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Dr Douglas Ross: President/Président
W Bryan Callaghan: Vice President/Vice-président
Earl Campbell: Chair, Local Organizing Committee/Président, Interdance générale

EYE-OPENER SESSION

00
PREPARATION OF THE MEDICAL LEGAL REPORT AND ROLE OF THE MEDICAL EXPERT

Rose Carter
Edmonton, AB

01
ASSESSING QUALITY OF LIFE IN PATIENTS AWAITING DELAYED BREAST RECONSTRUCTION

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PURPOSE: Women pursuing delayed breast reconstruction (DBR) often wait years before surgery and spend this interval living with a mastectomy defect. This study compared psychosocial, and sexual well-being between women awaiting DBR, and women who received IBR with expander-implants at comparable time points post-mastectomy.

METHODS: Eligible patients were identified from a prospectively maintained database of patients who completed the BREAST-Q, a patient-reported outcome measure for breast surgery, between March 2011 and December 2012. Patients were matched based on age at the time of mastectomy, body mass index (BMI), and the time interval between mastectomy and BREAST-Q administration, which was either between mastectomy and DBR, or after mastectomy with IBR. The BREAST-Q was completed at least 6 months after mastectomy alone/mastectomy with IBR. The dependent variables were the BREAST-Q Psychosocial well-being score, and the BREAST-Q Sexual well-being score. Univariate analysis and clinical judgment were used to identify variables included in the model. Multivariate linear regression models were constructed to control for confounders.

RESULTS: The study sample consisted of 220 post-mastectomy patients, 146 (66.1%) awaiting DBR, and 75 who received IBR with expander-implants. The sample was aged 50.6±9.1 (range 30 to 76) and completed the BREAST-Q an average of 2.5 years following mastectomy. Receipt of IBR and no hormone therapy were significant predictors of higher sexual and psychosocial well-being scores after controlling for BMI, age, marital status, children, alcohol consumption, adjuvant radiation and lymphedema (IBR $p<0.001$; no hormone therapy $p=0.017$; $R^2=0.29$).

CONCLUSIONS: Patients awaiting DBR reported significantly lower psychosocial and sexual well-being scores of the BREAST-Q, when compared with a matched cohort of IBR patients. This suggests that patients pursuing DBR may experience a preventable decrease in quality of life.

Learning Objective:

- *This research will potentially provide clinicians with evidence on which to base decisions after breast cancer diagnosis.*

02
PATTERNS OF CARE FOR IMMEDIATE BREAST RECONSTRUCTION IN ONTARIO: AN EXAMINATION OF THE PAST DECADE

T Zhong, K Fernandes, S Refik, J Platt, SOP Hofer, N Baxter
Toronto, ON

PURPOSE: We described recent rates of mastectomy and immediate breast reconstruction and the factors that influence their utilization in the past decade in Ontario.

METHODS: A total of 28,176 patients underwent mastectomy (25,141 alone and 3,035 with immediate reconstruction) between 2002 and 2012 in Ontario. Age-adjusted population-based rates and changes over time were calculated for mastectomy alone and immediate reconstruction using the Mantel-Haenszel chi-squared test for trend. We also evaluated factors associated with the use of immediate breast reconstruction using multivariable logistic regression with the generalized estimating equation (GEE) method to account for patient clustering within hospitals.

RESULTS: While age-adjusted population-based rate of mastectomy decreased by 9.3% ($p=0.006$), immediate breast reconstruction increased by 80% ($p<0.0001$). In addition to increased age and invasive breast cancer diagnosis, demographic factors that significantly decreased immediate reconstruction utilization included lower income, non-rural residence, and being an immigrant. In addition, patients were more likely to receive immediate reconstruction in teaching hospitals (OR 2.7, CI =1.4–4.9) and hospitals that performed a higher volume of breast cancer surgeries (OR 1.7; CI 1.1–2.9). Lastly, although patients who received immediate reconstruction lived closer to a higher volume breast reconstruction hospital (ie. better access), they still travelled significantly further to receive immediate breast reconstruction than patients who had mastectomy alone. Conclusion Despite being a universally covered benefit, there are disparities in immediate reconstruction rates with respect to income, urbanicity, and immigration status. Our findings may also indicate the need for patients to base their selection of hospitals on more than just proximity to where they live if they want to improve their odds of receiving immediate breast reconstruction.

Learning Objective:

- *To understand the methodology and results of a population-based patterns of care study.*

03
IMMEDIATE BREAST RECONSTRUCTION IN PATIENTS WITH LOCALLY ADVANCED BREAST CANCER (LABC) IS SAFE AND DOES NOT INTERFERE WITH ONCOLOGY TREATMENT

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Toronto, ON

PURPOSE: To review the results of a protocol for immediate breast reconstruction in patients with LABC.

METHODS: We developed a pathway for the treatment of patients with LABC which included the option for immediate breast reconstruction. We retrospectively reviewed all patients who underwent this protocol over

a one-year period. We recorded early and late surgical complications, reconstructive failures, delay to oncologic treatment and local regional recurrence.

RESULTS: We performed 31 immediate breast reconstructions in 20 patients diagnosed with locally advanced breast cancer (LABC) (9 unilateral and 11 bilateral) over a course of 12 months. Thirteen patients had alloplastic reconstruction while seven had autogenous. No patient was delayed in starting radiotherapy as a result of immediate reconstruction. The complication rate in the alloplastic group was 8% (2 complications in 13 patients with 26 implants). In both cases, reconstruction was 2 stage with exchange 6-11 weeks post radiotherapy. It was felt that the complication may be due to the combined effect of a very thin nipple areolar complex and radiation induced skin necrosis. One patient developed local recurrence while pregnant about 1 year post reconstruction.

CONCLUSIONS: Patients with LABC are often denied immediate reconstruction due to concerns about delays to therapy, risk of recurrence and higher reconstructive failure rates. In our study, we found no therapy delays, a low early recurrence rate and alloplastic reconstructive failure rates similar to patients having 2 stage reconstruction in the absence of radiotherapy. This preliminary study suggests that immediate reconstruction in this patient population is safe and should be considered.

Learning Objectives:

- *To discuss the role of immediate breast reconstruction in LABC*
- *To review delay to oncology treatment as a result of LABC*
- *To discuss a pathway for immediate breast reconstruction in patients with LABC.*

04

THE APPLICATION OF COMPETENCY-BASED EDUCATION TO PLASTIC SURGERY RESIDENCY TRAINING – A PILOT STUDY

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In Canada and worldwide, surgical education is evolving to incorporate the principles of competency-based education (CBE) in which residents must objectively demonstrate the ability to perform procedures prior to completion of training. Currently, there are no objective measures to define competency for plastic surgery procedures.

PURPOSE: To determine the "essential" steps for two pilot plastic surgery procedures in an effort to objectively define competence for these procedures.

METHODS: Two pilot procedures were selected based on an initial educational needs assessment (breast augmentation and facelift). Each procedure was broken down into all possible unique steps. A educational literature review suggested that consensus regarding "essential" unique steps could be reached by polling expert opinions using Delphi methodology. The latter technique involved repeated questionnaires with respondent feedback sent to plastic surgical educators and leaders across Canada who were asked to select individual steps from the list deemed essential for a graduating resident. A consensus from respondents of greater than 90% for each individual step was required to define a particular step as "essential" for the procedure.

RESULTS: 15 of 25 steps for breast augmentation and 24 of 36 steps for facelifting were identified as essential competencies.

CONCLUSION: The essential competencies for two pilot plastic surgery procedures were determined using expert and educator consensus. This necessary initial step will enable resident training platforms and objective evaluation criteria to be developed to facilitate adoption of CBE into current residency curriculums.

Learning Objectives:

- *The learner will be able to understand the principles of CBE and its potential application to Plastic Surgery residency training. As well, the learner will understand how Delphi methodology was utilized to determine essential procedural competencies for two pilot plastic surgery procedures.*

05

PHANTOM PUBLICATIONS IN APPLICANT FOR CANADIAN PLASTIC SURGICAL RESIDENCY PROGRAMS

Arash Izadpanah, Ali Izadpanah, A Islur, M Karunanayake, L Sigurdson
Winnipeg, MB

INTRODUCTION: Professionalism, honesty and academic integrity have become a focus in all disciplines. Despite the extensive emphasis on professionalism, falsified information in applicant's resumes have become increasingly common across different disciplines. Some studies have reported as many as one third of applicants misrepresenting their publications in their resumes. We sought to determine the incidence of phantom publication rates in applicants applying to Canadian Plastic Surgical programs.

MATERIALS AND METHODS: The curriculum vitae of applicants applying to a Canadian Plastic Surgical Program (University of Manitoba) for the 2011-2012 academic year were reviewed by two independent authors. Citations for journal articles, book chapters, other published materials and presentations were verified using PubMed/MEDLINE, Ovid, and Google Scholar, and described journal. Descriptive analysis and association between phantom publication and highest academic degree other than Medical Doctorate, number of presentations, and publications using Spearman Rank's analysis was determined.

RESULTS: Eighty-seven applicants applying to a Canadian plastic surgery program were reviewed independently by two authors. Three applicants were excluded because of missing resumes. All applicants' personal information was blinded to the researcher. Eighty-four applicants met our inclusion criteria, reporting a total of 475 publications and presentations (276 publications and 199 presentations). There were 86 phantom publications/presentations (18.1%). Having more "complex" citations ($p=0.022$), the number of presentations ($p=0.001$), the number of publications ($p=0.001$) and total number of publications and presentations ($p=0.001$) were associated with a statistically significant higher likelihood of reporting phantom publications.

CONCLUSION: The incidence of phantom publications in Canadian Plastic Surgery applicants is comparable to other disciplines. Emphasis on academic integrity and professionalism should persist to decrease any enticement to do so in applicants to such a competitive field.

Learning Objective:

- *Listeners will be introduced to the concept of phantom publication and professional integrity. Program directors will be notified about the incidence of phantom data on CaRMS applicant.*

06

THE USE OF THE INTERNET, EMAIL AND PERSONAL ELECTRONICS IN THE CARE OF SURGICAL PATIENTS

MA Plant, JS Fish
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PURPOSE: Information is becoming increasingly accessible and communication is becoming more rapid through the use of smartphones, email and the internet. This has directly impacted virtually all areas of work and life and the way we care for patients is no exception. Current University and Hospital Policies may be incongruent with what residents are actually doing. Since Plastic Surgery is constantly advancing tools and technology in surgery, we felt a group of Plastic Surgeons should be the first to formally study residents' use of technology and how it fits into the current policy framework.

METHODS: 294 Surgical Residents at the University of Toronto were surveyed regarding their knowledge of university policies and usage of communication technologies and the Internet in their clinical duties

RESULTS: 161 residents (54.7%) responded. 93.8% regularly used the Internet, however 72% were completely unaware of the existence of guidelines or were aware, but had no familiarity with their content. 85% regularly used email for clinical duties and 74% rated email as "very" or "extremely" important for patient care. 98.7% had "smartphones" and 82.9% stated it was "very" or "extremely" important for patient care. Finally, text messaging was the primary communication method for 57.8% of respondents and paging for only 1.3%.

CONCLUSIONS: Technology use was high among residents; however, knowledge of guidelines was exceedingly low. Residents should be better educated regarding policies and these guidelines should be updated to reflect what is actually happening at the patient care level. Finally, hospitals should consider abandoning the paging system and consider facilitating better use of residents' mobile phones.

Learning Objectives:

- *To understand the ways residents use technology to care for surgical patients*
- *To gain insight into residents' knowledge of policy surrounding technology*

07

RESULTS FROM A QUALITY IMPROVEMENT INITIATIVE TO REDUCE BREAST SKIN NECROSIS AFTER MASTECTOMY WITH BREAST RECONSTRUCTION

S Winocour, A Degnim, T Hoskin, D Farley, C Grant, J Boughey, S Jacobson, J Jakub, T Torstenson, R Reusche, V Lemaine
Rochester, Minnesota, USA

PURPOSE: Necrosis of breast skin and/or the nipple areolar complex (NAC) following skin-sparing mastectomy (SSM) or nipple-sparing mastectomy (NSM) and immediate breast reconstruction (IBR) may lead to poor outcomes. A quality improvement (QI) project was undertaken using the DMAIC (Define, Measure, Analyze, Improve, Control) framework to improve surgical outcomes.

METHOD: Consecutive cases of SSM or NSM followed by IBR were reviewed. Breast and plastic surgeons retrospectively scored breast skin necrosis in postoperative photographs using the validated Mastectomy SKIN Score. Breast SKIN scores were assessed in both SSM and NSM, and in NSM cases the nipple areolar complex (NAC) was scored separately. SKIN scores were compared for time periods BEFORE initiating the QI project (Nov 2009-Oct 2010) and AFTER (Nov 2010-Dec 2011).

RESULTS: 334 patients underwent 567 breast procedures (378 SSM and 189 NSM). Cases with any partial or full thickness necrosis of the NAC decreased significantly from the BEFORE group (42/76=55.3%) to the AFTER group (15/86= 17.4%; $p<0.0001$). The frequency of breast skin necrosis of SSM cases did not change significantly in the BEFORE and AFTER groups (17/110=15.5% and 18/145=12.4% respectively; $p=0.49$). NSM cases with partial or full thickness breast skin necrosis decreased but was not statistically significant (11/76=14.5% BEFORE vs 5/86=5.8% AFTER; $p=0.06$). Cochrane-Armitage test for trend evaluating the combined score for depth and area confirmed a significant reduction in combined SKIN score severity for the NAC ($p<0.0001$) and for breast skin in NSM ($p=0.03$), but not for breast skin in SSM ($p=0.41$).

CONCLUSIONS: After this QI initiative to improve outcomes after SSM and NSM with IBR, significant reductions in necrosis were achieved in NSM.

Further work is ongoing to enumerate factors associated with improved outcomes.

Learning Objectives:

- *Describe the Mastectomy SKIN Score.*
- *Appreciate the role of QI projects using the DMAIC framework to improve IBR surgical outcomes.*

CANADIAN EXPERT PANEL

Facial Aesthetic Surgery: Safe Approaches to Quality Results

07A

Chair/Moderator: Richard Warren
Panelists: Thomas AB Bell, Gregory Waslen, Yvan Larocque

Learning Objectives:

- *The learner will make a better cosmetic diagnosis when analyzing aging faces.*
- *The learner will choose an appropriate surgical procedure to deal with the aging face*
- *The learner will be better able to perform facelift surgery for individual case scenarios.*

08

DEVELOPMENT AND ASSESSMENT OF A CUTANEOUS TISSUE STRETCH DEVICE AS A NOVEL SCAR THERAPY

J Kanevsky, J Vorstenbosch, J Diaz Abele, Y Tahiri, S Prakash, M Gilardino
Montréal, QC

PURPOSE: Mechanical force plays an important yet incompletely understood role in scar formation. Tension during the wound healing process may affect collagen deposition and TGF-β1 production. The purpose of the present study was to develop and test a device that produces parallel stretch on new scars and to analyze its potential to reduce scarring.

METHODS: Thirty-six mice with identical scars were randomized into three treatment groups (0.5X, 1X, or 2X device strength). Animals were treated for 10 days and their scars were scored using the Vancouver Scar Scale. Scar tissue samples were compared between treatment groups by histological analysis and TGF-β1 between control and treatment groups was measured by ELISA.

RESULTS: Scar morphology scores from 0.5X and 1X stretch groups were significantly lower than the control scar group ($p<0.05$). Scar scores from the 1X treatment group were also significantly lower when compared to the 0.5 X group ($p<0.05$). Histological analysis demonstrated that sham, control scar and 2X groups showed more collagen deposition and a thicker dermal scar than the 0.5x and 1x treatment groups. The dermis in unstretched scars had fewer fibroblasts with more collagen between cells when compared with the 0.5x fibroblasts and 2x group. TGF-β1 levels were significantly lower in the stretch treatment groups 0.5x (342.1±9) and 1x (254.1±3) when compared to the control scar group ($p<0.05$). TGF-β1 levels in the 1X treatment group were also significantly lower than the 0.5X treatment group ($p<0.05$).

CONCLUSION: Intermittent cutaneous tissue stretch parallel to the scar during the proliferative phase of wound healing can decrease scar formation on a macroscopic, microscopic and biochemical level.

Learning Objectives:

- *To explain the evolving role of tension in scar formation*
- *To highlight the potential of parallel stretch in scar formation*
- *To demonstrate a novel device and method to address problematic scars*

09

NEUREGULIN-1 / ERBB2 SIGNALING REGULATES EARLY AXONAL REGENERATION FOLLOWING PERIPHERAL NERVE INJURY

M Hendry, E Placheta, T Gordon, G Borschel
Toronto, ON

PURPOSE: Chronic denervation resulting from long regeneration times and distance contributes to poor surgical outcomes following nerve repair. Nerve grafts inserted from the side of an intact donor nerve into the side of a chronically injured nerve reverse these deleterious effects. The purpose of this study is to determine whether Neuregulin-1, a potent Schwann cell mitogen, regulates axonal regeneration and provides an explanatory mechanism for this protective effect. We selectively inhibit Neuregulin-1 signaling with Trastuzumab, a monoclonal antibody specifically blocking Neuregulin-1's receptor, ErbB2.

METHODS: The common peroneal nerves of 32 Lewis rats (16 saline; 16 Trastuzumab) were surgically transected and repaired. These injuries were allowed to heal for two or four weeks. Individual neurons were retrogradely labeled and counted in the ventral horn of the spinal cord using fluorescent dyes administered 1 cm distal to the site of surgical repair. Histomorphometry was used to quantify fiber diameter and myelin thickness within the regenerating nerve.

RESULTS: Significantly fewer neurons regenerated in rats treated with Trastuzumab (295±19) compared with rats receiving saline (367±23) at two weeks post repair ($p<0.05$). No difference was observed at four weeks post-repair in rats treated with Trastuzumab (330±11) compared to saline (336±8). Regenerated fibre diameter (FD) and myelin thickness (MT) did

not differ between rats treated with Trastuzumab (FD = 3.44±0.06 μm; MT = 0.51±0.02 μm) and those treated with Saline (FD = 3.35±0.06 μm; MT = 0.55±0.02 μm) four weeks post-repair.
CONCLUSIONS: Neuregulin-1 signaling is required for the early phase of axon regeneration following acute nerve injury and repair. Neuregulin-1's regulation of the Schwann cell response to injury is currently being explored.
Learning Objectives:
- *Listeners should be able to describe the role of Neuregulin-1 signalling in axonal regeneration.*

TP01
TOTAL TONGUE RECONSTRUCTION – THE MANTA RAY FLAP

JW Robinson, JC Selber
Victoria, BC

INTRODUCTION: Total glossectomy defects are among the most significant challenges in head and neck reconstruction. Modest achievements in functional outcomes are due to the provision of tissue bulk, allowing the neotongue to act as an obturator in the oropharynx. The multidimensionality of these defects is also difficult to visualize, resulting in a paucity of reports on the technical details and refinements of total tongue reconstruction. We illustrate a novel, reproducible, and adjustable design for total tongue reconstruction termed the Manta Ray Flap, given the resemblance of the skin paddle design to the marine animal bearing the same name.
METHODS: The Manta Ray Flap design was performed in our most recent 3 patients with primary squamous cell carcinoma of the tongue, following total glossectomy and neck dissection. Our flap design for total tongue reconstruction is intended for an exact recipient site specifications, without the need for modification once harvested.
RESULTS: Our flap of choice is the anterolateral thigh (ALT) fasciocutaneous flap. A template in the shape of the Manta Ray is created by taking specific measurements of both the tongue resection, and the remaining defect. The resulting pattern is bilaterally symmetrical like the oropharynx, with the median raphe of the tongue constituting the line of symmetry. This creates a seam which will lie along the ventral portion of the tongue, meet in the midline at the anterior floor of mouth, double back towards the retromolar trigone, and end in the nadir of the valecula. Skin paddle inset begins with coning the tongue tip portion outside the mouth. The floor of mouth and retromolar trigone portion of the inset is performed transorally. A lateral pharyngotomy created during the resection facilitates inset along the base of tongue and pharynx. A portion of vastus lateralis muscle harvested with the flap is inset as needed over the exposed vessels, or in the floor of mouth from below. Split thickness skin grafting of the donor site may be required.
CONCLUSIONS: The Manta Ray flap design reproduces the projection and dimensions of the native tongue. There is adequate bulk in all dimensions through the folded, fusiform shape of the ALT, optimizing deglutition and speech outcomes. This technique is at once reproducible, reliable, functional and esthetic.

TP02
SINGLE STAGE TUBEROUS BREAST RECONSTRUCTION: THE MEDIAL WEDGE TECHNIQUE

N Guay, C White
Ottawa, ON

We describe the correction of the tuberous breast deformity with a single general anesthetic. The senior author has developed a technique that releases a medial wedge of breast parenchyma over an expandable permanent implant. This completes the correction in a single stage.

TP03
THE USE OF SERRATUS IN DIRECT-TO-IMPLANT BREAST RECONSTRUCTION – ENLARGING THE POCKET IN ONE STAGE

E Bovill, N Van Laeken
Vancouver, BC

With increasing breast size, the ability to recreate both volume and ptosis with a single-stage implant-based technique becomes limited by a skin-envelope/implant-pocket discrepancy. Larger patients are consigned to a two-stage procedure, or a larger piece of acellular dermal matrix. Our technique utilizes a serratus flap as a gusset at the lateral ADM/pectoralis major interface, extending the reconstructed breast size and improving natural ptosis whilst avoiding additional cost.

TP04
A TECHNIQUE FOR PREVENTING NAC MIGRATION IN NIPPLE-SPARING MASTECTOMY EXPANDER RECONSTRUCTION

E Bovill, S Macadam, P Lennox

Nipple-sparing mastectomy with expander reconstruction may achieve excellent aesthetic outcomes. With increasing volume and laxity of the skin envelope however, the potential for shear increases at the mastectomy flap/muscle-pocket interface, manifest by a tendency for the NAC to migrate superolaterally during the expansion phase. A potentially difficult correction is avoided utilizing this simple anchoring technique.

TP05
NIPPLE RECONSTRUCTION – HIDING THE SCAR

R Mahabir
Temple, Texas

I currently use a modified C-V flap for nipple reconstruction. In closing the donor site, I create a V-Y closure that dramatically reduces the donor site scar. The donor scar can then be completely concealed within a much smaller areolar tattoo.

TP06
INTRAVENOUS REGIONAL ANAESTHETIC "WITHOUT" ESMARCH STUDY

C Watters, S Duggan
Ottawa, ON

PURPOSE: To evaluate the clinical efficiency of Intravenous regional anesthetic (IVRA) or Bier's block when performed without the use of an Esmarch wrap.
METHOD: In this prospective study, patients undergoing outpatient upper distal extremity surgery were randomized into two groups.The Esmarch group had the arm exsanguinated by vertical elevation and then, tightly wrapped distal to proximal by the Esmarch followed by the double-cuffed tourniquet inflation (100 mm hg above systolic pressure) and lidocaine injection.The non-Esmarch group had the arm exsanguinated by vertical elevation with a closed fist for 20 seconds followed by double-cuffed tourniquet inflation (100 mm hg above systolic blood pressure) and lidocaine injection.The quality of the block was evaluated by noting time from tourniquet inflation to surgical incision, quality of block at 15 min, surgical tourniquet time, total tourniquet time, need for supplementation or conversion of anesthetic technique, surgical field assessment and patient satisfaction with the anesthetic technique.
RESULTS: 47 patients (n=23 Esmarch group, n=24 Non-Esmarch Group) One patient in each group had an unsatisfactory block at 15 minutes requiring supplemental local infiltration.Time to surgical incision, total tourniquet time, time to cuff reversal, surgical field assessment and patient satisfaction were not significantly different between groups.
CONCLUSION: Effective IV block anesthesia can be achieved by simply elevating the arm with a closed fist for 20 seconds prior to inflation of the double-cuff tourniquet and intravenous lidocaine injection. There is no need for the traditional Esmarch wrap.
Learning Objectives:
- *To demonstrate that we can evolve and improve traditional techniques.*

10
CD109 OVEREXPRESSION IN THE EPIDERMIS OF TRANSGENIC MICE DECREASES INFLAMMATION AND FIBROSIS

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Montréal, QC

PURPOSE: TGF-beta plays a critical role in the progression of normal wound healing. However, excessive TGF-beta signaling significantly increases the inflammatory response during wound healing, leading to fibrotic pathologies such as keloids and hypertrophic scars. Our group has demonstrated that overexpression of CD109, an inhibitor of TGF- beta signaling, in transgenic mice decreases fibrosis and scarring. In the present study, we investigate the effect of CD109 on inflammation in the skin using CD109 transgenic mice.

METHOD: Using transgenic mice overexpressing CD109 in the epidermis and wild-type controls, we evaluated the role of epidermal CD109 on inflammation using an excisional wound healing model, a bleomycin-induced model of skin fibrosis, and an LPS-induced model of skin inflammation by measuring inflammatory cytokine expression (IL-1 and MCP-1) and recruitment of neutrophils and macrophages to the wound.

RESULTS: During wound healing, compared to wild-type controls, CD109 transgenic mice express less IL-1 and MCP1, and recruit fewer neutrophils and macrophages to the wound site. Induction of fibrosis with bleomycin shows CD109 transgenic mice demonstrate fewer neutrophils and macrophages compared to wild-type controls. The CD109 transgenic mice also display improved wound healing and reduced fibrosis in these two models. Additionally, after LPS injection, fewer macrophages and neutrophils, along with less IL-1 and MCP-1, are observed in CD109 transgenic mice compared to wild-type controls.

CONCLUSIONS: These data demonstrate that overexpression of CD109 in the epidermis significantly decreases inflammation associated with wound healing, induction of fibrosis, and innate inflammatory activation.

Learning Objectives:

- *To appreciate the relationship between scarring and inflammation*
- *To understand that CD109 inhibits inflammation*
- *To consider approaches to regulate wound inflammation and scarring*

11
DIRECT-TO-IMPLANT SINGLE-STAGE IMMEDIATE BREAST RECONSTRUCTION WITH ACELLULAR DERMAL MATRIX: PREDICTORS OF FAILURE

P Gdalevitch, A Ho, K Genoway, P Lennox, N Van Laeken, S Macadam
Vancouver, BC

PURPOSE: Direct-to-implant single-stage immediate (DISSI) breast reconstruction using acellular dermal matrix (ADM) is an alternative to two-stage expander-implant reconstruction. Despite the expense of ADM, cost analysis at our institution found it to be cost-effective compared to the two-stage technique if performed in a single stage. The purpose of this study was to identify predictors of DISSI breast reconstruction failure, where failure was defined as need for early revisional surgery under general anesthetic.

METHODS: This study is a retrospective cohort design including all patients that underwent mastectomy followed by DISSI breast reconstruction between 2009 and 2011 at three University of British Columbia affiliated hospitals. Data was compared between patients with successful and failed DISSI breast reconstruction. Multivariate logistic regression was performed to identify predictors of failure.

RESULTS: Of 164 breasts that underwent DISSI breast reconstruction, 52 breasts (31.7%) met the criteria for failure. Breast cup size was the only statistically significant predictor of failure after controlling for smoking, laterality, radiation and prophylactic versus therapeutic mastectomy (c-statistic 0.68). Breasts with larger bra size had increasing odds of failure compared to bra size A (odds ratio for bra size B=4.86, C=4.96, D=6.01, $p<0.05$). Prophylactic mastectomy cases showed a trend towards successful outcome in this model (OR=0.47, p=0.061), while a history of smoking trended towards a failed outcome (OR=1.79, p=0.065).

CONCLUSION: DISSI breast reconstruction can be performed reliably in a single stage in patients with small to moderate breast size. Patients with large breast size have a higher revision rate and may have better outcomes using traditional two-stage implant reconstruction.

Learning Objectives:

- *At the end of this lecture, the learner will be able to identify patients more likely to have successful outcomes with DISSI breast reconstruction.*

12
COST AND OUTCOME ANALYSIS OF BREAST RECONSTRUCTION PARADIGM SHIFT

AM Fitzpatrick, LL Gao, BL Smith, MJ Yaremchuk, WG Austen Jr, EC Liao
Kingston, ON

PURPOSE: Increasing use of bilateral mastectomies for the treatment and prevention of breast cancer has generated an increased demand for bilateral breast reconstruction. This study analyzes changing patterns of reconstruction to accommodate the combined goals of increased volume of reconstruction and decreased morbidity. Cost and outcome endpoints were examined.

METHODS: A single institution series of 3,171 consecutive mastectomy cases over 10 years was divided into two time periods: 1999-2004 and 2005-2010. Endpoints between the periods were compared using two-tailed *t*-tests for continuous variables.

RESULTS: The number of patients undergoing bilateral mastectomy increased 2.6 fold from 1999-2004 (n=237) to 2005-2010 (n=634).

Unilateral mastectomy volume remained fairly constant from 1999-2004 (n=1104) to 2005-2010 (n=1196). Mean patient age at diagnosis decreased by 7 years ($p<0.001$). In 2005-2010, the autologous reconstruction rate decreased from 60% to 26%, while implant-based reconstruction increased from 40% to 74%. Notable reconstructive paradigm shifts included increased single-stage implant reconstruction and selective application of perforator flaps for bilateral autologous reconstruction ($p<0.001$). Two-stage tissue expander reconstruction accounted for the greatest share of total cost (45%) in 2005-2010.

Despite significant shifts in patterns of selection of reconstructive methods, the overall complication and revision rates remained low.

CONCLUSIONS: The combined demands of a younger patient demographic and increased need for bilateral reconstruction were largely met with single-stage and prosthesis-based procedures. This study provides a foundation for the detailed cost analysis necessary to elucidate the effects of changing reconstructive trends on local and national health care systems, and for the identification of necessary areas for growth and changes in order to subsequently direct allocation of resources at institutional and national levels.

Teaching Objectives:

- *This project illustrates changing trends in breast reconstruction practices, and the implications of evolving practices on cost of care.*

13
ANTIBIOTIC USE IN IMPLANT BASED BREAST RECONSTRUCTION

W Townley, N Baluch, T Zhong, SOP Hofer
Toronto, ON

PURPOSE: Infective complications following implant-based breast reconstruction can lead to devastating consequences. There is currently no consensus on the ideal prophylactic antibiotic regimen. This study compared the effect of post-operative antibiotic prophylaxis on complications in implant-based breast reconstruction.

METHOD: A retrospective cohort study was performed on consecutive women undergoing implant-based breast reconstruction at University Health Network, Toronto (2008-2012). All patients received a single pre-operative intravenous dose. Group A received no additional prophylaxis. Group B received antibiotics until drain removal. Patient (age, smoking), oncological and procedural variables (type of reconstruction, unilateral vs

bilateral, delayed vs immediate,) will be collected and analysed as independent variables. All complications will be recorded. Major complications are defined as: the need for re-operation, re-admission, removal of implant or delay in chemoradiotherapy. Univariate and multivariate logistic regression will be performed to compare outcomes between the two antibiotic regimens.

RESULTS: Three hundred eight patients (group A – 141; group B – 167) underwent 414 procedures (group A – 194; group B – 220) involving 668 breast implants (group A – 313; group B – 357) over the study period. At the time of submission, data had been collected and analysed on 49 implant operations in group A and 66 in group B. In group A, 8 complications occurred (16%; 4 minor, 4 major) compared with 7 in group B (11%; 5 minor, 2 major; p=0.41). The full results will be presented at the meeting.

CONCLUSIONS: Our study delivers a large volume of breast implant cases to try and determine whether post-operative antibiotics are necessary in implant-based breast reconstruction.

Learning Objectives:

- *At the end of the presentation, the participant will appreciate the rationale behind different antibiotic prophylaxis regimes in implant-based breast reconstruction and identify which method if any is most effective in preventing infective complications based on a large cohort study.*

14

COST UTILITY ANALYSIS COMPARING THE VERTICAL SCAR AND INVERTED T-SHAPED TECHNIQUES FOR REDUCTION MAMMAPLASTY

A Thoma, N Ziolkowski, M Kaur, E Duku, R Patterson, C Goldsmith
Hamilton, ON

PURPOSE: Vertical Scar (VSR) and Inverted T-shaped (ITR) breast reductions are the two most common procedures for breast hypertrophy in North America. Head to head comparison of these two procedures in terms of economic evaluation has never been performed. The purpose of this study was to perform a cost-utility analysis (CUA) to determine if the VSR is more cost-effective at 1 year postoperatively.

METHOD: Two hundred fifty-five patients were randomized to receive VSR or ITR from date to date. Costs were calculated from the Patient's, Ministry of Health's, and Society's perspectives. The effectiveness of the procedures was measured with Quality Adjusted Life Years (QALYs). QALYs were obtained by having patients completing the Health Utilities Index Mark-3 at 1 week preoperatively, and 1, 6 and 12 months postoperatively. Direct medical costs were obtained from: MOH Schedule of Benefits 2012, St Joseph's Healthcare Finance office, and a private homecare nursing company. Productivity (indirect) costs were captured in a Patient Cost Diary for one year postoperatively. An incremental cost-utility ratio (ICUR) was calculated.

RESULTS: 147 patients (75-VSR; 72–ITR) completed the 12-month postoperative follow-up. The total direct medical costs were calculated to be $2,871.98 for VSR and $2,917.32 for the ITR; the productivity costs were $6,827.76 for VSR, and $9,131.08 for ITR; and out-of-pocket costs was calculated as $88.90 for VSR and $91.07. VSR is less costly at $10,889.98 (SD $4,426.01) compared with ITR at $12,387.83 (SD $5,524.43). QALYs were calculated to be 2.90 for VSR and 3.88 for ITR. A sensitivity analysis of increasing the effectiveness of VSR by 1 standard deviation translated to a win-win situation where VSR is both more effective and less expensive.

CONCLUSION: VSR is less costly but also less effective than ITR. As the effectiveness between the two techniques is close, a minor shift in effectiveness makes the VSR a cost-effective technique.

Learning Objectives:

- *To understand how the results of a cost utility analysis is used to guide decisions when to accept new technologies*
- *To recognize various perspectives involved in performing cost utility analyses*
- *To understand the methodological aspects of performing a health economic evaluation*

15

SURGICAL SITE INFECTION REDUCTION IN THE BREAST REDUCTION PATIENT POPULATION THROUGH IMPLEMENTATION OF BEST PRACTICE STANDARDIZATION AT THE OTTAWA HOSPITAL

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Ottawa, ON

PURPOSE: Surgical site infections (SSI) are the most common type of nosocomial complication within breast reductions. The National Surgical Quality Improvement Program (NSQIP) benchmark rate for SSIs in breast reductions is 5.9%. The Ottawa Hospital's rate of SSI in breast reductions from January 2010 to June 2011 was 14.8%. We sought to lower the rate of SSIs among six plastic surgeons practicing within three tertiary care hospitals in Ottawa. This was achieved through a literature review identifying factors to reduce SSIs, and then implementing best evidence based practices for the six surgeons. The NSQIP SSI results were then compared before and after implementation of these best practice changes.

METHOD: Six surgeons were surveyed to examine their perioperative practices in breast reductions. The last 10 breast reduction patients of 2011 from each were examined for these variables. Twelve best practices from the literature to reduce SSIs were then implemented in February 2012 as a standardized change within the Ottawa hospital. The main outcome measure was the change in the surgical site infection rates as calculated by the NSQIP database one year after the implementation. Surgeon compliance was measured with self-reports and reviews of operative reports.

RESULTS: The NSQIP surgical site infection rate had a significant drop from 14.8% to 4.2% post implementation of best practice changes. Although only BMI was found to be significant in affecting the rates of complications, the other factors identified as potential causes of SSIs will be discussed.

CONCLUSIONS: Implementation of best practices was found to significantly reduce SSIs in breast reduction patients, from 14.8 to 04.2% over a 12-month period. Based on the general nature of the NSQIP data we cannot conclude which of the twelve best practice factors most dramatically reduced the rate of infection. Further studies will be performed.

Learning Objectives:

- *To recognize potential factors affecting SSI rates within reductions*

16

IS IT TIME TO CHANGE PLASTIC SURGICAL PRACTICES FOR GYNECOMASTIA? IS ROUTINE PATHOLOGICAL EVALUATION OF TISSUE FROM GYNECOMASTIA NECESSARY? A 15-YEAR RETROSPECTIVE REVIEW

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Saskatoon, SK

METHOD: This is a 15-year (1996-2012) single institutional retrospective pathological review of tissue samples of gynecomastia received at the Saskatoon Health Region, Saskatoon. The Laboratory Information System (LIS) was used to identify all cases using the key search words "gynecomastia" OR "gynaecomastia" OR "gynecomazia" OR "gynaecomazia".

RESULTS: The 15-year LIS search detected a total of 452 surgical pathology cases. Pseudogynecomastia (mature adipose tissue only – no breast) was identified in two (0.4%) cases. Of the remaining 450 cases, patients' ages ranged from 5-92 years (median 31y). 43% of the cases were bilateral (28% left-sided; 29% right-sided). All 450 (100%) cases showed no pathological characteristics of concern except for classical findings of a male breast with features of gynecomastia. The weight of the specimens received ranged from 0.2-1147.2 g (average 79 g). The number of tissue blocks sampled ranged from 1-42, with an average of 4 blocks/case (~$250/case), resulting in a cost of approximately $7,500/year to the Saskatoon Health Region.

CONCLUSIONS: As no significant pathological findings were detected in 452 cases and 2178 slides, we feel it is time to reexamine whether routine histopathological examination of tissue from gynecomastia is still warranted. This, coupled with the financial and productivity costs, should encourage reassessment of the current policies and practices of the existing routine histopathological examination of gynecomastia tissue samples.

Learning Objectives:

- *The audience should a) understand the current practices and policies of routine histopathological examination of gynecomastia tissue specimens; b) consider a change of this current practice; and c) reflect on the financial cost-benefit ratio and reevaluate time-saving resource allocations in the current climate of budget restraints.*

17

DIRECT TO IMPLANT WITH "AUTODERM": ACHIEVING BREAST RECONSTRUCTION SATISFACTION IN THE SETTING OF ELEVATED BMI AND SIGNIFICANT PTOSIS

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Calgary, AB

PURPOSE: To evaluate single-stage implant reconstruction in a subset of women whose habitus and breast shape are at risk for an unsatisfactory result from a traditional 2-stage, expander/implant approach.

METHODS: Consecutive women with grade 2 or 3 ptosis, or D cup or larger breasts seeking immediate alloplastic breast reconstruction, underwent a Wise or horizontal breast reduction scar design for the mastectomy incision. The inferior pole of the breast was de-epithelialized and used as a vascularized version of acellular dermal matrix, sutured to the freed, inferior edge of pectoralis major. Post-operatively adjustable implants were used to achieve breast volume. Implant port removal, nipple reconstruction and balancing procedures were carried under local or general anesthesia as appropriate. The BRECON-31TM instrument was applied upon completion of reconstruction.

RESULTS: Twenty-four women with a mean age of 49yo (range 29-66) were treated with this approach over one year. Eleven women had invasive cancer, 8 in situ, and 5 BRCA. Fifteen women had bilateral, and nine had unilateral mastectomies. Mean BMI was 28 (range 20-40). Mean breast size was 38D (range 32-42, B-G). Median mastectomy weight was 1078g (range 232-1320g). Average "autoderm" dimensions were 8cm (range 4.5-15cm) by 19cm (range 15-30cm). Median implant volume was 565cc (range 325-685). On average, four (range 1-6) post-operative visits were required. Secondary procedures were complete by median of 80 days (range 49-223d) from mastectomy. Complications included mastectomy flap necrosis (four breasts), port erosion (2), and cellulitis (2), and were managed with simple wound care, antibiotics and port removal. Overall satisfaction was high (77/100) with excellent scores for self-image (91), arm concerns (88), intimacy (88), satisfaction (85) and expectations (83).

CONCLUSION: A single stage technique using "autoderm" provides an efficient and satisfactory breast reconstruction in women of high BMI.

Teaching Objectives:

- *To understand the technique of direct-to-implant with "autoderm"*

18

IMMEDIATE SINGLE-STAGE BREAST RECONSTRUCTION WITH ABSORBABLE MESH

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Boston, Massachusetts, USA

PURPOSE: Immediate direct-to-implant breast reconstruction (DTI) has gained popularity in recent years with improvement in skin/nipple-sparing mastectomy and the availability of acellular dermal matrix (ADM). Success in immediate DTI reconstruction using an ADM sling has been demonstrated in multiple studies, including a large published series from our own institution. We hypothesize that DTI reconstruction is possible with absorbable mesh (Vicryl™) in place of ADM, providing for a reliable and cost-effective reconstruction.

METHODS: A retrospective review was performed of 40 consecutive direct-to-implant breast reconstructions performed by the senior author (WGA). All patients were followed for a minimum of one year.

RESULTS: Sixty-one breasts in 40 consecutive patients were reconstructed using an immediate direct-to-implant approach with absorbable mesh Vicryl™). Nineteen (47%) cases were unilateral and 21 (53%) cases were bilateral. Mean implant size was 471cc (range 150 – 800cc) with an implant volume to specimen weight ratio of 0.91. Mean follow up is 16.4 months. Two patients experienced complications requiring re-admission (5%) leading to one implant loss (1.6%). There was no incidence of skin necrosis, seroma, or hematoma in this series.

Implant position and aesthetic results were acceptable in all patients.

Cost analysis of replacing Vicryl™ mesh for ADM in direct-to-implant reconstruction in our institution (MGH) demonstrated a 33% and 41% cost reduction in unilateral and bilateral cases, respectively.

DISCUSSION: Direct-to-implant breast reconstruction using absorbable mesh resulted in satisfactory aesthetic outcomes, a low complication rate, and lower cost. We believe this series demonstrates a novel cost- effective approach for direct-to-implant breast reconstruction.

Learning Objectives:

- *Participants will become familiar with current clinical practice for direct-to-implant breast reconstruction.*
- *Participants will be presented with a novel and efficient technique for performing immediate breast reconstruction.*

19

CLINICAL EXPERIENCE WITH SERI™, A SILK-DERIVED BIORESORBABLE SCAFFOLD, IN TWO-STAGE IMPLANT BASED BREAST RECONSTRUCTION

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INTRODUCTION: SERI™ is a CE-Marked, silk-derived, bioresorbable scaffold developed for soft tissue support.

METHODS: In a single-arm US trial (SURE-001), 50 subjects (73 breasts) underwent two-stage breast reconstruction with SERI-supported subpectoral placement of tissue expander (TE) at the time of mastectomy. During stage II surgery, a permanent breast implant replaced the TE. Outcomes evaluated: investigator satisfaction, ease-of-use, palpability, and visibility, and subject satisfaction with the breast. Each investigator obtained IRB approval and subjects provided written informed consent. [NCT01256502]

RESULTS: Mean (±SD) investigator satisfaction was 9.1±1.03 (10=very satisfied) at six months. Mean(±SD) subject satisfaction at screening and six months was 3.7±1.06 and 4.4±0.84 (5=very satisfied), respectively. Most (≥98%) investigators rated SERI easy/very easy-to-use. At most 6-month assessments, SERI was deemed not palpable (≥90%) or visible (≥98%). Mean (±SD) TE size was 484±156 cc and TE volume fill during surgery was 58%±25% of TE size. At 6 months, 29/50 subjects (46 breasts) completed stage II surgery. Reported key complications requiring intervention (n,subjects;n,occurrences;%breasts]): skin necrosis (6[1 bilateral];7;9.6%), hematoma (5;5;6.8%), seroma (3[1 bilateral];4;5.5%), and cellulitis (1[1 recurrence];2;1.4%). There was one case of breast infection resulting in the only SERI/TE explantation.

CONCLUSIONS: We report the clinical experience with SERI, a non-tissue-based off-the-shelf device for soft tissue support. SERI use was associated with high degrees of investigator and subject satisfaction, and ease-of-use. Complication rates were at or less than the expected rates for these procedures. This trial suggests that SERI may be a promising material when used for soft tissue support in breast reconstruction.

Learning Objectives:

- *To discuss clinical experience with SERI, a new silk-derived, non-cadaver-based product for soft tissue support*
- *To understand the near-term outcomes observed in the SURE-001 study including the complication profile of SERI*

AW FARMER LECTURE

19A
I SHALL NOT HATE

Izzeldin Abuelaish, MD

"I know that what I have lost. What was taken from me will never come back. But as a physician and a Muslim of deep faith, I need to move forward to the light, motivated by the spirits of those I lost. I need to bring them justice… I will keep moving but I need you to join me in this long journey." - Dr Izzeldin Abuelaish

Dr Izzeldin Abuelaish is a spectacular inspiration for peace and forgiveness in the world.

The Palestinian infertility expert, researcher and international professional speaker employs righteous anger not for revenge, but to seek peace in the Middle East.

Dr Abuelaish MD MPH, lost three daughters and a niece to a horrendous shelling in the 2009 Gaza War, yet he continues to be a proponent of peace between Palestinians and Israelis, and according to an Israeli colleague, is a "magical, secret bridge" between the two cultures.

Little wonder he has been named one of the world's 500 most influential Muslims, interviewed by media heavyweights Anderson Cooper, Christiane Amanpour and Sir David Frost, and has given speeches at such political pulpits as the Canadian House of Commons, the American Congress and the European Parliament.

For three consecutive years, he has been nominated for the Nobel Peace Prize and has been acclaimed by U.S. President Barack Obama.

His 2010 book, I Shall Not Hate: A Gaza Doctor's Journey, is an international best-seller. One of Dr Abuelaish's vehicles for peace is health – he has worked in Israeli hospitals, treating both Israelis and Palestinians.

His presentations are delivered with heart and depth.

The "Gaza Doctor" lives with his five children in Toronto, Ontario, where he is an associate professor at the Dalla Lana School of Public Health at the University of Toronto.

EYE-OPENER SESSION

19B
BODY CONTOURING IN THE MASSIVE WEIGHT LOSS PATIENT

Jonathan Toy
Edmonton, AB

Obesity is an increasing health issue for millions of people around the world.

With the rise in bariatric surgical procedures, there has been a concomitant increase in the demand for Plastic Surgical reconstruction after Massive Weight Loss (MWL).

Body contouring in the MWL patient requires modification of existing techniques and the utilization of new techniques specifically designed to deal with extreme amounts of excess skin and soft tissue deflation and descent. With multiple body areas needing treatment, the staging and combinations of procedure can be a complex process. Safety and risk management in the MWL patient is of paramount importance.

Learning Objectives:

At the end of this session, the learner will be able to:

- *Recognize the expanding issue of the massive weight loss patient in view of body contouring and the role of the Plastic Surgeon*
- *Assess, create a surgical plan, and stage surgical procedures for the patient presenting for body contouring after massive weight loss*
- *Identify safety issues and minimize risk in body contouring patients after massive weight loss*

20
CANADIAN PLASTIC SURGERY RESIDENT WORK HOUR RESTRICTIONS: CURRENT PRACTICES AND PERCEPTIONS OF RESIDENTS AND PROGRAM DIRECTORS

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Winnipeg, MB

PURPOSE: To examine the current practices and perceptions of Canadian plastic surgery residents and program directors regarding work hour restrictions.

METHODS: An anonymous online survey developed by the authors was sent to all Canadian plastic surgery residents and program directors. Basic summary statistics were analyzed.

RESULTS: Responses from 80 residents (53%) and 10 program directors (77%) were received. Residents reported working an average of 73 hours in hospital per week with 8 call shifts per month. During call shifts, they reported an average of 5 hours of sleep. Most residents (88%) reported taking an average of 0 post-call days off per month and 61% always work post-call regardless of how much sleep they've had. Most respondents (63%) reported wanting the option of working post-call and 77% do not want their work week restricted to 80 hours.

Resident surgical and medical errors attributed to post-call fatigue were perceived by 26% and 49% of residents, and similarly, 30% and 40% of program directors, respectively.

The majority of respondents believe (percentage of residents and program directors in agreement, respectively): the operative (77%,90%) and medical (74%,60%) abilities of residents, and their ability to learn (82%,70%), suffer if they've been up most of the night; That residents won't have enough time to master their surgical skills if they don't work post-call (53%,80%). Residents perceived pressure from attendings (56%) and other residents (53%) to work post-call. No program directors reported expecting their residents to work post-call on very little sleep.

CONCLUSIONS: The majority of Canadian plastic surgery residents responding to this survey do not take, nor want, post-call days off. Residents and program directors agree that surgical and medical abilities were perceived to decrease with decreased sleep, however the desire of residents to master surgical skills and meet perceived expectations appears to encourage them to work post-call.

Teaching Objectives:

- *To investigate the perceptions of Canadian plastic surgery residents and program directors regarding work hour restrictions.*
- *To discuss the ongoing changes to resident work hour restrictions and how they may impact plastic surgery residents.*

21
"WHETHER YOU THINK YOU CAN, OR YOU THINK YOU CAN'T – YOU'RE RIGHT". THE DETRIMENTAL EFFECTS OF NEGATIVE SOCIAL-COMPARATIVE FEEDBACK IN MEDICAL TRAINEES LEARNING SUTURING TECHNIQUES

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Vancouver, BC

PURPOSE: Social-comparative feedback has been shown to influence learner self-efficacy beliefs and motor skill acquisition. This feedback is provided to make the learner believe that he/she is performing better or worse than the group average, regardless of his/her actual performance. Our objective was to examine the role of social-comparative feedback in medical trainees learning basic suturing techniques.

METHODS: Novices (n=30) observed and practiced the simple interrupted suturing technique. Following this, trainees were divided into groups and shown fabricated performance summaries indicating that they were performing better or worse than their peers, regardless of their actual performance. Trainees were then asked to perform the horizontal mattress technique and following practice, again received positive or negative feedback consistent with their initial group assignment. A retention test was performed ~48 hours later to infer learning of the horizontal mattress technique. Subjective variables of interest included self-reported situational motivation, self-esteem, and self-efficacy. Objective measures included expert assessment of video data, total skill completion time, and number of hand movements.

RESULTS: There were no group differences at baseline for self-reported outcome measures and on the pre-feedback manipulation task (simple interrupted suture). Those receiving negative feedback reported lower self-efficacy during acquisition and retention testing (horizontal mattress) compared to those receiving positive feedback (p=0.004), and required significantly more time (p=0.031) and hand movements (p=0.046) to complete the task.
CONCLUSION: Our findings suggest that there is a significant relationship between negative social-comparative feedback and mindset that modifies performance, learning, and self-efficacy beliefs in medical trainees acquiring basic procedural skills.
Learning Objectives:
- *Understand the effect of providing social- comparative feedback on trainee psychological wellbeing and performance while learning basic suturing techniques.*

22
TOWARDS AN EVIDENCE-BASED STRATEGY FOR RESIDENT SELECTION

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PURPOSE: We review literature investigating plastic surgery residency applications and admission criteria. We apply results to the Canadian system, guiding programs to make evidence-based decisions on resident selection.
METHOD: Two Medline searches were performed: 1. Keywords "resident or residency" AND "selection" AND "surgery" and 2. MeSH search "internship and residency" AND "surgery plastic". Abstracts were screened for English language, relevance to admission selection, and specificity to plastic surgery. Reference lists were reviewed for additional papers. Twenty-five papers from peer-reviewed journals were analyzed. All studied the American plastic surgery matching process. Editorials (11) were qualitatively analyzed for themes on plastic surgery interview or admission criteria. Quantitative papers (7) from program directors and applicant surveys were compared for selection criteria and the relationship to interview invitation or matching.
RESULTS: Quantitative studies listed personal attributes including interview performance, maturity, leadership and personality within the top influential factors. However; only objective academic assessments were found to be positively associated with interview invitation including AOA Honors society membership, publications, USMLE part I score, and medical class rank. These academic measures were highly rated among program directors. Applicants with more than ten interviews had >80% match success.
CONCLUSION: The Canadian plastic surgery match lacks the objective measures of medical school academic honors that American plastic surgery programs use to distinguish top candidates. Previous general surgery literature illustrates an association between academic achievements in medical school (AOA Honors society, USMLE part I score, medical class rank) and first-time licensing board pass rates. Canadian programs may benefit from including academic assessments in residency applications.
Learning Objectives:
- *To illustrate common selection criteria in the plastic surgery match.*
- *To evaluate the quality of literature and apply results to the Canadian context.*

23
TISSUE EXPANSION FOLLOWED BY RADIATION IN A PORCINE MODEL: A PILOT STUDY

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PURPOSE: Immediate breast reconstruction is not currently recommended if post-operative radiation is anticipated due to higher complication rates and poorer cosmetic outcomes. Our purpose was to study the effects of tissue expansion followed by radiotherapy on porcine skin. The primary outcomes of post-operative complications and the secondary histocutaneous effects of tissue expansion and radiation were examined.
METHOD: Two Yorkshire pigs were anaesthetised. Each pig had six surgical sites, of which four sites had tissue expanders inserted in the dorso-lateral midline. Following a two-week healing period, a two-week expansion phase commenced. A total of 350 ml of saline was injected. 35Gy of radiation was then administered in five divided fractions to one side of each pig, decided by coin toss. The pigs were euthanized on POD68; tissue samples were collected for histopathology.
RESULTS: Of the eight initial surgical sites and four control sites, 62.5% of sites developed post-operative complications and 50% of tissue expanders were lost. Mild radiation complications were seen it two of the radiated sites, with grade 1 and 2 epithelial damage observed. Histopathologically, the majority of samples displayed normal epidermal, dermal, and subcutaneous layers; no significant histological difference was noted between the radiated and unradiated samples.
CONCLUSIONS: Despite its shortcomings, the porcine model is a good representation of human tissue in the setting of tissue expansion and irradiation. We expect these results to give insight in to the possibility of concomitant or staged tissue expansion and radiation therapy in post-mastectomy patients. Further subjects should be included to allow for statistically significant inferences to be made.
Learning Objectives:
- *To further understand the histopathological and clinical implications of tissue expansion followed by radiation in the setting of breast reconstruction.*

24
HYALURONIC ACID-PHOSPHATIDYLETHANOLAMINE CREAM: A NOVEL SKIN CARE TECHNOLOGY

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London, ON

PURPOSE: Hyaluronan is an endogenous glycosaminoglycan with a known role in tissue regeneration and extracellular matrix architecture. The purpose of the current investigation is to evaluate a novel technology, a phosphatidylethanolamine modified hyaluronic acid (HA-PE) cream (CA Patent PCT/CIPO 2,703,532), for its effects on skin thickness in a murine model.
METHODS: To evaluate the effect on skin thickness, unmodified hyaluronan (HA) and HA-PE were mixed separately into a vehicle cream. Each topical formulation was applied to the shaved backs of anesthetized female C57BL6 mice. Four days following application, two 4mm punch biopsies of treated skin from each mouse were harvested. All samples were formalin- fixed, paraffin-embedded, sectioned and stained for hyaluronic acid. Validated image analysis software (Image J, NCBI) was used to quantify the epidermal and dermal thickness in each group and the amount of hyaluronan present in the samples.
RESULTS: The HA-PE treated mice had a greater amount of hyaluronan in the epidermis, as measured by pixel density, compared with the HA control.
Both groups (HA and HA-PE) appeared to have similar amounts of hyaluronan in the dermis, although endogenous levels are high, making detection of applied hyaluronan difficult to measure in the dermis. Epidermal and dermal thickness was greater in the HA-PE treated group.
CONCLUSIONS: These results indicate that HA-PE shows promise, in a murine model, as a novel technology to increase skin thickness. We believe this is due to its penetration and retention in the skin following topical application.
Learning Objectives:
Following attendance, participants will be able to:
- *Describe three benefits of hyaluronan on skin*
- *Identify the role of HA-PE on skin rejuvenation*

25
INFLAMMATION AND REMODELING OF ACELLULAR DERMAL MATRICES IN A RAT MODEL

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BACKGROUND: Acellular dermal matrices (ADMs) are biomaterial scaffolds derived from human cadaver skin from which the epidermis and

cellular components of the dermis have been removed leaving behind the extracellular matrix structure of the dermis. This acts as a framework to allow ingrowth of the host's own cells. In recent years ADM has garnered much attention for its promising applications in reconstructive surgery. Methods used to decellularize biologic matrices differ, with resulting differences in host response and tissue remodeling post-implantation. The purpose of this study was to evaluate the post-implantation host response of two acellular dermal matrices in an immunocompetent rat model.

METHODS: Matrix characteristics of an ADM produced by a novel decellularization technique and commercially available Graft Jacket® (Wright Medical Tech) were evaluated for residual cell components prior to implantation. The two ADMs were implanted onto the dorsum of Sprague Dawley rats along with fresh cadaver skin (positive control) and a sham pocket (negative control). The rats were sacrificed at 1, 3 and 9 weeks and explant samples evaluated with immunohistochemical staining for inflammatory mediators CD-68 (macrophages), ED-1 (endothelial cells), alpha-SMA (myofibroblasts), CD-80 (M1 macrophage phenotype – proinflammatory), CD-168 (M2 macrophage phenotype – regenerative) as well as rat collagen types 1 & 3.

RESULTS: Matrix characterization post-processing demonstrated ADM produced by a novel decellularization technique provided greater cellular component removal compared with Graft Jacket® ADM. Preliminary analyses showed that the novel ADM explants demonstrated less inflammatory response and increased early neovascularization compared with Graft Jacket.

CONCLUSIONS: Post-decellularization matrix characteristics, such as residual cellular components, produce notable differences in the host response. Preliminary results indicate decreased inflammation and improved remodeling in the novel ADM when compared to a commercially available form.

Learning Objectives:

- *Participants will be able to describe the make up of acellular dermal matrices on a molecular level.*
- *Participants will be able to describe the effect of matrix components on host inflammatory response post implantation.*
- *Participants will be able to identify that there are alternative methods used for decullarization in the production of ADMs, with corresponding differences in residual cellular components that effect host response with regard to inflammation and integration.*

26
CURRENT BIOPSY PRACTICES FOR SUSPECTED MELANOMA: A SURVEY OF SOUTHWESTERN ONTARIO FAMILY PHYSICIANS

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London, ON

PURPOSE: Family physicians (FPs) have an opportunity to diagnose pigmented lesions early with a timely biopsy. The objective of this study was to assess current biopsy practices used by FPs in diagnosing melanoma.

METHODS: From the CPSO physician directory, a computer-generated random sample of 100 practicing FPs from large and 100 from small communities in Southwestern Ontario were identified. Paper-based surveys exploring practice setting, basic melanoma knowledge, biopsy practices, and referral wait times were mailed using a modified-Dillman protocol.

RESULTS: Response rate was forty-nine percent and respondents reflected the demographic make-up of FPs nationwide as per the National Physician Survey. Knowledge testing revealed reasonable scores (3.2 out of 5, SD 1.03). Sixty-one percent of respondents had diagnosed a patient with melanoma through a biopsy in the past two years. Twenty percent of respondents across Southwestern Ontario would always perform an excisional biopsy of skin lesions suspicious of melanoma. The remaining 80% would avoid an excisional biopsy in an aesthetically sensitive area if there is risk of failure to close the defect primarily, where clinic equipment lacks, and if a patient has multiple co-morbidities. If an excisional biopsy was not performed, half of the respondents would perform an incisional biopsy (eg, punch biopsy). Three quarters of respondents recalled that their patients are seen within three months when referred to a specialist without a tissue diagnosis of melanoma.

CONCLUSION: FPs appropriately recognize that excisional biopsies are ideal in melanoma management; yet also recognize that they are inappropriate in certain situations. Half of FPs will move on to an incisional biopsy when excision is not appropriate. Continuing to support FPs with the skills and knowledge needed to perform biopsies will facilitate early diagnosis, and hopefully, improved survival.

Learning Objectives:

- *To describe factors influencing the early diagnosis and referral of melanomas by FPs*

27
A NOVEL FORM OF NEGATIVE WOUND PRESSURE THERAPY

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Ottawa, ON

Negative pressure wound therapy (NPWT) has been used increasingly by clinicians as a means of treating a multitude of surgical and non-surgical wounds. One such novel product is Smith and Nephews PICO dressing, designed as a low cost, single use, NPWT dressing for wounds of low to moderate (<300cc/week) exudate.

The authors objectives are to perform a cost analysis comparing conventional wound dressings to VAC (KCI) to PICO (Smith and Nephew) as based on the cost to the ministry of health of both supplies and associated nursing care.

METHODS: A review of all current literature regarding PICO dressings was carried out. Direct medical cost were estimated for a university based hospital in Ottawa, yielding expected cost for 1) simple serial dressings; 2) VAC therapy; and 3) PICO dressings for wounds of low to moderate exudate. For ease of comparison, one month of standard therapy was used. Expert interview was used to establish frequency of associated dressing changes, home care nursing costs, and current best practice in regards to serial dressing composition.

RESULTS: Baseline and expected costs were calculated for the three different treatment modalities. Serial dressings proved to have the lowest cost followed by PICO single use NWPT and then VAC over a one month period. Associated time of care in terms of hours of nursing required was also less for PICO dressings.

DISCUSSION: Here we present a novel single use NPWT device show in previous small case studies to be equally effective to VAC dressings for similar wounds in terms of time need to treat and outcomes at an overall cost savings to the health care system. Further formal randomized control trials are necessary to confirm this in a clinical setting.

Learning Objectives:

This talk is geared toward improving understanding and knowledge base regarding:

- *health care resource management*
- *product and service cost analysis*
- *critical literature review of novel therapeutic interventions*

28
PATIENT SAFETY IS IMPROVED WITH THE INTRODUCTION OF A SURGICAL CHECKLIST IN A MINOR OPERATING ROOM SETTING

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BACKGROUND: Adverse events have been reduced by checklist utilization in the Major Operating Room. Minor surgery is a significant part of a plastic surgery practice (65% of all procedures) and is not as highly regulated as the Major Operating room. The purpose of this study is to determine if a checklist could reduce adverse events in a minor operating room setting.

METHODS: This is a prospective interventional study from April – November 2012 involving 240 patients at a university teaching hospital. The study group consisted of patients booked for a minor surgical procedure requiring only local anesthetic in an ambulatory setting.

Subjects were enrolled sequentially with half receiving their procedure before and half after the checklist was implemented. Data were collected

by two independent observers not associated with the ambulatory care centre or the care of the patient. Outcome measures included human (eg. Hand hygiene, consent obtained), system (specimen identification), and patient (eg. Infection). χ^2 analysis compared data pre and post intervention (SPSS version 21), with significance $p<0.05$, and results reported as OR ± 95% CI.

RESULTS: Subjects enrolled in the pre and post checklist did not differ with respect to age or gender. After checklist introduction, the surgeon was five times more likely (OR 5 [3-12]) to ask about patient allergies (χ^2 [1]= 21; $p<0.0001$), two times (OR 2 [1-3]) more likely to ask about blood thinners (χ^2 [1]=6.7; $p<0.01$) and four times more likely (OR 4 [2-9]) to obtain consent for the correct side (χ^2 [1]=9.6; $p<0.003$). The surgeon was also six times more likely (OR 6 [3-10]) to perform hand hygiene before the surgical procedure (χ^2 [1]=37; $p<0.0001$). The assistant, usually a medical student or resident, was five times more likely (OR 5 [2-13]) to perform hand hygiene (χ^2 [1]=12; $p<0.001$) post-checklist implementation. No differences were noted in patient factors (reduced infection or hematoma rates) pre and post implementation.

CONCLUSION: Surgical Safety Checklists in the minor operating room improved patient safety over the course of this study. Larger multicenter trials need to be performed to fully elucidate the true benefit on patient factor adverse events.

Learning Objectives:

- *The learner will value the importance of surgical checklists in the minor operating room setting as a tool to improve patient safety.*

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PLASTIC SURGICAL RANDOMIZED CONTROLLED TRIALS: CHALLENGES AND OPPORTUNITIES FOR EVIDENCE BASED PLASTIC SURGERY, A SYSTEMATIC REVIEW

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PURPOSE: To evaluate the plastic surgery literature by examining key components of quality of randomized controlled trials (RCTs) comparing surgical interventions.

METHODS: An electronic search of the Plastic Surgery literature identified all RCTs involving humans, published from 2000 to 2012 that compared one surgical intervention to another surgical intervention. Four reviewers (SV, CC, NZ and MK) independently, and in duplicate, assessed manuscripts for potential relevance, and performed data extraction.

RESULTS: Of the 1745 hits obtained, 181 articles met the inclusion criteria, representing 171 unique RCTs. One in five RCTs were conducted in the USA (20%) or the UK (18%). Publication rates of RCTs increased from 2.5/year (from 2000-2003) to 19/year (from 2004-2012). Here, we present a sample of 43 of 171 RCTs (the full data analysis of 171 RCTs will be available at the time of presentation). These RCTs demonstrated the following data: 28% of RCTs performed randomization properly, 4% of RCTs reported proper allocation concealment methods, 8% of RCTs blinded patients or an outcome assessor. Of the RCTs that did not blind their patients, we independently judged that 58% of these RCTs could have feasibly blinded the patients to their treatment. The concept of intention-to-treat is mentioned in 12% of RCTs and the average loss to follow-up rate was 10%. An a priori sample size calculation was reported 25% of the time, while the median sample size was 40 patients.

CONCLUSIONS: We identified several reporting deficiencies and methodological challenges in surgical RCTs. Reinforcement of reporting guidelines among plastic surgery journals and education may substantially improve quality of RCTs.

Learning Objectives:

- *Participants will learn the key methodological safeguards that maximize the validity of a plastic surgery RCT assessing a surgical intervention.*
- *Participants will learn about trial characteristics of all plastic surgical RCTs published since the year 2000.*

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THE ROLE OF PROPHYLACTIC ANTIBIOTICS IN HAND TRAUMA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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PURPOSE: Traumatic hand injuries are common in plastic surgery. However, there is no consensus on the role of prophylactic antibiotics in complex hand injuries. The goal of this systematic review was to evaluate the use of prophylactic antibiotics in hand trauma and determine effect on infection prevention through meta-analysis.

METHODS: The databases MEDLINE, CENTRAL, and EMBASE were searched electronically. Studies were eligible if they were randomized controlled trials (RCTs) evaluating antibiotic use in hand trauma. Bite wounds, burns, and simple lacerations were excluded. Full-text selection and data abstraction were carried out by two reviewers independently and in duplicate. A meta-analysis of studies was conducted when possible. Subgroup analysis based on injured structure and wound contamination was also performed.

RESULTS: Nine eligible RCTs were identified. Eight of these studies were included in the meta-analysis. Pooled results for all included hand injuries did not show significant difference in infection outcome. Similarly, antibiotics in open fractures did not reveal benefit in combined data from four RCTs. However, a single RCT did show a significant increase in infection in open fractures without antibiotics. Additional subgroup analysis for specific hand injuries did not show a difference between intervention and comparison groups.

CONCLUSIONS: This is the first systematic review evaluating the use of antibiotics in hand injuries more complex than simple lacerations. Results from most individual studies as well as from pooled data do not support prophylactic antibiotics for the majority of traumatic hand injuries. While proper irrigation and debridement of hand wounds remain the standard of care to protect against infection, the routine use of antibiotics is not evidence based.

Learning Objectives:

- *To reconsider the appropriateness of prophylactic antibiotic use in patients with hand injuries*
- *To recognize that the literature to date does not show infection reduction with antibiotics in most complex hand injuries*

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THE SUITABILITY OF USING THE HAMATE FOR RECONSTRUCTION OF THE FINGER MIDDLE PHALANX BASE: AN ASSESSMENT OF CARTILAGE THICKNESS

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PURPOSE: To compare the cartilage thickness of the distal surface of the hamate to the finger middle phalanx base to assess its suitability as an osteochondral graft.

METHOD: A three-dimensional laser scanner was used to construct computer models of the hamate and finger middle phalanx base with and without cartilage using cadaveric specimens. The cartilage and non-cartilage surfaces were aligned and the distance between them calculated as the cartilage thickness. The mean, maximum and coefficient of variation (CV%; a measure of uniformity of cartilage distribution) as well as cartilage distribution maps were computed.

RESULTS: The mean cartilage thickness of the hamate was 0.73±0.08 mm compared to the mean of the finger middle phalanx base of 0.40±0.12 mm. The maximum thickness of the hamate was 1.27±0.14 mm compared to the maximum of the finger middle phalanx base of 0.67 ± 0.14 mm. The CV% of the hamate was 27.8±4.2 compared to the CV% of the finger middle phalanx base of 26.6 ± 8.1. The cartilage thickness distribution of the hamate was consistent with the maximum thickness area spanning the median ridge. For the middle phalanx base, the most consistent pattern was also a maximum thickness area spanning the median ridge. However, over half the middle phalanx base specimens had maximum areas outside the median ridge.

CONCLUSIONS: The distal surface of the hamate has significantly thicker cartilage than the finger middle phalanx base. Both the hamate and finger middle phalanx base have maximum areas spanning the median ridge, however this was more consistently observed with the hamate.

Teaching Objectives:

- *At the end of this lecture, the learner will be able to assess the suitability of using hamate osteochondral grafts to repair the PIP joint with respect to cartilage thickness.*

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OPIOID USE FOLLOWING OUTPATIENT CARPAL TUNNEL RELEASE: ARE WE PRESCRIBING TOO MANY?

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PURPOSE: Over the last decade, there has been an increase in the number of opioid analgesic prescriptions.A better understanding of actual opioid consumption after elective upper extremity surgery may lead to safer prescribing practices and less medication available for diversion. The purpose of our study was to evaluate the use of opioid analgesia required following elective hand surgery and provide safer prescribing practices.

METHOD: A prospective study of all patients undergoing elective carpal tunnel surgery from March 2012-September 2012 was undertaken. Patients underwent open short-scar carpal tunnel release under local anesthetic. Patients were placed in bulky dressings (no splint) for 24 hours.Data collected included age,gender, analgesic prescribed, satisfaction with pain control, number of tablets remaining, need for post-operative splinting, other analgesic medications used, and success of surgery. Exclusion criteria included: previous upper extremity surgery, pre-operative use of opioid medications, or pre-existing acute/chronic pain.

RESULTS: Fifty-six patientswere enrolled into the study; 49 patients met the inclusion criteria and completed the study. Average age was 57 years (18-88 years of age) and females accounted for 66% of all patients. Forty tablets consisting of either Tylenol # 3 or Tramacetwas prescribed to all patients. Satisfaction rate with pain control was 98%. Average number of tablets consumed was 10.46 (0-40 tabs). More than 50% of patients consumed less than 2 tablets. Average post-operative days requiring analgesia was 2.33 (0-7 days). One patient continued to have pre-operative symptoms. Five patients continued to wear their pre-operative splint for an average of two weeks. Overall, 1531 tablets were leftover for the entire cohort.

CONCLUSION: Excess analgesics are prescribed after elective carpal tunnel surgery and could potentially become a source for diversion. Opioid analgesics are typically required for one to three days post-operatively and should be prescribed in amounts less than 15 tablets.

Learning Objectives:

- *The audience will develop better prescribing practices and understand the analgesia requirements for patients undergoing elective hand surgery.*

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AN ANALYSIS OF THE RELATIONSHIP BETWEEN EYEBROW SLOPE AND WRINKLE PATTERNS IN THE PERI-ORBIT AND FOREHEAD REGIONS

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PURPOSE: The purpose of this study is to characterize changes in the wrinkle pattern of the peri-orbit and forehead region, and to correlate this with changes in eyebrow slope.

METHOD: Standardized AP facial photographs of 100 women aged 20-80 at rest were analyzed. Eyebrow slope was calculated using the height at the medial limbus and highest point. Wrinkle number and severity at the medial forehead (MF), lateral forehead (LF), glabella (GL), and lateral orbit (LO) were graded using a validated wrinkle severity score. The average number and severity at each site was compared across and within groups (decade of age) using the Kruskal-Wallis test. The Mann-Whitney U-test was used to identify significantly different pairings. Similar analysis was conducted across and within groups divided by incremental increases in slope.

RESULTS: With increasing age there is a statistically significant differential increase in number and severity of wrinkles, with MF and LF plateauing at the 5th decade, and LO and GL continuing to increase in older decades. The analysis showed that with decreasing slope there was a significant increase in LO number and severity, and this increase was significantly greater compared to MF and LF.

CONCLUSIONS: With aging there is a distinct pattern of wrinkle changes, with a differential increase of LO and GL wrinkles.

Eyebrow slope flattening with aging beyond the 5th decade is significantly correlated with increased LO wrinkle severity and number. This could be explained by unopposed orbicularis oculi action at the lateral brow. This information can help us to improve brow rejuvenation techniques.

Learning Objectives:

- *At the end of this presentation the participants should be able to describe the contribution of wrinkle patterns to eyebrow slope.*

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PERIOPERATIVE SYSTEMIC STEROIDS IN RHINOPLASTY: SYSTEMATIC REVIEW AND META-ANALYSIS

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PURPOSE: To estimate the effectiveness of systemic perioperative steroid treatment compared to placebo for patient and surgeon important outcomes in rhinoplasty.

METHODS: Electronic databases were searched for relevant trials (MEDLINE, EMBASE, Cochrane Library). Abstracts from national conferences, articles in press and included bibliographies were hand searched. No language restrictions. Included studies were randomized controlled trials of systemic perioperative steroid treatment versus placebo in rhinoplasty evaluating at least one of the following outcomes: intraoperative bleeding, edema (four-point scale) and ecchymosis (four-point scale). Title and abstract screening and data extraction were performed in duplicate. Cochrane risk of bias tool was applied to included studies. Mean differences were calculated with 95% confidence intervals. Heterogeneity is incorporated into a random effects model. Quality of evidence for each outcome was assessed with the GRADE approach.

RESULTS: 336 patients from eight studies are included. Perioperative steroid treatment is not associated with increased intraoperative bleeding (MD=13.7 ml, 95%CI=−11.3-38.7; p=0.28). At 24-hours, perioperative steroids decrease edema (MD=0.93, 95%CI=0.66-1.2; p<0.0001) and ecchymosis (MD=0.87, 95%CI=0.59-1.2; p<0.0001). At four-day assessment, perioperative steroids decrease edema (MD=0.65, 95% CI =0.35-0.94; p<0.0001) and ecchymosis (MD=0.61, 95% CI = 0.10-1.1; p=0.02). Minimal clinically important difference is 0.5 on each scale. Steroids are associated with a non-statistical or clinically important decrease in edema and ecchymosis at seven days. Results are consistent across subgroup analysis of tapering doses and sensitivity analysis of risk of bias.

CONCLUSION: There is strong evidence to support systemic steroid treatment in rhinoplasty to reduce short-term edema and ecchymosis without increased intraoperative bleeding. These findings are not present at seven-day assessment. We suggest analysis of patient satisfaction and long term cosmetic outcome.

Teaching Objectives:

- *Participants will identify patient and surgeon important outcomes in rhinoplasty reported in the literature.*
- *Participants will describe the short-term benefit of perioperative steroids.*

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A NOVEL METHOD FOR RHINOPLASTY TRAINING: A REALISTIC THREE-DIMENSIONAL NASAL MODEL

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PURPOSE: Rhinoplasty is a complex surgical procedure with a steep learning curve and small margin for error. A realistic three-dimensional silicone nasal model has been developed and has the potential as a valuable hands-on training module for rhinoplasty training

METHOD: Computed tomographic data were acquired and used to create an anatomically accurate rhinoplasty training model. This is an updated modification to the prototype developed by Zabaneh et al.

The nasal model consists of a transparent silicone skin that allows learner visualization of substructures. Refinement has also been made to better mimic anatomical layers of the nose, allowing for realistic surgical planes to be developed. A step-by-step instructional video is created using this model to highlight basic rhinoplasty techniques. Plastic surgery residents from the University of Alberta were invited to watch the video, followed by hands-on training using the rhinoplasty models. Questionnaires were distributed prior and following each rhinoplasty training session to the learners to assess for changes in comfort and competence for the procedure.

RESULTS: We hypothesize that hands-on practice on the rhinoplasty models will improve surgical competency and comfort in plastic surgery residents.

CONCLUSION: Our three-demensional nasal model, in conjunction with our instructional video, can be a valuable educational asset in rhinoplasty training.

Learning Objectives:

- *Participants will be exposed to a novel method for surgical education that has a practical application to resident training.*

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LIDOCAINE AND THE TUMESCENT TECHNIQUE

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PURPOSE: Tumescent Technique liposuction is a popular method of outpatient body contouring. This technique allows for adequate removal of excess adiposity, requires minimal sedation, and may be performed in the clinic setting. There is no definite consensus on the optimum dose of lidocaine required for the procedure, with reported dosages ranging from 7 mg/kg to 90 mg/kg. The most widely accepted dose is 35 mg/kg; however, this is often inadequate to perform liposuction on more than one body area. The purpose of this study was to review the dosage of lidocaine used in Tumescent Technique liposuction at our institution, and to determine the complication rate associated with increased dose.

METHODS: A two-year retrospective chart review of patients who had outpatient liposuction at our centre was completed. Patient demographics, area of liposuction, lidocaine dose, and complications were recorded. Analysis was completed with SSP statistical software.

RESULTS: Eighty-two patients were reviewed: 96% were female, and average age was 49 years. Over half of the patients had liposuction on more than one anatomic area. The average and median doses of lidocaine were 44 mg/kg and 47 mg/kg, respectively. No major complications were reported; 8.5% had minor complications. The average dose used in patients with recorded complications was 49 mg/kg, and these complications were limited to nausea and lightheadedness. Heart rate was noted to increase postoperatively ($p<0.01$); however, there was no significant change in blood pressure.

CONCLUSIONS: This review suggests that higher doses of lidocaine may be used with the Tumescent Technique when performing liposuction on larger body areas. We have found it to be a safe and well-tolerated practice.

Learning Objectives:

- *At the end of this presentation attendees should understand: (1) Tumescent technique liposuction; and (2) higher doses of lidocaine are safe to use in an outpatient setting.*

37
REGIONAL VARIATION IN RATES OF IMMEDIATE BREAST RECONSTRUCTION: IT MATTERS WHERE YOU LIVE IN ONTARIO

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PURPOSE: The objective was to examine whether immediate breast reconstruction (IBR) rates varied across census divisions (CDs) in Ontario, and whether access to a plastic surgeon (PS) influenced IBR rates.

METHODOLOGY: We identified a population-based cohort of women aged 18-65 who underwent mastectomy in Ontario between 2002 through 2011 using administrative data. Locations of all PS were determined and total BR volume measured. Funnel plots were used to assess variation of individual CDs. The influence of PS supply (categorized by access to PS, by practice volume of BR) on observed area variation was evaluated using Poisson random effects regression.

RESULTS: 18,712 women underwent mastectomy and 2411 had IBR (Ontario rate 12.9%). Only 61/257 (24%) active PS perform BR regularly (>once/month). Several individual CDs varied significantly from the Ontario rate. Regional differences in PS supply explained over 50% of area variation ($p < 0.0001$). The rate of IBR in CDs with very low access to a PS was 6.3% (RR 0.44, $p<0.0001$), whereas the rate in CDs with low or moderate access was 10.6% and 8.6%, respectively (RR 0.72, $p=0.015$ and RR 0.61, $p=0.022$, respectively) compared to CD with the greatest access (rate 14.3%).

CONCLUSIONS: This study showed that rates of IBR are low in Ontario, and some regions exhibited very low rates. We found that IBR rates are greatest in regions with access to PS that regularly performs BR and lowest in regions with limited access. Regional variation in rates of IBR may be addressed by improving patient access through strategies aimed at increased BR service provision by PS.

Learning Objectives:

- *Participants will be able to define small area variation and describe potential reasons for variation of IBR in Ontario.*

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MRI VOLUMETRIC ANALYSIS OF BREAST FIBROGLANDULAR TISSUE TO ASSESS RISK OF THE SPARED NIPPLE IN BRCA 1/2 PATIENTS WHO ARE CONSIDERING PROPHYLACTIC NIPPLE-SPARING MASTECTOMY

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PURPOSE: Prophylactic nipple sparing mastectomy (NSM) in BRCA 1/2 mutation carriers is an option for risk reduction but remains controversial over concern that residual fibroglandular tissue (FGT) with malignant potential remains in the spared nipple. The objective of this study is to formally evaluate the residual volume of FGT in the spared nipple and identify sources of variability.

METHODOLOGY: A segmentation protocol was applied to breast MRIs from 105 consecutive BRCA 1/2 patients. The MRI segmentation quantified volumes for total breast FGT and nipple FGT at varying retroareolar thicknesses. The proportion of FGT in the nipple relative to the breast was calculated as the primary outcome. Associations between the proportion of FGT in the nipple (5mm) and patient characteristics were examined using uni- and multivariable analyses.

RESULTS: At 5mm and 10mm retroareolar thickness, residual FGT comprised 0.24% (s.d. 0.15%) and 0.42% (s.d. 0.21%), respectively, of the total breast FGT ($p<0.001$, Cohen $d = 0.03$). Smaller breast volume, lower BMI (β: −0.428, $p<0.001$ and β: −0.3, $p<0.009$, respectively) and parity ($p<0.009$, Cohen $d = 0.02$) were predictive of greater proportion of residual FGT. A multivariable model included breast volume and parity (β: −0.46, $p<0.0005$ and β: 0.19, $p<0.044$, respectively; $R^2=0.28$, $F=16.5$, $p<0.0005$). Conclusions: The proportion of FGT remaining in the spared nipple is extremely small. This proportion may be influenced by breast volume and parous status. Doubling the retroareolar thickness significantly increases the proportion, yet this likely does not translate into a clinically meaningful increase. Overall, our findings support the current trend of increasing rates of prophylactic NSM performed in the BRCA 1/2 patient population

Learning Objectives:

- *To review prophylactic NSM for risk reduction in BRCA 1/2 patients.*

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PREDICTORS OF MASTECTOMY FLAP NECROSIS IN PATIENTS UNDERGOING IMMEDIATE BREAST RECONSTRUCTION: A REVIEW OF 718 PATIENTS

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PURPOSE: Mastectomy flap necrosis (MFN) following mastectomy and immediate breast reconstruction can compromise post-surgical recovery, lead to additional surgeries, and compromise aesthetic outcome. The objective of this study was to determine if there is a difference in the rate of MFN in patients undergoing immediate alloplastic versus autologous breast reconstruction. The secondary objective was to identify additional patient and surgical factors that influence the rate of MFN.

METHODS: A retrospective chart review of patients who underwent immediate breast reconstruction between 2003-2011 in the UBC Breast Program was performed. Demographic, oncologic, reconstructive, and surgical data were compiled.

RESULTS: 404 alloplastic and 314 autologous patients were reviewed. The overall rate of MFN was 12.9%. There was a trend towards higher MFN rate in the autologous group (15.2% vs. 11.6%, p=0.095). After controlling for age, BMI, smoking status, preoperative breast radiation, surgery duration, cancer side, mastectomy type, and postoperative chemotherapy, no association was found between reconstruction type and MFN. BMI greater than 30, smoking, and preoperative radiation were independent predictors of MFN. Surgical factors including longer duration of surgery and Wise pattern mastectomy incision were also found to be associated with increased odds of MFN.

CONCLUSION: We found no difference in the rate of MFN between immediate alloplastic and autologous reconstruction. A number of patient and surgical factors were found to be predictors of MFN. The results of this study will help surgeons tailor their reconstruction based on patient's risk factors in order to minimize the incidence of MFN.

Teaching Objectives:

- *The learners will be able to identify patient and surgical factors that increase the risk of MFN.*
- *The learners may consider these factors when counseling their patients on options for immediate breast reconstruction.*

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BREAST REDUCTION SCARS: A PROSPECTIVE SURVEY OF PATIENTS' PREFERENCE

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PURPOSE: Reduction mammoplasty is a commonly performed procedure in plastic surgery; however, scarring is cited as a cause of postoperative dissatisfaction. The purpose of this study is to evaluate patient preferences between the three common breast reduction scar patterns (Horizontal, Wise, Vertical).

METHODS: A total of 66 patients were recruited into the study prior to their consultation with the senior author (N.H.). Each patient was shown line drawings and postoperative photographs of the three breast reduction techniques: Horizontal, Wise, and Vertical. The patients then scored the scars on a modified Likert scale. The survey responses had no impact on the patients' medical care. Non-parametric Friedman test was used to compare the mean scores and univariate generalized linear regression analysis was performed to adjust for confounding factors. Post-hoc analysis was performed with Bonferroni. A p-value of 0.001 was statistically significant.

RESULTS: The mean preference ranking was significantly higher for Horizontal compared to Wise and Vertical ($p<0.001$). The mean difference between Horizontal and Wise was 2.982 (95% CI 2.0 and 3.96), and mean difference between Horizontal and Vertical was 2.27 (95% CI 1.29 and 3.25). There was no significant difference between the preference ranking of Wise and Vertical (p=0.264) and the mean difference was 0.71 (95% CI −0.27 and 1.7). Generalized linear regression analysis revealed that age, BMI, and torso/bra size had no significant effect on the preference ranking.

CONCLUSION: To our knowledge, this is the first study designed to prospectively evaluate patients' preference with respect to postoperative scars. Our results provide evidence that the horizontal breast reduction is the preferred reduction technique with respect to scar placement.

Learning Objectives:

- *To understand how scar placement varies with different breast reduction techniques and to learn patient's preferences with respect to postoperative scars.*

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OPTIMIZING PATIENT-CENTRED CARE IN BREAST RECONSTRUCTION: THE IMPORTANCE OF PREOPERATIVE INFORMATION AND PATIENT-PHYSICIAN COMMUNICATION

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PURPOSE: In breast reconstruction, achieving patient satisfaction is a central goal. While much is known about clinical variables that may influence satisfaction, little is known about how the process of care (POC) may positively or negatively affect patient perceptions of outcome. The aim of this study was to examine how preoperative information and interactions with the surgical and medical team might influence patient satisfaction with the outcome of surgery.

METHODS: A multi-centre, cross-sectional study design was employed. The BREAST-Q © (Breast Reconstruction Module) was administered in a postal survey to a cohort of breast reconstruction patients in the US and Canada. The association between patient satisfaction with the process of care and satisfaction with the outcome of breast reconstruction was evaluated using linear regression analysis. Multivariate regression models were constructed to control for confounders and to identify possible predictors of satisfaction with breasts and satisfaction with overall outcome.

RESULTS: The study sample (n=510; response rate was 66%) was characterized by a mean age of 54.3±9.3 (21.0–81.0) and BMI of 25.2±4.3 (16.3–48.9). On multivariate analysis, satisfaction with information and satisfaction with the plastic surgeon predicted higher satisfaction with breasts (adjusted for age, BMI, complications, study centre, adjuvant radiotherapy, and procedure type; Information $p<0.001$, plastic surgeon p=0.003; $R^2=0.29$) and higher satisfaction with overall outcome (Information $p<0.001$, plastic surgeon $p<0.001$; $R^2=0.31$).

CONCLUSION: Patient-centred care is an important aspect of quality of care. Patient's level of satisfaction with preoperative information and with their interaction with the plastic surgeon are important variables that significantly influenced satisfaction with their breasts and overall outcome. Future research to develop methods to enhance information delivery and the surgeon-patient relationship may optimize outcomes in breast reconstruction patients.

At the end of this presentation, the learner will be able to:

- *Learn more about the BreastQ © Process of Care Scales and how it can be incorporated into clinical practice to evaluate patient-centred care.*
- *Gain a better understanding of how the BreastQ © Process of Care Scales is associated with the scales Satisfaction with Outcome and Satisfaction with Breasts.*
- *Appreciate that patient-centred communication of information as well as factors that promote a strong patient-surgeon relationship can have an important impact on patient outcomes.*

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EFFECTS OF CHEMOTHERAPY AND RADIOTHERAPY ON THE COMPLICATION RATES AND AESTHETIC OUTCOMES IN IMMEDIATE VERSUS DELAYED AUTOLOGOUS BREAST RECONSTRUCTION

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PURPOSE: To compare outcomes in patients receiving neoadjuvant therapy (chemotherapy plus radiotherapy) before immediate breast reconstruction and patients receiving adjuvant therapy (chemotherapy plus radiotherapy) before delayed breast reconstruction.

METHOD: This study is a retrospective review of autologous (DIEP or p-TRAM flap) breast reconstruction patients between September 2000 and August 2012. Outcomes include complication rates, aesthetic outcomes and locoregional recurrence rates.
RESULTS: One hundred and sixty nine women with a mean age of 48±8 years were included in this review. The average length of surgical follow up was 746±703 days. One hundred and eleven patients had neoadjuvant therapy prior to mastectomy and immediate reconstruction. In this group one patient developed total flap loss and one partial flap loss. Fifteen percent had mastectomy flap necrosis with 8% requiring revision surgery. Twenty seven percent had delayed wound healing. Fifty-eight patients had mastectomy and adjuvant therapy with delayed breast reconstruction. In this group no patients had total flap loss but three had partial flap loss. Ten percent had mastectomy flap necrosis with 5% requiring surgery. Twenty eight percent had delayed wound healing.
CONCLUSIONS: Patients that underwent immediate breast reconstruction following neoadjuvant therapy and mastectomy demonstrated higher rates of wound infection and mastectomy flap necrosis than patients with delayed reconstruction after adjuvant therapy and mastectomy. Rates of delayed wound healing were similar between the two groups.
Learning Objectives:
- *Identify the effects of radiation and chemotherapy on autologous breast reconstruction*
- *Review the timing sequence of chemotherapy and radiation in the setting of mastectomy and autologous breast reconstruction*

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LONG–TERM OUTCOME OF SEVERE CRANIOFACIAL VASCULAR MALFORMATION OPERATED UNDER CARDIAC BYPASS – 10 SURGICAL PROCEDURE SERIES

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INTRODUCTION: Cardiopulmonary bypass (CBP) and circulatory arrest as an assist in the surgical excision of a severe facial vascular malformation was first described by Mulliken and Murray in 1979. Later on, its use had expanded for resection of intracranial vascular malformations. However, up-to-date, there have not been any published series of these procedures being used in the resection of craniofacial vascular malformations.
PURPOSE: We sought to review the long-term outcome of the first 10 surgical procedures performed at McGill University Health Centre (MUHC) for large vascular malformations resection using hypothermic CBP with or without circulatory arrest.
METHODS: All consecutive patients at the MUHC who had a craniofacial vascular malformation resected with the aid of CBP were reviewed. A comparison of the classic midline sternotomy with cardiac arrest to percutaneous femoral bypass with hypothermic "low-flow" was performed. Charts were reviewed for the operative intervention including bypass parameters, and short-term and long-term complications of the procedure.
RESULTS: Cardiopulmonary bypass was used in nine patients for ten surgical procedures for the resection of a variety of craniofacial vascular malformations from 1987-2001. All lesions had sclerotherapy and embolization of the feeding vessels 72-96 hours preoperatively. The average age of our patients was 21±13.4 years (2 to 37 years). Procedures were conducted via either an open bypass or a closed femoral approach. There were no mortalities. There were two major cardiac intraoperative complications and one major postoperative complication, which were managed with no sequelae. The average length of postoperative hospital stay was 10 days. All patients went on to full recovery. The blood transfusions varied from 10 units to zero for our last patient. In long-term follow-up, all patients had no recurrence of the aforementioned lesions.
CONCLUSIONS: The assistance and adjunct of CBP is a useful procedure in the resection of very large vascular malformations, in selected cases. There were no major long-term complications in this series. With the evolution of our approach, the use of complete circulatory arrest was not required in the majority of cases, and an adequate resection was usually possible with the "low-flow" state alone as we developed this technique with more experience through the process. Long-term outcome indicated a complete resolution of the lesions.
Learning Objectives:
- *The participant will be able to appreciate the role of cardiac bypass in management of severe vascular malformations.*
- *The significance of low-flow hypothermic bypass and the evolution from no-flow to low-flow is emphasized.*

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LONG-TERM OUTCOMES OF RETAINED HARDWARE IN POST TRAUMATIC MANDIBULAR OSTEOMYELITIS

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PURPOSE: The development of osteomyelitis following open reduction and internal fixation of mandibular fractures often leads to infected non-union. This requires debridement followed by fracture stabilization to achieve bony union. In many instances this is achieved by placement of internal fixation devices. However, this is contrary to infectious disease principles, which advocates the removal of hardware for eradication of infection. The purpose of this study is to determine the long-term outcomes of retained hardware required in the management of post- traumatic mandibular osteomyelitis.
METHODS: A retrospective chart review was performed on patients who had undergone open reduction and internal fixation of mandibular fractures in the Capital Health Region in Edmonton between 2003-2012. This was cross-referenced with patients presenting with a mandibular infection requiring surgical intervention. Twenty-two patients who were identified with confirmed mandibular osteomyelitis form the basis of this study.
RESULTS: All of the patients were treated with debridement of infected devitalized bone and stabilization with internal plate and screw fixation. Following debridement, thirteen patients had a residual bone gap treated with a cancellous bone graft in the acute phase. All patients were treated with culture specific antibiotics. With the exception of one patient, all achieved radiographic bony union in the presence of retained hardware. None of those with bony union have presented with any further infection related complications in follow-up ranging from six months to nine years.
CONCLUSIONS: Our study suggests that the presence of hardware is not an impediment to achieving bony union in the setting of mandibular osteomyelitis. Furthermore, once union is achieved, hardware does not need to be removed to prevent future infectious complications.
Learning Objectives:
- *At the end of this lecture, the learner may consider treating mandibular osteomyelitis without removal of hardware.*

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CT SCAN VS STANDARD RADIOGRAPH: COMPARING RADIATION EXPOSURE, COST, AND TIME UTILIZATION IN THE WORK-UP OF A SUSPECTED MANDIBLE FRACTURE

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PURPOSE: In many facilities, there is no standardized screening process for patients with suspected mandible fractures. Commonly patients requiring operative management for a mandible fracture acquire pre-operative CT images for surgical planning, even if adequate plain films already exist. For this reason we wanted to determine if patients are receiving multiple excessive radiological investigations prior to definitive care at a suspected increased cost, time delay, and increased radiation exposure to the patient.
METHOD: We performed a retrospective analysis of 516 patients presenting to 4 Vancouver Hospitals for the management of a potential mandible fracture over the last 5 years. Patients were classified as initially being screened with a CT-scan or a plain x-ray and all subsequent pre-operative images were identified. Total Radiation dose, total radiological investigation cost, and time to diagnosis were calculated and compared.
RESULTS: Individuals initially screened for a mandible fracture with a CT scan had significantly more radiation exposure (1.47 mSv vs. 0.37 mSv, $p<0.0001$). Patients with a mandible fracture, who were initially screened with a plain film received less total radiation (0.83 mSv vs. 1.47 mSv, $p<0.0001$). There was no difference in time delay to diagnosis depending

on the modality used to screen for a mandible fracture (16.2 vs. 16.4 hours, p=0.1093). Screening patients with plain films is significantly cheaper than using a CT scan ($101.88 vs. $176.81; p<0.0001), but there is no difference in total cost if the patient does have a mandible fracture ($192.20 vs. $169.33, p=0.409).

CONCLUSIONS: All patients with a potential isolated mandible fracture should be screened with a plain-film prior to obtaining a CT scan. Patients with a mandible fracture are managed faster at no additional cost if they are initially assessed with a CT scan.

Learning Objectives:

- *Be able to recognize appropriate radiological screening procedures for potential isolated mandible fractures.*

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APPROACHES TO ORBITAL FLOOR FRACTURES AMONG CANADIAN PLASTIC SURGEONS: A NATIONAL SURVEY AND A LITERATURE REVIEW

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PURPOSE: The treatment of orbital fractures continues to be managed by various surgical specialties with no clear consensus on optimal approach/technique. This study summarizes the approach of members of Canadian Society of Plastic Surgeons (CSPS) to orbital fracture management, contrasted with that published by other specialties.

METHODS: An electronic survey sent to 353 members of the CSPS. Comparison was made to a 10-year literature review (2002-2012) of surgical approaches and implants in Plastic Surgery, ENT, Ophthalmology, and Maxillofacial Surgery (OMFS). Inclusion criteria included studies of ≥ 10 patients, English language, and clear reporting of patient numbers.

RESULTS: The response rate was 71.7% of 120 eligible candidates. A third of plastic surgeons reported they are less likely to operate on these fractures relative to earlier in their career. Six factors have the greatest influence on operative decision: enophthalmos, hypophthalmos, positive forced duction, defect size, motility restriction, and persistent diplopia. The most common approach to the orbit is midlid/infraorbital (45%) followed by transconjunctival (31%) and subciliary (24%). Medpor and Titanium are the most preferred implants (83%) compared to autologous materials (5%). The literature review demonstrated similarities between Plastic and ENT surgeons in implants preference (Medpor and autogenous bone), while OMFS prefer PDS and Ophthalmologists Medpor and Supramid. Subciliary is preferred by Plastic Surgeons and OMFS, whereas transconjunctival is popular among Ophthalmologists and ENT. Endoscopic approach is mainly preferred by ENT surgeons.

CONCLUSION: Interesting inter-specialty differences exist in managing orbital fractures likely related to different background training. However, some differences exist between Canadian Plastic Surgeons and the Plastic Surgery literature mainly in surgical approaches and implants used.

Learning Objectives:

- *At the end of this session, learner will know the operative indications for orbital floor fractures of Canadian Plastic Surgeons and distinguish different management approaches among four different specialties.*

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SYSTEMATIC REVIEW OF MATERIALS USED FOR ORBITAL FLOOR FRACTURE REPAIR

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PURPOSE: Different materials are available for orbital floor fracture repair. We set out to identify and assess studies comparing outcomes of these repair materials. Material types assessed include: autogenous, alloplastic, resorbable and nonresorbable.

METHODS: We searched The Cochrane Library, Ovid MEDLINE (1946 to October 2012) and EMBASE (1990 to January 2013). Two review authors independently selected, assessed and extracted trial data. Our selection criteria included comparative studies assessing outcomes of two or more repair materials. The primary endpoint included postoperative enopthalmos/exophthalmos. Secondary endpoints included: diplopia, gaze restriction and requirement for reoperation or implant removal.

RESULTS: Our search resulted in 675 articles, of which, 22 articles were included in the review. A total of 2721 orbital floor fracture repairs were assessed in the included studies. The following materials were compared: autogenous bone (n=352), autogenous cartilage (n=44), lyophilized dura mater (n=195), synthetic absorbable (n=402), hydroxyapatite (n=191), porous polyethylene (n=637), porous polyethylene with titanium (n=95), titanium mesh (n=356) and patient specific titanium mesh (n=12). The primary endpoint, postoperative enopthalmos/exophthalmos, was reached: less frequently with titanium versus bone graft (odds ratio [OR] 2.69 with 95% confidence interval [CI] 1.43 to 5.06), less frequently with synthetic resorbable versus bone graft (OR 2.28 with 95% CI 0.2 to 23.1), less frequently with titanium versus synthetic resorbable (OR 1.91 with 95% CI 0.47 to 7.72), fairly equally with titanium versus Medpore (OR 1.16 with 95% CI 0.52 to 2.58) and fairly equally with Medpore versus Medpore-Titanium (OR 0.96 with 95% CI 0.18 to 5.20).

CONCLUSION: This study assesses the risk of various clinical endpoints associated with different orbital floor fracture materials. Titanium mesh proved to be superior to synthetic resorbable materials and bone graft. There was no difference between medpore, titanium or medpore-titanium, suggesting that each of these materials are equally effective. Enopthalmos was most commonly observed in cases in which autologous bone was employed suggesting that this material was least effective for repairing orbital floor defects.

Learning Objectives:

- *Participants will be able to describe the risks and benefits of various orbital floor fracture repair materials with regards to various postoperative clinical endpoints including postoperative enopthalmos/exophthalmos.*

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COMPARING THE USE OF 3-D PHOTOGRAMMETRY AND COMPUTED TOMOGRAPHY IN ASSESSING CRANIOSYNOSTOSIS

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PURPOSE: Craniosynostosis is diagnosed using clinical assessment and computed tomography. With increasing awareness of radiation exposure associated risks, computed tomography use is particularly concerning in craniosynostosis patients because they are exposed at a younger age and more frequently than the average child. 3-D photogrammetry is advantageous: it involves no radiation, is conveniently obtainable within clinic, and does not require general anesthesia. This study aims to assess how 3-D photogrammetry compares to computed tomography in the assessment of craniosynostosis.

METHODS: CTs and 3-D photographs of patients who underwent craniosynostosis surgery were assessed and aligned to best-fit. The intervening area between the CT and 3-D photogrammetry curves at the supraorbital bar in axial view were calculated. Statistical analysis was performed using t-test. 95% confidence intervals were determined and equivalence margins were applied.

RESULTS: In total, 41 pairs of CTs and 3-D photographs were analyzed. The 95% confidence interval was 198.16 mm^2 to 264.18 mm^2 and the mean was 231.17 mm^2. When comparisons were made in the same bandeau region omitting the temporalis muscle, the 95% confidence interval was 108.94 mm^2 to 147.38 mm^2 and the mean was 128.16 mm^2. Although statistically significant difference between the modalities was found, they can be attributable to the dampening effect of soft tissue.

CONCLUSION: Within certain error margins, 3-D photogrammetry is comparable to computed tomography. However, a dampening effect is attributable to soft tissue. 3-D photogrammetry may be more applicable for severe cases of craniosynostosis but not milder deformity. Further study is warranted before considering 3-D photogrammetry as an alternate modality for assessing craniosynostosis, the need for cranio-orbital reshaping and correction of dysmorphology.

Learning Objectives:
- *To understand 3-D photogrammetry technology and its potential uses in diagnosis and follow-up of craniosynostosis.*
- *To understand benefits and limitations of computed tomography and 3-D photogrammetry for craniosynostosis assessment.*

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DEVELOPMENT OF A NOVEL TOOL TO ASSESS NURSES' AND RESIDENTS' ABILITY TO MONITOR FREE FLAPS IN THE EARLY POST-OPERATIVE PERIOD

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PURPOSE: Clinical assessment and monitoring of free flaps in the early post-operative period is essential to recognize and prevent flap failure. Clinical monitoring, routinely performed by nurses and residents, remains the mainstay of practice. Currently, there is no reproducible way to determine if and when a clinician has the clinical skills to recognize a compromised flap. The purpose of this study was to test the reliability and validity of a novel tool to evaluate clinicians' ability to monitor free flaps in the post-operative period.

METHODS: Using text and image-based clinical vignettes, a novel tool to evaluate participants' knowledge, judgment, and confidence in assessing flaps was developed. Literature review and expert consensus was used to ensure construct and content validity. Pilot testing amongst plastic surgeons, plastic surgery residents, nurses, and medical students was performed. Subgroup analysis of experienced clinicians (≥10 years of flap care) and novice clinicians (≤1 year) was performed to test convergent and discriminant validity. Participants repeated the questionnaire at 1-2 weeks for test-retest reliability.

RESULTS: Thirty-six participants, including 4 plastic surgeons, 8 plastic surgery residents, 18 nurses, and 6 other clinicians completed the assessment tool. Mean experience in flap care was 11.7 years (range: 0-31) with a mean of 2.7 (range: 0-7) flaps cared for per month. Between assessors and test-retest reliability varied from 74-97% and 27-97%, respectively. Experienced clinicians were significantly more knowledgeable (p=0.034) and confident (p=0.014) in their assessment of the flaps compared to novice clinicians.

CONCLUSIONS: We have developed a novel tool that may be used to evaluate a clinician's ability to monitor free flaps in the early post-operative period. Further testing is required to refine the measure and to establish utility in medical education and clinical practice.

Learning Objectives:
- *Recognize the importance of clinical monitoring in the post-operative care of free flaps*
- *Understand the development of a validated scale to evaluate clinical skills for post-operative flap assessment.*

50
HYALURONIC ACID VERSUS STEROID INJECTION IN BASAL JOINT ARTHRITIS: A SYSTEMATIC REVIEW AND ANALYSIS

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PURPOSE: Basal joint arthritis is initially managed with lifestyle changes, thumb spica splinting, and steroid injections. The injection of hyaluronic acid into the basal joint gained popularity, however the efficacy of the treatment varies. This systematic review compares the outcomes of hyaluronic acid versus steroid injections in basal joint osteoarthritis.

METHODS: A systematic review was performed with an electronic search of PubMed, EMBASE and the Cochrane Central Register of Controlled Trials to identify articles (1950-November, 2012). Forty-four articles were found and read in their entirety. 8 articles studied hyaluronic acid, and only four articles met our inclusion criteria of randomized controlled-trials. Articles were reviewed for severity of osteoarthritis, product injected, repeat injections, pain relief and duration, upper limb functional improvement, motor strength, range of motion, and cost analysis.

RESULTS: Two of the four articles had data suitable for meta-analysis. Pooled data showed no significant difference in pain relief at six months in patients with clinical and radiological evidence of basal joint osteoarthritis. The third study showed comparable pain relief at 6 months. The fourth study showed moderate superiority of hyaluronic acid in pain relief and lateral pinch strength at 6 months.

CONCLUSION: Despite increasing use of hyaluronic acid injection in joint arthropathies, there are limited studies comparing hyaluronic acid and steroid injections for treatment of basal joint osteoarthritis. There is no definitive data supporting the use of hyaluronic acid over steroids. Thus, further randomized controlled-trials are warranted to address the role of hyaluronic acid in treating basal joint osteoarthritis.

Teaching Objectives:
- *Explore new medical treatment of basal joint osteoarthritis.*
- *Hyaluronic acid injections may have a role in the treatment of basal joint osteoarthritis.*

51
NEURECTOMY WITH INTERPOSITIONAL NERVE GRAFTING: A NOVEL TECHNIQUE FOR THE TREATMENT OF MORTON'S NEUROMA

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PURPOSE: Recurrence rates of "Morton's neuroma" following neurectomy have been reported from 2% to 35% (Stamatis and Karabalis, 2004). To our knowledge, interpositional nerve grafting has not been attempted to help reduce recurrence of secondary neuromas or address post-excisional sensory deficits in the afflicted digits and web space. Here, we present a series of 11 cases employing the novel use of interpositional nerve grafting, which we postulate may alleviate residual numbness and recurrent neuralgia.

METHOD: A retrospective chart review of 9 patients (3M:6F; age range 18-71; 11 neuromas) with clinical and radiographic evidence of Morton's neuroma from August, 2003, to March, 2012, was undertaken. The surgical technique involved neurolysis of the involved common digital nerve within the intertarsal space and accurate delineation of the length of Morton's neuroma to be excised. Distal to the neuroma, and distal to the bifurcation of the common digital nerve, a segment of proper digital nerve coursing into an adjacent toe was isolated. This segment, equal in length to the defect created by neuroma excision was harvested as an autogenous interpositional nerve graft. The graft was sutured between the common digital nerve and the proper digital nerve of the toe opposite the one where the nerve graft had been harvested. At final follow-up, patients were assessed for neuroma recurrence, 2-point discrimination and subjective changes in pain, numbness and overall satisfaction.

RESULTS: The average procedure time was 53±12 minutes. All 11 cases resulted in complete resolution of pain without recurrence, and return to full weight-bearing status. Sensation to the grafted hemi-web space returned in all but 1 case where numbness persisted. Wound dehiscence secondary to hematoma formation occurred in 1 case. No other complications were reported.

CONCLUSIONS: Interpositional nerve grafting is an adjunctive treatment following Morton's neuroma excision to reduce post-excision numbness and reduce recurrence rates.

Learning Objectives:
- *At the end of this session, participants will be able to describe surgical treatment options for Morton's neuroma.*

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PENNINGTON-MODIFIED KESSLER FLEXOR TENDON REPAIR: IS THE TECHNIQUE TOO DIFFICULT TO RELIABLY ACHIEVE?

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PURPOSE: Many flexor tendon repair techniques are described; their respective names often confused. One commonly used is the Pennington-modified Kessler repair, a 2-strand technique that relies on a locking loop configuration using a technically difficult single pass of the suture. The goals of this study are to evaluate the use of nomenclature by surgeons, and to evaluate the achievability of a locking loop repair.

METHODS: Twenty plastic surgeons were questioned regarding the repair technique used in their practice (name and diagrammatic representation). Following explanations, they were then asked to perform a Pennington-modified Kessler tendon repair using a beef tendon model. The 20 tendons were then dissected to evaluate the loop configurations.
RESULTS: 45% of surgeons had >10 years of practice and 25% were active members of the provincial replantation program. There was a 40% rate of correspondence between name and representation of techniques. The technique cited as most commonly used (45%) was the Pennington-modified Kessler, with a correspondence rate of 78% between name and representation. A correct locking loop was performed in only 10% of model tendons. None of the surgeons using a Pennington-modified Kessler in their practice were able to perform a complete locking loop correctly.
CONCLUSIONS: The complexity of the nomenclature designating different flexor tendon repair techniques leads to its improper use. Furthermore, a suture technique for which resistance is based on a locking loop configuration using a single pass of the suture is technically too difficult to reliably achieve, even for experienced hand surgeons. For this reason, as well as its reliance on only 2 strands, the Pennington modified Kessler should be discarded as a flexor tendon repair technique.
Learning Objectives:
- *At the end of this presentation, the learner will be able to properly designate different repair techniques and correctly describe the locking loop configuration.*

CSPS GUEST LECTURE

52A
BEHIND THE CURTAIN: SURGICAL JUDGEMENT BEYOND COGNITION

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Carol-Anne Moulton MEd PhD FRACS, is an assistant professor, department of surgery and co-director, hepatopancreatico-biliary (HPB) fellowship program, University of Toronto (Toronto, Ontario). She also is a scientist at the University of Toronto Donald R. Wilson Centre for Research in Education, where her research work focuses on the psychosociological considerations of surgeon error and surgical judgment, as well as the social psychology of surgeons. As a clinician, her focus is on hepatopancreatico-biliary (HPB) surgical oncology.
Dr Moulton is a graduate of University of Melbourne Medical School, Australia. She completed general surgery training through the Austin Health campus, Melbourne, and earned certification from the Royal Australasian College of Surgeons (RACS), where she was the first recipient of the RACS Fellowship in Surgical Education. Dr Moulton completed a clinical fellowship in laparoscopic upper gastrointestinal/HPB surgery at St Vincent's Hospital, Melbourne, and an HPB surgical oncology clinical fellowship at Toronto General Hospital. She received a masters of education through a fellowship at the Donald R. Wilson Centre and University of Toronto, followed by a PhD from the Institute of Medical Science, Toronto, where she studied surgical judgment.

53
ASSESSING PATIENT SAFETY IN CANADIAN AMBULATORY SURGICAL FACILITIES: A NATIONAL SURVEY

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PURPOSE: There is increasing interest in the public and professional medical community regarding standards of care in Canadian facilities where procedures are performed outside-of-hospitals. Limited data exists to reflect the Canadian experience with office-based surgery. The Canadian Association for Accreditation of Ambulatory Surgical Facilities (CAAASF) is a national organization formed in 1990 to establish and maintain standards to ensure surgical procedures done outside a public hospital are performed safely. The aim of this study is to determine how many procedures are performed annually in CAAASF member facilities, as well as to examine complication rates. In addition, the practice of several key patient safety interventions was studied.
METHODOLOGY: All facilities accredited by the CAAASF were surveyed. Surveys were sent by e-mail, fax and mail to all 69 CAAASF member facilities. Three separate mailings were made in 2011. The survey focused on procedural data, complication rates and patient safety interventions.
RESULTS: The response rate was 89% (61/69). In total, 40,240 estimated procedures were performed. A total of 263 complications were reported (0.007%). With regards to patient safety interventions, 93% used antimicrobial prophylaxis, 100% used strategies to maintain normothermia, and 82% employed measures for venous thromboembolism prevention. 44% of facilities permitted procedures to be performed on patients with obstructive sleep apnea and all facilities had established criteria for preoperative evaluation of these patients.
CONCLUSION: This is the first study to report on the Canadian experience with office-based surgery and to provide a perspective on current standards of care practiced in accredited Canadian ambulatory surgical facilities. Appropriate accreditation, well-established patient safety related standards of care and careful patient selection form the basis for safe and effective office-based surgery.
Learning Objectives:
- *To develop awareness of ambulatory surgical facilities and their practices in Canada.*

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ARTERIALIZATION OF THE VENOUS SYSTEM FOR SALVAGE OF CRITICAL HAND ISCHEMIA: A CASE SERIES

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PURPOSE: Limited salvage options exist for critical hand ischemia secondary to distal arterial disease, which are not amendable to bypass. Arterialization of the venous system in the upper extremity has recently regained attention, however only scattered cases are reported in the literature. Our study aims to determine the outcome of venous arterialization to assess its clinical feasibility in limb salvage.
METHOD: All patients who underwent venous arterialization for hand ischemia at a single institution were retrospectively reviewed. Indications, operative details, preoperative and postoperative findings as well as requirement of further amputations were studied.
RESULTS: Eight hand arterializations were performed in six patients with mean age of 55 (range 33 to 75) who presented with severe ischemic pain of the hand and clinical evidence of arterial vascular insufficiency. There were two hands with acute ischemia (symptoms under one week) and six with chronic symptoms. Etiology includes atherosclerosis (4), severe Raynaud's disease (2), distal arterial occlusion secondary to intravenous drug use (1), and distal arterial aneurysm and diffuse narrowing due to Buerger's disease (1). All cases were distal arterial occlusions not amendable to bypass that were confirmed on pre-operative imaging. The cephalic vein was placed end-to-side into the radial artery in the vicinity of the wrist in all cases. During a mean follow-up period of 6.8 months (range 1.5 to 17), all patients exhibited immediate pain reduction, and improvement in their associated sequelae of ischemia. All arterialized hands survived. Two patients presenting with acute ischemia required fingertip amputations for ischemic changes that were irreversible despite venous arterialization.
CONCLUSIONS: Our study is the largest series to date to demonstrate that venous arterialization may be a valuable salvage option in acute and chronic arterial ischemia of the hand when traditional forms of revascularization are not feasible.
Learning Objectives:
- *Participants will consider the efficacy of venous arterialization in ischemic hand salvage.*

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NERVE TRANSFERS AND CORTICAL PLASTICITY: TO WHAT EXTENT DOES IT OCCUR?

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PURPOSE: In order for nerve transfer surgery to be successful a degree of cortical plasticity or "re-learning" is required. It is thought that the greater the time from surgery or transfer, the more independently a recipient muscle will function – relying less on donor muscle activation for its own recruitment. We hypothesize, however, that cortically plasticity does not occur to the degree that has been described – which in part could explain poorer results seen in antagonistic nerve transfers.
We evaluated long-term results of a variety of different transfers in order to determine how truly independently the recipient muscles were functioning.
METHODS: Three different transfers were assessed – each in two different anatomic positions. In the first position, the donor muscle was recruited, or caused to "fire" and in the second position the donor muscle was relaxed. Strength was assessed clinically (MRC scale), objectively (kg of force) and electrophysiologically. The contralateral limb was used as a control to account for any intrinsic changes in strength due to limb positioning.
RESULTS: Average time since surgery was 5.4 years (range 3.9 - 6.8).
Donor muscle recruitment was found to increase average strength by at least one MRC grade and was found to have greater influence on objective strength of recipient muscle. Additionally greater motor unit recruitment was seen on EMG with donor muscle activation.
CONCLUSIONS: Cortical plasticity may not occur to the extent that has previously been hypothesized. These findings may have implications for consideration of future antagonistic transfers, as well as have implications for how these transfers are rehabilitated.
Learning Objectives:

- *Participants will learn to identify the difference between synergistic and antagonistic nerve transfers as well as develop an overview of our current understanding of the extents of cortical plasticity with nerve transfer.*

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REVISION CARPAL TUNNEL SURGERY: A 10-YEAR REVIEW OF INTRAOPERATIVE FINDINGS AND OUTCOMES

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PURPOSE: To evaluate intraoperative findings and outcomes of revision carpal tunnel release (CTR), and to identify predictors of pain outcomes.
METHODS: A retrospective cohort study was performed of consecutive patients undergoing revision CTR (2001-2012). Patients were classified according to presentation with persistent, recurrent or new symptoms. Study groups were compared on baseline characteristics, intraoperative findings, and outcomes (strength, pain). Within each group, changes in postoperative pinch, grip strength and pain were analyzed. Predictors of postoperative average pain were examined using both linear and logistic regression analyses.
RESULTS: Revision CTR was performed in 97 extremities (87 patients). Symptoms were classified as persistent in 42 (43%), recurrent in 19 (20%) and new in 36 hands (37%). The recurrent group demonstrated more diabetes and a longer interval from primary CTR, and was less likely to present with pain ($p<0.05$). Incomplete release of the flexor retinaculum and scarring of the median nerve were common intra- operative findings overall. Nerve injury was more common in the new group ($p<0.0001$). Postoperative pinch, grip strength, and pain significantly improved from baseline in all groups, apart from strength measures in the recurrent group. Persistent symptoms ($p=0.017$) and >1 prior CTR ($p=0.015$) had higher odds of worsened/no change in postoperative pain. Higher preoperative pain ($p=0.008$), use of pain medication ($p=0.002$), and workman's compensation ($p=0.033$) were significant predictors of higher post-operative average pain in multivariable analyses.
CONCLUSIONS: Carpal tunnel surgery can have devastating consequences. Most patients do improve following revision CTR, but a methodical approach to diagnosis and adherence to safe surgical principles are critical to success. Symptom classification, number of prior CTR, baseline pain, pain medications, and workman's compensation status are important predictors of pain outcomes in this population.
Learning Objectives:

- *To understand outcomes of recurrent carpal tunnel surgery, and intraoperative findings associated with persistent, recurrent, and new symptoms.*

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TEMPORAL TREND OF CARPAL TUNNEL RELEASE SURGERY

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BACKGROUND: Carpal tunnel release (CTR) surgery is among the most common hand surgeries, although little is known about its epidemiology. In this study, we aimed to investigate temporal trends, age and gender variation and current practice patterns in CTR surgeries.
METHODS: We conducted a population-based time series analysis among over 13 million residents of Ontario, Canada who underwent operative management for carpal tunnel syndrome (CTS) from April 1, 1992 to March 31, 2010 using administrative claims data.
RESULTS: The primary analysis revealed a fairly stable surgical procedure rate of approximately 10 patients per 10,000 population per year receiving CTRs without any significant, consistent temporal trend ($p=0.94$). Approximately 13% of patients undergoing a CTR surgical procedure had a nerve conduction study prior to their procedure. Secondary analyses revealed significantly higher procedure rates among older patients relative to younger patients. The annual surgical procedure rate among those age > 75 years increased to over 25 patients per 10,000 population ($p<0.01$), whereas the rate for those age 15-35 years declined over time to approximately 3 per 10,000 population ($p=0<0.01$). CTR surgical procedures were approximately two-fold more common among females relative to males. Lastly, CTR procedures are increasingly being conducted in the outpatient setting while procedures in the inpatient setting have been declining steadily – by 2010, approximately one-third of CTR procedures were being performed in the outpatient setting (18.7%, $p<0.01$).
CONCLUSION: CTR procedures are conducted at a rate of approximately10 patients per 10,000 population annually with significant variation with respect to age and gender. CTR procedures in ambulatory care facilities may soon outpace procedure rates in the in-hospital setting.
Learning Objectives:

- *The participant will be able to identify temporal trends, age and gender variation and current practice setting patterns in carpal tunnel release surgery.*
- *Carpal tunnel release surgery in the ambulatory care setting is generally less expensive and more efficient than in-hospital surgery, therefore, surgeons should take this issue into consideration when determining the surgical technique and setting for CTR surgery. This may have a substantial economic impact on hospital resources and health care costs.*

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A PROSPECTIVE MULTIDISCIPLINARY MULTICENTRE ASSESSMENT OF THE SCRATCH COLLAPSE TEST AS AN ADJUNCT FOR EVALUATING CARPAL TUNNEL SYNDROME

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PURPOSE: The Scratch Collapse Test (SCT) has been previously proven to be a statistically significant adjunct in the clinical assessment of peripheral neuropathies. This study aimed to prospectively compare the SCT to other diagnostic manoeuvres in the evaluation of carpal tunnel syndrome (CTS) and to confirm whether the SCT can be blocked by topical anesthesia for assessment of additional sites of compression.
METHOD: Consecutive patients presenting with symptomatic CTS were prospectively enrolled over a six month period. Three diagnostic adjuncts for assessment of CTS (Tinel, Phalen, and the SCT) were performed by members of the Electrodiagnostic Laboratory, the Division of Plastic Surgery, and the Division of Physiatry. In each patient with a positive SCT, a topic anesthetic skin refrigerant (PainEase) that decreases the nerve conduction velocity of C fibers and A-delta fibers was used to eliminate the ipsilateral positive SCT. Other potential sites of nerve compression were

then assessed using the SCT. Exclusion criteria included patients with prior carpal tunnel release, impaired shoulder function, or inability to participate in the test.

PRELIMINARY RESULTS: Approximately fifty consecutive patients with positive electrodiagnostic studies were enrolled. Preliminary sensitivities for Tinel, Phalen, and the SCT were 57%, 79%, and 71% respectively. Preliminary specificities were 100% for all tests. The use of PainEase was successful at supressing the SCT at the wrist in all patients and additional sites of median nerve compression were found in several patients.

CONCLUSIONS: The SCT is comparable in both sensitivity and specificity to other diagnostic adjuncts for CTS and may be more reliable than traditional examinations. The SCT was blocked by topical anesthesia. The clinical usefulness of this test includes more precise localization of nerve compression sites including within the carpal tunnel itself as well as other potential sites of compression.

Learning Objective:

- *Participants will be aware of how to perform the SCT and utilize PainEase topical spray to assess multiple nerve compression sites.*

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AMBULATORY CLEFT LIP SURGERY: A VALUE ANALYSIS AND APPLICATIONS TO THE HEALTHCARE SYSTEM

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BACKGROUND: Health systems face fiscal constraints since neither is there an endless supply of resources, nor are there reliable ways to control patient demand.

Some form of prioritization occurs as to what services to offer and which programs to fund. An data driven approach to decision making is requisite which incorporates outcomes including safety and quality in the setting of fiscal prudence. A value model championed by Michael Porter encompasses these parameters where value is defined as outcomes divided by cost. The purpose of this study is to assess ambulatory cleft lip surgery from a quality and safety perspective, and assess costs associated with ambulatory cleft lip surgery in North America. Conclusions will be drawn as to how the overall value of cleft lip surgery may be enhanced.

METHODS: A value analysis was performed. Analyses of published manuscripts related to ambulatory cleft lip repair over the past 30 years was performed to determine what percentage of patients would be candidates for ambulatory cleft lip repair from a quality and safety perspective. An economic model was constructed based on costs associated with the inpatient stay related to cleft lip repair.

RESULTS: Upon analysis of the published reports in the literature, currently a minority of patients are discharged in an ambulatory fashion (28%) following cleft lip repair. Further analysis suggests 88.9% of patients would be safe candidates for same-day discharge. From an economic perspective, the mean cost per patient for ambulatory cleft surgery to the health care system in the United States was $2390, and in Canada $1800.

CONCLUSIONS: The present analysis reviewed germane publications over a thirty-year period, ultimately suggesting that ambulatory cleft lip surgery results in preservation of quality and safety metrics for most patients. The financial model illustrates a potential cost savings through the adoption of such a practice change. For appropriately selected patients, ambulatory cleft surgery enhances overall health care value.

Learning Objective:

- *To understand how a value model can apply to ambulatory cleft lip surgery.*

60

A RETROSPECTIVE ANALYSIS OF FUNCTIONAL OUTCOMES OF THE HYBRID PALATOPLASTY TECHNIQUE: A TWENTY-YEAR EXPERIENCE

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PURPOSE: The hybrid palatoplasty technique for complete unilateral (or mixed bilateral) cleft palate repair consists of a Veau flap on the lesser segment and a bipedicled flap on the greater segment by utilizing a Von Langenbeck relaxing incision. The alveolar cleft is left intentionally unrepaired. Although first described in 1996, the functional results of the hybrid technique have hitherto not been reported.

METHODS: With Research Ethics Board approval, a retrospective review of all hybrid palatoplasties performed at The Hospital for Sick Children between 1989 and 2009 was performed. Patients were followed-up until a minimum age of five years. The primary outcome measures were the post-operative fistula rate and the incidence of velopharyngeal incompetence (VPI).

RESULTS: The cleft database identified 205 cases of hybrid palatoplasty over the twenty-year period. To date 121 complete charts have been made available for evaluation. Thirty-three patients (27%) were female. The majority (95%) had a Veau type III cleft. Ten patients (8%) were syndromic. The mean age at primary palatoplasty was 1.16 years (SD 0.33). No post-operative fistulae were recorded.

Five-year follow-up data was available for 100 patients, with a mean follow-up of 7.97 years (SD 1.94). Normal velopharyngeal function was recorded in 65 patients. VPI was documented in 35 patients (35%): a single patient awaits further speech investigation, 12 had a secondary Furlow procedure (with four scheduled) and 17 had a pharyngeal flap (with one scheduled). When excluding syndromic cases, the VPI rate was 31%. The mean age at secondary speech surgery was 8.29 years (SD 1.66).

CONCLUSIONS: The hybrid technique is associated with a low risk of fistula formation and preliminary data suggests a VPI rate of 31%.

Learning Objectives:

- *Participants will understand the expected functional outcomes following hybrid palatoplasty with respect to fistula formation and speech.*

61

A SYSTEMATIC REVIEW OF THE EFFECTIVENESS OF MANDIBULAR DISTRACTION IN IMPROVING AIRWAY OBSTRUCTION IN CHILDREN WITH MANDIBULAR HYPOPLASIA

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BACKGROUND: Distraction Osteogenesis (DO) is an effective technique to elongate the deficient mandible. The purpose of the present study was to specifically evaluate the effectiveness of DO in the treatment of airway compromise in patients with mandibular hypoplasia.

METHOD: A comprehensive literature review was performed. Inclusion criteria were studies involving isolated distraction of the mandible, English language, and results that included data about airway changes. Selected manuscripts were analyzed with regards to patient demographics, principle diagnosis, distractor type, distraction protocol, pre and post-distraction airway status and complications.

RESULTS: Forty-nine manuscripts met inclusion criteria, resulting in 611 patients with craniofacial malformations who underwent mandibular DO. The mean age of the patients at the time of the procedure was 17.4 months. The most common diagnoses were Pierre Robin sequence (52%), mandibular hypoplasia (11%), Goldenhar Syndrome (6%), and Treacher-Collins Syndrome (6%). In 91.4% of cases, mandibular DO was found to be successful in the treatment of airway obstruction. 148 (88.6%) of the 167 patients who were tracheostomy dependent at the time of the procedure were successfully decannulated. DO was reported to avoid the need for tracheostomy in 270 of 444 (60.8%) patients. Among the patients who had obstructive sleep apnea, only two cases had persistent symptoms post-mandibular DO (96.4% resolved). A 26% overall complication rate was noted. The mean time of follow up was 26.7 months.

CONCLUSIONS: In addition to its positive effect on facial appearance, mandibular DO is an effective procedure for the treatment of airway obstruction associated with congenital craniofacial defects involving mandibular hypoplasia.

Learning Objective:

- *The learner will be able to describe the effectiveness of mandibular DO for the treatment of airway obstruction in children with mandibular hypoplasia.*

62

OUTCOME ANALYSIS AFTER HELMET THERAPY USING 3D PHOTOGRAMMETRY IN PATIENTS WITH DEFORMATIONAL PLAGIOCEPHALY: THE ROLE OF ROOT MEAN SQUARE

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PURPOSE: Deformational plagiocephaly (DP) is a multifactorial non-synostotic cranial deformity with a reported incidence as high as 1 in 7 infants in North America. Treatment options have focused on non- operative interventions including head repositioning and the use of an orthotic helmet device. Previous studies have used linear and two dimensional outcome measures to assess changes in cranial symmetry after helmet therapy. Our objective was to demonstrate improvement in head shape after treatment with a cranial molding helmet by using Root Mean Square (RMS), a measure unique to 3D photogrammetry, which takes into account both changes in volume and shape over time.

METHOD: Three dimensional photographs were obtained before and after molding helmet treatment in 40 infants (4-10 months old) with deformational plagiocephaly. Anatomical reference planes and measurements were recorded using the 3dMD Vultus® analysis software. RMS was used to quantify symmetry by superimposing left and right quadrants and calculating the mean value of aggregate distances between surfaces.

RESULTS: Over 95% of the patients demonstrated an improvement in symmetry with helmet therapy. Furthermore, when the sample of infants was divided into two treatment subgroups, a statistically significant correlation was found between the age at the beginning of treatment and the change in the RMS value. When helmet therapy was started before seven months of age a greater improvement in symmetry was seen.

CONCLUSIONS: This work represents the first application of the technique of RMS analysis to demonstrate the efficacy of treatment of deformational plagiocephaly with a cranial molding helmet.

Learning Objectives:

- *Recognize the three dimensional nature of DP and the limitations of 2D cranial measures;*
- *Understand treatment options for DP with emphasis on the use of a cranial molding orthosis;*
- *Achieve familiarity with the role of 3D photogrammetry as an outcome measure in DP.*

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AGE-BASED APPROACH TO SAGITTAL SYNOSTOSIS: APPLICATION OF EXTENDED STRIP CRANIECTOMY (ESC) AND TOTAL CRANIAL VAULT RESHAPING (TCVR) TECHNIQUES

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PURPOSE: Little consensus exists as to the procedure of choice in the management of sagittal synostosis. The purpose of this study was to compare outcomes and complications following a TCVR procedure (>6 months of age) and ESC with post-operative molding helmet therapy (<6 months of age) using morphometric CT-based/3D camera analysis.

METHOD: 126 patients with sagittal synostosis seen at the Hospital for Sick Children, Toronto between 1999-2011 underwent surgical treatment. Morphology was assessed by CT-based morphometric analysis or 3D (3dMD, Atlanta, GA) camera analysis. Complications were tabulated.

RESULTS: Eighty-one patients (66M;15F, 5.3 months of age) underwent ESC and 45 patients (38M;7F, 26.1 months of age) underwent TCVR (mean follow-up of 17±11 months). No mortalities were encountered. Surgical cost, length of stay, surgical time, transfusion rates and major complications were greater in the TCVR group ($p<0.05$). CT-based outcomes analysis demonstrated excellent improvement in sagittal profile at one-year post-op in both groups. 3D photometry demonstrated pre and post-op changes in cranial form with no differences between surgical technique.

CONCLUSIONS: Surgical management of sagittal synostosis should be based upon patient age. ESC is effective for infants six months of age and under taking advantage of rapid brain growth and thin bone to allow for physiologic remodelling of the infant calvarium. Vault reshaping techniques are applicable in those over 6 months of age.

Learning Objectives:

- *To understand the craniofacial stigmata of sagittal synostosis*
- *To become familiar with surgical treatment options of sagittal synostosis*
- *To understand outcomes and complications following surgery for sagittal synostosis*

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A COST-BENEFIT ANALYSIS COMPARING CUSTOM COMPUTER-GENERATED CRANIOFACIAL IMPLANTS VS. TRADITIONAL BONY CRANIOPLASTY FOR CONGENITAL AND TRAUMATIC CRANIAL DEFORMITIES

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PURPOSE: Cranioplasty for cranial defects can be performed either with gold- standard autologous bone grafts and osteotomies or alloplastic materials in skeletally mature patients. Recently, custom computer-generated implants (CCGI) have gained popularity due to their patient-specific, preoperatively designed anatomic forms and obviated donor site morbidity. Besides their apparent advantages in properly selected patients, however, a cost-benefit analysis has not been performed. The purpose of the present study was to compare the perioperative cost-benefit of cranioplasties performed with autologous techniques versus CCGI for both traumatic and congenital reconstructive indications.

METHODS: A retrospective chart review of patients who underwent cranioplasty from 1990 to January 2013 at our centre was performed. Costs were calculated to include operative lengths, length of hospital/ICU stay, hardware utilized and need for transfusion.

RESULTS: The average total cost per case for autologous reconstruction (n=16) was 3.7% higher than CCGI (n=5) cranioplasty ($25,528.34 compared to $24,592.80). Operative and anesthesia time were 51% and 37% less, respectively, in the CCGI cases. The average length of hospitalization was 49% less in CCGI cases. Blood transfusion was required in two autologous cases but was not required in any CCGI cases. None of the CCGI cases required revision for contour deformity or resorption whereas 38% of autologous reconstructions required a revision cranioplasty and 31% demonstrated bony resorption.

CONCLUSION: The analysis of our experience demonstrated an overall minor cost advantage and a significant patient benefit (decreased OR time, hospitalization and revision rate) of CCGI cranioplasty over traditional autologous bone techniques. These promising preliminary results warrant future studies to determine a definitive cost-benefit and complication comparison between the techniques.

Learning Objectives:

- *To compare the potential cost-benefit of CCGI vs. autologous cranioplasty for both traumatic and congenital reconstructive indications.*

CANADIAN EXPERT PANEL

AESTHETIC BREAST SURGERY: ACHIEVING BETTER OUTCOMES

Chair/Moderator: Frank Lista
Participants: Elizabeth Hall-Findlay, Brian Peterson, Wayne Carman

Ross Tilley Lecture

64A

ALL THE PIECES OF THE PUZZLE

JL Giuffre
Winnipeg, MB

The Ross Tilley scholarship provides opportunities for young surgeons to gain insights and skills from national and international settings. I would like to graciously thank the Ross Tilley Scholarship committee for allowing me to realize the objectives of this prestigious scholarship while completing

a Hand Surgery Fellowship at the Mayo Clinic, Rochester, MN from July 2009 through June 2010. During this fellowship I had a unique opportunity to apprentice under numerous internationally respected surgeons. My mentors were both orthopedic and plastic surgeons and I owe a great debt of gratitude to Drs. Alexander Shin, Allan Bishop, Richard Berger, Steven Moran, Marco Rizzo, Peter Amadio, and Bassam Elhassan. This fellowship was very unique in that it offered comprehensive training in complicated wrist surgery (including reconstructions of scapholunate and lunotriquetral ligaments; reconstructions of the DRUJ, treatment of carpal fractures and various carpal fusions), reconstruction of the brachial plexus (including nerve grafting, nerve transfers, tendon transfers, free functioning muscle transfers and arthrodesis) as well as in general hand surgery. After completing the fellowship, an orthopedic colleague and I established a new plastic/orthopedic surgery hand and upper extremity program.

The spectrum of this practice now includes the treatment of complex hand and wrist injuries, the treatment of congenital upper extremity anomalies, repair and reconstruction of various tendinous, muscular, and nervous pathologies, coverage of upper extremity soft tissue defects, free functioning muscle transfers and nerve transfers for brachial plexus and peripheral nerve disorders and vascularized bone flaps.

I feel honored to present a vignette of an amazing fellowship year at the Mayo Clinic Rochester and hope to also demonstrate how it has shaped the practice of a young Plastic Surgeon. It will illustrate a journey from the clinic, to the lab, to the operating room and into current practice. All the pieces of the puzzle.

65
RAPID INSUFFLATION USING THE ROLLER PUMP: ACHIEVING BETTER INTRA-OPERATIVE HEMOSTASIS AND TEMPERATURE CONTROL IN PATIENTS WITH BURNS >40% TBSA

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PURPOSE: Patients presenting with burns >40% TBSA require significant debridement and grafting procedures. Two substantial challenges during these surgeries are limiting blood loss, and maintaining normothermic temperature. To overcome these challenges, several techniques have been developed, including the Pitkin syringe and the pneumatic tourniquet methods, which aim to insufflate large amounts of hyperthermic, hemostatic solutions intraoperatively. In this retrospective trial, we compared the abilities of the pneumatic tourniquet technique and the roller pump to achieve intraoperative hemostasis and prevent hypothermia.

METHODS: We conducted a case-controlled, retrospective review of patients with >40% TBSA burns, treated either with the rapid infusion roller pump, or the pneumatic tourniquet technique. Each group was controlled for %TBSA, presence of inhalation injury, age, and admission date. Information collected included units of blood products required during each procedure, as well as the lowest intraoperative temperature, and the average temperature drop from pre-operative to intra-operative.

RESULTS: Data was collected and analyzed from 10 case-controlled patients in each group using Excel and SPSS.

Roller Pump (n=10), Control (n=10) Average units RBC / patient (units) : 1.5±0.4 * Mean Temp Decrease (°C): 1.0±0.1 * Lowest Intra-op Temp (°C): 36.0±0.2 * Insufflation / Procedure (cc): 7570.1±963.3 * Duration of Procedure (min): 204.3 ± 20.1

Control (n=10) Average units RBC / patient (units) : 3.5±0.4* Mean Temp Decrease (°C): 2.1±0.2* Lowest Intra-op Temp (°C): 35.2±0.1* Insufflation / Procedure (cc): 3058.7 ± 499.3* Duration of Procedure (min): 219.4 ± 19.1 Mean ± SE, *p<0.01

CONCLUSIONS: The data suggests the rapid infusion roller pump technique is capable of achieving superior intra-operative hemostasis and normothermic temperatures compared to the pneumatic tourniquet technique.

Learning Objectives:

- *By the end of this presentation, participants will understand the difficulty in maintaining hemostasis and normothermia intraoperatively in patients with >40% TBSA burns, and that the roller pump is a tool that comes closer to these goals than others in widespread use.*

66
THE INCREASING RISK OF GLASS-FRONTED FIREPLACE BURNS IN CANADA

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PURPOSE: There is an alarming lack of public awareness surrounding the safety of glass-fronted fireplaces. This has resulted in an active prevention campaign from the American Burn Association Prevention Committee. One issue encountered while advocating for prevention among manufacturers and private companies is the lack of accurate data which illustrates the true extent of these preventable events. The purpose of this study was to examine Canadian annual trends in glass-fronted fireplace burns, as well as characteristics of these burns in terms of demographics, severity and location.

METHODS: The Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) Database, a national dataset of pediatric burn injuries from 15 hospitals between 1990 and 2010, was analyzed retrospectively to determine incidences and relationships between burn and patient characteristics.

RESULTS: Six hundred and sixteen cases of burns from glass-fronted fireplaces presented to the 15 hospitals included in the study. The incidence increased at an average of 2.7 cases per year. This is a greater than twenty-fold increase over twenty years. Seventy-five percent of cases occurred in children under the age of 2, and ninety-five percent occurred in children under the age of 4. Ninety-four percent involved the upper extremity.

CONCLUSIONS: Results demonstrate a consistent rise in the incidence of glass-fronted fireplace burns, likely due to the increasing popularity of household gas fireplace units. These units are a particular risk to children under the age of two. This data supports the need for further advocacy for change in manufacturing and legislation.

Learning Objectives:

- *Participants will be made aware of a rapidly growing risk from an increasingly common household appliance often overlooked as a major hazard.*
- *Participants will be provided evidence to encourage support for ongoing measures aiming to reduce this preventable injury.*

67
PEDIATRIC SCALD BURNS – A VALUE ANALYSIS OF TWO COMMON TYPES OF DRESSINGS

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INTRODUCTION: Scalds represent the most frequent pediatric burn injury. Inpatient burn wound management of intermediate sized burns (<20% TBSA) represents a significant proportion of the cost, with Acticoat and silver sulphadiazine (SSD) amongst the most commonly used dressings. Many articles describe efficacy outcomes of these dressings, yet few economic analyses are presented. In an effort to analyze overall health care value (outcomes/cost) in burns not requiring surgery, we compare management of scald burns with Acticoat vs. SSD from a both a quality perspective and using microcosting to determine which option optimizes healthcare value.

METHODS: Published articles of Acticoat and SSD for pediatric burn wounds over the past 25 years were analyzed. Healing time, hospital duration, and frequency of dressing care were chosen as quality metrics. An economic model was constructed based on costs associated with the two burn management options.

RESULTS: Over the 25 year period, 356 articles studied the use of SSD in burns, with 9 related to safety and 38 to efficacy. For Acticoat, of 55 studies published; 7 were related to safety and 7 to efficacy. Mean age and burn size were equivalent. Mean time to healing was 14.9 days for Acticoat and 14.6 days for SSD. Mean duration in hospital was 14.9 days for SSD and 5.9 days for Acticoat. Dressings were performed 2x/week for Acticoat and 2x/day for SSD. We estimated the mean total cost per patient to the healthcare system of $27,638 for SSD and $10,910 for Acticoat.

CONCLUSION: Published outcomes (healing time) are equivalent using Acticoat or SSD for pediatric scald burns. The financial model illustrates a potential significant cost savings when Acticoat is used, primarily as a

result of an outpatient model of care. Overall health care value is optimized through the use of Acticoat for pediatric scald burns.

Learning Objective:

- *To perform a value analysis for pediatric scald burn care*

68

BURN SPECIALITY FOR PLASTIC SURGERY RESIDENTS

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PURPOSE: Burn is a corner stone of all eleven plastic surgery training programs in Canada. Despite the amount of residents graduating from these training programs, numbers of graduates applying for a Burn fellowship are considered sub-optimal.

METHODS: A questionnaire was conducted to demonstrate the interest, knowledge and major factors influencing or discouraging residents from choosing Burn as a sub-specialty in their future career. An online survey was emailed to 125 random plastic surgery residents in Canadian training programs. Residents responded to knowledge questions on a scale of three. Fifty-six plastic surgery residents have responded to this survey.

RESULTS: With a survey response rate of 45 %, total of eight residents were interested in obtaining a fellowship or continue their career in burns. Repetitive tasks (n=41), OR circumstances (including odor, temperature, etc) , emotional aspects (n=23) and life style (n=16) were major factors discouraging residents from choosing burn as specialty. In contrast, satisfaction of life-saving job and involvement in humanitarian mission were major attractive factors. Role model was least of a factor in both categories. Around 71 % of the resident considered their knowledge in burn to be average. Most of the residents believe that burn must be obligatory and continue to be part of all plastic surgery training programs (n=55). Sixty-six percent prefer being part of the intensive care and resuscitation process.

CONCLUSION: Repetitive tasks and OR circumstances were major concerns for plastic surgery residents in avoiding choosing burn as their career choice. Role model and mentorship are less important as a factor. Humanitarian missions and life-saving aspects were well recognized by the residents to be of importance in choosing burn specialty.

Learning Objectives:

- *The findings from this survey may help plastic surgery program directors or burn surgeons in particular to find out strategies to attract future trainees*

69

A REVIEW OF NORTH AMERICAN TRAUMATIC THUMB REPLANTATIONS

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PURPOSE: Traumatic thumb amputation is a not uncommon problem with significant associated cost to patients, hospitals and society. To review North American trauma center practice patterns for traumatic thumb amputations.

METHODS: The design was a 5-year retrospective review of the National Trauma Data Bank, investigating patients with traumatic thumb amputations. Analyses of these patients based on replantation attempt, mechanism of injury, and demographics were performed. Comparisons were made between hospitals based on teaching status and on patient volume for replant attempt and success rates.

RESULTS: There were 3,341 traumatic thumb amputations with 550 (16.5%) attempts at replantation and an overall success rate of 84.9%. Non- teaching hospitals treated 1,238 (37.1%) patients, and attempted 123 (9.9%) replantations with a success rate of 80.5%. Teaching hospitals treated 2,103 (63.0%) patients, and attempted 427 (20.3%) replantations with a success rate of 86.2%. Treatment at a teaching hospital increased the odds of attempted replantation by a factor of 3.1 ($p<0.001$) when compared to a non-teaching hospital. Treatment at a high-volume center increased the odds of attempted replantation by a factor of 3.4 ($p<0.001$) when compared to low-volume hospitals.

CONCLUSIONS: Practice patterns show that teaching and high volume hospitals attempt to replant a higher percentage of amputated thumbs. Success rates are similar across practice settings.

Learning Objectives:

- *Participants will be able to describe practice patterns of the treatment of traumatic thumb amputation in North America.*
- *Participants will be able to compare attempt and success rates for thumb replantations between teaching and non-teaching facilities and high and low-volume centres.*

70

CHART REVIEW STUDY OF THE RECONSTRUCTIVE SUCCESS OF THE 'COMPONENT SEPARATION' TECHNIQUE FOR COMPLEX ABDOMINAL WALL DEFECTS

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PURPOSE: To evaluate the success rate (complication & recurrence rates) of the component separation technique, in patients with complex abdominal wall defects, in a level-1 trauma centre.

METHODOLOGY: Retrospective medical records review. Univariate Analyses was performed using recurrence as the outcome. The association between binary variables and recurrence was tested using the Fisher's exact test. Continuous variables were compared for those who recurred and those who did not recurred using the non-parametric Wilcoxon rank-sum test. $P < .05$ was considered statistically significant.

RESULTS: A total of 41 patients fit the inclusion criteria with an average age of 54.7 years and an average BMI of 28.8 kg/m^2. The mean defect size was 16.5±5.4 cm. The component separation technique alone was used in 70.7% (n=29), while component separation with mesh was used in 26.8% (n=11) of cases. Follow up ranged from 15 days to 36 months (mean, seven months). The overall complication rate was 31.7% (n=13). The overall recurrence rate was 22% (n=9). Diabetes mellitus (n=5) was a significant risk factor for major complications, (p=0.03). Hernia recurrence was significantly associated with the presence of intra-abdominal contamination at the time of repair and with patient having major complications post operatively, (p=0.03 & p=0.04, respectively). There was no significant association between the recurrence rate and the size of the defect or with the presence of entero-cutaneous fistula.

CONCLUSIONS: Component separation technique has been very useful addition in the management of complex abdominal wall defects

Learning Objectives:

- *Identify the patient-related factors & surgery-related factors that can contribute to postoperative complications and recurrences post complex abdominal wound repairs using the component separation technique.*

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EXPECTED VALUE DECISION MAKING IN UPPER EXTREMITY TRANSPLANTATION

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PURPOSE: Over the last fifteen years, upper extremity transplantation has become a clinical reality. The practice remains controversial, however, with some parties citing ethical, psychological, and financial reasons against transplantation. We wanted to utilize established health economic principles of expected value decision making to assist in prioritizing which patients would benefit most from an upper extremity transplant.

METHOD: We created a decision tree model for upper extremity transplantation. Current literature has established health utility values for single and double extremity transplantation. We combined this with data from the transplant registry on survival rates, together with the incorporation of Chen's functional outcome probabilities. This data was used to establish expected values, after which a sensitivity analysis was performed to demonstrate association with major complication rates.

RESULTS: The utility values of patients living with single and double amputations are 0.75 and 0.63 respectively. Using a hypothetical major complication rate of 10%, unilateral humeral level transplantation had a lower expected value of 0.746. Unilateral wrist level transplantation was slightly higher at 0.755. With double amputees, expected values were more favorable at much higher hypothetical complication rates. At 40% risk of major complication, bilateral humeral level expected value was 0.632, and bilateral wrist level was 0.643.

CONCLUSIONS: Expected values show that upper arm transplantations need ideal conditions in order to be favorable. Even at the functionally ideal wrist level, risks of major complications need to be strictly controlled to around 10% or lower. Bilateral amputees demonstrate far more favorable expected values up to almost 50% major risk level.

Learning Objectives:

- *Gain an understanding of Expected Value Decision making and Health Utility values. Be able to prioritize upper limb amputees into groups most likely to benefit from a transplantation.*

72
THE NATURAL HISTORY OF UN-OPERATED NON-SCISSORING SPIRAL METACARPAL FRACTURES

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PURPOSE: Spiral metacarpal fractures frequently result in shortening of the metacarpal shaft which may lead to extension lag at the metacarpophalangeal joint and reduced grip strength. These fractures have been treated surgically to restore metacarpal length, however there are costs and potential complications associated with surgery, post- operative management and wound healing which further threaten power recovery in the hand. We sought to determine the effect of conservative management of un-operated spiral metacarpal fractures.

METHODS: 61 consecutive patients presenting with non-scissoring spiral metacarpal fractures were treated conservatively between December 2006 and June 2011. Twenty patients were lost to follow up. Forty-one patients were studied prospectively to determine the natural history of their power outcome and range of motion. Thumb fractures and those requiring surgical intervention for scissoring were excluded.

RESULTS: Follow up data beyond 8 weeks was available for 13 patients. Mean grip strength was 36.18 kg on the uninjured side and 36.58 kg on the injured side. The mean of strength differences for uninjured side minus injured side was -0.41 kg. The strength-difference values did not differ significantly from zero ($p = 0.72$).

CONCLUSIONS: The loss of metacarpal length associated with these fractures does not cause a power deficit large enough to significantly affect grip strength and functional recovery in the hand. Furthermore, a review of grip strength outcomes following various approaches to internal fixation has revealed results similar to those obtained via conservative techniques. Conservative measures can therefore confidently be used in a clinical setting for the management of non-scissoring spiral metacarpal fractures, circumventing the use of invasive surgical procedures with their associated risks and consequences.

Learning Objectives:

- *To describe the natural history of un-operated spiral metacarpal fractures and its relationship to grip strength and function. To identify a role for conservative management of un-operated non-scissoring spiral metacarpal fractures.*

73
ABDOMINOPLASTY IN COMBINATION WITH OTHER COSMETIC PROCEDURES CAN BE PERFORMED SAFELY AS AN OUTPATIENT

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BACKGROUND: Abdominoplasty is one of the top ten procedures performed by plastic surgeons. The ASPS reports an 85% increase in the number of abdominoplasties performed in the U.S. over the last 12 years. Abdominoplasty has been shown to be safe outpatient procedure (Levine et al. PRS 2006). The purpose of this study is to determine if abdominoplasty in combination with other cosmetic procedures can be safely performed as an outpatient.

METHODS: This is a retrospective chart review including patients from 2006-20011. Subjects were included if they had an abdominoplasty alone as an outpatient (control) or an abdominoplasty in combination with a second surgical procedure as an outpatient or inpatient (experimental). Demographic information and complications associated with wound healing (eg. dehiscence), surgery specific (eg. seroma) and systemic complications (eg. DVT) were evaluated. Parametric data were evaluated with independent t-tests and non-parametric with chi-square analysis using SPSS v.21.

RESULTS: A total 71 outpatient abdominoplasties, 77 outpatient combination and 22 inpatient combination procedures were performed in the study period. Groups did not differ with respect to age, gender, ASA class, or caprini score. The majority of combined cases included a second breast procedure (64%) and 20% of these patients had two or more surgical procedures. Inpatients (1135±582) had higher pannus resection weights compared to outpatients (729±379) ($p< 0.05$).

There were no differences in wound healing, abdominoplasty specific complications (eg. seroma), non-abdominoplasty specific complications (eg. capsule formation) or systemic complications between the groups (DVT).

CONCLUSION: Abdominoplasty in combination with other aesthetic procedures can be performed safely as an outpatient procedure.

Learning Objectives:

- *The learner will appreciate that abdominoplasty in combination with other cosmetic surgical procedures can be performed safely as an outpatient.*

74
PSYCHOMETRIC DEVELOPMENT OF A NEW PRO INSTRUMENT: THE FACE-Q SCALES FOR FACELIFT PATIENTS

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PURPOSE: Improved satisfaction with facial appearance is the primary desired outcome for patients undergoing facelift procedures. The FACE-Q is a new patient-reported outcome (PRO) instrument composed of scales to evaluate a range of outcomes (appearance concerns, quality of life, adverse effects) for patients undergoing any type of facial cosmetic surgery, minimally invasive cosmetic procedure or facial injectable. The objective of this study was to describe the development and psychometric properties of a set of FACE-Q scales relevant to measuring outcomes in facelift patients.

METHOD: The FACE-Q was developed according to international guidelines for PRO instrument development. Scales relevant to facelift patients include five appearance scales (each with five items) covering the following facial areas: cheeks, lower face and jawline, nasolabial folds, area under the chin, and neck. In addition, an adverse effects checklist was developed to measure postoperative symptoms and complications. Data were collected in a larger study that included 225 facelift patients (all had surgery within the past 5 years) between June 2010 and June 2012 (response rate 78%). Rasch measurement theory (RMT) analyses was used to examine clinical meaning, thresholds for item responses, item fit, item locations, differential item functioning (DIF), standardized residuals, and person separation index (PSI).

RESULTS: Participants were 36 to 77 years of age and 205 were female. The five appearance scales were found to be clinically meaningful, reliable, valid and responsive to clinical change. Specifically, RMT findings were as follows: no disordered thresholds; overall and individual item fit statistics (29/30 items −2.5/+2.5); no DIF by gender, age or ethnicity; PSI >0.88 (0.88-0.90). Cronbach's alpha were all >0.94 (0.94-0.97).

CONCLUSIONS: The FACE-Q scales for facelift patients are scientifically sound and clinically meaningful scales that may be used to measure the impact of facelift surgery on patient satisfaction.

Learning Objectives:

- *Participants will be able to describe the psychometric criteria necessary for rating scale development and construction.*
- *Participants will have a better understanding of the role PRO data can have in aesthetic surgery.*

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NEURONAVIGATIONAL MODELING FOR CRANIAL VAULT RESHAPING IN CHILDREN WITH NON-SYNDROMIC CRANIOSYNOSTOSIS

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Ottawa, ON

PURPOSE: Recent evidence regarding ionizing radiation in childhood has raised significant concerns about oncogenic risk. Imaging protocols in the management of non-syndromic craniosynostosis usually revolve around computed tomography (CT). As such, we hope to determine the imaging protocols used in Canada in the management of these children.

METHODS: All Canadian pediatric craniofacial surgeons were contacted regarding their imaging protocols for these patients. Ten of twelve responded.

RESULTS: Every institution established and followed their own protocol as opposed to a published protocol. Imaging protocols fell into one of two general categories: routine CT scans of all patients (60%), or case-specific (40%).

Of institutions with routine scans, common reasons for scanning were: preoperatively for diagnosis (20%), surgical planning (50%) and assessing for abnormalities (40%), 1 day postoperatively for documentation (40%) and evaluating complications (50%), and 1 year postoperatively for documentation (20%).

Of institutions with case-specific scanning, proportion of patients imaged with CT varied from <1% to 50%, depending on institution. Proportion of cases in which management was altered by CT imaging ranged between 0% and 100%.

Ninety percent of surgeons reported that pre- and post-operative specialized photographs would be an adequate measure of aesthetic outcome.

CONCLUSIONS: Institutions differed considerably with regard to 1) general protocol of routine vs case-specific CT scans; 2) timing of scans; and 3) purpose of scans.

The only area of broad agreement was that specialized 3D photography would be sufficient in measuring aesthetic outcome. This is a safe modality that may have broad national application and decrease the need for riskier modalities.

Given these results and emerging concerns regarding radiation exposure, establishing evidence based protocols is imperative.

Learning Objectives:

- *Participants will be made aware of current imaging practices in the management of craniosynostosis, which will be discussed in the context of emerging evidence regarding ionizing radiation in children.*

76
TREATMENT OF MANDIBULAR FRACTURES: A QUALITY ASSESSMENT REVIEW OF TREATED INPATIENTS FROM 2005 TO 2009 AT VGH

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PURPOSE: To investigate the surgical techniques utilized in the management of mandible fractures at various anatomic sites, utilization of post-operative CT scan of the facial skeleton, and incidence of radiographic evidence of post-operative complications.

METHODS: A retrospective charts review of patients treated for mandible fractures at VGH between January 1, 2005 and December 31, 2009 was performed. Post-operative radiographs were reviewed for adequacy of reduction and evidence of post-operative complications.

RESULTS: Three hundred fifty-nine patients with 576 fractures were included in the study. 276 patients underwent pre-operative CT, and 110 underwent post-operative CT. Fractures involving the tooth bearing segments were more likely to be treated with ORIF (symphysis 85.0%, body 81.8%, angle 80.0%), whereas fractures of the non-tooth bearing segments were more likely to be treated with MMF alone (subcondylar 68.9%, condyle 79.2%). In patients who underwent post-operative CT scan, non-anatomic reduction (>1mm gap) was present in between 26.9-50% of cases depending on anatomic location. Screw placement within the tooth root was present in 17.3% of cases, and placement within the mandibular canal was present in 7.2% of cases.

CONCLUSIONS: Significant variation exists in the surgical management and utilization of radiography in mandibular fractures. Our investigation suggests that the incidence of sub-optimal reduction and post-operative complications of misplaced screws may be significantly higher than surgeons expect. A prospective study examining the clinical correlation to radiographic findings and surgeon impression of reduction adequacy is warranted.

Learning Objectives:

- *The participant will gain knowledge on different practice patterns and complication incidence in mandibular fracture management.*

77
C-ARM ASSISTED ZYGOMA FRACTURE REPAIR: A CRITICAL ANALYSIS OF THE FIRST 20 CASES

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PURPOSE: Zygoma fracture repair has undergone significant evolution in the last thirty years. Wide exposure allowing for anatomic bone repositioning, has become mainstay of treatment. This is not without drawbacks and may result in visible scars, eyelid malposition, canthal asymmetry and temporal hollowing. The objectives of the present study were to critically evaluate accuracy and untoward sequelae of a c-arm assisted, single incision, zygoma fracture repair technique.

METHODS: All patients with a unilateral, displaced zygoma fracture were treated using the c-arm assisted technique (08.2009-08.2011). Surgery involved a single upper buccal sulcus incision, trans-oral zygoma reduction under single view c-arm guidance (top figure) and miniplate fixation at the zygomatico-maxillary buttress. Intra-operative reduction was determined primarily by radiographic evaluation of symmetries of arch angulation, zygoma body projection and width (bottom figures). Post-operatively, facial symmetry and eye projection were evaluated, negative sequelae and operative times tabulated. Facial symmetry was determined by calculating differences in zygoma projection, width and height between treated and uninjured sides on post-operative CT. Eye projection was measured using Naugle exophthalmometer.

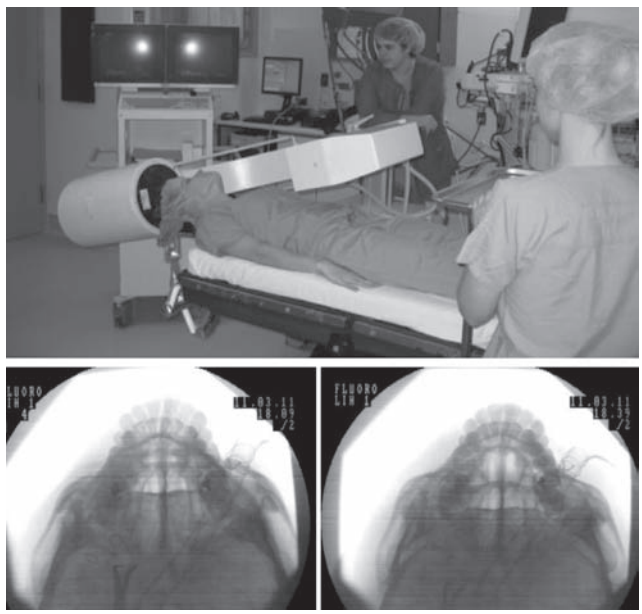

Figure 1) Top *Intra-operative set-up demonstrating positions of patient, c-arm and monitor, radiology (background) and scrub (foreground) technicians.* **Bottom** *Pre- and post-repair intraoperative c-arm images of a patient with a right zygoma fracture demonstrating decreased projection and width of the zygoma body as compared with the uninjured left side*

RESULTS: Twenty consecutive patients were included. The mean differences (sd, p-value) in zygoma projection, width and height between the treated and uninjured sides were 1mm (0.8, 0.9), 1.5mm (0.4, 1.4) and 1.2mm (1.0, 0.1) respectively. The mean difference in eye projection

was 0.5mm (0.8, 0.3). Mean operative time for isolated zygoma fracture cases was 76 mins. Accuracy (0.3mm, 0.4mm, 0.7mm) and operative times (39 min) improved significantly with experience (last 3 cases).
CONCLUSIONS: This study objectively demonstrates that C-arm assisted zygoma fracture repair helps restore symmetric zygoma and eye positions while avoiding cutaneous scaring, eyelid and canthal malpositioning and temporal hollowing. The technique is simple to learn the operative time is relatively short.
Learning Objective:
- *The participant will be able to understand changing trends in facial trauma management.*

78
THREE-DIMENSIONAL ANALYSIS OF THE ARTERIAL ANATOMY OF POSTERIOR THIGH REGION AND PROFUNDA FEMORIS PERFORATOR FLAPS: CADAVERIC AND COMPUTER TOMOGRAPHY ANGIOGRAM STUDY

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BACKGROUND: The posterior thigh has been gaining momentum as a potential donor site for microsurgical tissue transfer. This can be attributed to the perforators of the profunda femoris artery. Due to the increasing use of the profunda femoris perforator flaps, a three-dimensional evaluation has been performed. The purpose of this study is to extend the anatomical understanding of the profunda femoris perforators and to comprehensively document the three-dimensional vascular anatomy of the profunda femoris flaps.Methods: Ten fresh, cadavers underwent whole body lead oxide–gelatin injection. Spiral computed tomographic scanning was then performed on the cadavers and three-dimensional reconstructions were performed using specialized software (MIMIC's). A sequential dissection technique was used and dissection notes were taken on specific arteries and marked with radio opaque beads. Dissection notes were then compared with the CT images of the cadaver injection and the source of vessels were identified.
RESULTS: the average number of profunda femoris cutaneous perforators in the posterior aspect of the thigh was 5±2, the majority of them were septocutaneous with percentage of 65% and 35% being musculocutaneous perforators. 0.8±0.3 mm was the average internal diameter of the perforators, and the average pedicle length was 68±33 mm from the profunda femoris artery and 29 ± 14 mm from the deep fascia. The average vascular territory of profunda femoris cutaneous was 229±72 cm^2, with a 46±13 cm^2 perforator zone. The profuna femoris perforators lie along the line from the ischium to the lateral femoral condyle, The three-dimensional reconstructed model of the posterior thigh can display the modality, spatial location, and adjacent relationship of the profunda femoris artery.
CONCLUSIONS: This study explains and clarifies the anatomy of the profunda femoris artery perforator flap, also provides three-dimensional modeling in combination with traditional sectional imaging of the posterior thigh, which ultimately allows for greater insight into perforator anatomy. Three-dimensional reconstructive modeling is now a clinically available process, which, in the future, could provide great value in basic science investigation, clinical training, preoperative design, and virtual surgical procedures. As the utilization and understanding of the profunda femoris perforator flap increases, three-dimensional modeling has become crucial in its execution.
Learning Objectives:
- *The participants will be introduced to the arterial injection technique and 3D model reconstruction.*
- *The participants will understand the complexity of the arterial anatomy of the posterior thigh and recognize the reliable and constant perforators in the posterior thigh and the relevance with adjacent perforators.*

79
USE OF THE FREE ANTEROLATERAL THIGH FLAP FOR RECONSTRUCTION OF THE PEDIATRIC ANOPHTHALMIC ORBIT

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PURPOSE: Paediatric patients with anophthalmic orbits pose unique reconstructive challenges.The current standard of care, implant-based reconstruction, leads to enophthalmos and eyelid retraction with orbital growth. Free tissue transfer, with its inherent growth potential, provides an attractive option.for secondary reconstruction. The anterolateral thigh (ALT) flap has not previously been described for this use. The purpose of the current study is to characterize the use of the ALT flap for the reconstruction of the paediatric anophthalmic orbit and to outline the authors' technique.
METHOD: A retrospective review of anophthalmic orbit reconstruction using a free ALT flap at a paediatric tertiary care centre was performed. Review parameters included demographics, treatment history, operative details, and post-operative regimen. Outcome measures included operative time, hospital length of stay, complications, and qualitative aesthetic outcomes. Descriptive statistics were performed.
RESULTS: Four patients underwent reconstruction for a unilateral anophthalmic orbit using a free ALT flap (2011-2013). Mean age was 10.9 years (SD 4.8). Diagnoses included retinoblastoma(n=2), medulloepithelioma(n=1), and orbital teratoma(n=1), and management consisted of enucleation(n=1) or exenteration(n=3) with implant reconstruction ± radiation(n=3). Secondary reconstruction consisted of release of retracted eyelids, restoration of orbital volume with a free ALT flap, passage of the pedicle through a lateral orbitotomy, and anastomosis to the superficial temporal vessels. Mean operative time was 7:56 (SD 1:10). Mean follow-up was 5.9 months (SD 8.8, range 1-19). Satisfactory aesthetic outcomes and successful retention of an ocular prosthesis were achieved in all cases. Inferior fornix revision was required in a single case.
CONCLUSION: The outlined free ALT flap technique is a favourable option for secondary reconstruction of the paediatric anophthalmic orbit, restoring symmetry while offering the potential for further growth.
Learning Objectives:
- *To gain insight into the principles of paediatric anophthalmic orbit reconstruction.*
- *To learn the authors' technique for ALT flap reconstruction of the paediatric anophthalmic orbit, and its associated benefits and limitations.*

80
PROVINCIAL EVIDENCE-BASED GUIDELINES FOR BREAST RECONSTRUCTION

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PURPOSE: To inform breast reconstruction practice in Alberta, through the rigorous process of systematic guideline development.
METHODS: The PubMED, EMBASE, National Guidelines Clearinghouse, and SAGE databases were searched for literature published since 1980 on breast reconstruction following mastectomy. Evidence was selected and reviewed by a working group comprised of breast surgeons from the Provincial Breast Tumour Team, plastic surgeons with experience in breast reconstruction, and a methodologist from the Guideline Utilization Resource Unit (AHS, Cancer Care).
Plastic surgeons identified from the CSPS, CPSA, RCPSC, and Alberta Society of Plastic Surgeons rosters were invited by email or fax to participate in the working group. The guideline was drafted based on the evidence, and then reviewed using an iterative process with the working group to finalize and grade the recommendations. The guideline was ultimately endorsed by the Provincial Breast Tumour Team (breast surgeons, medical and radiation oncologists, nurses, pathologists and pharmacists).
RESULTS: Plastic Surgery representation included northern and southern Alberta, and academic and community centres. The literature search

emphasized RCT's, meta-analyses, and large prospective studies, and revealed 81 relevant publications that were included in the review. Nine recommendations were made and covered candidacy for breast reconstruction, type, timing, and risks of reconstruction, factors affecting outcome, extent of mastectomy (IMF, LMF and fascia preservation, skin and nipple-sparing), the role of acellular dermal matrices and lipofilling, and post-reconstruction surveillance.

CONCLUSION: Systematic guideline development, involving general and plastic surgeons, is feasible in this setting. Breast reconstruction consultation should be available for patients with mastectomy. This guideline reflects an Albertan interpretation of the best available evidence, and may prove as useful guidance across a variety of issues pertinent to post-mastectomy breast reconstruction.

Learning Objectives:

- *To understand the process of guideline development.*
- *To understand the Alberta guidelines for breast reconstruction.*

POSTERS

P01

HOW LONG SHOULD WE WAIT TO CUT, AFTER INJECTING EPINEPHRINE? A LEVEL ONE EVIDENCE STUDY

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PURPOSE: The purpose of this study was to see how long it really takes to obtain the lowest cutaneous hemoglobin concentration after lidocaine with epinephrine injection in human skin. Seven to ten minutes is often quoted in multple choice exams and textbooks as the time until maximal vasoconstriction after injection of lidocaine with epinephrine. In our clinical experience there is significantly less cutaneous bleeding if one waits considerably longer than 7-10 minutes for most procedures on human skin.

METHOD: This was a randomized control trial where volunteers were injected simultaneously in each arm with either 1% lidocaine with epinephrine or 1% lidocaine plain, and the underlying soft tissue's relative hemoglobin concentration was measured over time using reflectance spectroscopy. The spectroscopy technician, local anesthetic injector, and all volunteers were blinded.

RESULTS: The mean time until lowest hemoglobin concentration was 25.9 minutes with a standard deviation of 9.1 minutes, and a 95% confidence interval of 25.9±5.1.

This was found to be significantly different and longer than the commonly quoted historical literature value of 7-10 minutes, using a two-tailed one sample t-test ($p<0.001$).

CONCLUSIONS: Waiting 25 minutes after injection of local anesthetic with epinephrine before making a skin incision will result in less intraoperative bleeding.

Learning Objectives:

- *At the end of this lecture, the learner will be able to compare the differences in timing of skin perfusion changes caused by injection of either lidocaine plain versus lidocaine with epinephrine.*
- *The learner will be able to consider the optimal time to wait post injection of lidocaine with epinephrine that achieves the lowest cutaneous bleeding.*
- *The learner will be given tips on how to incorporate the 25 minute delay into clinical practice without wasting the surgeons valuable time.*

P02

DIFFERENTIATING THE FRONTOSPHENOIDAL VARIANT OF ANTERIOR PLAGIOCEPHALY

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PURPOSE: Isolated frontosphenoidal synostosis is a form of anterior plagiocephaly. Accurate morphological assessment aids in distinguishing this from unicoronal synostosis.

METHOD: A 10-year retrospective review of craniosynostosis cases with anterior plagiocephaly presenting to the Hospital for Sick Children. Isolated unicoronal and frontosphenoidal synostosis along with combined unicoronal and frontosphenoidal synostosis subtypes were classified. A morphological analysis of the 3D CT reconstructions was undertaken to determine distinguishing features.

RESULTS: Six cases of isolated frontosphenoidal synostosis were identified. A morphological analysis demonstrates a reduced vertical height (0.89:1) and increased width (1.11:1) of the orbital aperture on the affected side compared to the unaffected. It also results in reduced temporal bulging and deviation of the nasal root away from the affected side (1.5°). In contrast, unicoronal synostosis results in increased vertical height (1.15:1) and reduced width (0.89:1) of the orbital aperture on the affected side compared to the unaffected. Temporal bulging is increased and there is deviation of the nasal base toward the affected side (−2°). Combined synostosis demonstrates a morphological pattern between these two extremes.

CONCLUSION: This study represents the largest case series of frontosphenoidal synostosis. Our analysis demonstrates sequential change in nasal, orbital and temporal morphology between frontosphenoidal, combined and unicoronal synostosis. Such features can be explained using the principles of Virchow's Law. These morphological features can aid in simplifying the diagnosis of subtypes of anterior plagiocephaly. CT scans form an integral part of confirming the clinical diagnosis of craniosynostosis and 3D reconstructions improve this accuracy. Accurate diagnosis is important for surgical management and correction of the underlying deformity.

Learning objectives:

- *Participants will be able to apply the principles of Virchow's Law to craniosynostosis.*
- *Participants will be able to identify the frontosphenoidal variant of anterior plagiocephaly with 3D CT.*

P03

A SYSTEMATIC REVIEW OF TREATMENT OF KAPOSIFORM HEMANGIOENDOTHELIOMA AND TUFTED ANGIOMA IN THE PEDIATRIC POPULATION

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Kaposiform hemangioendothelioma and tufted angioma are rare vascular tumours of childhood. They can be associated with significant morbidity and even mortality when associated with Kassabach-Merritt Syndrome. Most of the literature on management of these rare tumours consists of case reports or small case series.

PURPOSE: This study reviews the current reported treatment methods for kaposiform hemangioendothelioma and tufted angioma.

METHODS: Using MEDLINE and the Cochrane Database, a systematic review was performed of pediatric patients who had received treatment for KHE and TA.

RESULTS: A total of 43 patients were reviewed from 27 studies. Thirty-one patients developed Kassabach-Merritt Phenomenon. Five patients died as a result of their tumours. The most commonly offered first line treatment was medical treatment. It was also the treatment that most frequently provided definitive management. Steroids were the most common medical option but other pharmaceuticals included vincristine, interferon and propranolol. Non medical management options were surgical resection, embolization, and embolization.

CONCLUSIONS: Medical treatment is the mainstay of treatment for kaposiform hemangioendothelioma and tufted angioma. The heterogeneity of the current studies underscores the need for standardized methods of treatment and evaluation of response.

Learning Objectives:

At the end of this presentation, participants will be able to:

- *identify the most commonly used treatment options for kaposiform hemangioendothelioma and tufted angioma*
- *list the challenges of treating kaposiform hemangioendothelioma*

P04

ETHNICITY AND ETIOLOGY IN BURN TRAUMA

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PURPOSE: The purpose of this study was to determine whether burn mechanism and severity are affected by ethnicity. It is hypothesized that

mechanism, severity and other patient characteristics differ between ethnic groups. If true, this data can be used to augment community-specific burn prevention strategies.

METHOD: Data for burn patients admitted 1979-2009 were reviewed from the BCPFF Burn Unit registry. Data was subdivided for the following four ethnicities: Caucasian, Aboriginal, Asian and Indoasian reflecting the population distribution of the region. Age and gender were also assessed. Burn mechanism, severity, and contributing factors were then compared between these four ethnic groups.

RESULTS: Caucasians were the largest group (79.1%) and represented a high incidence of flame injury (53.9%). Caucasians present with the highest mortality rates (6.6% compared to 4.1% for all other ethnicities, p<.006). Asian patients (8.1%) showed a significantly higher incidence of urban (64%) and workplace (28.9%) injuries with a larger proportion of scald injury (38.9%). Indoasian patients included larger numbers of women (36.4%) and household scald injuries (33.9%) while Aboriginals suffered the highest rates of flame injury (60.1%) in rural areas with more frequent contributing factors such as alcohol.

CONCLUSIONS: Our review has revealed differences in burn mechanism, gender injured, contributing factors and mortality rates when comparing between four different ethnic groups. The results of this study provide the opportunity to focus communication and burn prevention strategies within specific communities and ethnic groups.

Learning Objectives:

- *Participants will learn burn trauma can vary based on ethnicity of the patient. With this an understanding will be gained of the potential patterns and outcomes within the various ethic populations encountered in our practice.*

P05

AN EXAMINATION OF CARTILAGE THICKNESS OF THE THIRD TOE METATARSOPHALANGEAL AND FINGER METACARPOPHALANGEAL JOINTS FOR RECONSTRUCTION

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An examination of cartilage thickness of the third toe metatarsophalangeal and finger metacarpophalangeal joints for reconstruction

PURPOSE: To determine whether the third toe metatarsophalangeal joint can reasonably serve as a bone and cartilage donor site for metacarpophalangeal joint reconstruction.

METHODS: Ten cadaver right hand-foot pairs were dissected to reveal finger metacarpophalangeal and third toe metatarsophalangeal joints. Articular surfaces were imaged using a 3D laser scanner, before and after cartilage dissolution. Computer generated contour maps were created and used to calculate mean and maximum cartilage thicknesses of each joint surface. Surfaces were then compared using the Mann-Whitney test to determine if significant differences existed between cartilage thicknesses of the metacarpophalangeal joints and third toe metatarsophalangeal joints.

RESULTS: The mean cartilage thicknesses for the index, long, ring, small metacarpal heads (MCHs) and third toe metatarsal heads (MTHs) were 0.60±0.13 mm, 0.58±.09 mm, 0.56±0.18 mm, 0.55±0.11 mm, and 0.57±0.17 mm, respectively. Corresponding mean proximal phalanx base (PPB) thicknesses were 0.55±0.13 mm, 0.56±0.13 mm, 0.47±0.19 mm, 0.49±0.11 mm, and 0.65±0.12 mm, respectively.

CONCLUSIONS: There were no significant differences between the mean cartilage thicknesses of the third toe MTHs and finger MCHs. Their cartilage distribution patterns were uniform, with the thickest cartilage concentrated palmarly. These findings suggest that the third toe MTH may be a feasible donor to finger MCHs. The mean cartilage thicknesses of the ring and small PPBs were significantly smaller than the third toe PPBs and the cartilage distribution patterns were variable, suggesting that osteochondral grafts obtained from the third toe PPB may differ from the recipient's normal joint anatomy. In select cases, the cartilage thickness and distribution was quite similar between the index or long PPB and the third toe PPB, and for these individuals, using the third toe may be an option.

Learning Objectives:

- *Metacarpophalangeal/metatarsophalangeal cartilage distribution; laser scanning advantages*

P06

FIBROLIPOMATOUS HAMARTOMA OF THE MEDIAN NERVE AS A CAUSE OF BILATERAL ACUTE CARPAL TUNNEL SYNDROME IN A 3-YEAR-OLD CHILD – A CASE REPORT

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PURPOSE: The aim of this case report is to present an unusual cause of incessant crying in a young child with bilateral acute carpal tunnel syndrome.

METHOD: A 3-year-old male child was investigated for incessant crying by the pediatrician, for which no obvious cause could be attributed. The child was sensitive in his left wrist, which had been mildly swollen for 3-4 months. He underwent operative exploration of the left wrist with carpal tunnel decompression. Three months later, he underwent urgent nerve decompression on the opposite side due to persistent crying and progressive pain requiring oral morphine and Tegretol necessitating two visits to the Emergency-Room.

RESULTS: Operative exploration of the left wrist showed the presence of a fusiform swelling intimately associated with the median nerve. This lesion was isolated and an incisional biopsy for histopathological examination was undertaken. A concomitant carpal tunnel decompression was performed. Histopathology revealed the presence of predominantly fibrous tissue admixed with mature adipose tissue in the absence of atypia, consistent with fibrolipomatous hamartoma of the median nerve.

CONCLUSIONS: Fibrolipomatous hamartoma of the median nerve is an extremely unusual cause of acute bilateral carpal tunnel syndrome in a young child with a clinical presentation of 'incessant crying'. Surgical intervention in this case was for symptomatic pain management which was relieved by carpal tunnel decompression. It is important to be aware of such unusual pathologies and limit surgical interventions in this location as excision is associated with high morbidity and resultant deformities.

Learning Objectives:

At the end of this presentation, the audience should:

- *have an increased clinical awareness of the occurrence of acute carpal tunnel syndrome as a cause for unexplained crying in young children,*
- *identify the importance of minimal operative interference of such nerve lesions,*
- *recognize the unusual bilaterality of this rare lesion.*

P07

SKIN CANCER IN TRANSPLANT PATIENTS: A CHART REVIEW

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PURPOSE: To determine the prevalence in Saskatchewan of BCC, SCC and Melanoma in the immuno-compromised transplant population.

METHOD: Ethics Approval was granted by the Saskatoon Health District to allow for a systematic chart review of all patients seen in the last 10 years regarding evaluation of their skin post transplant. This retrospective, single-centre descriptive study comprised 94 patients transplanted from 1988 to 2010.

RESULTS: Among 94 transplant recipients under our care, skin malignancies were diagnosed in 29 patients (30.9%). The histological diagnoses included squamous cell carcinoma (n=11; 11.7%), basal cell carcinoma (n=12; 12.7%), both SCC & BCC (n=5; 5.3%) and melanoma (n=3; 3.2%).

CONCLUSIONS: Saskatchewan as a province averages the highest sun exposure in Canada given that fact one would expect a higher incidence of skin cancer in our patients. This however was not the case as there was a slightly lower incidence of skin malignancies noted in our local population. The possible etiology in the difference in incidence may lie within length of follow-up, patients not returning for their annual checkup, physician education regarding avoidance of the sun and also a improvement in immunosuppressive therapies when compared to 20-30 years ago. With the lack of literature regarding this subject in Canada it could be of benefit to initiate a larger more statistically significant analysis of this select population, as most literature is potentially outdated.

Learning Objectives:

- *Participants will identify that the risk of skin cancer development in organ transplants recipients increases steadily with time post transplant*

- *Current treatment strategies are getting better but surgeons should still take time to explain to organ transplant recipients the various factors that put them at risk and how to avoid them*

P08
THREE-DIMENSIONAL PRINTING OF THE INTERNAL MAMMARY ARTERY PERFORATOR VASCULAR ANATOMY

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INTRODUCTION: The use of 3D imaging has led to significant clinical advancements in plastic and reconstructive surgery. The purpose of this study is to describe the use of three-dimensional (3D) printing in the creation of a solid 3D anatomical model of the internal mammary artery (IMA) and its perforators (IMAPs) and demonstrate their course, origin, and relationship to surrounding structures.

METHODS: A fresh cadaver was injected with a lead oxide/gelatin mixture and plain film and computer tomographic (CT) angiograms were obtained and analyzed. The CTA DICOM images were imported into Materialise's Interactive Medical Imaging Control System (MIMICS) software to produce three-dimensional reconstructions of the IMAP anatomy. A stereo lithographic (STL) file of the left dominant IMAP was created from the reconstruction and exported. From the STL file, a solid 3D model was created using a MakerBot Replicator 3D printer using a sequential layering process with polylactide (PLA) plastic.

CONCLUSIONS: Three-dimensional printing is an emerging technology used in a wide variety of applications. We describe the first use of this process to reproduce vascular anatomy of a cadaver using data obtained from angiograms and computed tomographic angiograms analyzed with MIMICS. The course, point of perforation, and relationship to surrounding anatomical structures can be easily understood using these solid models, which can be a valuable application for comprehension of vascular anatomy and surgical planning of perforator flaps.

Learning Objectives:

- *At the end of this lecture, the learner will be able to appreciate the use of 3D printing for creation of anatomical models of vascular anatomy.*

P09
ANATOMICAL STUDY OF THE PRINCEPS POLLICIS ARTERY PERFORATOR FLAP

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PURPOSE: Local skin flaps are frequently used to reconstruct traumatic wounds in hand. The thumb in particular is often injured. Perforators of the princeps pollicis artery (PPA) were analysed to determine feasibility for incorporation into a propeller flap raised from the thenar area for reconstruction of the ventral aspect of the thumb. The purpose of this study was to describe perforators of the PPA which could be used for local skin flap reconstruction of the thumb.

METHOD: Eight fresh cadaveric hands were available for study after whole body lead oxide/gelatin injection. All cadavers were imaged with computerized tomographic angiography. CT data was imported into Materialize's Interactive Medical Imaging Control System for three-dimensional analysis and the number, length, calibre and location of perforators from the PPA were determined. In assessing perforator location, a Cartesian plane was developed with its origin placed mid-axis at the metacarpal head. X was measured from the origin moving along the long axis of the MC shaft; Y was measured along a line perpendicular to the origin. X and Y coordinates were recorded to generate a scatter plot representing the mean location for perforators arising from the PPA.

RESULTS: The analysis revealed n=17 perforators in eight specimen hands with a mean calibre of 1.2±0.4 mm, and mean length of 10.5±4.7 mm coursing along the radial aspect of the thenar region. Mean X position was 13.4±8.4 mm and mean Y position was 8.3±6.0.

CONCLUSIONS: Perforators of the PPA were found in all hands. The average length of the perforator was determined to be sufficient for rotation. The good calibre and mean location near the base of the thumb suggests that a cutaneous flap from the radial thenar region can be raised based on this perforator as a propeller flap.

Learning Objectives:

- *The learner will be able to evaluate this flap.*

P10
ELEVATION AS A TREATMENT FOR FASCIOTOMY WOUND CLOSURE

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PURPOSE: There are currently numerous techniques in the literature that attempt to optimize wound closure following fasciotomies. However, primary closure of fasciotomy wounds continues to be difficult to accomplish successfully because of the underlying edema from the compartment syndrome. We address the underlying pathology by using a simple and a physiologically sound approach. Our approach focuses on alleviating the edema by strictly elevating the limb, followed by primary closure.

METHOD: Twelve consecutive fasciotomy wounds (6 lower legs, 1 thigh, 2 hands and 3 arms), referred to us from 2005-2012, were closed using our approach. Following the initial consultation, the wound was elevated on 5 pillows with strict guidelines to follow. Once closure was determined safe, the wound was debrided, undermined and closed primarily without tension. Following closure, patients were followed for an average of 4.2 months (range 2-8 months).

RESULTS: All twelve fasciotomy wounds responded with no revisions, complications, failures, or loss of skin sensation. We did not covert to any techniques available in the literature. Our approach was successful in all locations we closed. The average closure time was 3.4 days (range 3-5 days), following the initial consultation. Six former patients had closure done under local anesthesia.

CONCLUSIONS: Our approach involving strictly elevation is a simple and a physiologically sound approach that addresses the underlying edema. It is favorable for its efficient closure time and high success rate, while providing superior cosmetic results. It should be a part of a plastic surgeon's armamentarium in closing fasciotomy wounds, especially in settings with limited resources.

Learning Objectives:

- *The learner will appreciate the use of limb elevation as an approach to close fasciotomy wounds, enhancing their armamentarium. Learners will also be able to compare our approach with other techniques found in the literature.*

P11
A SYSTEMATIC REVIEW OF TISSUE-EXPANDER/IMPLANT VERSUS AUTOLOGOUS ABDOMINAL TISSUE BREAST RECONSTRUCTION

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Hamilton, ON

PURPOSE: To evaluate the safety, patient-reported outcomes ('PRO') and economic evidence of the tissue-expander/implant ('TE/I') versus autologous abdominal tissue ('AAT') reconstruction in breast-cancer patients following mastectomy.

METHOD: A systematic review was undertaken to address the above questions. Search was undertaken to identify peer-reviewed literature on TE/I and AAT from various databases from January 2000 to September 2012. Two reviewers independently screened titles, abstracts of all identified reports using pre-defined inclusion/exclusion criteria. Data was extracted from full text articles using a standardized data abstraction form.

RESULTS: 2161 abstracts were reviewed and 28 observational, comparative studies met the final inclusion criteria. Fourteen studies reported on safety, fifteen on patient-reported outcomes and four on costing/resource utilization. Due to the heterogeneous outcome definition, difficulties exist in comparing across studies. Overall, the findings suggest that there were no significant differences in safety outcomes between TE/I and AAT reconstructions although certain complications (implant ruptures versus flap necrosis) are method specific and downstream re-operations are more common in TE/I. PRO, specifically patients' quality of life ('QOL') scores, showed statistically significant improvements with both methods in: mental health, role/emotional health, vitality, social functioning and general health perceptions, although TE/I patients' aesthetic satisfaction decreases

over time while remaining stable for patients receiving AAT. No full economic evaluation was identified.

CONCLUSIONS: The evidence available on safety, efficacy and economics is mainly from low-quality studies lacking comparability across studies. Despite this, available evidence suggests that breast reconstruction has the potential to provide great improvement in a patient's QOL after mastectomy, regardless of reconstruction method. Additional studies are necessary to evaluate: comparative safety, effectiveness and especially economic profiles of different breast reconstruction approaches.

Learning Objectives:

- *Learn about the comparative perioperative and long-term safety profiles*
- *Discover patient satisfaction using PRO*
- *Discern the economic value of different approaches to breast reconstruction*

P12

THE USE OF INDOCYANINE GREEN LASER ANGIOGRAPHY TO EVALUATE AND AID IN TREATING TRAUMATIC HAND INJURIES

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PURPOSE: Indocyanine green laser angiography is an intraoperative technology which utilizes ICG fluorescent dye to access tissue perfusion in a real-time manner. It was popularized in breast reconstructive surgery to evaluate mastectomy flap perfusion. This visualization optimizes outcomes by predicting regions of possible tissue necrosis. We believe this adjuvant technology can be utilized in traumatic hand surgery and augment the clinical exam by differentiating between areas of adequate or inadequate perfusion.

METHODS: Retrospective review of eight patients where ICG angiography was utilized intra-operatively.

RESULTS: All eight patients in this study sustained hand/wrist trauma through various mechanisms. Patient ages were from 12 to 56. One patient sustained a ring avulsion injury with soft tissue degloving.

There was clinical evidence of devascularization, but ICG angiography confirmed perfusion. In another case, a patient sustained near- circumferential lacerations of two fingers and was transferred to our institution by helicopter due to clinical concern for ischemic digits. ICG angiography displayed intact vascularity to these digits as was confirmed by surgical exploration. In yet five other near amputation cases, ICG angiography was used to evaluate perfusion preoperatively to determine surgical staging for revascularization of digits or tissue debridement in degloved areas. In a final case, the technology determined the optimal angiosome for reverse radial forearm flap in a palmar degloving injury.

CONCLUSION: ICG angiography aided our treatment decisions, helping us to formulate or change surgical plans, and allowed for more surgical confidence. Going forward, we hope to determine whether it can be a cost effective tool to reduce operative time and prevent multiple trips to the OR.

Learning Objective:

- *Participants will be able to identify uses of ICG angiography at their own institutions that can aid in surgical planning and be cost effective when dealing with traumatic hand injuries.*

P13

ANATOMIC SITES OF ORIGIN OF THE SUPRASCAPULAR AND LATERAL PECTORAL NERVES WITHIN THE BRACHIAL PLEXUS

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The purpose of this study is to clarify the anatomical origins of the suprascapular nerve (SSN) and lateral pectoral nerve (LPN) from the brachial plexus as an aid to surgical exploration.

METHODS: The SSN and LPN were studied in 100 adult cadaver specimens. Topographic points of origin were described as distance from the bifurcation of the upper trunk (UT) for the SSN or distance from the formation point of the lateral cord (LC) for the LPN. Structures were digitized in 12 specimens and visual anatomical models were reconstructed.

RESULTS: The SSN originated from: (1) the posterior division of UT (UTP) in 61 specimens at a point 3.1±3.1 mm (mean±SD) distal to the bifurcation of the UT; (2) the point of UT bifurcation in 29 cases; (3) the UT in 6 cases at a point 3.8±2.0 mm proximal to bifurcation point; and (4) directly from the C5 root in 4 cases. The LPN originated from: (1) the anterior division of UT (UTA) in 88 cases from a point 24.8±9.9 mm proximal to the point of LC formation; (2) from the point of LC formation in 5 cases; (3) from the LC in 4 cases at a point 12.3 ± 5.9 mm distal to the LC formation point; and (4) solely from the anterior division of the middle trunk (MTA) in 3 cases. Eighty- two cases had origins from both the UTA and MTA.

CONCLUSIONS: The SSN most frequently originates from the UTP, and the LPN from the UTA and the MTA.

This information can be used to guide the surgeon in identifying the key landmarks of the supraclavicular brachial plexus at surgical exploration. Learning objectives: Participants will learn the topographic anatomy of the UT and its branches with a focus on useful landmarks for brachial plexus surgery.

P14

PATIENT REPORTED OUTCOME MEASURES IN RECONSTRUCTIVE BREAST SURGERY

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PURPOSE: There has been increased attention to the application of evidence-based medicine and patient reported outcomes (PROs) in plastic surgery. Specifically there has been interest in PROs using formally constructed and validated questionnaires that are also meaningful to the patient. As such breast specific questionnaires such as the BRECON, BREAST-Q and Michigan Breast Outcomes Questionnaire (MBOQ) have been created. This does not mean, however, that there is not a role for generic questionnaires, which have their own advantages. Our intent was to perform a systematic review of all breast reconstruction outcomes studies to determine which had successfully used validated questionnaires, both generic and specific.

This was to then be able to illustrate to the "everyday" plastic surgeon the validated PROs that are not only available for their use, but also what their respective advantages may be.

METHOD: A search was undertaken in PubMed from 1978 to 2012 to identify all possible articles. Other databases were crossed referenced with similar keywords to yield maximal results. Inclusion criteria included all articles assessing breast reconstruction outcomes using PROs.

Exclusion criteria were non-English articles and PROs that had not been validated. Results were reported according to the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) and were evaluated according to the criteria set forward by the Scientific Advisory Committee of the Medical Outcomes Trust (MOT).

RESULTS: Articles were identified and then narrowed by exclusion criteria.

PROs identified included generic questionnaires (SF-36, HADS), breast specific questionnaires (QLQ-BR23, FACT-B), and breast reconstruction specific questionnaires (BREAST-Q, BRECON, MBOQ).

Successful use was demonstrated according the MOT criteria.

CONCLUSIONS: A variety of PROs can be successfully applied to the reconstructive breast surgery population.

Learning Objectives:

- *Participants will be able to identify a generic versus specific PRO measure and become familiar with PROs used in reconstructive breast surgery.*

P15

PROPRANOLOL FOR INFANTILE HEMANGIOMAS – SINGLE-CENTRE EXPERIENCE OF 250 CASES

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PURPOSE: Infantile Hemangiomas (IHs) are the most common paediatric vascular tumours; and propranolol is an established first-line treatment. Presentation of our experience managing IHs with propranolol using an established therapeutic protocol, within a multi-disciplinary vascular anomalies clinic.

METHODS: Retrospective review of pediatric patients treated with propranolol in our Vascular Anomalies Clinic from July 2008 to December 2011. Data regarding the patients, their lesion(s), clinical course, and outcomes was collected and analysed.
RESULTS: 250 patients (80.4 % females, 19.6 % males) were treated with propranolol; 34.4% were born pre-mature; 5.6% post-mature. 75.6% had a single hemangioma, 24.4% had multiple lesions. 43.2% presented with superficial IHs; 20.4% with deep, 36.4% with mixed. Indications for propranolol included: visual compromise (42.0%); symptomatic lesions (30.4%); airway obstruction (8.8%); feeding difficulty (8.4%); predicted long-term aesthetic concerns (4.4%); and other reasons (6.0%).
Mean age at beginning of treatment was 5.6 months (SD 4.4 months; range 0.7 – 48.1 months). Mean age at end of treatment was 19.0 months (SD 7.7 months; range 5.5 – 61.1 months). Mean duration of therapy was 13.4 months (SD 6.7 months; range 0.2 – 43.0 months). 29 patients (11.6%) underwent systemic steroid therapy. As well, 92 patients (36.8%) underwent eye-patching therapy.
Adverse effects, requiring modifications in management including dosage reduction/alterations, temporarily withholding or premature cessation of treatment, were observed in 26 patients whilst taking propranolol (10.4%). Adverse events not affecting propranolol therapy were observed in 61 patients (24.2%).
Overall improvement in IH was experienced by 240 patients (96.0%). However, 10 patients (4.0%) did not exhibit improvement in their condition. Patients who successfully responded to propranolol therapy were, on average, 2.9 months younger at the commencement of propranolol compared to those who did not respond, (p=0.02).
20 patients' IH lesions showed signs of regrowth after propranolol therapy was stopped (8.0%). 6 of them restarted propranolol (2.4%). Those requiring propranolol to be restarted were treated for, on average, 5.2 months longer than those that did not, (p = 0.03).
CONCLUSIONS: Propranolol can safely and significantly improve the management of IH, and the revised therapeutic protocol will aid in the process.
Learning Objectives:

- *Presentation of experience managing IHs with propranolol using an established therapeutic protocol, within a multi-disciplinary vascular anomalies clinic.*
- *Propranolol can safely and significantly improve the management of IHs.*
- *Starting propranolol at an earlier age can improve the outcomes of the IH lesions.*
- *Optimal care of the IH patient is best provided by an experienced multi-disciplinary vascular anomalies team, following an established therapeutic protocol.*

RESIDENT POSTER COMPETITION

RP01
PRESCRIPTION OPIOID ABUSE: A REVIEW OF CLINICAL PRACTICE IN HAND SURGERY

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PURPOSE: Post operative analgesia plays an important role in the management of out-patient hand ambulatory procedures. Unfortunately, there has been a rise in prescription opioid abuse in Canada and as such prescribing practices need to be scrutinized. The goal of this study was to review patterns of opioid prescription in an elective hand surgery practice and to identify if patient, anesthetic or surgical factors influenced prescribing patterns.
METHOD: Charts of all ambulatory hand surgery patients from 2005 to 2012 were reviewed. Data collected included demographics, medical history, diagnosis, type of surgery, complications, anesthetic type, ASA class, prescription drug and quantity prescribed.
RESULTS: A total of 298 charts were reviewed of which 163 met inclusion criteria.
Procedures were largely soft-tissue relative to bone (58.9% vs 41.1%). The majority of patients were prescribed Tylenol #3 (74%, n=121) or Percocet (23%, n=37). Patients undergoing bone procedures (OR 1.6; 95% CI 0.76, 3.37), younger patients (P=0.005, chi-square test) and those receiving general anesthetic (OR 2.64; 95% CI 0.73, 9.53) were more likely to be prescribed Percocet. Patients with risk factors for severe post-operative pain, specifically male sex, young age, high BMI, ASA class I and undergoing a bone procedure, were not all necessarily prescribed of a stronger opioid.
CONCLUSIONS: In our study, patients were more likely to receive a prescription for a stronger opioid (Percocet) if they were younger than 44 years of age, had bone surgery or had a general anesthetic, while other predictive factors of severe post-operative pain did not seem to influence prescribing practice. Further assessment of patient related outcomes with respect to post operative pain management is necessary to appropriately tailor opioid prescription.
Teaching Objectives:

- *List predictive factors of severe post-operative pain in ambulatory surgery*
- *Identify patients at increased risk of developing severe post-operative pain*

RP02
THE USE OF SMARTPHONE PHOTOGRAPHY IN ACUTE HAND TRAUMA REFERRALS

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PURPOSE: Transfer of upper limb trauma patients from peripheral hospitals to tertiary centres for acute treatment can be life and limb saving, but is expensive, and unnecessary transfers are not uncommon. Identifying these cases prior to transport would allow more timely treatment and prevent unnecessary utilization of resources associated with transfer. Smartphones allow rapid acquisition and transfer of photographs, which may enhance the description of the injury and improve decision making prior to transfer.
METHODOLOGY: 10 Surgeons (5 Hand, 5 Plastic) reviewed 10 upper limb trauma cases and answered questions based on the history alone, then on the history and images displayed on an iPhone 5®. Areas assessed included evaluation of damaged structures and development of a treatment plan, including the necessity for acute transfer. Also evaluated were changes in the diagnoses and treatment plans, confidence in these criteria and subjective opinion of the added value of the smartphone images compared to history alone.
RESULTS: The addition of smartphone images frequently resulted in changes in the diagnosis and/or treatment plans as well as the decision to accept transfer. Clinicians' confidence in their diagnosis and treatment plan was increased in most cases. Several injuries were identified in the images that had not been communicated verbally. Smartphone images were rated as highly useful.
CONCLUSIONS: Smartphone images are highly useful in forming a working diagnosis and treatment plan and assessing the need for acute transfer. In many cases the images demonstrated a discrepancy between the description and the actual injury that modified treatment. In real-life, there would have been numerous digits salvaged, length preserved in others and several unnecessary emergent transfers avoided.
Learning Objective:

- *To understand the applications and limitations of smartphone images in assessing acute upper extremity trauma referrals.*

RP03
A CRITICAL REVIEW OF COST EFFECTIVENESS ANALYSIS IN THE MANAGEMENT OF CARPAL TUNNEL SYNDROME

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PURPOSE: Previous studies comparing the cost effectiveness of surgical and nonsurgical management of carpal tunnel syndrome (CTS) have suggested surgical treatment is more cost effective. A careful evaluation of these studies suggests they may not be directly applicable to the typical management of CTS by hand surgeons in North America. This is particularly true of patients with mild CTS. Therefore, based on the current literature, it is not clear if the most cost effective management strategy for CTS should include a trial of nonsurgical management.

METHOD: Studies of cost-effectiveness analysis of the management of CTS were located in the literature using PubMed and the keywords "carpal tunnel syndrome" and "cost effectiveness analysis". We reviewed accepted management of CTS reported in the published literature. We then adjusted previous cost-effectiveness analyses to reflect accepted nonsurgical management and equalized costs of surgery amongst all patients that received surgery.

RESULTS: Previous North American cost-effectiveness analyses have included the cost of hand therapy in their nonsurgical treatment stream. Exercise and mobilization have very low quality evidence of benefit. As well, a trial of nonsurgical management should not impact the surgeon's decision to use general, regional or local anesthesia. If these previous models are adjusted to reflect accepted nonsurgical treatment in North America & equalize the cost of surgery amongst all patients, then a trial of nonsurgical management is more cost-effective than a straight to surgery approach ($2,162/person and $3,068/person respectively). This is even more evident in the mild CTS group ($1,418/person versus $3,076/person for nonsurgical versus surgical treatment respectively).

CONCLUSIONS: Multiple factors contribute to the cost-effectiveness of nonsurgical and surgical treatments of CTS. By adjusting previous clinical studies, we can demonstrate how nonsurgical treatment can be cost-effective.

Learning Objective:

- *The participant will be able to evaluate the cost- effectiveness of nonsurgical versus surgical treatment of CTS.*

RP04

CUSTOMIZING THE RECONSTRUCTION PLAN TO ACHIEVE GOOD SATISFACTION IN WOMEN UNDERGOING VARIOUS FORMS OF BREAST RECONSTRUCTION

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PURPOSE: To evaluate patient satisfaction in women who have undergone a variety of breast reconstruction techniques.

METHODS: Consecutive women undergoing autologous, alloplastic, or combined breast reconstruction at a single center were invited to participate.

Reconstruction type was highly customized and based on two separate consultations, taking into consideration the woman's expectations and wishes, disease and treatment factors, and health and habitus.

Following surgery, women were asked to complete the validated BRECON-31 TM: Breast Reconstruction Satisfaction Questionnaire, either in the clinic setting or as a mail-out. Patient demographics and operative details were collected from their medical records. A one-way analysis of variance compared the three groups (autologous, alloplastic, combined) across the ten subscale measures.

RESULTS: A total of 123 of 176 (70%) women participated in the study. The mean age of the respondents was 51.3 (range: 30-72). The primary language for all respondents was English (100%). Fifty women underwent autologous reconstruction (41%), fifty-eight alloplastic (47%), and fifteen combined (12%). Nine of the ten BRECON-31 TM subscales (Self Image, Arm Concerns, Intimacy, Satisfaction, Self-Consciousness, Expectations, and Breast Appearance, Nipple, and Abdomen) showed similarly high satisfaction regardless of reconstruction method ($p>0.05$).

Only the subscale Recovery showed a significant difference between the three reconstructive groups ($p=0.00006$), with autologous reconstruction scoring (51) compared to alloplastic (68) and combined (60).

CONCLUSION: Using a valid and reliable patient-rated outcome measure to assess breast reconstruction satisfaction, women score similarly for nine out of ten subscales. Women with autologous reconstruction scored more poorly on the Recovery subscale. From these results, we believe it is possible to achieve high satisfaction following breast reconstruction by tailoring the reconstruction type to the patient.

Learning Objectives:

- *To examine differences in patient satisfaction amongst women who have undergone various types of breast reconstruction using the BRECON-31 TM*

RP05

TWO-FLAP "YING AND YANG" CAPSULAR RECONSTRUCTION OF THE ULNAR COLLATERAL LIGAMENT OF THE THUMB MCP JOINT: A NEW TECHNIQUE

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PURPOSE: Thumb MCP joint ulnar collateral ligament (UCL) reconstruction has traditionally utilized a free tendon graft woven through remaining capsule or through drilled bone holes. We propose a new method of reconstruction creating a neo-UCL with a two-flap capsular repair based on the isometric principle of collateral ligament reconstruction.

METHODS: A retrospective chart review of UCL injuries treated with a two-flap capsular technique from December 2008 until present was performed.

Range of motion, grip strength, and key pinch was measured and compared to the unaffected contralateral thumb as control.

RESULTS: Twenty-two thumbs in 21 patients underwent MCP UCL reconstruction during the study period. Average follow-up was 13 weeks (6-56 weeks).

All patients regained full range of motion. Average key pinch strength was 89.5% (65-100%) of the control. Three patients required a secondary reconstruction with a tendon graft. Further analysis revealed that all three patients were non compliant with the post-operative instructions.

CONCLUSIONS: The two-flap "ying and yang" capsular technique offers an alternative for traditional tendon reconstruction of the thumb MCP UCL. Excellent ROM, strength, and pinch are provided. Lack of tendon harvesting and ease of repair are further advantages.

Learning Objectives:

- *Participants will be able to identify key elements of the two-flap capsular repair*
- *Participants will be able to offer a new reconstruction for UCL injuries*

RP06

A COMPARISON OF INTER-PROVINCIAL PLASTIC SURGERY PROCEDURE REMUNERATION RATES AND THEIR RELATIONSHIPS WITH LOCAL PRACTICES

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PURPOSE: Recent proposed cuts to physician remuneration have led to acrimonious battles between provincial medical associations and governments in Ontario and Alberta. This has resulted in both global and targeted inflation adjusted decreases to fee codes. Prime targets have been fee codes presumed to be richly remunerated. Any potential fee increases will likely rest only with those codes that are less remunerated. Interprovincial comparisons are important criteria when provinces set new fee codes. This study examines interprovincial fee code discrepancies for plastic surgery and identifies codes that provincial associations might wish to target for negotiation.

METHOD: Current fee code schedules were obtained from each province.

Codes and fees paid in each province were entered into an Excel® spreadsheet for 213 plastic surgery procedures. Standard deviations and percentage discrepancies from the mean were determined. Those greater than one standard deviation below the mean were selected as candidates for fee adjustment.

RESULTS: Considerable interprovincial discrepancies were identified. Local flap surgery and nail plate removal were remunerated below mean in NF. Split thickness skin grafts and facial local flaps met the study criteria in NS, and NB has the lowest fees in the country for follow-up of patients. Bilateral breast reductions and Dupuytren's resections may be targets for fee increases in Quebec, whereas metacarpal fractures and Dupuytren's codes may be targets in Ontario. Finger dislocations and tenosynovitis drainage as well as necrotizing fasciitis debridements met criteria in Manitoba. AB remuneration is low for non-cosmetic nasal surgery and mandible fractures. In BC, septoplasties are comparatively low. Microsurgical fee codes are significantly below mean in Saskatchewan.

CONCLUSIONS: In fee code negotiations, the above codes are logical candidates for individual provincial associations to select for adjustment.

Learning Objective:

- *The learner will appreciate inter-provincial remuneration discrepancies for plastic surgery procedures in Canada.*

RP07

MODELING OF THE 4TH AND 5TH CARPAL-METACARPAL JOINTS WITH 3D LASER SCANNING

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PURPOSE: To evaluate the articulating surfaces between the hamate and 4th and 5th metacarpal(MC) bases.

METHOD: NextEngine™ 3 dimensional laser scanner (accurate to ±100μm) captured the articular surfaces of the hamate with the 4th and 5th MC bases of 10 embalmed cadaver right hands. Articular surfaces were defined and modeled using Amira5.3.3, VP sculpt3.03 and MatLab7. Articular surfaces were evaluated in terms of size, shape, radius of curvature(ROC) by 3 point and sphere-fit (SF) and inter-facet angles.

RESULTS: 4th CMC: Hamate articular surface with the 4th MC was single, concave and well approximated by sphere fit (SF); radius of curvature (ROC) μ=11.18. 4th MC base was convex; SF ROC μ= 9.944. 6/10 articulations flattened from volar to dorsal. 5th CMC: Hamate surface was concave while MC base was convex. The joint surface was best approximated with two overlapping spheres. Ulnar sphere averaged 30.21% of the surface of the hamate and 29% of the MC base. Ulnar hamate SF ROC μ=11.63, ulnar 5thMC SF ROC 8.07. Radial SF hamate μ=7.92, radial 5thMC SF μ=7.47. Angle of divergence between spheres represented on the hamate surface was μ=21.4° while the 5thMC base angle of divergence was μ=10.99°. The angle formed between the 4th and 5th CMC joints at the hamate was μ=31.69°. A single articular facet between the 4th and 5th MC bases was concave on 4th and convex on the 5th MC base.

CONCLUSIONS: Laser scanning of cadaver 4th and 5th CMC joints clarifies the normal anatomy of joints essential for ulnar strength grasp. Useful applications include morphologic features of injury patterns, repair and osteochondral donor tissue.

Learning Objectives:

- *Participants will be able to describe the unique joint morphologies of the of the 4th and 5th carpal-metacarpal joints.*

RP08

DESCRIPTIVE STATISTICAL ANALYSIS OF ANTHROPOMETRY AND BLOOD PRESSURE IN INFANTILE HEMANGIOMA PATIENTS TREATED WITH CORTICOSTEROIDS AND PROPRANOLOL

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PURPOSE: Infantile hemangioma (IH) is the most common benign tumor of childhood. Traditionally, corticosteroids were considered the IH medication of choice. Since its introduction in 2008, propranolol has rapidly been adopted as an effective pharmacologic treatment. Despite its immense use in IH, there is significant uncertainty regarding the long-term effects of propranolol in pediatric patients. The aim of this study is to describe the long-term influence of propranolol and corticosteroids on anthropometric measurements (height, weight, BMI) and blood pressure (BP) in children.

METHOD: A prospective database of all IH patient visits to the pediatric vascular abnormality clinic at our institution between October of 2007 and September of 2011 were reviewed. Anthropometric measurements (height, weight, BMI) and BP were analyzed.

RESULTS: Two hundred ninety visits (119 patients) to the pediatric vascular abnormality clinic at London Health Sciences Centre were reviewed.

An increase in BP and BMI was noted in the corticosteroid group. Anthropometric measurements and BP values remained normal in children treated with propanolol. No hypotensive episodes were recorded in the propranolol group.

CONCLUSIONS: Propranolol appears to result in fewer long-term changes in BP and anthropometric measurements than systemic corticosteroid therapy. Propranolol should be considered a safe first line therapy for IH patients.

Learning Objectives:

- *At the end of this workshop, learners will be able to consider the long-term influence of corticosteroids and propranolol on anthropometry and BP in pediatric hemangioma patients.*

RP09

PLASTIC SURGEONS' APPARENT WEBSITE STRATEGY IS POSITIVELY CORRELATED WITH POPULATION CHARACTERISTICS AND NUMBER OF SURGEONS IN THE LOCALE

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PURPOSE: In 1980 business professor Michael Porter described distinct strategies with which businesses attain competitive advantage: Cost Leadership and Value Differentiation. Previously we showed that Canadian plastic surgeons have a preference for websites that favour a Value Differentiation strategy. In this investigation we examine whether or not a correlation exists between population characteristics and website strategy.

METHODS: For each plastic surgeon listed on the CSPS website we examined characteristics of their practice locales including population, population density, median age of the population, and number of plastic surgeons in the region including density of plastic surgeons in a particular community. These data were gathered from both the CSPS website and Statistics Canada. Correlations between value differentiator/low cost provider scores and these population characteristics were calculated using Microsoft Excel.

RESULTS: We found that a positive correlation existed between all of the above- mentioned variables and the degree of Value Differentiation strategy used by surgeons. The strongest correlation was seen between the number of surgeons practicing in a given geographic locale and the resulting degree to which their websites displayed a value differentiator approach.

CONCLUSION: These results suggest that plastic surgeons in Canada consider their market and their competition when creating their websites and that those surgeons in more competitive markets tend to portray themselves online as Value Differentiators as opposed to Cost Leaders. However, the somewhat weak positive correlation suggests that as a group plastic surgeons in Canada could be more assertive in tailoring their strategy to their market.

Learning Objectives

- *At the end of this discussion, the participant will be able to understand the relevance of Porter's competitive strategies to their business model and website design. Also, participants will consider the effect that the characteristics of a particular locale may have on marketing strategy, specifically promotional websites.*

RP10

OUTCOMES FOLLOWING A MODIFIED REDUCTION AND ASSOCIATION OF THE SCAPHOID AND LUNATE WITH A BIOABSORBABLE COMPRESSION SCRE

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PURPOSE: Scapholunate (SL) dissociation represents the most common carpal instability. The reduction and association of the scaphoid and lunate (RASL) achieves a fibrous union between the scaphoid and lunate by fixation with a Herbert screw. We describe a modified RASL with a bioabsorbable compression screw and DIC capsulodesis.

METHODS: A retrospective review was performed for patients who have undergone a RASL by a single surgeon. A Bio-Compression screw® (Arthrex, Naples, FL) was used to obtain an association between the scaphoid and lunate. Radiographs were reviewed pre-operatively and at various intervals post-operatively. Demographic and ROM data were also gathered. Statistical comparisons were performed using a one-way ANOVA.

RESULTS: Scapholunate reconstruction was performed in 44 patients. Males made up 80% of the patients, and 55% of the injuries occurred in the dominant hand The mean age was 45 years, with an average of 61 weeks between date of injury and the procedure. Preoperative radiographs were compared to those from 3, 6, and 12 months post-op. There was no significant difference in the scapholunate gap or radiolunate angle among the timepoints. The scapholunate angle was reduced from 57.0° pre-op to 44.6° at 12 months ($p<0.01$). There was no significant difference in the modified carpal height ratio between pre-op values and 3, 6, or 12 months. At three months, the mean grip strength was 22.8kg. The mean range of motion was 32 of flexion, 35 of extension, 17 of ulnar deviation, and 12 of radial deviation. Six patients required a salvage procedure.
CONCLUSIONS: The modified RASL results in a decreased scapholunate angle at one-year post-op indicating association between the scaphoid and lunate. The MCHR is maintained and early ROM values are similar to other forms of SL reconstruction
Learning Objectives:
- *Describe a modified RASL procedure, and outcomes following this procedure*

RP11
RESTORATION OF UPPER LIMB FUNCTION USING A DOUBLE FREE GRACILIS MUSCLE TRANSFER AFTER COMPLETE BRACHIAL PLEXUS AVULSION INJURY: FIRST CASES REPORTED IN CANADA

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PURPOSE: Severe brachial plexus avulsion injuries can result in complete loss of sensory and motor function. Reconstruction is challenging and complex, with limited options. Free gracilis muscle transfer is a particularly effective technique to restore prehensile function in pre-ganglionic injuries of the brachial plexus, as well as for delayed post-ganglionic injuries.
METHOD: The use of the double free gracilis transfer to restore elbow flexion and wrist extension (first muscle) and finger flexion (second muscle) was first described by Doi in 1996 and is used commonly in Japan. We report the first two patients treated with this technique in Canada.
RESULTS: Both patients sustained complete brachial plexus avulsion injuries resulting in a flail arm.
Pre-operatively, patient 1 had normal trapezius strength, but the rest of his left arm muscles were a grade 0 on the MRC scale. Following his double free gracilis transfer, he achieved grade 4 strength. His elbow flexion strength improved from 0 kg to 6 kg and his DASH questionnaire score improved from 81 points to 30 points.
After his injury, patient 2's left shoulder adduction was a grade 1 while his other left arm muscles were a grade 0. Following surgery, he achieved grade 3 strength.
Patient photographs and videos will be presented to demonstrate the patients' range of motion pre, intra, and post operatively. Operative details, radiographic imaging, and EMG studies will be discussed.
CONCLUSIONS: The double free gracilis double muscle transfer is a valuable technique to restore elbow, wrist, and finger function. Patient satisfaction is high and active range of motion can be significantly improved. Our experience supports the use of this technique following brachial plexus injury.
Learning Objectives:
- *Participants will be able to describe the reconstructive options for complete brachial plexus avulsion injury.*
- *Participants will be able to describe the technique, risks, and benefits of performing a double free gracilis muscle transfer.*

RP12
TREATMENT OF IN-TRANSIT MELANOMA WITH INTRA-LESIONAL INTERLEUKIN-2: A SYSTEMATIC REVIEW

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PURPOSE: Several phase II studies have recently emerged on intra-lesional interleukin-2 (IL-2) for the treatment of in-transit melanoma. This systematic review addresses the efficacy and side effect profile of IL-2.
METHODS: MEDLINE, EMBASE, Cochrane Library, and Google Scholar databases were searched from 1980 to 2012 for studies evaluating the clinical response to using intra-lesional interleukin-2 for the treatment of in- transit melanoma. Titles and abstracts were screened by two independent researchers for suitability of inclusion using predetermined inclusion and exclusion criteria. Studies were evaluated for quality using a modified quality assessment tool for observational studies. Data was pooled and analyzed for both lesion and patient response rates to determine an overall response to treatment.
RESULTS: 49 studies were identified, and after exclusion criteria, 43 were removed, leaving six observational trials in the systematic review.
Treatment regimens (IL-2 dosage; treatment intervals), and response rates were variable. Overall, 2,182 lesions and 140 patients were treated with IL- 2 in these six studies. The mean pooled outcomes per lesion treated included complete response 78%, partial response 2.5%, and no response/progression of disease in 19.6%. Response rates by subject included complete response in 49.6% of patients. Treatment was generally well tolerated by patients with mild side effects including localized pain and swelling, and mild flu-like symptoms. There were only three grade 3 adverse events reported in a total of 140 treated patients, including rigors, headache, and fever with arthralgia.
CONCLUSIONS: This systematic review suggests that intra-lesional IL-2 safely and effectively provides locoregional control of in-transit melanoma, with relatively mild side effects.
Learning Objectives:
- *To understand the challenges in controlling in transit disease with traditional treatment methods.*
- *To understand the published outcomes in phase 2 trials of intra-lesional IL-2 therapy for in-transit melanoma.*

ABSTRACTS/RÉSUMÉS

Groupe pour L'Avancement de la Microchirurgie Canada (GAM)

Abstracts presented at the 33rd Annual Meeting / 33e Réunion annuelle
Dr Lucie Lessard: President / Présidente
Dr Sheina Macadam: Secretary / Secrétaire

01
BIOTISSUE MICROSURGICAL SIMULATION AND TEACHING; ECONOMICS, SET UP AND CANMEDS COMPETENCIES

Nicolas A Guay, Colin P White
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PURPOSE: As the need for skill training is increasing, surgical simulation has become a standard part of plastic surgery training programs. Microsurgical biotissue simulation products (1 to 6 mm) have given us an opportunity to create a new platform for microsurgical training and revisit an area of weakness in our post graduate surgical training.
METHOD: We will review the literature on biotissue simulation. We will describe our biotissue microsurgical laboratory set up and start up costs. We will also outline the initial instrument costs (4 microscopes, 5 microsurgical instruments sets, 2 cameras, 1 projector and screen). We will outline the cost per sitting/per resident for a 4 to 6 anastomosis session of 2 hours. We will then compare this to the per sitting/per resident cost for biotissue versus live animal (rat) sessions.
RESULTS: Our three year experience with this set up and current CanMeds competencies are described. We will describe the 8-step CanMeds medical expert progressive competency scheme that takes the trainee from loupe magnification of venous and arterial caliber (4 mm to 6 mm) with a 6-0 and 4-0 nylon suture to a 1 mm microsurgical anastomosis with 10-0 nylon suture.
CONCLUSIONS: This surgical simulation set up and objectives present a systematic experience in microsurgery for all plastics residents. Residents gain medical expertise rapidly allowing them to softly translate the gained microsurgical skills to operating room.
LEARNING OBJECTIVES: To describe the University of Ottawa microsurgical simulation laboratory.To compare the costs of a biotissue microsurgery treaching laboratory to the classic model using live animals.

02
CORONARY ARTERY BYPASS GRAFTING FOLLOWING FREE FLAP BREAST RECONSTRUCTION

Janae L Maher, Kendall R Roehl, Raman C Mahabir
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PURPOSE: The number one cause of death in women is heart disease. Studies have clearly shown the superiority of internal mammary artery grafts for coronary revascularization over other conduits or intracoronary techniques. Our goal was to design an algorithm for recipient vessel selection in patients undergoing free tissue transfer breast reconstruction.
METHODS: A review of the literature was performed to identify potential evidence to contribute to a best practice guideline. The lack of evidence lead us to create the guideline based on a workgroup consensus, expert opinion, cadaveric studies and case reports.
RESULTS: As we operate on older patient populations, the need for internal mammary artery use for CABG after autologous breast reconstruction may arise more frequently. We discuss the current literature regarding recipient vessel choices and level of recipient vessel harvest in order to help continually evolve the practices of our specialty to the potential future needs of our patients. We also present a best practice decision algorithm for vessel selection and harvest, as well as and a sample case of CABG utilizing the LIMA 35 days after previous autologous breast reconstruction using the LIMA.
CONCLUSION: As the number of patients we operate on who may later require their internal mammary artery for CABG increases, so too must our understanding and selection of recipient vessels for free autologous breast reconstruction.

Learning Objectives:
- *Participants should be able to describe an algorithm for the selection of recipient vessels for free flap breast reconstruction*

03
USABILITY OF INTERNAL MAMMARY RECIPIENT VESSELS IN MICROVASCULAR BREAST RECONSTRUCTION

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PURPOSE: The internal mammary vessels have gained popularity to become the recipient vessels of choice in microvascular breast reconstruction for many surgeons. Their position allows convenient accessibility and enables aesthetically favourable, medial positioning of the reconstructed breast. Some reports however, have raised concerns regarding the small calibre of the internal mammary veins and their friability, especially when there has been pre-operative chest wall radiation, reporting high conversion rates to alternative recipients. This study examines the suitability of the internal mammary vessels in a large series of microvascular breast reconstructions.
METHODS: A retrospective chart review of all patients who underwent microvascular breast reconstruction in the 5-year period between September 2007 and September 2012 was performed. The operative notes were reviewed to identify the recipient vessels used in all cases. Data on other patient variables that may influence the suitability of the vessels was also collected including details of previous surgery, radiation or chemotherapy, medical history and cardiovascular risk factors. Intraoperative or postoperative vascular complications were noted.
RESULTS: Details of 586 autologous consecutive breast reconstructions in 405 patients were reviewed. The internal mammary vessels were the target recipient vessels in all cases. The conversion rate to alternative recipient vessels was less than 1%. Vessel calibre was sufficient to permit anastomosis in all cases. Intraoperative and post-operative vascular complication rates were low. Factors such as previous surgery, radiation, chemotherapy or cardiovascular co-morbidities did not influence usability of the internal mammary vessels or associated complication rates.
CONCLUSION: The internal mammaries can be reliably used as recipient vessels in the vast majority of microvascular breast reconstruction irrespective of previous treatment modalities.
Teaching Objectives:
- *To understand the advantages and suitability of the internal mammaries as recipient vessels in microvascular breast reconstruction.*

04
A NEW MICROSURGERY SET USING DOUBLE ENDED INSTRUMENTS AND A DOUBLE HOOK DEVICE

Tim Sproule
The Scarborough Hospital and the University of Toronto, Toronto, ON

PURPOSE: A unique and innovative instrumentation set that facilitates microsurgery will be presented that utilizes double ended instruments and a double hook device.
METHOD: Titanium double ended instruments have been designed and manufactured that improve the speed and ergonomics of micro dissection, vessel preparation and micro anastomosis. A double hook device in multiple sizes has also been manufactured which allows for precise and tension free approximation of structures prior to repair. These innovations have been extensively tested in a busy multidisciplinary microsurgical practise.
RESULTS: Utilizing this instrumentation reduces the time necessary to complete anastomoses, reduces the number of instruments that need to be

used during a microsurgical procedure, and eliminates the need for double approximators.

CONCLUSION: This new microsurgery instrumentation set may have some usefulness as an adjunct to those who practise microsurgery.

Learning Objectives:

- *A new instrumentation set to facilitate microsurgery will be presented. Design highlights and numerous clinical applications will be discussed and demonstrated.*

05

INCIDENTALOMAS ASSOCIATED WITH ABDOMINAL AND PELVIC CT ANGIOGRAMS FOR ABDOMINAL BASED BREAST FREE FLAP RECONSTRUCTION

O Ho, S Hofer, T Zhong

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PURPOSE: More microsurgeons are now routinely ordering CT angiograms (CTAs) prior to breast reconstruction using deep inferior epigastric perforator (DIEP) flaps to provide better surgical planning and improve preoperative decision making. These investigations occasionally result in unexpected findings in otherwise asymptomatic women. The aim of this study is to determine the incidence of unexpected findings in preoperative CTAs and to correlate these with patient and breast cancer characteristics.

METHODS: A retrospective chart review from May 2008 to December 2012 was performed reviewing all patients who underwent DIEP flap breast reconstruction. Radiology reports of their preoperative CTAs were reviewed and details of unexpected findings were recorded. These patients past medical and cancer history and additional radiological investigations, outcomes, and interventions were assessed.

RESULTS: In total, 387 patients charts were reviewed. Currently data analysis is ongoing. Over half of the patients who had CTA imaging, had incidental findings. Of which, over half of were suggested to have further imaging including ultrasound, bone scan, MRI, and/or another CT.

The most common types of incidentalomas were hepatic, renal, bone, ovarian, and uterine.

CONCLUSION: Most incidental findings from pre-DIEP CTAs are benign. However, unexpected findings on imaging in a population of women with previous breast cancer or strong breast cancer risk factors can lead to undue stress and anxiety. It is important to counsel patients of the possibility of incidental findings and the possibility of changes to their reconstructive course prior to CTA investigations.

Learning Objectives:

- *To understand the rate of incidental findings in pre-DIEP CTAs in the microsurgical breast reconstruction population.*
- *To establish the importance of counselling patients when obtaining CTAs and after results are reported in order to set expectations and explain the implications of findings.*

06

THE SUPERCHARGE END-TO-SIDE ANTERIOR INTEROSSEOUS TO ULNAR MOTOR NERVE TRANSFER FOR RESTORING INTRINSIC FUNCTION: PRELIMINARY EXPERIENCE

Kristen Davidge, Susan Mackinnon

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PURPOSE: To review our preliminary experience with the supercharge end-to-side anterior interosseous to ulnar motor nerve (SETS) transfer, and to refine our indications for this technique.

METHODS: A retrospective cohort study was performed of all patients undergoing the SETS procedure between August 2009 and December 2012. Preoperative (diagnosis, comorbidities, clinical presentation, electrodiagnostic findings) and intraoperative data were reviewed and related to clinical successes and failures in regards to recovery of ulnar intrinsic function. General functional outcomes, including strength, pain, and DASH, were also documented. Pre/post comparisons were performed using paired t tests.

RESULTS: 62 patients (71% male, mean age at surgery 48.0±17.8 years) underwent the SETS procedure. Diagnoses were varied, but all patients presented with clinically significant ulnar intrinsic weakness and electrodiagnostic evidence of acute or chronic denervation of the first dorsal interosseous muscle. The SETS transfer was performed at a mean distance of 8.1±1.1 cm from the wrist crease. Thirty-two of 42 patients (76%) with adequate follow-up demonstrated recovery of ulnar intrinsic function at a mean of 5.3±2.7 months postoperatively. In seven patients undergoing concomitant ulnar nerve decompression, intrinsic recovery was too rapid to be attributable to the SETS procedure. Failures of the SETS procedure were most commonly seen in patients where the anterior interosseous nerve had also been injured.

CONCLUSIONS: The SETS transfer is a useful technique for augmenting intrinsic muscle function for 2nd and 3rd degree axonotmetic (incontinuity) lesions of the ulnar nerve. The best probability of success is seen in patients with acute ulnar nerve injuries with an intact, uninjured donor nerve. Clinical determination of the proportion of intrinsic recovery attributable to the SETS transfer is challenging, and perhaps may be only confirmed by electrodiagnostic evaluation in future studies.

Learning Objectives:

- *To highlight indications and outcomes of the SETS transfer*

07

MUSCLE FLAP PREPARATION ALTERS RESISTANCE ARTERY FUNCTIONS THAT LEAD TO SEVERE IMPAIRMENT IN MUSCLE FLAP PERFUSION IN VIVO

Alissa Sami[1,4], Tim Mak[2], David C Mazer[1,3], Gregory MT Hare[1,3], James L Mahoney[1], Melinda A Musgrave[1,4]

[1]Division of Plastic Surgery, St Michael's Hospital; [2]Department of Anesthesia and Physiology, University of Toronto; [3]LiKa Shing Knowledge Institute, University of Toronto; [4]Department of Surgery, University of Toronto, Toronto, ON

PURPOSE: To investigate the effect of vasopressors on muscle perfusion in an animal free flap model.

METHODS: Bilateral rectus abdominus muscles in Sprague Dawley rats were used as a surrogate free muscle flap and contralateral unoperated control. Microvascular blood flow was simultaneously recorded in both muscles by Laser Doppler Flowmetry (Oxford Optronix). Quantitative oxygen delivery was assessed with G4 oxyphor and a PMOD device. After surgery, a 15-minute baseline was recorded prior to infusion of phenylephrine in a dose dependant manner (0.025 ; 0.050; 0.10; 0.20 and 0.30 µg/kg/min). A 30-minute recovery period was recorded before rat euthanasia.

RESULTS: Perfusion in the non manipulated rectus muscle (control) showed a statistically significant decrease in blood flow only at the highest dose of phenylephrine (12 µg/kg/min; $p<0.05$). However, surgical manipulation alone resulted in a profound decrease in overall blood flow in the rectus muscle flap (free flap) in the absence of phenylephrine (989.5 vs 479.31 BFU; $p<0.001$).

Muscle preparation and manipulation itself also showed a statistically significant decrease in muscle flap PO_2 with exposure of muscle alone showing better oxygenation than control muscle flaps and free muscle flaps respectively (24.7 vs 16.9 vs 2.7 Torr ; $p<0.001$).

These effects were not augmented with any dose of phenylephrine.

CONCLUSIONS: The effect of surgery alone on oxygenation were surprising. Flap vasoconstriction during free flap surgery may better reflect a systemic inflammatory response of surgical change. This could potentially lead to microvascular vasoconstriction and an overall flap oxygenation deprivation compromising flap viability.

Teaching Objectives:

- *To present a novel animal model of flap perfusion and oxygenation*
- *To discuss a novel mechanism of flap compromise*
- *To understand flap perfusion and oxygenation as determinants of flap viability*

08
NERVE TRANSFERS FOR TREATMENT OF ISOLATED AXILLARY NERVE INJURIES

Margaret Wheelock, Jennifer Giuffre
University of Manitoba, Winnipeg, MN

PURPOSE: Little has been written in the literature on isolate daxillary nerve injuries following traumatic shoulder injuries. Patients present with atrophy of the deltoid, loss of sensation in the axillary nerve distribution and weak shoulder range of motion (ROM).The use of nerve transfers to restore elbow function and shoulder abduction in C5-6 nerve root injuries has been previously described.This study looks at a series of patients with isolated axillary nerve injuries treated with a triceps nerve branch to the axillary nerve transfer.

METHODS: A retrospective review of 6 patients who underwent a transfer of a triceps nerve branch to the axillary nerve was performed. Pre- and post-operative deltoid strength and shoulder flexion and abduction were evaluated.

RESULTS: Six patients, 5 male and 1 female, underwent a triceps nerve branch to axillary nerve transfer for isolated axillary nerve injury post traumatic shoulder dislocation. The average age was 55 years (37-66). The average delay from injury to transfer was 8.6 (4-12) months. Five of the transfers used a branch to medial triceps and one transfer used a branch to the lateral head of triceps. Deltoid function was 0/5 in all patients preoperatively and an average of 3.2/5 postoperatively. Four of six patients reported full or near full shoulder abduction and forward flexion postoperatively. There was one patient lost to followup. There were no complications.

CONCLUSION: Radial to axillary nerve transfers following traumatic shoulder injury can provide good recovery of deltoid strength and shoulder ROM with minimal complications.

Teaching Objectives:

- *Early diagnosis and referral of axillary nerve injury is important in management of these injuries.*
- *Nerve transfer can result in good recovery of strength with near normal range of motion for this subset of patients.*

09
VASCULARIZED PROXIMAL FIBULA EPIPHYSEAL TRANSFER FOR DISTAL RADIUS RECONSTRUCTION: A SYSTEMATIC REVIEW

Salah Aldekhayel, Omar Fouda Neel, Mario Luc
McGill University, Montreal, QC

PURPOSE: Reconstruction of distal radius in children is cumbersome, requiring restoration of joint function and attaining axial growth. Vascularized proximal fibula epiphyseal transfers (VFET) have been popularized over non-vascularized transfers and prosthesis. This systematic review aims to evaluate the effectiveness of VFET and its associated complications.

METHODS: Electronic search of MEDLINE and EMBASE databases between 1980 and 2012 was done to identify studies reporting outcomes of VFET for distal radius reconstruction in children less than 15 years. Inclusion criteria were English articles, and clinical studies with clear reporting of technique used and objective outcome measures (graft growth, bone union, complications).

RESULTS: A total of 539 studies were identified, of which 12 studies met the inclusion criteria with a total of 25 patients. Reported diagnoses included sarcoma (44%), congenital anomalies (32%), and trauma (24%). Patients were divided into two groups based on the technique used: (AF) antegrade flow (60%) and (RF) reverse flow (40%). Pedicles used were either anterior tibial (48%), peroneal (12%), or combined epiphyseal and anterior tibial or peroneal arteries (40%). All grafts demonstrated bony union. Graft growth rate was 0.88 cm/year in RF group compared to 0.47 cm/year in AF group. Recipient complications included four premature closures of epiphyseal plate (all in AF group), one flap loss, and six wrist deviations. Donor complications included one leg-length discrepancy and five common peroneal nerve palsy (all in RF group), one of which was permanent.

CONCLUSION: VFET is an effective surgical option capable of restoring joint function and axial growth potential in single stage with very reasonable outcomes. Reverse flow technique based on anterior tibial artery is shown to have superior outcomes.

Learning Objectives:

- *At the end of this presentation, the participant will:Identify goals of distal radius reconstruction in children.Recognize outcomes and complications of VFET.*

10
SOFT TISSUE RECONSTRUCTION OF SARCOMA DEFECTS FOLLOWING PRE-OPERATIVE RADIATION Â€“ FREE TISSUE TRANSFER IS SAFE AND RELIABLE

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PURPOSE: Neoadjuvant radiotherapy followed by surgical resection and soft tissue reconstruction provides the best possibility of achieving superior limb function in soft tissue sarcomas. The aim of this study was to report our experience of free flap microsurgical reconstruction of recently irradiated soft tissue sarcoma defects.

METHOD: A retrospective study of microsurgical outcome in consecutively treated extremity and trunk sarcoma patients undergoing free tissue transfer between 2007 and 2012 was conducted from a prospectively collected database. Outcomes in pre-operatively irradiated patients were compared with non-irradiated patients. Demographic data, operative details, limb salvage rate, post-operative including microsurgical complications, and long-term limb function (Toronto Extremity Salvage score, TESS; Musculoskeletal Tumour Society Rating Scale, MSTS) were recorded and analysed for differences between the two study groups.

RESULTS: Forty-six patients underwent 46 free flaps (pre-irradiated n=32, non-irradiated n=14) over the study period. Microvascular complications (intraoperative revision, flap re-exploration, flap loss) were uncommon and similar between the two groups (4/32 and 2/14 respectively, $p>0.05$). Recipient site wound healing complications (i.e. not flap related) occurred more frequently in pre-irradiated patients (16 events) compared with the control group (2 events, $p=0.03$). There was no significant difference in limb salvage rate, or TESS/MSTS functional outcome scores between the two patient groups.

CONCLUSIONS: Free tissue transfer is safe and effective in patients undergoing surgical resection and reconstruction for sarcoma following neoadjuvant radiotherapy.

Teaching Objectives:

- *At the end of the presentation, delegates will understand the role of free tissue transfer in select cases of limb salvage in sarcoma reconstruction; consider the benefit of neoadjuvant radiotherapy in terms of outcome/ limb function and appreciate that despite increased wound healing complications, flap-related complications are not increased.*

11
EFFICIENT USE OF THE SUBSCAPULAR SYSTEM: A TWO-TEAM APPROACH WITHOUT THE NEED FOR REPOSITIONING IN 64 MICROVASCULAR TRANSPLANTS

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PURPOSE: To present our experience with the subscapular system for upper and lower extremity reconstruction using a two-team approach without the need for repositioning. This technique combines the extreme versatility and low morbidity of the subscapular system with the increased efficiency of a two-team approach.

METHOD: A retrospective chart review was conducted at our microsurgical facility from 2007-2011 for patients undergoing free flap transplantation based on the subscapular system to the upper or lower extremity, without intra-operative repositioning.

RESULTS: 64 patients were included with 37 upper and 27 lower extremity transplants. Flap type included the latissimus, partial superior latissimus,

dorsal thoracic fascia, serratus, scapular bone or thoracodorsal artery perforator flaps, either alone or as chimeric flaps. The ipsilateral subscapular system was used in 16% of cases for lower extremity defects where the anterior tibial vessels served as recipient vessels. The contralateral subscapular system was used in the
remaining cases for upper extremity or lower extremity defects where the superficial femoral, genicular, popliteal, sural, or posterior tibial vessels served as recipient vessels. All patients were placed in the lateral decubitus position for the duration of the case. With the exception of one partial flap loss secondary to infection, all flaps survived.

CONCLUSIONS: Minor modifications in patient positioning make it entirely possible to use the subscapular system for nearly all defects of the upper and lower extremities without the need for repositioning. These techniques allow the use of a two-team approach, thereby increasing efficiency, reducing surgical time and lowering operating room costs.

Teaching Objectives:

- *To learn details of intra-operative patient positioning that allow for a two-team approach for flaps based on the subscapular system for defects of the upper and lower extremity.*

12

SCALP REPLANTATION FOLLOWING POLAR BEAR ATTACK; A CASE REPORT AND REVIEW

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INTRODUCTION: Polar bears (*Ursus maritimus*) are terrestrial mammals that live predominantly in the Arctic. Global warming has affected the ecosystem causing a change in their distribution geographically. More injuries from polar bears will increase in incidence as human-bear encounters increase.

CASE REPORT: This is the first case report of a polar bear attack causing partial scalp avulsion requiring scalp replantation in Canada. A review of literature from 1965 to January 2013 for scalp replantation is presented.

DISCUSSION: Scalp replantation and revascularization is a rare event. Majority cases of flap loss has been described secondary to postoperative venous congestion which was managed with use of Nitro patch in our case.

CONCLUSION: Scalp re-implantation should be performed on all scalp avulsion injury when possible to obtain the best functional and aesthetic outcome.

Teaching Objectives

- *A review of indications and outcome for scalp replantation is presented.*

13

CTA OF THE LCFA FACILITATES HARVESTING DOUBLE ISLAND ALT AND ALT/AMT FLAPS FOR HEAD AND NECK RECONSTRUCTION

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BACKGROUND: During double-skin island anterolateral thigh (ALT) and/or anteromedial thigh (AMT) flap harvest, inadequate or absent perforators may necessitate modification of the flap design, exploration of the contralateral thigh, or additional flap harvest. Computed tomographic angiography (CTA) has been shown to facilitate perforator mapping to optimize flap design, particularly when multiple skin islands are required. The purpose of this study was to determine the efficacy of CTA imaging in double-island flap design and harvesting.

METHODS: We studied a prospective cohort of 36 consecutive patients who received preoperative CTA mapping before a planned ALT flap reconstruction for complex head and neck defects. The CTA appearance of perforator location, origin, caliber, and course were assessed and compared between thighs of each patient. Data were analyzed to determine anatomic variability and candidacy of each thigh and patient for a common origin double-island ALT or ALT/AMT flap.

RESULTS: Seventy-one thighs in 36 patients were available for review. The ALT perforator origins were symmetric between thighs of the same patient 84% of the time, whereas the AMT perforator origins were symmetric only 44% of the time. The available number of ALT and AMT perforators per thigh were discordant between thighs. A double-island ALT/AMT flap was judged to be possible in 41% of the thighs and in 64% of the patients. Harvest of a double-island AMT/ALT was possible in both thighs in only 17% of patients. In thirty-six percent of the patients, the ALT and AMT perforators did not share a common origin, precluding harvest of a double-island ALT/AMT flap. In 8% of thighs only one ALT perforator was present, yet an AMT perforator with a common origin was also present, allowing execution of a double-island AMT/ALT flap. Three patients (8%) had only one perforator in one thigh, but two or more perforators in the contralateral thigh with a common origin.

CONCLUSIONS: Our data demonstrate that the perforator anatomy is discordant between thighs in the same patient, but most patients have at least one thigh that allows successful harvest of a double-island flap. Foreknowledge of the patterns of perforator anatomy provided by CTA allows the surgeon to select the thigh with the most advantageous anatomy for successful double-island ALT or ALT/AMT flap harvest, thus avoiding the added morbidity of second flap harvest or exploration of the contralateral thigh.

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