DIVISION OF PLASTIC SURGERY
ANNUAL RESIDENT RESEARCH DAY

Friday, June 2nd, 2017

King’s University College
266 Epworth Avenue, London
King Student Life Centre
The Educational Foundation of the Canadian Society of Plastic Surgeons has provided a Continuing Medical Education Grant in support of our program.
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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.
Robertson Harrop, MD, MSc, FRCS(C), FACS

Dr. Rob Harrop is a pediatric plastic surgeon at the Alberta Children’s Hospital and is Head of the Section of Plastic Surgery at the University of Calgary. He is a clinical Associate Professor in the Department of Surgery. He has special interest and expertise in microsurgery, peripheral nerve surgery, and complex congenital hand surgery.

Dr. Harrop completed medical school at Queen’s University, did a rotating internship at the Calgary General Hospital and then did his plastic surgery residency at the University of Alberta. During his residency he completed an MSc in wound healing molecular biology under the supervision of Dr. Ted Tredget. Following his residency he did a cosmetic surgery fellowship with Dr. Lloyd Carlson in Toronto and a pediatric plastic surgery fellowship at the Hospital for Sick Children at the University of Toronto. Upon his return to Calgary, he completed an MSc in Clinical Epidemiology at the University of Calgary, studying population health.

He is on staff at the Alberta Children’s Hospital and Foothills Medical Centre. He is a member of the EQuiS (Efficiency, Quality, Innovation and Safety) Research Group at the Alberta Children’s Hospital which studies strategies to improve outcomes in children undergoing surgery. He has served as research director for both the Section of Plastic and the Department of Surgery at the University of Calgary. He has been the head of the Section of Plastic Surgery at the University of Calgary since 2013. Dr. Harrop holds executive positions with the Alberta Society of Plastic Surgeons, the Educational Foundation of the Canadian Society of Plastic Surgeons and the Board of the Canadian Society of Plastic Surgeons. When not working he enjoys time with family, skiing, hiking and learning to play Flamenco guitar (with greater emphasis on the “learning” than the “play”ing).
### AGENDA

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<tr>
<td>7:30 – 8:00 a.m.</td>
<td><strong>Breakfast</strong> with the Sponsors (Learning Commons)</td>
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<td>8:00 – 8:05</td>
<td>Welcome and Introductions (Room KC004)</td>
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<tr>
<td>8:05 – 8:35</td>
<td>Dr. Rob Harrop, Visiting Professor</td>
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<tr>
<td></td>
<td>“The ‘Minor Surgery Clinic’: ‘Doing More Than You Think with Less Than You Think’”</td>
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<tr>
<td>8:35 – 8:40</td>
<td><strong>DISCUSSION</strong></td>
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<td>8:40 – 8:48</td>
<td>Dr. Kathleen Nelligan (PGY1)</td>
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<td>“Does a periareolar incision for cardiac surgery improve patient scar satisfaction?”</td>
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<td>8:48 – 8:56</td>
<td>Dr. Kitty Wu (PGY1)</td>
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<td>“An Anthropometric Assessment of Proximal Hamate Autograft for Scaphoid Proximal Pole Reconstruction”</td>
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<td>8:56 – 9:04</td>
<td>Dr. Logan McGinn (PGY2)</td>
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<td>“Four-Corner Fusion in SLAC &amp; SNAC Wrist: Does Fixation Method Really Make A Difference?”</td>
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<td>9:04 – 9:10</td>
<td><strong>DISCUSSION</strong></td>
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9:10 – 9:18  Dr. Jessica Truong (PGY2)  
“The Promotion of Adipogenesis in a Rat Model of Radiation Induced Fibrosis of the Mammary Fat Pad”

9:18 – 9:26  Dr. Troy Ng (PGY3)  
“Prospective evaluation of reverse end-to-side anterior interosseous nerve to ulnar nerve transfer for severe compressive ulnar neuropathy at the elbow: A preliminary analysis of demographic and baseline data to date”

9:26 – 9:34  Dr. Christine Nicholas (PGY3)  
“Does Extensor Tenolysis/Dorsal Capsulectomy Improve Function Following Injury? A Retrospective Review”

9:34 – 9:45  DISCUSSION

9:45 – 10:15  Morning Break with the Sponsors (Learning Commons)

10:15 – 10:45  Dr. Toni Zhong, Visiting Alumna  
“From Breast Health to Population Health to Global Health: The Evolution of my Research in the last Decade“

10:45 – 10:53  Dr. Ashley Kim (PGY4)  
“A case series of Syrian Refugees treated at the Hand and Upper Limb Centre”
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<tr>
<td>10:53 – 11:00</td>
<td>DISCUSSION</td>
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<td>11:00 – 11:08</td>
<td>Dr. Emily Liu (PGY4)</td>
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<td>“Effect of Hand-Dominance and Elbow Position on Prosupination Strength”</td>
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<td>11:08 – 11:16</td>
<td>Dr. Caitlin Symonette (PGY4)</td>
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<td>“Active individuals &gt;65 years old do not have an increased odds of a poor outcome following distal radius fracture”</td>
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<tr>
<td>11:16 – 11:24</td>
<td>Dr. Kathryn Sawa (PGY5)</td>
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<td>“Inter-rater Reliability of Radiographic Proximal Phalanx Fracture Angulation”</td>
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<td>11:24 – 11:30</td>
<td>DISCUSSION</td>
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<tr>
<td>11:30 – 12:15 p.m.</td>
<td>Dr. Rob Harrop, Visiting Professor</td>
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<td>“Unexpected Places to which Plastic Surgery has Taken Me”</td>
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<td>12:15 – 12:30</td>
<td>DISCUSSION &amp; WRAP UP/EVALUATIONS</td>
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<td>12:30 – 1:15 p.m.</td>
<td>Lunch with the Sponsors</td>
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<td>(Learning Commons)</td>
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PLASTIC SURGERY RESIDENTS

Dr. Kathleen Nelligan (PGY1)
Dr. Kitty Wu (PGY1)
Dr. Logan McGinn (PGY2)
Dr. Jessica Truong (PGY2)
Dr. Troy Ng (PGY3)
Dr. Christine Nicholas (PGY3)
Dr. Ashley Kim (PGY4)
Dr. Emily Liu (PGY4)
Dr. Caitlin Symonette (PGY4)
Dr. Kathryn Sawa (PGY5)
ABSTRACTS
Does a periareolar incision for cardiac surgery improve patient scar satisfaction?

Nelligan K, Chu M, and Grant A

Background: Traditional incisions for cardiac surgery such as median sternotomy and lateral thoracotomy have significant cosmetic limitations. Recently, periareolar incisions have been proposed as an alternative and more cosmetically acceptable approach for minimally-invasive cardiac surgery but no studies have assessed patient scar satisfaction with this approach.

Rationale: Collaborate across surgical specialties to improve patient satisfaction and cosmesis in cardiac surgery by determining if periareolar incisions result in improved patient scar satisfaction.

Methods: Females 18-80 years of age who underwent cardiac surgery between 2011-2016 through median sternotomy, lateral thoracotomy or periareolar incision were invited to complete a telephone survey on scar satisfaction. Baseline demographics were obtained by patient report and chart review. Outcomes assessed included patient scar satisfaction, patient-perceived scar appearance, scar symptoms and complications. Two-tailed Fisher Exact test was used to compare frequencies.

Results: Seven females were recruited of whom 71% had periareolar incisions and 29% had lateral thoracotomies. The average age was 39.4 years and average time from surgery was 24.5 months. There were no wound-related complications in the early post-operative period. Overall, patient satisfaction was high in both groups. In the periareolar group, 80% of patients were very satisfied as compared to 50% in the lateral thoracotomy group but this difference did not reach statistical significance (p = 1). All patients in the periareolar group perceived their scar appearance as excellent, compared to 50% in the lateral thoracotomy group (p = 0.25) Three patients reported scar-related symptoms including itchiness, numbness and paresthesias.

Conclusions: Both periareolar incisions and lateral thoracotomy were associated with high scar satisfaction. Most participants felt that their scar appearance was excellent. This study was limited by small sample size and retrospective design. A larger prospective study with standardized assessment time-points is required to better describe scar satisfaction with periareolar incisions in this population.
An Anthropometric Assessment of Proximal Hamate Autograft for Scaphoid Proximal Pole Reconstruction

Wu K, Padmore C, Lalone E, and Suh N

Purpose: Scaphoid non-union and avascular necrosis following proximal pole fractures presents a difficult surgical problem. This anthropometric study assesses the fit of the ipsilateral proximal hamate for use as autologous bone graft for scaphoid proximal pole reconstruction.

Methods: Twenty-nine cadaveric specimens (15 males, 14 females; mean age 70 ± 11.28 years) underwent computed tomography and 3D reconstruction of the scaphoid and hamate. The length of the scaphoid was measured (Mimics Materialise NV, Belgium) and a third of the length was used to delineate the proximal scaphoid and hamate to simulate a proximal third scaphoid fracture and hamate autograft. Using computational modelling, the proximal scaphoid and hamate were divided into 6 sections for comparison: dorsal, middle, and volar radioscpahoid, and dorsal, middle, and volar scaphocapitate segments. These 6 areas were compared using an iterative point-to-point distance algorithm to determine average distance between the surfaces of the proximal hamate and proximal scaphoid.

Results: The mean length of the scaphoid was 27.9mm ± 2.7mm and the mean length of the divided proximal pole and proximal hamate was 9.3mm ± 0.93mm. The mean absolute distance between the graft and native scaphoid was smallest in the middle scaphocapitate (0.508mm ± 0.195 mm), volar scaphocapitate (0.546mm ± 0.266mm), and middle radioscpahoid segments (0.557mm ± 0.407mm). Meanwhile, the mean distance was largest in the dorsal scaphocapitate (0.675mm ± 0.295mm), volar radioscpahoid (0.736mm ± 0.290mm), and dorsal radioscpahoid segments (0.751mm ± 0.316mm). Females had smaller average absolute distances in all sections as compared to males (p<0.05). Furthermore, the hamate was undersized in the volar radioscpahoid (73.5%), volar scaphocapitate (71.0%), and dorsal scaphocapitate segments (55.7%) and oversized in the middle radioscpahoid (61.7%), middle scaphocapitate (53.7%), and dorsal radioscpahoid segments (51.3%).

Conclusions: The proximal hamate is a suitable anthroprometric autograft for scaphoid proximal pole reconstruction. The mean distances between proximal hamate autograft and native scaphoid were largest in the dorsal scaphocapitate, volar radioscpahoid, and dorsal radioscpahoid segments suggesting these areas would require osteotomy to achieve adequate fit.
Hypothesis: Four-corner fusion (4CF) has traditionally been reported to have a higher complication rate with similar functional outcomes as the PRC. To date, there have been limited comparisons that specifically focus on whether the fusion method utilized in 4CF affects functional outcomes and complication rates. In this study, we explored the differences in outcomes of two different fixation methods in 4CF and how these compare to traditionally reported 4CF outcomes in the literature.

Method: A retrospective chart review was conducted to compare headless compression screw (HCSF) versus staple fixation (SF) in four-corner fusion for SLAC or SNAC wrist in a single surgeon’s practice over a ten-year period. Primary functional outcomes included pre- versus post-operative flexion-extension arc and grip strength, complication rate and time to fusion. Two-tailed T-tests were used to compare the outcomes of HCSF and SF methods. The Chi-squared test was used to evaluate the complication rates associated with each method.

Results: Sixty-nine patients were identified; 38 patients were treated with HCSF and 31 with SF. The majority of patients were male (83%) with an average age of 60.2 years and 53.3 in the HCSF & SF groups, respectively. Patients were followed on average for a 10-month period. HCSF patients had improved flexion arc post-operatively (108% of pre-operative arc), whereas SF patients lost an average of 23.8% of their pre-operative range. Grip-strength was improved in both groups. A statistically significant higher complication rate was associated with SF (45%) versus HCSF (13.2%). Hardware irritation/pain (7), delayed union (4) and nonunion (1) were the most common complications of SF, where as neuropaxia (2) and hardware failure (2) were the most common complications associated with HCSF. The higher complication rate and equivocal functional outcomes traditionally reported for 4CF may be associated with specific fixation methods such as the SF.

Conclusions: Patients with SLAC and SNAC wrist undergoing 4CF with headless compression screw fixation have better arc of motion and a lower complication rate than those treated with staple fixation. Although various fixation methods are available for 4CF, functional outcomes and complication rates are inconsistent among these methods. The literature reports 4CF as having a higher complication rate than PRC, however, various fixation options are utilized in 4CF and may be a key factor contributing to this discrepancy.
The Promotion of Adipogenesis in a Rat Model of Radiation Induced Fibrosis of the Mammary Fat Pad

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

Purpose: Radiofibrosis of breast tissue ultimately compromises breast tissue reconstruction by interfering with tissue viability and healing; autologous fat transfer has recently been shown to reduce radiotherapy-related tissue injury, thought to be attributed to the presence of adipose-derived pluripotent stem cells. We have identified a novel gene HMMR/RHAMM, whose expression decreases adipogenesis and increases fibrosis. We have developed RHAMM peptide mimetics (NPI-0110) to block RHAMM signalling, and it is thought that the injection of such a peptide will promote adipogenesis and decrease fibrosis in mammary tissue in rats.

Method: High frequency ultrasound was used to assess volume through thickness measurements and 3D reconstruction of mammary fat pads in 20 retired breeder female rats that were non-irradiated, irradiated, treated, and not-treated with peptide NPI-0110 at days 0, 7, 14, and 21. Rats were euthanized at Day 21, and mammary fat pad tissues were processed for expression of fibrotic and adipogenetic markers using real-time polymerase chain reaction and immunohistochemistry.

Results: Volume estimates of fat pad and expression of fibrotic markers such as Collagen-1, Collagen-3, and TGFß-1, and adipogenetic markers such as PPARγ and adiponectin are potentially ameliorated by peptide NP-110 and radiotherapy when quantified via qPCR and immunohistochemistry.

Conclusions: Results from this study may aid in therapies in the human patient population which decrease the significant morbidity associated with a very challenging and common clinical problem – reconstruction in previously radiated beds in general and breast cancer specifically.
Prospective evaluation of reverse end-to-side anterior interosseous nerve to ulnar nerve transfer for severe compressive ulnar neuropathy at the elbow: A preliminary analysis of demographic and baseline data to date

Ng T, Doherty C and Ross D

Introduction: Severe ulnar nerve compression at the elbow is a common and potentially debilitating condition for patients. Surgical intervention has thus far yielded inconsistent results, particularly with regard to reinnervation of the hand intrinsic muscles. More recently, reverse end-to-side transfer of the anterior interosseous nerve to the ulnar nerve has shown promise as a method of “supercharging” the nerve recovery process. This study seeks to prospectively compare outcomes of patients receiving this newer surgical technique versus those receiving the current standard of care.

Methods: This is a single-centre, prospective, randomized control study. Patients over 18 years old with severe (McGowan Grade III) compressive neuropathy at the elbow will be randomized to one of two treatment arms. Demographic, clinical, and electrodiagnostic data will be collected at baseline and at multiple visits up to 2 years postoperatively. Univariate analysis will be performed to compare the outcomes of the two study groups.

Results: Twelve patients have been enrolled to date, with 9 randomized to the nerve transfer group and 3 to the transposition alone group. Comparison of demographic data, baseline questionnaire results, and preoperative strength testing did not show significant differences between the two treatment arms. Limited postoperative data indicate improvement in patient reported symptoms.

Discussion: Analysis of the data obtained to date indicates no statistically significant differences between the two subgroups and relatively early clinical improvement postoperatively. Further steps include further patient recruitment, ongoing follow-up, and incorporation and analysis of electrodiagnostic data.
Does Extensor Tenolysis/Dorsal Capsulectomy Improve Function Following Injury? A Retrospective Review

Nicholas C and Ross D

Introduction: Extensor tendon adhesions and dorsal capsular contracture of the PIP joint often pose issues with function following injuries in the hand. Specifically, they can limit the patient’s flexion. The purpose of this study was to determine whether extensor tenolysis +/- capsulectomy resulted in a significant change in post-operative function and whether it had an impact on extension. Additionally, different variables were assessed to determine their impact on change in flexion.

Methods: Over a 5 year period from 2011-2016, one surgeon’s practice was reviewed and any operative procedures for extension contracture were included. These patients’ records were then analyzed and assessed for their preoperative and post operative function. Nature of the injury, timing, use of CPM and details of hand therapy were also collected.

Results: 34 patients and 38 fingers were included with complete data available for 33. The mean flexion before surgery was 38° and following surgery 68° (p<0.001). There was no statistically different change in extension. Patients with postoperative CPM had a larger change in flexion (40° vs. 23°) although this was not statistically significant. Additionally, there was a greater change in flexion following release of PIP joints vs. MCP joints.

Discussion: As expected, dorsal release results in improved flexion for patients following injury with no clinically significant deterioration in extension. This procedure appears to be most effective when addressing contractures of the PIP joint. The use of CPM may help to further improve patient’s performance.
A case series of Syrian Refugees treated at the Hand and Upper Limb Centre

Kim A and Doherty C

Introduction: The conflict in Syria which began in 2011 has caused widespread displacement of over 5 million Syrian refugees. Since November 4, 2015, Canada has resettled 40,081 Syrian refugees and over 1500 are in London, Ontario. Several have been referred to the Hand and Upper Limb Centre for upper extremity injuries sustained during the Syrian conflict, many of which are as a result of war related trauma. This is a descriptive study on this patient population and highlights the unique challenges faced during consultation.

Methods: A retrospective review was performed of seven consecutive patients from Syria referred to the Hand and Upper Limb Centre. A qualitative study on the Syrian refugee experience was also performed with an open-ended interview at the Cultural Competency Learning Centre in London, Ontario.

Results: Delayed presentation of incompletely treated injuries is common. Themes of language barriers, cultural values and psychological factors of refugees post-resettlement are highlighted.

Conclusion: An understanding of the Syrian crisis and subsequent migration, as well as an awareness of unique cultural and health values is crucial in our ability to provide adequate care to this patient population.
Effect of Hand-Dominance and Elbow Position on Prosipination Strength

Liu E, Doherty C, Ross D

Introduction: Pronation movements are generated by the pronator quadratus and pronator teres muscles. The pronator quadratus muscle is denervated in anterior interosseous to ulnar nerve end-to-side transfer, and the resultant impact on pronation strength has not been investigated in the literature. This study aims to develop normative values of pronation and supination strength, and to understand the impact of hand-dominance and elbow position. A sample of patients who have undergone anterior interosseous nerve transfer will be compared to normative data, to evaluate the effect of pronator quadratus denervation on prosipination strength.

Methods: Twenty right-handed volunteers with no history of upper-extremity trauma or neuropathy were recruited for the study. Volunteers underwent standardized physical assessments using the Biodex Dynamometer. Isokinetic testing was established at a velocity of 60 degrees/second, and participants completed five repetitions of pronation strength testing for each set. Four sets were conducted in total: in both extremities, and with the elbow in full extension and flexed to 90 degrees. Peak prosipination torque values were measured, and ratios were calculated between non-dominant and dominant sides. Angle of peak torque was measured to understand the relationship between forearm position and maximum torque generation.

Results: Ten males and ten females participated in the study (n=20). Mean peak pronation values with the elbow in 90 degrees of flexion were 7.96 N·m for the dominant extremity, and 7.96 N·m for the non-dominant extremity (p=0.997). Male pronation and supination peak values were significantly higher than female values. For supination testing, mean peak torque values with the elbow flexed were 7.09 N·m for the dominant side, and 6.17 N·m for the non-dominant (p=0.38). Peak torque values decreased with the elbow in extended position for both pronation and supination measurements. Peak pronation torques in the same participant were highly correlated between the flexed and extended positions of the elbow (r = 0.926), and when comparing the dominant and non-dominant extremities (r=0.882 flexed, r=0.932 extended). Non-dominant to dominant ratios did not suggest differences in pronation values between extremities (mean = 1.04, elbow flexed; and mean=0.90, elbow extended). Larger differences were observed in supination values (mean=0.90, elbow flexed; mean=0.77, elbow extended). Peak pronation torques were generated with the forearm in the supinated position, and peak supination torques occurred in a pronated position.

Conclusion: Peak torque values are higher in pronation than in supination, and higher in males than in females. Torque values are affected by elbow position, and decrease when the elbow is extended. Hand dominance does not have a strong effect on peak pronation strength, whereas peak supination strength is lower in the non-dominant extremity. Peak torque strengths are strongly correlated between an individual’s dominant and non-dominant extremities, and with changes in elbow position.
Active individuals >65 years old do not have an increased odds of a poor outcome following distal radius fracture

Symonette CJ, MacDermid J, Grewal R

Introduction: Distal radius fractures (DRF) are common in individuals over 65 years old. Management algorithms have favored a non-operative approach in this cohort given our understanding of satisfactory outcomes despite anatomic malalignment. The purpose of the current study was to evaluate the influence of activity level on outcomes following DRF in patients older than 65 years.

Methods: A prospective cohort of 81 elderly (aged ≥ 65 years) patients with DRF were recruited from a tertiary care referral center. The influence of activity level, based on the Rapid Assessment of Physical Activity (RAPA) score, on 1 year post-injury Patient-Rated Wrist Evaluation (PRWE) scores was investigated. The odds ratio (OR) of a poor PRWE outcome was calculated with 95% confidence intervals.

Results: The majority of the cohort (n=67, 83%) had a good PRWE outcome and were treated non-operatively (n =66, 81%). Average radiographic parameters for our cohort were an UV of 1.9mm +/- 1.9mm (+/-SD), RI of 18.7° +/- 5.9° (+/-SD) and dorsal tilt of 4.5° +/- 11.9° (+/-SD). The OR of a poor PRWE outcome was not significant for active individuals (OR 1.13, CI 0.34 – 3.79, p = 0.84).

Conclusion: Our study provides further support for non-operative management of patients over 65 years old with distal radius fractures. Activity level does not appear to influence the likelihood of a poor outcome.
Inter-rater Reliability of Radiographic Proximal Phalanx Fracture Angulation

Sawa K and Richards R

**Introduction:** Quantifying the degree of proximal phalanx fracture angulation is essential as treatment recommendations are often based on the degree of radiographic angulation at the fracture site. Standardized radiographic measurements also aid in effective physician communication and treatment planning. The objective of this study was to assess the inter-rater reliability of plain film proximal phalanx fracture angulation.

**Methods:** A total of 19 radiographs of diaphyseal proximal phalanx fractures were reviewed by a plastic surgeon, a plastic surgery resident and a radiology resident. Angulation was measured using three radiographic techniques; dorsal cortex, volar cortex and medullary. Intraclass correlation coefficients (ICCs) and their 95% confidence intervals were calculated.

**Results:** A total of 171 angulation measurements were obtained (57 per rater). All rater agreement was highest for the volar cortex technique and lowest for the dorsal cortex technique. Inter-rater reliability for proximal phalanx fracture angulation was poor for all radiographic measurement techniques (ICC < 0.2).

**Discussion:** Radiographic angulation measurements for proximal phalanx fractures have poor inter-rater reliability. Further training and/or an emphasis on clinical findings rather than radiographic measurements may be warranted.
Thank You for Participating in Our Annual Resident Research Day!

Plastic Surgery Resident Research
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