focus on teaching and assessing of the cognitive domain and alignment of learning objectives equally to all competencies. **Learning Objectives:** To be able to appraise the quality of current educational literature in plastic surgery and be familiar with properties of high-quality educational studies and methods of their assessment.

RP21 - A 40-Year Review of Demographics and Clinical Outcomes of Adult Burn Patients Admitted to a Single Provincial Burn Center

T. Omeis*, K. Nickel, and A. Papp

Vancouver, British Columbia, Canada

Purpose: Burn admissions are associated with lengthy hospital stays, high mortality rates, and significant costs to the health-care system. This study was designed to evaluate trends in demographics and outcomes of all burn patients admitted to a provincial burn center over a 40-year period. **Methods:** Demographic and clinical data was extracted from a provincial burn database on all burn patients admitted between 1976 and 2015. Patient demographics, Baux score, complications, length of stay and mortality rates were all reviewed. The recorded data was evaluated and divided into 5-year increments to summarize the findings. **Results:** Between 1976 and 2015 there were a total of 5151 admissions to our center. Rate of admissions steadily declined up until 1998, after which, admissions remained constant. Males represented 74% of all admissions. The average age increased by 2.5 years per 5-year time window. Baux score increased by 2 points per 5-year window. The mortality rate of all comers remained constant at 6.3% over the 40 years studied. The survival rate of patients requiring hemodialysis for renal failure increased to 90% in the last 5 years. Increased age, Baux score, female gender, and complications

including renal failure, pneumonia, aspiration pneumonia, and septicemia were all associated with significantly increased mortality rates. **Conclusion:** The incidence of burn related admissions has remained constant in the last 15 years despite an increase in the average age and Baux score. Trends of increased survival rate in patients with high risk complications such as renal failure requiring hemodialysis suggests that there has been an improvement in the management of higher risk patients. **Learning Objective:** To discuss trends in the demographics and outcomes of burn related admissions over the last 40 years.

RP22 - Applications of Eye-Tracking Technology for Validity Evidence of Microsurgical Skill Assessment Tools

E. Fung*, G. Wilkes, and B. Zheng

Edmonton, Alberta, Canada

Purpose: Microsurgical assessment tools such as the Western Ontario Microsurgical Skill Acquisition/Assessment (UWOMSA) depend on expert review. Validity of scores can be affected by the evaluator's familiarity with the tool, level of attention, and fatigue. The author sought to provide response process validity evidence for the UWOMSA by employing established concepts in eye tracking research, including gaze-overlap and fixation metrics. **Method:** Two fellowship trained expert microsurgeons were asked to watch and score twenty-one anonymized recorded knot tying modules using the UWOMSA. The evaluators completed a training phase to standardize scoring. A remote eye tracking system was used to record eye metrics. Pearson correlation was calculated to compare gaze overlap with Cronbach's alpha and interclass correlation coefficient (ICC) for item and inter rater reliability. **Results:** Cronbach's Alpha was, 0.884 ($P < .0001$), or very good. Overall ICC was 0.707, ($P = .006$) suggesting acceptable inter rater reliability in the compiled score. Gaze overlap between the reviewers was very high ($70\% \pm 0.089$). However, the ICC of the tissue handling component was unacceptable (0.357, $P = .179$). Further analysis showed that there was no relationship with the vessel handling score and the number of errors in the recorded performances (-0.020 , $P = .935$). **Conclusions:** Evaluators who have been trained to use the UWOMSA show an acceptable level of inter rater reliability. However, despite directing their gaze at identical points of interest throughout the video the 2 evaluators do not gather the same visual information, especially when scoring tissue handling. The results suggest that the evaluators require more training in grading the tissue handling item. **Learning Objectives:** To understand (1) sources of validity in test development; (2) the problems associated with surgical assessment tools; and (3) the potential use of eye tracking in test development.

*Presenting author.