University of Manitoba & University of Saskatchewan

Combined Orthopedic Resident Research Day

October 28, 2020

University of Manitoba

University of Saskatchewan

PROGRAM

WebEx link: https://usask.webex.com/usask/j.php?MTID=m3710b2bc488e15082b44a9ea55b3dd4d

Tuesday, October 27, 2020

4:55 PM	Welcome and Introduction	Dr. Ted Tufescu
5:00 – 6:30	Review Cases: Pelvis/Acetabulum	Dr. Pierre Guy

Wednesday, October 28, 2020

Session (1) - Moderator: Dr. Thomas Turgeon

7:55 – 8:00	Welcome Remarks	Dr. Ted Tufescu
8:00 – 8:10	Culturally Appropriate & Socially Relevant Assessment of Pain: The use of the Kids Hurt App within the Indigenous Youth Population in Manitoba	Dr. Melinda Fowler
8:10 – 8:20	Comparing Superficial vs. Deep Local Anesthetic Infiltration to Improve Patient Experience During Carpal Tunnel Release	Dr. Kristi Billard
8:20 – 8:30	Achilles Tendon Ruptures: Function, Strength & Tendon Length	Dr. Sophie Zhu
8:30 – 8:40	Novel nail and plate implant for intra-articular distal femur fractures	Dr. Meri Kieksi

Session (2) - Moderator: Dr. Jarrett Woodmass

8:40 – 8:50	Arthroscopic Versus Open Ankle Arthrodesis: Longitudinal Comparison of Patient-Reported Outcomes	Dr. Monther Abuhantash
8:50 – 9:00	Calcaneus fracture fixation: assessing the adequacy of the sinus tarsi surgical fixation technique	Dr. Nebojsa Kuljic
9:00 – 9:10	Social determinants of health in orthopedics: an assessment of fracture patients' non-fracture needs: a survey based prospective cohort pilot study	Dr. Ian Laxdal
9:10 – 9:20	Multiple Rice Body Formation after Total Elbow	Dr. Elizabeth Quon
9:20 – 9:30	Functional Outcomes after Cheilectomy vs Cheilectomy and Moberg Osteotomy	Dr. Jessica Littmann
9:30 – 9:45	**Health Break**	

Session (3) - Moderator: Dr. Anthony King

9:45 – 9:55	Four-Corner Arthrodesis with differing methods of osteosynthesis – A systematic review and meta-analysis abstract	Emmitt Hayes Med IV Student
9:55 – 10:05	Comparison of Pain Score and Analgesic Usage between Bone-Patellar Tendon-Bone, Hamstring and Quadriceps Tendon Autographs for anterior Cruciate Ligament Reconstruction	Dr. Jasmine Levesque
10:05 – 10:15	Rate of Total Hip Replacement after LEGG-Calve-Perthes Disease (LCPD) in a Canadian Province	Dr. Jonathan Tan
10:15 – 11:00	Guest Speaker Presentation: **How Teams Work: Collaboratively Solving Hip Fracture Mechanics**	Dr. Pierre Guy
11:00 – 12:10	**Lunch Break**	

Session (4): Moderator: Dr. Laura Sims

12:10 – 12:20	Hardware complications following plate fixation of the olecranon	Dr. Riley Hemstock
12:20 – 12:30	Acromioclavicular Joint Separation: The Presence of Additional Pathology in Grade I and II Injuries	Dr. Drew Mulhall
12:30 – 12:40	Comparison of Screw Design and Technique on Cervical Lateral Mass Screw Fixation: A Biomechanical Study	Dr. Mark Xu
12:40 – 1:25	Guest Speaker Presentation: **The BC Hip Fracture Redesign Initiative: from Traditional to Big Data Analysis**	Dr. Pierre Guy
1:25 – 1:35	Conclusion of Academic Program	Dr. Ted Tufescu
1:35 – 1:55	**Health Break**	
1:55 – 2:25	Judges Deliberation	
2:25 – 3:25	Awards Presentation	

GUEST SPEAKER

Dr. Pierre Guy MDCM, MBA, FRCS(C)
Associate Professor
Head, Division of Orthopedic Trauma UBC Dept of Orthopedics Co-Director, Centre for Hip Health and Mobility Chair, Canadian Orthopedic Foundation
University of British Columbia

Dr. Pierre Guy is Associate Professor and clinician-scientist at UBC Department of Orthopaedics, where he heads the Division of Orthopedic Trauma. He is the Centres' Co-Director. His medical training and residency were completed at McGill University, followed by orthopaedic trauma fellowships in Hannover and Berlin, Germany and at UBC. Dr. Guy also holds a Master's degree (MBA) from the John Molson School of Business, Concordia University. He is a practicing Orthopedic Trauma Surgeon at BC's level 1 Trauma Centre, Vancouver General Hospital. He is a founding member of the Canadian Orthopedic Trauma Society and an active member of the Canadian Orthopedic Association and the Orthopedic Trauma Association. He chairs the Canadian Orthopedic Foundation, Canada's Orthopedic Research Charity, and is a member of the Canadian Orthopedic Association Executive Committee.

Dr. Guy's research is focused on hip, pelvis and acetabulum fracture prevention, treatment and post injury function. He collaborates with Mechanical, Electrical and Materials Engineers to evaluate the mechanism of fractures and imaging using novel techniques. He pursues clinical research trials and health services research, and collaborates with Government to realise Quality Improvement projects. He respectively co-leads the BC Hip Fracture Redesign project and the Canadian Hip Fracture Collaborative. His interdisciplinary team includes graduate students, clinical-residents, engineering trainees, epidemiologists, and biostatisticians.

Additional links to Dr. Guy's work: https://scholar.google.ca/citations?user=4Wlup6cAAAAJ&hl=en

ORTHOPEDIC SURGERY
FACULTY AND RESIDENTS

University of Manitoba

Dr. Peter MacDonald
Section Head

Dr. Ted Tufescu
Residency Program Director

Dr. Sheila McRae
Research Director

Dr. Jonathan Tan, PGY 5
Dr. Mark Xu, PGY 5
Dr. Ian Laxdal, PGY 4
Dr. Sophie Zhu, PGY 3
Dr. Drew Mulhall, PGY 2
Dr. Jasmine Levesque, PGY 2
Dr. Monther Abuhantash, PGY 1
Dr. Melinda Fowler, PGY 1
Dr. Riley Hemstock, PGY 1
Dr. Jessica Littmann, PGY 1

University of Saskatchewan

Dr. Anthony King
Division Head

Dr. David Sauder
Residency Program Director

Dr. Laura Sims
Research Director

Dr. Kristi Billard
Dr. Meri Kieksi
Dr. Nebojsa Kuljic
Dr. Elizabeth Quon
Emmitt Hayes, Med IV Student

RESIDENTS ABSTRACTS

Dr. Melinda Joye Fowler
PGY1 Orthopedic Surgery
University of Manitoba

Dr. Melanie Morris, Dr. Lori Anne Archer, Dr. Josee G. Lavoie, Dr. Margot Latimer

CULTURALLY APPROPRIATE & SOCIALLY RELEVANT ASSESSMENT OF PAIN: THE USE OF THE KIDS HURT APP WITHIN THE INDIGENOUS YOUTH POPULATION IN MANITOBA

Background: Current western medical methods of gathering information on pain are not culturally appropriate or relevant to Indigenous youth. We know that there is a disproportionately higher rate of pain within the Indigenous youth population. We also know that they share information about their pain through storytelling and art. Based on the Aboriginal Children's Hurt and Healing National Initiative at Dalhousie University, the development of the Kids Hurt app was guided by members of the Eskasoni community and directly involved Indigenous youth through conversations, art and storytelling to describe their experiences of pain. The app is being trialed within the community it was developed and further applications to Indigenous youth in other geographic regions will help evaluate its generalizability.

Objective: To determine the effectiveness of the Kids Hurt app in gathering information about pain in a culturally appropriate and relevant way within our Indigenous youth population in Manitoba.

Study design: A mixed methods research study using a Two-eye seeing approach will be utilized.

Methods: 10-20 Indigenous youth ages 13-19 years, attending a pediatric surgical appointment will be recruited from the children's hospital with patient and/or guardian consent. The youth will complete the self-administered Kids Hurt app on a tablet, a semi-structured interview using the Kids Hurt App usability testing questionnaire, and the K10 scale activity. Content validity, usability and feasibility will be reported. The K10 scale will be used to evaluate how the participants self-report of mental health on the app correlates with an established measure.

Expected Outcomes: This study will demonstrate the effectiveness of the Kids Hurt app in collecting data around pain from Indigenous youth in Manitoba.

Clinical Relevance: The Kids Hurt app has the potential to collect pain data in a culturally appropriate and socially relevant manner thus allowing more effective pain management.

Dr. Sophie Zhu
Sophie Zhu MD,CM
PGY-3 Department of Orthopaedic Surgery
University of Manitoba

Supervisor: Sheila McRae, Robert Longstaffe

ACHILLES TENDON RUPTURES: FUNCTION, STRENGTH & TENDON LENGTH

Background: Risk of re-rupture is comparable between nonoperative (NOM) and operative (OM) management of Achilles tendon ruptures (ATR). However, controversy remains regarding impacts on strength and functional activities with a shortage of studies examining high impact maneuvers such as jumping and hopping. The purpose of this study is to compare NOM and OM of acute ATR using tests that target both explosive activity and endurance required in many sporting activities.

Hypothesis: NOM of ATR will result in greater functional deficits, achilles tendon elongation and calf muscle atrophy compared to OM however it will not correlate with patient outcome scores.

Study design: Retrospective cohort study.

Methods: All adult patients between 18 and 65 years of age who sustained an acute complete ATR between 2014 and 2019 and had a surgical consult within 3 weeks of injury are eligible for this study. Approximately 100 patients (50 per group) are expected to consent. Exclusion criteria are contralateral ATR or inability to participate in functional testing. Consented patients will attend one study visit in which they will perform standing heel rise height, hop tests, drop counter movement jump, and strength testing using a isokinetic dynamometer. Achilles tendon length and thickness will be measured using ultrasound. Ankle range of motion, Achilles tendon resting angle, calf circumference and PROMs will be completed.

Results: Limb Symmetry Indices (affected: unaffected) and PROMs will be compared between NOM and OM using analysis of variance. Further evaluation will examine if a difference exists when the impact of tendon length is controlled.

Conclusions: This systematic evaluation of functional activity may bring to light deficits associated with OM vs NOM. This has the potential to provide a basis for conducting a randomized controlled trial involving high level athletes to determine if OM or NOM provides any significant difference in athletic performance.

Dr. Kristi Billard
PGY-4 UofS Orthopedic Surgery
University of Saskatchewan

Comparing Superficial vs. Deep Local Anesthetic Infiltration to Improve Patient Experience During Carpal Tunnel Release

Presenter: Kristi Billard, MD, Department of Surgery, Division of Orthopedics, University of Saskatchewan; David Sauder, MD, FRCSC, Department of Surgery, Division of Orthopedics, University of Saskatchewan; Laura Sims, MD, FRCSC, Department of Surgery, Division of Orthopedics, University of Saskatchewan; Alex Cheng, Statistical Analysis, PhD Candidate, University of Saskatchewan; Anne Sperling, RN, Research Assistant, Clinical Trial Support Unit, University of Saskatchewan

Background: Carpal tunnel syndrome is a common clinical problem that can be reliably treated with surgical carpal tunnel release (CTR). This procedure is generally performed with the patient wide-awake using local anesthetic (LA). While most patients tolerate this type of procedure, there is a possibility of some discomfort or pain. We compared two LA infiltration techniques to determine which is best to provide the least amount of pain or discomfort during a CTR. The two methods are subcutaneous infiltration alone (superficial) and subcutaneous infiltration with infiltration into the carpal tunnel (deep).

Methods: On the morning of their procedure, 74 participants (n=80 cases) were recruited and randomized to either deep or superficial LA infiltration. There were 38 in the deep group and 42 in the superficial group. The primary outcomes were presence and severity of pain during the LA infiltration and the procedure.

Results: Average age of participants was 63.04 ± 12.92 (n=40 females and n=34 males). In the deep group, 21% experienced pain during freezing compared to 9.5% in the superficial group (p=0.149), while 13.2% of the deep group and 11.0% of the superficial group experienced pain during the procedure (p=0.866).

Conclusion: In this randomized clinical trial comparing deep vs. superficial LA infiltration techniques for CTR, we found that there was no statistically significant difference in the pain experienced during the administration of the LA or during the procedure. Given these findings, we recommend using superficial infiltration for CTR as it is technically easier and reduces the risk of potential median nerve injury.

Dr. Monther Abuhantash
PGY1 Orthopedic Surgery Resident
University of Manitoba

Supervisor: Alastair Younger, Orthopedic Surgeon, University of British Columbia

ARTHROSCOPIC VERSUS OPEN ANKLE ARTHRODESIS: LONGITUDINAL COMPARISON OF PATIENT-REPORTED OUTCOMES

Background: End-stage ankle arthritis has long been managed surgically with open ankle arthrodesis (OAA). More recently, arthroscopic ankle arthrodesis (AAA) is thought to be associated with improved patient-reported outcome measures (PROMs) and fewer complications. The objective of this study was to systematically compare these two approaches.

Hypothesis: There are no differences in PROMs or complications between AAA and OAA patients in the treatment of end-stage ankle arthritis at up to 5 years post-operative.

Study Design: Retrospective longitudinal cohort study.

Methods: All patients that underwent an AAA or OAA between 2003 and 2019 were screened for inclusion in this study. Patients were included if minimum 2-year follow-up information was available. The following PROMs were completed preoperatively, at 6-months and annualy thereafter to 5 years: AAS, AOS and SF-36 scores. PROMs were compared at all timepoints using a mixed effects regression model adjusted for age, sex, smoking status, diabetes, and preoperative COFAS grade. Complications and survivorship were also compared.

Results: Of 874 patients screened, 351 patients were eligible for the study, 223 AAA and 128 OAA. Groups were similar at baseline with respect to demographics, but COFAS grade was higher in the OAA group than AAA. At one-year post-operatively, the mean AAS score was higher in the AAA group, but there were no other differences between outcomes at any other timepoint. Risks of requiring a revision for nonunion were higher in the AAA group, while risk of wound complications was higher in the OAA group.

Conclusions: There were no differences in PROMs of patients who underwent AAA versus OAA patients up to 5-years postoperative, except for an improved AAS in the AAA group at one-year. Previously proposed advantages of AAA over OAA may therefore need to re-assessed and weighed against the technical challenges and associated complications of the arthroscopic technique.

Dr. Nebojsa Kuljic
PGY-2 UofS Orthopedic Surgery
University of Saskatchewan

Authors: Nebojsa Kuljic, Scott Willms, Yanzhao Cheng, Trent Thiessen, Lee Kolla

Calcaneus Fracture Fixation: Assessing the adequacy of the Sinus Tarsi surgical fixation technique

Background: Intra-articular calcaneus fractures are devastating injuries and are life-changing for patients that develop post-traumatic arthritis, a common outcome. Debate exists as to whether non-operative, symptomatic management or operative treatment best manages these injuries, partially due to the difficulty of achieving anatomic subtalar joint reduction and the high rate of postoperative complications. Traditionally, a large, lateral extensile incision has been used, plagued with soft tissue complications quoted at rates upwards of 22%. A less invasive incision known as the limited sinus tarsi approach (ST-a) has previously been described, proposed to lower complication rates without compromising radiographic nor clinical outcomes. The primary purpose of this study was to objectively assess the adequacy of joint reduction along with the associated soft tissue complications through the ST-a and compare it to the standards of the lateral extensile incision.

Methods: All calcaneus fractures fixated through the ST-a at our institution were reviewed between March 2017 and Jan 2020. Inclusion criteria included the presence of preoperative and post-operative X-rays and CT scans. Primary outcomes were radiographic measures, including Bohler's angle on X-ray, and the maximum summative step deformity at the posterior facet of the subtalar joint in all three planes on CT. Secondary clinical outcomes included soft tissue complications (infection, delayed wound healing) and the need for reoperation. Soft tissue complication rates were half that of the comparative extensile approach.

Results: 30 patients were included with an average age of 48.9 ± 13.9 (n=24 males, n=6 females) and Sanders classification of 2.8. Pre-operatively, the mean Bohler's angle and summative posterior facet step deformity were 5.8 ± 16.6° and 17.2 ± 9.3mm, respectively. These radiographic outcomes were significantly improved postoperatively to 27.2 ± 7.7° and 5.3 ± 2.9mm.

Conclusions: Radiographic joint reduction using the ST-a was acceptable compared with industry standards along with a lower incidence of soft tissue complications than previously quoted for the lateral extensile approach. Although technically more demanding, the ST-a is a valuable method for the treatment of intra-articular calcaneal fractures and should be considered when planning operative management.

Dr. Ian Laxdal
PGY-4 UofM Orthopedic Surgery
University of Manitoba

Supervisor: Dr. Tufescu FRCSC

Social determinants of health in orthopedics: an assessment of fracture patients' non-fracture needs: a survey based prospective cohort pilot study

Background: Despite diligent orthopedic management and an uncomplicated course, fracture patients may report poor outcomes suggesting other factors may be contributing. The purpose of this study was to explore which, if any, social determinants are associated with poor outcomes following fracture.

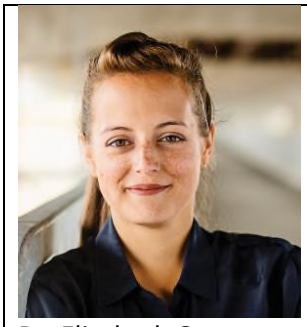
Hypothesis: *Certain* social determinants of health, as identified using a novel Non-Fracture Needs survey (NFN), are associated with poor outcomes in fracture patients at 6-months post-injury.

Study Design: Retrospective cohort study.

Methods: Patients >18 years old with a fracture treated operatively or non-operatively between 2017-2018 were screened within three weeks of injury at their first surgical consult for inclusion in this study. Polytrauma patients were excluded. Participants completed the NFN, a 42-question survey on social determinants developed for this study, as well as the EQ-5D global health outcome regarding their pre-injury health status. The EQ-5D was repeated at 6-months post-injury. Multivariate regression analysis was performed with the NFN and patient demographics as independent variables and EQ-5D at 6-months post-injury as the dependent variable.

Results: The following items were predictive of lower EQ-5D scores at 6-months post-injury: difficulty receiving medical treatment, paying for medication or physiotherapy [mean EQ-5D decrease 30 (R^2:0.17,DF:2,F:3.66,P=.035)], needing help visiting the doctor [mean EQ-5D decrease 20 (R^2:0.14,DF:1,F:6.42,P=.016)], difficulty buying clothes [mean EQ-5D decrease 20 (R^2:0.24,DF:2,F:5.93,P=.006)], lack of support around the home and for daily tasks such as making food, bathing or cleaning [mean EQ-5D decrease 22 (R^2:0.23,DF:1,F:10.91,P=.002)], relying on someone to drive them to work or school [mean EQ-5D decrease 15 (R^2:0.13,DF:1,F:5.38,P=.026)] and help getting groceries and medicine [mean EQ-5D decrease 20 (R^2:0.168,DF:1,F:7.49,P=.0095)].

Conclusion: The NFN survey identified multiple themes associated with social determinants of health associated with poor outcomes in fracture patients at 6-months post-injury. These include financial constraint, lower social support and transportation issues. This pilot-study will provide a framework for further research and clinical intervention to improve patient outcomes.



Dr. Elizabeth Quon
PGY-1 UofS Orthopedic Surgery
University of Saskatchewan

Authors: Dr. Elizabeth Quon, Dr. David Sauder

Multiple Rice Body Formation after Total Elbow Arthroplasty

Multiple rice body formation in the setting of a total joint arthroplasty is a rare occurrence. On review of the literature there are only a few cases, most of which occurred in total hip arthroplasty and another case that involved bursitis in the setting of rheumatoid arthritis. Here we review a case of rice body formation in a 57 year old male who underwent a total elbow arthroplasty for rheumatoid arthritis. He then went on to develop pain and swelling a year later that was worrisome for infection. However, upon irrigation and debridement, multiple rice bodies were removed from a large cyst. Post-operatively the patient began to develop further swelling and was taken back to the operating room for a second irrigation and debridement as well as a total synovectomy. He has since not experienced any further symptoms and it is thought that the synovectomy may have relieved this process. This case was unique in that it was in the setting of a total elbow arthroplasty for rheumatoid arthritis and the inflammatory process flared postoperatively which is uncommon as a total elbow usually resolves symptoms of this inflammatory process.

Dr. Jessica Littmann MD
PGY1, Orthopedic Surgery
University of Manitoba

Supervisor: Dr. Heather Barske

FUNCTIONAL OUTCOMES AFTER CHEILECTOMY VS CHEILECTOMY AND MOBERG OSTEOTOMY

Background: Hallux rigidus is the second most common forefoot pathology after hallux valgus. A common joint sparing procedure to treat hallux rigidus is a dorsal cheilectomy. However, some clinicians advocate the addition of a Moberg osteotomy (proximal phalanx osteotomy) to improve functional outcome. The optimal procedure is still being debated, particularly for the early stages of the disease.

Hypothesis: There will be no difference in functional outcome or complications requiring revision surgery between cheilectomy with or without the addition of a Moberg osteotomy at one year postoperative.

Study design: Retrospective cohort study.

Methods: A pilot study comparing patients who underwent cheilectomy or cheilectomy with Moberg-type osteotomy from 2010 to 2015 was previously undertaken at a sole clinic with two contributing surgeons. Based on preliminary findings, this study is being extended to include patients from 2016 to 2019. Previously collected patient reported outcomes (PROMS) including the Foot and Ankle Ability Measure (FAAM) and the Foot Function Index (FFI) will be compared using analysis of variance. Also, relative risk of complications will be calculated.

Results: A total of 100 patient records (50 in each group) are expected to be reviewed for this study. This includes the 50 participants already in the pilot study. It is anticipated that both groups will improve with surgery, and that there will be no significant difference in PROMS. In the pilot study, four of 23 patients in the cheilectomy group had recurrences with three undergoing revision surgery compared with two of 37 patients in the combined procedure group, both requiring revision. It is expected this risk of complications will be maintained.

Conclusions: Extending the study another four years will increase the sample size and thus increase statistical power allowing for more meaningful comparison of function outcomes and complications.

Dr. Emmitt Hayes
PGY4 Orthopaedic Surgery
University of Saskatchewan

Emmitt Hayes, Yanzhao Cheng, David Sauder MD, FRCSC, Laura Sims MD, FRCSC

Four-Corner Arthrodesis with differing methods of osteosynthesis: A systematic review and meta-analysis

Purpose: To compare the union rates and clinical outcomes of four-corner arthrodesis with different methods of osteosynthesis.

Methods: A systematic review of studies published on OvidMedline, Embase, and Pubmed was conducted. Primary studies that reported clinical and radiographic results following four corner arthrodesis for scapholunate advanced collapse (SLAC), scaphoid non-union advanced collapse (SNAC), or other types of wrist arthritis in human subjects were eligible. Biomechanical or cadaveric studies, case reports, studies that did not define and report a radiographic union rate, reviews and technical articles, studies that did not report the method of osteosynthesis, and studies that used multiple methods of osteosynthesis but did not separate results for individual methods of osteosynthesis were excluded. A meta-analysis was performed for radiographic union rate, range of motion (ROM), and grip strength.

Results: We identified and reviewed 291 full texts, selecting 57 studies for coding. The radiographic union rate did not significantly differ between studies using K-wire, screw, staple, nonlocking plate, metal locking plate, and radiolucent locking plate osteosynthesis. Overall Proc GLM analysis showed that fixation method significantly affected palmar flexion but pairwise comparison did not reveal any significant differences between individual groups. Grip strength (% contralateral) was significantly lower in studies with metal locking plate fixation compared to K-wire fixation (63.2% vs 82.6%). There were no other statistically significant differences between groups with respect to flexion, extension, radial deviation, ulnar deviation, and grip strength.

Conclusion: All methods of osteosynthesis result in similar union rates, with no significant differences between methods. While there were some significant differences in ROM and grip strength, these differences are unlikely to be clinically relevant. This study is limited by the retrospective nature of included studies. Further randomized control trials are needed to directly compare methods of osteosynthesis.

Level of Evidence: III

Dr. Jasmine Lévesque MD
PGY2 Orthopaedic Surgery
University of Manitoba

Co-investigators: Sheila McRae PhD, Jarret Woodmass MD, Greg Stranges MD, Devin Lemmex MD, Robert Longstaffe MD, and Peter MacDonald MD

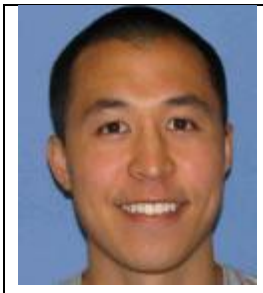
COMPARISON OF PAIN SCORE AND ANALGESIC USAGE BETWEEN BONE-PATELLAR TENDON-BONE, HAMSTRING AND QUADRICEPS TENDON AUTOGRAPHS FOR ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Background: Anterior cruciate ligament (ACL) reconstruction involves significant early postoperative pain. Having insight into the magnitude of pain and analgesic use based on graft choice selection may provide a basis for patient education and guide prescription practices.
Hypothesis: There will be no difference in postoperative pain and analgesic use in the first 14 days following primary ACL reconstruction between bone-patellar tendon-bone (BPTB), hamstring (semitendinosus/gracilis (STG)), and quadriceps tendon (QT) autografts.
Study design: Prospective cohort study.

Methods: Patients were recruited at the time of initial consult for primary ACL rupture with each of 5 participating surgeons assigned to perform a specific graft throughout the study (2 BPTB, 2 QT, 1 STG). Pain on a 10 cm visual analogue scale and analgesic use measured by number of pills taken were documented by the patient for 14 days postoperative. Analgesics were categorized as opioids, nonsteroidal anti-inflammatories, and acetaminophen. Pain and analgesic use were compared based on one-way analysis of variance.

Results: Ninety-four patients (25.0 ± 7.7 years; 49 males, 45 females) participated in the study, 27 with BPTB, 36 STG, and 31 QT autografts. There were no differences in pain scores between graft type at any time point. Peak pain scores (mean ±SD) were seen at Day 1 morning (6.1 ± 0.4), Day 1 evening (6.3 ± 0.4), and Day 2 morning (5.9 ± 0.4) for the STG, QT and BPTB groups, respectively. There were no differences between grafts in the mean number of analgesic pills of each category taken per day or the total number of analgesic pills taken at 48-hours, 7- and 14-days postoperative.

Conclusion: Graft type did not impact early (14-day) post-operative pain level with respect to magnitude or timing of peak pain nor did it impact analgesic use in primary ACL reconstruction.



Dr. Jonathan Tan
PGY-5, Orthopedic Surgery
University of Manitoba

Supervisor: Dr. James McCammon

RATE OF TOTAL HIP REPLACEMENT AFTER LEGG-CALVE-PERTHES DISEASE (LCPD) IN A CANADIAN PROVINCE

Background: Legg-Calve-Perthes Disease (LCPD) is a pediatric hip condition that leads to early hip degeneration. Using the rate of total hip arthroplasty (THA) as a surrogate measure for symptomatic hip degeneration, the rate of THA was compared in LCPD patients with and without previous surgical intervention.

Hypothesis: Early surgical intervention may improve hip function, resulting in a lower rate of THAs in the early surgical group compared to the nonoperative group.

Study Design: Retrospective cohort study.

Methods: A retrospective review was conducted using de-identified administrative records of patients diagnosed with LCPD in Manitoba from 1984 to 2018. The rate of THAs in patients with LCPD was determined for two groups: (1) patients with earlier surgical intervention and (2) patients with no previous surgical intervention.

Results: The rate of THA between the previous operative and nonoperative groups was found to be 32% and 40% respectively ($p = 0.458$). Mean age at time of THA was 33.9 (SD 9.4) in the operative group and 46.3 (SD 13.5) in the nonoperative group. 59% of patients were diagnosed after age 9.

Conclusions: There was no significant difference in rate of THA in operative and nonoperative groups. While the literature supports operative intervention to improve the chance of developing a spherical head, this study shows that the outcomes of operative treatment are not always better than nonoperative treatment. This emphasizes the importance of early diagnosis and careful patient selection in surgical treatment. Improving education in identifying LCPD in its earlier stages may help expedite treatment and potentially lead to more favourable outcomes.

Dr. Riley Hemstock
PGY-1 Orthopaedic Surgery
University of Manitoba

Dr. Charles Bouchard (PGY-5 Orthopaedic Surgery), Dr. Robert Chan (Orthopaedic Surgery) University of Alberta

Hardware complications following plate fixation of the olecranon

BACKGROUND: Olecranon fractures are common orthopedic trauma injuries, comprising up to 10% of upper extremity fractures. Plate fixation is a favoured fixation method due to superior mechanical properties. However, a common adverse outcome of this method is hardware irritation requiring hardware removal. Historical data suggests the hardware removal rate related to hardware irritation in olecranon fractures is between 17-54%. In addition, more severe injuries are associated with an overall worse prognosis, including development of arthrosis, in the literature.

HYPOTHESIS: The hardware removal rate of olecranon fractures due to hardware irritation will be lower than the rate reported in the literature due to improvements in implant design. Olecranon fractures requiring reoperation are associated with more complex fracture types.

STUDY DESIGN: This is a retrospective chart and radiographic review of patients in the Edmonton Zone of Alberta Health Services who were treated with plate fixation between 2010 and 2017 following acute olecranon fractures.

METHODS: Electronic and physical medical records consisting of operative notes and clinical notes, as well as corresponding radiographs, were reviewed to determine implants used, complications and additional procedures performed.

RESULTS: 600 surgically treated olecranon patients were identified and 321 patients were found to have plate fixation of the olecranon. Chart review determined 50 patients had re-operations due to hardware irritation for a rate of 15.6%. Compared to patients that did not require reoperation, the reoperation group had a higher incidence of Type III olecranon fractures (17.4% vs 8.4%, $p = 0.036$) and Monteggia pattern injuries (13.5% vs 4.9%, $p = 0.008$).

CONCLUSIONS: This study demonstrated a rate of 15.6% hardware removal due to irritation, which is significantly lower than the reported literature. Secondary outcomes included a higher likelihood of reoperation because of hardware irritation for complex fracture patterns and in younger patients.

Dr. Drew Mulhall
PGY-2 Orthopaedic Surgery
University of Manitoba

Supervisor: Dr. Peter MacDonald

ACROMIOCLAVICULAR JOINT SEPARATION: THE PRESENCE OF ADDITIONAL PATHOLOGY IN GRADE I AND II INJURIES

Background
Acromioclavicular (AC) joint injuries comprise 12% of shoulder girdle injuries and are typically described using the Rockwood Classification. There are six grades based on ligament status and direction of clavicular displacement. Generally, grade I and II injuries are non-operative, IV to VI are operative, and III remains controversial. Patients with grade I and II injuries can remain symptomatic for several years and have radiographic evidence of AC joint degeneration. We aim to identify if further pathology exists in grade I and II injuries.

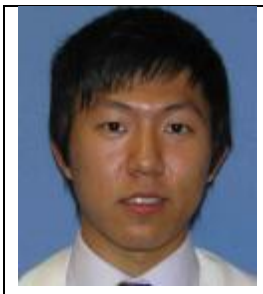
Hypothesis
Additional pathology is present in grade I and II AC joint injuries.

Study design
Prospective case series.

Methods
Patients categorized as having a grade I or II AC injury by a primary care physician were consented at the time of initial consult between 2018 and 2020. Patients underwent an MRI within 21 days of injury and additional pathologies were reported in a standardized fashion by fellowship-trained musculoskeletal radiologists.

Results
Thirteen patients (12 male/1 female) were consented with a mean age of 28.6±10.8. Mean time from injury to MRI was 7.9±6.4 days. Nine injuries were sport-related and 4 were accidental traumas. Following MRI, the grade of 10/13 patients changed from I or II to II or III, 3 remained unchanged, and none were downgraded. Additional pathologies identified were: muscle injury (7), rotator cuff tears (2), labral tears with paralabral cysts (2), AC joint effusions (2), and a nondisplaced fracture (1). No glenohumeral joint effusions or long biceps tendon injuries noted. One patient did not have additional findings.

Conclusions
Radiologic evidence suggests that most AC joint injuries are more severe than clinically diagnosed. Identifying additional pathology may alter diagnostic and treatment guidelines for grade I and II AC joint injuries. We plan to recruit 30 patients to substantiate these findings.



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COMPARISON OF SCREW DESIGN AND TECHNIQUE ON CERVICAL LATERAL MASS SCREW FIXATION: A BIOMECHANICAL STUDY

Background: There are many options but no clear optimal technique for cervical lateral mass screw fixation. Furthermore, it is unknown how a backed-out or revision screw compares to the index screw-bone interface fixation strength.

Objective: To determine the optimal screw trajectory, design, and depth of penetration for achieving the greatest mechanical strength of the bone-screw interface.

Study Design" Biomechanical Study

Methods: Validated sawbone models were used to test the maximum axial pull-out strengths for the following: 1) screw types: cancellous vs cortical, 2) screw trajectories: Roy-Camille vs Magerl, 3) screw penetration depths: unicortical vs bicortical vs bicortical backed-out to become unicortical, 4) revision: bicortical insertion of index screw which was removed and replaced with a greater diameter screw inserted unicortically. Six tests were performed for each condition, and fixation was evaluated by maximum pull-out force using an Instron E-10000 servo-electric load frame. Univariate analysis of variance for statistical analysis (significance at $p<0.05$).

Results: Roy-Camille trajectory demonstrated greater pull-out strengths compared to Magerl trajectory (676N vs 374N, $p<0.001$). Cortical screws demonstrated greater pull-out strengths than cancellous in the Roy-Camille trajectory (738N vs 614N, $p<0.001$), but no difference in Magerl trajectory (371N vs 377N, $p>0.05$). Pull-out strengths for screw penetration depths from greatest to least were ($p<0.05$): bicortical (603N), revision screw (548N), unicortical (493N), backed-out bicortical to unicortical screw (456N).

Conclusions: Lateral mass screw fixation demonstrated greatest pull-out strengths in the following conditions: 1) screw trajectory: Roy-Camille > Magerl; 2) screw type: cortical > cancellous in Roy-Camille trajectory, but no difference in Magerl trajectory; 3) screw penetration depths: bicortical > revision > unicortical > backed-out bicortical. Surgeons should consider fixation strengths for varying lateral mass screw techniques. When backing out a screw to accommodate a rod, the screw should be replaced with a larger diameter revision screw to achieve maximal fixation strength.