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MEDICINE & DENTISTRY

Western

DIVISION OF
PLASTIC & RECONSTRUCTIVE SURGERY
ANNUAL RESIDENT RESEARCH DAY

Friday, May 31st, 2019

Ivey Spencer Leadership Centre
551 Windermere Road, London
Amphitheatre A

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Notes

Objectives:

1. To learn about the key research areas within the division of plastic surgery with a goal to stimulate further collaboration.
2. To learn more about the principles of qualitative and quantitative research.
3. To learn about the use of new technology in plastic surgery.
4. To learn about new developments in hand and upper limb surgery research.
5. To learn about new developments in cosmetic plastic surgery.

Tom Hayakawa,
B.Sc., M.D., F.R.C.S.(C)

Dr. Tom Hayakawa is an Assistant Professor in the Section of Plastic Surgery at the University of Manitoba, Health Sciences Center in Canada, and the Director of Microsurgery.

He has been in practice for 14 years, specializing in oncology and trauma reconstruction with an emphasis on microsurgical reconstruction. He and his two partners in practice perform 300-400 free flaps per year and have an active microsurgery fellowship training program. Dr. Hayakawa is an active member and participant of the CSPS, GAM, and the ASRM and is frequently invited to speak on expert panels and provide instructional courses. He has also been a board examiner for the Royal College of Physicians and Surgeons for the past 10 years.

Dr. Hayakawa received his training in microsurgery at the Harry Buncke Microsurgical Institute in San Francisco, California, and is a member of the Harry J. Buncke Society. He also completed a cosmetic / facial aesthetic fellowship with Dr. Robert Flowers, at the Plastic Surgery Institute of the Pacific, Honolulu, Hawaii.

Dr. Hayakawa has accumulated over 100 peer reviewed articles, presentations, and invited lectureships. He has also contributed to several textbook chapters on the topic of microsurgery.

AGENDA

7:30 – 8:00 a.m.	**Registration & Breakfast with the Sponsors** (Cherry Room & Nutrition Hub)
8:00 – 8:05	Welcome and Introductions (Amphitheatre A)
8:05 – 8:35	Dr. Tom Hayakawa, Visiting Professor *"Functional Sarcoma Reconstruction"*
8:35 – 8:45	DISCUSSION
8:45 – 8:53	Dr. Stacy Fan (PGY1) *"Outcomes of immediate alloplastic breast reconstruction in patients receiving post-mastectomy radiation therapy"*
8:53 – 9:01	Dr. Katie Garland (PGY1) *"Comparison of One-Year Alveolar Gap Outcomes in Patients With and Without Latham Appliance"*
9:01 – 9:09	Dr. Spencer Chambers (PGY2) *"The Impact of Scaphoid Malunion on Carpal Kinematics: A Biomechanical Analysis"*
9:09 – 9:20	DISCUSSION
9:20 – 9:28	Dr. Jesse Hackett (PGY2) *"Perimeter Margin Staged Excision for Aggressive BCC Subtypes"*

AGENDA

9:28 – 9:36	Dr. Kathleen Nelligan (PGY3) *"Saline Versus Silicone Implants in Breast Reconstruction: A Cost-Utility Analysis"*
9:36 – 9:44	Dr. Kitty Wu (PGY3) *"Developing a 3D bio-artificial tissue model for breast capsular contracture"*
9:44 – 10:00	DISCUSSION
10:00 – 10:30	**Morning Break with the Sponsors** (Cherry Room & Nutrition Hub)
10:30 – 11:00	Dr. Haemi Lee, Visiting Alumna *"Back to the Future: What I would Tell My Younger Self"*
11:00 – 11:08	Dr. Jessica Truong (PGY4) *"Patterns of peripheral nerve injury in shoulder dislocations"*
11:08 – 11:15	DISCUSSION
11:15 – 11:23	Dr. Troy Ng (PGY5) *"Mastectomy flap necrosis after nipple-sparing mastectomy and immediate implant-based reconstruction: Exploration of predictive variables contributing to operating room times"*
11:23 – 11:31	Dr. Christine Nicholas (PGY5) *"Resident Perceptions & Preferences of Final Examinations After Competence by Design"*

AGENDA

11:31 – 11:40	DISCUSSION
11:40 – 12:25 p.m.	Dr. Tom Hayakawa, Visiting Professor *"Strategic thinking in Microsurgery"*
12:25 – 12:45	**DISCUSSION & WRAP UP/EVALUATIONS** *(Please place completed evaluations in box at Registration desk)*
12:45 – 1:30 p.m.	**Lunch with the Sponsors** (Cherry Room & Nutrition Hub)

PLASTIC SURGERY RESIDENTS

Dr. Stacy Fan (PGY1)
Dr. Katie Garland (PGY1)
Dr. Spencer Chambers (PGY2)
Dr. Jesse Hackett (PGY2)
Dr. Kathleen Nelligan (PGY3)
Dr. Kitty Wu (PGY3)
Dr. Jessica Truong (PGY4)
Dr. Troy Ng (PGY5)
Dr. Christine Nicholas (PGY5)

ABSTRACTS

Outcomes of immediate alloplastic breast reconstruction in patients receiving post-mastectomy radiation therapy

Stacy Fan, Kara Ruicci, Tanya DeLyzer

Background: The most common type of breast reconstruction is alloplastic-based. Post-mastectomy radiation therapy (PMRT) has been shown to increase complication rates and contribute to poorer aesthetic outcomes. The purpose of this study was to look at complication rates and outcomes of patients that have undergone one-stage or two-stage immediate alloplastic breast reconstruction and require PMRT at LHSC/SJHC.

Methods: Institutional research ethics board approval was obtained. We identified patients who underwent one-stage or two-stage immediate alloplastic breast reconstruction over a 10-year period from January 1, 2009 to January 1, 2019 by six Plastic Surgeons at LHSC/SJHC. Patients who had concurrent autologous reconstruction, prophylactic mastectomy, or non-chest wall radiation were excluded from our study. We obtained data on patient demographics, breast reconstruction, and complications including infection, wound dehiscence, implant exposure, capsular contracture, revision surgery, and reconstructive failure (explantation). Complication rates were then compared between those receiving radiation to tissue expander versus implant using Fisher's exact test.

Results: A total of 440 patients were identified from the Plastic Surgeon schedules and an additional 278 from the General Surgeon schedules. Thirty-six patients (5-8.2%) fit our inclusion criteria of either one-stage or two-stage immediate alloplastic breast reconstruction and chest wall PMRT. Of those, 24 patients underwent radiation to implants and 11 patients to tissue expanders. Complication rates were similar between groups for all complications including infection (8.3% vs. 0%, p=1), wound dehiscence (4.2% vs. 9.1%, p=0.54), capsular contracture (41.7% vs. 18.2%, p=0.43), implant exposure (4.2% vs. 9.1%, p=0.54), revision surgery (8.3% vs. 9.1%, p=1), and reconstructive failure (37.5% vs. 27.3%, p=1).

Discussion: Overall complication rates in patients undergoing immediate alloplastic breast reconstruction and receiving PMRT at LHSC/SJHC are similar to the literature (45.8% in implant-radiated group vs. 36.4% in tissue expander-radiated group). Complication rates for infection, wound dehiscence, capsular contracture, implant exposure, revision surgery, and reconstructive failure were similar between those who received radiation to their implants and to tissue expanders, which may be secondary to inadequate power due to small sample size.

Comparison of One-Year Alveolar Gap Outcomes in Patients With and Without Latham Appliance

Katie Garland, Jessica Truong, Damir Matic

Purpose: Patients born with cleft lip and palate with an alveolar gap of larger than 4mm are often treated with pre-surgical infant orthopedic (PSIO) devices before cleft lip repair in an attempt to improve the outcome of the lip and nasal reconstruction. This treatment is undertaken at 6 weeks of age and can include an active device (eg. Latham appliance). It has been postulated that the active nature of this device which moves the palatal segments closer together may be associated with a growth disturbance potentially through pre-maxillary suture fusion/necrosis. The purpose of this study is to assess whether there is a difference in alveolar gap between patients treated with the active device compared to no device at the time of palate repair, 9 months after formal lip repair.

Methods: A consecutive series of 48 patients with unilateral cleft lip from a single surgeon's practice were examined. Horizontal and vertical measurements of the alveolar gap were taken before appliance and 9 months post pre-surgical orthodontics from 2000-present. Measurements were taken from pre-device molds as well as from patient charts.

Results: Of the 48 patients, 33 received Latham devices and 15 received no device. Latham patients had a 75% and 90% decrease in vertical and horizontal gap measurements respectively between initial measurements and at time of palate repair. Patients with no device had a 52% and 94% respectively. There was no statistically significant difference between alveolar gap measurements at 9-month follow up between those treated with PSIO and no PSIO.

Conclusions: There does not appear to be any difference in alveolar gap measurements at 9 months between patients treated with active PSIO versus no PSIO. Ongoing data collection and analysis will examine the long-term facial morphology changes in these patient populations.

The Impact of Scaphoid Malunion on Carpal Kinematics: A Biomechanical Analysis

Spencer Chambers, Nina Suh, James Johnson, Clare Padmore

Introduction: The clinical significance of scaphoid malunion is controversial as the biomechanical sequelae remains poorly understood. In this cadaveric study, the effect of increasing scaphoid malunion on carpal motion was assessed.

Purpose: To determine the kinematics of the scaphoid, lunate, capitate, trapezoid, and trapezium during unconstrained simulated wrist flexion/extension and to examine the effect of increasing simulated malunion on carpal bone kinematics.

Materials and Methods: Four (4) cadaveric upper extremities were tested in an active wrist simulator with loads applied to the wrist flexors/extensors (**Figure 1**). Scaphoid, lunate, capitate, trapezium, and trapezoid kinematics were captured using optical tracking and analyzed with respect to the radius. Each specimen was simulated in its native state to collect baseline data. Severities of malunion from 10°- 30° were simulated by creating a wedge osteotomy in the volar cortex of the scaphoid and fixating the resultant fragments using two Kirshner wires. The resultant motion paths where then recorded.

Results: There is a trend towards increasing lunate flexion associated with increasing scaphoid malunion.

Conclusion: In this interim sample study analysis there are secondary alterations to lunate motion that may signify carpal instability. Clinical significance of this motion alteration is yet to be elucidated, but this model serves as a basis for understanding the kinematic consequences of scaphoid humpback deformities.

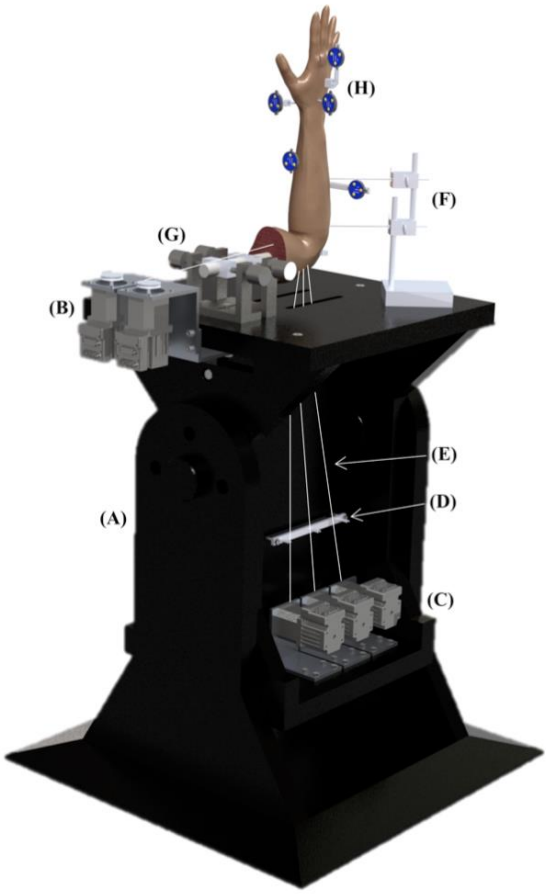

Figure 1: In Vitro Active Motion Simulator. This device is capable of loading the seven muscle groups of interest to simulate active wrist flexion-extension and radial-ulnar deviation: (A) simulator platform; (B) biceps brachii SmartMotor; (C) motor manifold used to control the magnitude of forces applied to the muscle group of interest; (D) cable guide rail used to converge the suture lines from the motor manifold the specimen; (E) suture cables connecting SmartMotors to the muscle group of interest; (F) ulnar support tower fixing the specimen at 90° of flexion; (G) humeral clamp rigidly fixing the specimen to the simulator; and (H) Optotrak six DOF tracking markers.

Perimeter Margin Staged Excision for Aggressive BCC Subtypes

Jesse Hackett, Aaron Grant

Introduction: Basal Cell Carcinoma (BCC) is the most common form of skin cancer in Canada and its treatment is a significant aspect of many Plastic Surgeons' practice. Aggressive histological subtypes of BCC are known to have a higher rate of incomplete resection with standard surgical excision and as a result often require multiple procedures with greater morbidity to the patient. While Moh's Microsurgery (MMS) is the gold standard for excision of high-risk lesions, it is not widely available and thus not a viable option for many patients. A technique that employs the mapping of peripheral cutaneous margins – Perimeter Margin Staged Excision - has been demonstrated to be effective at decreasing recurrence rates in other aggressive cutaneous malignancies. The purpose of this study was to assess the utility of applying Perimeter Margin Staged Excision for aggressive subtypes of BCC.

Methods: A multi-database literature review was conducted to assess the prior use of this technique in aggressive subtype BCC. A prospective case series of a single surgeon's experience with Perimeter Margin Staged Excision in 24 patients is described.

Results: No prior study has evaluated the advantage of Perimeter Margin Staged Excision in the treatment of aggressive subtype BCC. Our data demonstrate an initial incomplete excision rate of 37.5% with 9 patients requiring a second perimeter excision. Of those 9 patients, 6 had a negative margin on second excision while 2 required a third stage and 1 patient opted for radiotherapy. No recurrences were diagnosed during the length of follow-up.

Discussion: No previous work has demonstrated the value of Perimeter Margin Staged Excision in the treatment of aggressive subtypes of BCC. This study supports its use as a viable alternative to standard surgical excision where Moh's microsurgery is not readily available. Further work may establish this technique as providing improved patient outcomes with higher long-term cure rates compared to standard excision.

Saline Versus Silicone Implants in Breast Reconstruction: A Cost-Utility Analysis

Kathleen Nelligan, Sisira Sarma, Douglas Ross, Christopher Doherty

Purpose: While the rates of implant-based breast reconstruction are increasing, it is known that saline and silicone implants vary in complication rates, initial cost and associated quality of life. However, the relative cost-effectiveness of these implant types is not known. The purpose of this study is to examine the cost-utility of saline and silicone implants in the context of immediate, unilateral, implant-based reconstruction.

Method: A cost-utility analysis comparing saline and silicone implants was conducted from the perspective of the Ministry of Health and Long-Term Care. Health states, probabilities and utilities were derived from the literature. Costs were obtained from institutional case-costing and purchasing centres. A decision tree model developed in TreeAge Pro was populated with probabilities, costs and QALYs. Expected values were generated through the roll-back method. Costs and QALYs were discounted at 3% per year to account for future values. The willingness-to-pay threshold was set at $50K/QALY to be comparable with published cost-utility analyses.

Results: The cost-utility analysis revealed an incremental cost of $103.63 associated with the use of silicone implants and a gain of 0.89 QALYs. The incremental cost-utility ratio was $116.51 per QALY for silicone implants. Silicone implants remained cost-effective through sensitivity analyses varying implant complication and discounting rates.

Conclusions: Silicone implants are cost-effective for implant-based breast reconstruction. Given the improved quality of life-associated with silicone implants and only a marginal increase in cost, this analysis supports continued use of silicone implants despite higher initial cost. This analysis may be beneficial to physicians, policy-makers and hospital administrators when justifying choice of implant in the context of breast reconstruction.

Developing a 3D bio-artificial tissue model for breast capsular contracture

Kitty Wu, Ana Maria Pena Dias, David O'Gorman,
Eva Turley, Tanya DeLyzer

Introduction: Breast capsular contracture is an unpredictable and difficult complication in implant-based breast reconstruction. There is a paucity of non-surgical treatment options, in part due to the lack of human pre-clinical models for capsular contracture. The objective of this study is to develop a 3D bio-artificial tissue (BAT) model of capsular contracture and test the efficacy of an anti-fibrotic RHAMM function blocking peptide (NPI-110).

Methods: Seven breast capsular tissue samples from seven patients undergoing capsulectomy or implant exchange were collected and classified according to Baker grade. Capsular tissue was sectioned and incubated in DMEM media to allow outgrowth of primary fibroblasts. The FlexCell TissueTrain system was used to create bio-artificial collagen 1 tissue cords. 3 x 10^5 primary fibroblasts from grade 1 and grade 4 cells were embedded into each cord and contraction measured over 14 days. Contracture was then measured over 14 days with the application of 20uM of peptide NPI-110 on day 0 and then 5uM on days 4 and 8 in grade 1 and grade 3 primary fibroblast-embedded cords.

Results: The BAT model reproduces the increased contractility of grade 4 fibroblasts, which demonstrate ongoing cord contractility over 14 days. Grade 1 and 4 cells contract to 50% of control cords by day 2; however, grade 4 cells demonstrate ongoing contraction until day 14 whereas Grade 1 cells plateau after day 9. Peptide testing did not demonstrate any difference between Grade 1 and Grade 3 cells with or without treatment at any time point.

Conclusions: The bio-artificial tissue model accurately replicates enhanced contractility of grade 4 capsular fibroblasts and presents a robust pre-clinical model with applications in future anti-fibrotic peptide testing and personalized medicine. Future experiments will include optimization of peptide dosing and timing.

Patterns of peripheral nerve injury in shoulder dislocations

Jessica Truong, Thomas Miller, Christopher Doherty, Douglas Ross

Purpose: Nerve injuries associated with shoulder dislocations significantly prolong and impair recovery. The patterns of nerve injury and their outcomes as they relate to shoulder dislocation are poorly described in current literature. The purpose of this study is to investigate the patterns of nerve injury after shoulder dislocation, the factors (eg. age, sex, time to reduction, repeat dislocation) which are associated with different patterns, and how the aforementioned contribute to clinical outcomes.

Methods: A retrospective chart review was conducted of a specialized peripheral nerve group practice (Peripheral Nerve Clinic, St. Joseph's Health Care, London, ON). Charts of patients who were treated between 2008 and 2018 with a peripheral nerve injury in association with shoulder dislocation were identified. Demographic data, patterns of injury, and clinical outcome in the form of EMG, MRC grade, and clinical notes were extracted.

Results: 216 patients were identified as having a shoulder injury with associated nerve injury, 43 of these suffered a dislocation. Of those, 43.6% suffered an anterior dislocation, 41.0% had an associated fracture, and 41.0% had an associated rotator cuff tear. Age greater than 60 was associated with multiple nerve injuries, whereas age less than 40 (33.3% of patients) was associated with isolated axillary nerve injuries. Overall, 51.3% had pan plexus injuries or at least two nerves involved, and 30.8% went on to have reconstructive nerve surgery predominantly in the form of nerve transfers.

Conclusions: Shoulder dislocations may be associated with significant nerve injuries. Older patients suffer more complex nerve injuries which may significantly affect global upper extremity function. Nearly one third of these patients will require surgical intervention.

Mastectomy flap necrosis after nipple-sparing mastectomy and immediate implant-based reconstruction: Exploration of predictive variables contributing to operating room times

Troy Ng, Christopher Doherty, Muriel Brackstone

Introduction: Immediate breast reconstruction following nipple-sparing mastectomy is increasing in popularity as an option for a specific patient population. Previously, this study compared outcomes between two different mastectomy techniques; in this stage, the focus turned to the identification of factors potentially affecting operating times.

Methods: Consecutive patients who underwent mastectomy with immediate reconstruction with either expander or implant over a 36-month period were reviewed. A one-month washout period was observed before and after the sharp dissection technique was introduced. All mastectomies were performed by one of seven experienced general surgeons. Demographic, oncologic, and perioperative details were recorded. Assessment of possible predictive variables affecting operative times and case times was done through statistical analysis on STATA. Student t, ANOVA, and Pearson correlation tests were used where appropriate.

Results: 116 breasts (62 patients) met inclusion criteria for review. Comparison of the cautery and sharp techniques showed a significant difference in both procedure time (202.9 vs 183.5 min; $p = 0.03$) and case time (244.5 vs 222.2 min; $p = 0.02$). Analysis of each group separately did not reveal any factors significantly affecting operating times aside from the use of textured anatomic implants in a small number of patients in the cautery group ($p = 0.01$).

Conclusions: In cases of nipple-sparing mastectomy and immediate breast reconstruction, operating room efficiency may be improved through use of the sharp dissection technique as opposed to electrocautery. Further data gathering and analysis may reveal other possible contributory factors.

Resident Perceptions & Preferences of Final Examinations After Competence by Design

Christine Nicholas, Logan McGinn, Douglas Ross

Introduction: Competency by Design (CBD) is an outcomes based curriculum being introduced to Plastic Surgery training in July 2020. As part of this change, modifications will be required in the final assessment period. The purpose of this study was to determine resident's perspectives on examination timing and additionally determine the impact of these exams on psychological, emotional and scholarly functioning.

Methods: An online questionnaire was developed by the senior author with input from the other authors. This survey was distributed to all program directors across the country in addition to the two previous years of final residents. The response period was over one month in early 2019.

Results: 115 responses were obtained from an estimated 166 candidates. 38% of respondents had completed their exam. A majority of residents were either vaguely or not aware at all of the changes to examination timing, structure and addition of a Transition to Practice component which would take place with the change to CBD. In regards to stress, 36% found the examinations to be unnecessarily stressful while almost 60% of respondents felt the exams impacted their wellbeing to varying degrees. Most residents agreed that examinations should begin in late PGY4 to early PGY5 and finish in the fall of PGY5.

Discussion: Although changes in the plastic surgery training program are coming, many residents are not aware. Education on changes to come is required. The impacts of these changes on pursuing fellowships and skill acquisition still needs to be explored. Additionally, there exists opportunities to explore avenues to improve the psychological effect of the examination on residents.

Notes

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Plastic Surgery Resident Research

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