University of Saskatchewan &
University of Manitoba

Combined Orthopedic Resident Research Day

Friday, November 1, 2019

Asher Auditorium
Saskatoon City Hospital

VISITING PROFESSOR

Dr. Fabian Krause

Department of Orthopaedic Surgery and Traumatology, University of Bern, Switzerland

As of 2011, Professor Dr. Fabian Krause is the head of Foot & Ankle Surgery in the Department of Orthopaedic Surgery, Inselspital, University of Bern, Bern, Switzerland.

After finishing medical school at the University of Würzburg, Germany, Dr. Krause started his career in Germany before he migrated to Bern, Switzerland in 1999.

During his orthopaedic training at the Inselspital, the University Hospital of Bern, Switzerland, he discovered his deep interest in Foot & Ankle surgery and related research.

In 2007-08 Prof. Krause completed a Foot & Ankle Fellowship at the University of British Columbia. He became a board certified orthopaedic surgeon in 2003, completed his PhD in 2011, and recently became Associate Professor in 2019.

Recent research activities focused on the effect of osteotomies to improve static alignment in ankle arthritis.

Orthopedic Surgery
FACULTY & RESIDENTS

University of Saskatchewan

Dr. Anthony King
Division Head

Dr. David Sauder
Program Director &
Research Director

Dr. Paul Kulyk, PGY5
Dr. Matthew Mastel, PGY5
Dr. Kristen Pugh, PGY5
Dr. Sameh Ibrahim, PGY5
Dr. Sarah McLaren, PGY4
Dr. Scott Willms, PGY4
Dr. Kristi Billard, PGY3
Dr. Merituuli Kieksi, PGY3
Dr. Emily Chan, PGY2
Dr. Jefferson Scott, PGY2
Dr. Matthew Getzlaf, PGY1
Dr. Nebojsa Kuljic, PGY1

University of Manitoba

Dr. Peter MacDonald
Section Head

Dr. Ted Tufescu
Program Director

Dr. Sheila McRae
Research Director

Dr. Tiffany Huynh, PGY5
Dr. Gabriel Larose, PGY5
Dr. Samuel Larrivée, PGY5
Dr. Graeme Matthewson, PGY5
Dr. Jonathan Tan, PGY4
Dr. Mark Xu, PGY4
Dr. Ian Laxdal, PGY3
Dr. Ryan Vidal, PGY2
Dr. Sophie Zhu, PGY2
Dr. Drew Mulhall, PGY1

8:30	Continental Breakfast	
8:55	Welcome & Introduction	Dr. David Sauder
	Moderator: Dr. David Sauder	
9:00	Epidemiological Trends of Meniscectomy in Saskatchewan	Dr. Emily Chan
9:10	Arthroscopic Skills Acquisition in Medical Professionals	Dr. Samuel Larrivée
9:20	The Novel Rip-Stop Suture Pattern is Superior to the Traditional Suture Bridge: A Matched Cohort Study	Zachary Oleynik
9:30	Outcomes and Complications After Repair of Complete Distal Biceps Tendon Rupture with the Cortical Button Technique	Dr. Tiffany Huyhn
9:40	Break	
	Moderator: Dr. Ted Tufescu	
10:00	Periprosthetic Fracture Rate After Short and Long Hip Nails: Analysis of a Health Region Database	Dr. Gabriel Larose
10:10	Patient Factors Affecting Soft Tissue Complications in Operative Treatment of Intra-Articular Calcaneal Fractures	Dr. Ryan Vidal
10:20	Supracondylar Fractures: Comparing Infection Rate in Full Surgical Preparation and Draping Versus Semi-Sterile Technique	Dr. Ian Laxdal
10:30	Medial Plating of Pilon Fractures Predicts Post-Operative Soft Tissue Complications Requiring Subsequent Surgery	Dr. Mark Xu
10:40	Break	
11:00	The Role of the Volkmann Triangle in Malleolar Fractures	Dr. Fabian Krause
11:45	Lunch Break	

RESIDENT RESEARCH DAY PROGRAM

	Moderator: Dr. Peter MacDonald	
12:30	**Four Corner Arthrodesis with a Locking Dorsal Circular PEEK Plate- Evidence from Saskatchewan**	**Emmitt Hayes**
12:40	**The Effect of Patient Resilience and Pain Catastrophizing on Carpal Tunnel Surgical Outcomes**	**Dr. Sarah McLaren**
12:50	**CT Arthrography Versus MRI and MRI Arthrography in Intrinsic Ligament Wrist Tears**	**Robbie Singh**
1:00	**Conical Versus Cylindrical Pedicle Screw Design**	**Dr. Jonathan Tan**
1:10	**Does Femoral Acetabular Impingement Etiology Correlate with the Location of Labral Tears?**	**Dr. Kristi Billard**
1:20	**Break and Group Photo**	
	Moderator: Dr. Trent Thiessen	
1:40	**The Role of Subscapularis Repair in Reverse Shoulder Arthroplasty – A Meta-Analysis and Systematic Review**	**Dr. Graeme Matthewson**
1:50	**Complications of Superior Capsule Reconstruction for Irreparable Rotator Cuff Tears: A Systematic Review**	**Dr. Sophie Zhu**
2:00	**Acromioclavicular Joint Separation: The Presence of Additional Pathology in Grade I and II Injuries**	**Dr. Drew Mulhall**
2:10	**Tibial Post Fracture in Total Knee Arthroplasty: Two Cases After Recent Change in Implant**	**Dr. Paul Kulyk**
2:20	**Controversial Topics in Total Knee Arthroplasty: A Five Year Update**	**Dr. Matt Mastel**
2:30	**Conclusion of Academic Program**	**Dr. David Sauder**
3:30	**Cocktails and Awards Dinner**	

Epidemiological Trends of Meniscectomy in Saskatchewan

Emily Chan, PGY2 Richard C Chaulk, Jason Shin
University of Saskatchewan

Background: Arthroscopic meniscectomy (APM) for degenerative meniscal tear is one the most commonly performed procedures in orthopaedic surgery [1], despite increasing evidence demonstrating no benefit over conservative management[2-8]. The current incidence and trends of APM in Canada are not well-defined due to scarcity of population-based studies. As such, the purpose of this study is to determine the epidemiology and trends of APM in Saskatchewan over the last 20 years.

Methods: After obtaining institutional review board approval, physician billing codes were used to identify patients who underwent APM in Saskatchewan between January 1, 1998 and December 31, 2017. Records were obtained from eHealth Saskatchewan, a provincial health database. Data was analyzed for overall incidence and age-specific trends of APM during the study period.

Results: Overall incidence rate of APM showed no consistent trend; an initial reduction (2002-2003) was followed by a steep increase (2009-2011) and finally a gradual decline during the last few years of study. In middle-aged and older individuals the incidence of this procedure either remained stable or increased over time. Additionally, the frequency of meniscectomy was significantly greater in individuals >50 years old during the second decade of study (2008-2017), compared to the first decade (OR 1.48, $p<0.001$). Regional stratification demonstrated that frequency of APM in Saskatoon remained fairly stable over time, whereas the frequency in Regina substantially increased during the second decade.

Conclusion: There has been an overall increase in the incidence of APM in Saskatchewan over the last 20 years, particularly in patients older than 50.

Arthroscopic Skills Acquisition in Medical Professionals

Samuel Larrivée, PGY5 Gregory Stranges
University of Manitoba

Background: Knee arthroscopy is one of the most commonly performed orthopedic procedures and is a difficult technical skill to acquire. The aim of this study was to compare traditional master-apprentice style of learning (TL) to a self-guided module-based training (MBT) program on an arthroscopic surgery simulator.

Hypothesis: We hypothesize that performance scores will improve significantly in both training groups compared to a control group (C).

Study design: 3-arms randomized controlled trial

Methods: Health Sciences students where recruited and randomized into one of the three groups: MBT, TL, or C (1:1:1 ratio). Participants in the MBT group were required to practice on the simulator by themselves a minimum of two hours per weeks, while the TL received one-on-one coaching by a senior resident for fifteen minutes per week. The control group received no additional training in between the two sessions. All groups were assessed at baseline and at four weeks using objective measures from the surgical simulator (procedure time [PT], camera path length [CPL], meniscus cutting score [MCS], detailed visualisation [DV], safety score [SS] and total score [TS]), and subjective ratings scales (OAAS global assessment form, and Competency Based Assessment form [CBA]). Improvement after intervention was tested using repeated measures ANOVAs and post-hoc comparisons with Bonferroni correction.

Results: Thirty participants were recruited. There was significant Group x Time interaction for PT ($p = 0.006$), CPL ($p=0.008$), SS ($p=0.013$), TS ($p=0.003$), OAAS form ($p<0.001$) and CBA form ($p<0.001$). MBT group was superior to C group for PT ($p=0.02$), CPL ($p=0.003$), TS ($p=0.004$) and OAAS form ($p=0.021$), but there were no significant post-hoc differences between MBT and TL groups, or TL and C groups.

Conclusion: Knee arthroscopy simulation training with self-learning modules can improve skill in untrained participants in comparison to a control group. Incorporating module-based simulation training into a junior resident's curriculum could provide additional time and practice to improve arthroscopic skills.

The Novel Rip-Stop Suture Pattern is Superior to the Traditional Suture Bridge: A Matched Cohort Study

Zachary Oleynik, Med II, Jeremy Reed, Mitchell Thatcher, Aden Mah, Megan Dash
University of Saskatchewan

Rationale: Anecdotally the author's novel "rip-stop" (RS) suture technique, started in January 2017, for rotator cuff repair was superior in terms of failure rate. This study set out to quantify, and prove or disprove, that suspicion.

Methods: A Matched cohort study drawing data from a chart review and patient phone interviews. Patients were matched according to rotator cuff tear size (0-1.5cm, 1.51cm – 3.00cm) and age (10-year strata). The RS cohort was matched and compared against a pre ripstop cohort, consisting of a standard double row suture bridge repair.

Primary Outcome:
Failure rate of Rotator Cuff Repair (RCR)

Secondary Outcome:
Patient satisfaction with procedure (Sane Score)
Patient function following the procedure

Results: A cohort of 93 rip-stop patients with more than 1yr f/u was identified via EMR. We were able to match 77 patients from pre-ripstop group based on age (10 year strata) and tear size. 77 patients were eligible for study in each group after matching. No difference in groups re: age (61+/-9, p=0.17) or tear size (large 37% vs. 57% in RS group, p=0.156), but there were more males in RS group (75% vs. 59%, p=0.021). RS group demonstrated a **significant** decrease in failure rate over the traditional technique (RS - 2/77, 2.6%, traditional 10/77, 13%, p=0.017).

Conclusion: Although it cannot be declared conclusive due to its retrospective nature, this study demonstrates strong evidence that the ripstop suture technique is superior (10.4% improvement in failure rate, reaching statistical significance) to traditional suture bridge techniques in terms of failure rate. In the practice of the author it has proven itself as safe, cost effective, and relatively easy to perform for an experienced arthroscopist.

Funding Source: UofS College of Medicine Dean's Summer Research Project

Outcomes and Complications After Repair of Complete Distal Biceps Tendon Rupture with the Cortical Button Technique

Tiffany Huynh, PGY5, Jon Marsh
University of Manitoba

Background: Numerous techniques have been described for the repair of complete distal biceps brachii tendon ruptures; however, the outcomes of some have been less extensively evaluated. The purpose of this study was to assess patient function after repair with cortical button fixation.

Hypothesis: The hypothesis is that there would be a change in range of motion (ROM) and strength of the operative arm but this would be associated with minimal disability as determined by the Disability of the Arm, Shoulder and Hand (DASH) score.

Study design: Retrospective cohort

Methods: Patients included were diagnosed with a complete distal biceps tendon rupture and were repaired with cortical button fixation via a one-incision anterior approach. Outcomes were assessed with ROM and strength measurements, DASH scores, and radiographs of the operative elbow. Descriptive statistics was generated for patient demographics and outcome variables. Paired t-tests were performed for strength and ROM.

Results: Sixty patients consented to this study. Age at follow-up was 49.6 ±7.8 years with 3.7±1.7 years from time of injury. Mechanism of injury included lifting heavy objects (62%) and sporting activities (25%). Elbow flexion and supination ROM were not different between the operative and contralateral (CL) arms. The operative elbow demonstrated decreased flexion and supination (96% and 91% of CL side) strength. Findings did not change when controlling for hand dominance. Mean DASH score was 7.9±11.4. Postoperative complications included heterotopic ossification (57%, 85% Brooker Grade 1), neuropraxia (12%), and re-rupture (5%).

Conclusions: Repair of complete distal biceps tendon ruptures with cortical button fixation was associated with decreased strength in elbow flexion and forearm supination compared to the contralateral arm, although differences are small and likely not clinically significant. There was a relatively high complication rate, however, most were minor and were associated with minimal disability, as reflected by the DASH scores.

Periprosthetic Fracture Rate After Short and Long Hip Nails: Analysis of a Health Region Database

Gabriel Larose, PGY5 Christopher Graham, Ted Tufescu
University of Manitoba

Background: Treatment of intertrochanteric hip fracture is generally surgical, with either a dynamic hip screw or a cephalomedullary hip nail. Recently, there is a trend toward use of hip nails. The use of short nails (SN) over long nails (LN), remains a source of controversy. Historically, SN were associated with a higher periprosthetic fracture rate compared with LN, however newer nail designs, appear to have solved this issue. Small retrospective studies show a refracture rate similar in both long and short nails. A bigger database review would help settle the issue, help surgeons choose between long and short nails.

Hypothesis: No difference in refracture rate between short and long nails

Study design: Retrospective cohort design

Methods: The Winnipeg Regional Hip Fracture Registry was reviewed. All patients with an intertrochanteric fracture treated with a cephalomedullary nail from June 2009 to December 2017 were included. Patient demographics were compared using a t-test. Fracture rate was compared using chi square test.

Results: 545 SN and 222 LN were reviewed. The SN group was older than the LN (SN: 81, LN 74 $p<0.001$). The refracture rate was similar in each group (SN 2,6% LN 0.9% $p=0.24$). There was no difference in blood transfusion (SN32% LN 35% $p=0.21$) or hospital stay (SN19 days, LN 23days $p=0.22$). However, the procedure time was shorter in the SN group (SN: 81min LN: 121min $p<0.001$).

Discussion: This study did not show a difference in periprosthetic fracture rate when comparing short and long cephalomedullary nails for the treatment of intertrochanteric fractures. The length of the procedure was quicker in the SN group. However, no difference in hospital stay or blood transfusion was seen between types of nail. Based these findings, surgeons can use the nail of their choice. Further study on long-term longevity could help us decide on which nail should be used.

Patient Factors Affecting Soft Tissue Complications in Operative Treatment of Intra-Articular Calcaneal Fractures

Ryan Vidal, PGY2 Ted Tufescu
University of Manitoba

Background: Fractures of the calcaneus account for approximately 2% of all fractures. A number of operative fixation techniques exist for treatment of calcaneal fractures and are associated with soft tissue complications in 7- 45% of cases using extensive lateral approaches. Conflicting evidence exists to support either operative or non-operative management of intra-articular calcaneal fractures. Currently, there is good evidence to show that a history of smoking, open fractures and severity of fracture can increase risk of infection when treated with a traditional extensive lateral approach. Minimal evidence exists for minimally invasive techniques. Our main objective will be to review operative calcaneal fixation to determine patient factors that predict soft tissue complications in both an extensive lateral approach and minimally invasive approaches.

Hypothesis: Primary: Patients with open injuries, diabetes, a history of smoking or intravenous drug use, work type (heavy labor versus no heavy labor) and type of Sanders classification will be able to predict soft tissue complication risk; Secondary: 1) Soft tissue complications are higher for the extensile lateral approach than minimally invasive techniques.

Methods: All cases of patient undergoing operative treatment of an intra-articular calcaneal fracture between 2011 and 2018 will be identified from a prospective database of patients treated at a level one trauma center. There are no exclusion criteria. A chart review will be undertaken to document open versus closed injuries, surgical technique (extensive lateral approach vs minimally invasive approaches) and operative time, past medical history, smoking or intravenous drug use and type of work. The University of Manitoba Statistical Services will be utilized to build a logistic regression model to determine the relationship between the above patient factors and presence/absence of soft tissue complications.

Results: It is anticipated that approximately 250 patients will be identified and approximately 35 will have soft tissue complications. Demographic information will be presented. Odds ratios (CI 95%) determined by the logistic regression model will be reported with presence/absence of soft tissue complications as the dependent variable and surgical technique, open vs closed fracture, operative time, smoking and diabetes history as the independent variables.

Conclusion: The clinical importance of this study is to provide objective evidence on which patient factors predict soft tissue complications in the operative fixation of calcaneal fractures. This study will provide evidence to add to current literature about risk factors for soft tissue complications when using an extensive lateral approach or a minimally invasive approach to treat intra-articular fractures. This will provide clinicians with better evidence to guide treatment when deciding on operative management and the risk of soft tissue complications.

Supracondylar Fractures: Comparing Infection Rate in Full Surgical Preparation and Draping Versus Semi-Sterile Technique

Ian Laxdal, PGY3 Paul Jellicoe
University of Manitoba

Background: Both semi-sterile and full preparation with draping techniques are used in supracondylar fracture repair. Current literature states supracondylar fracture repair with closed reduction and percutaneous pinning have infection rates ranging from 0% to 7.3%. Although semi-sterile technique offers reduced operative room time and cost there is debate whether full preparation and draping is safer in regards to infection. The use of pre-operative antibiotics have also been debated in the literature. Currently, there are no studies comparing infection rates between techniques within the same center.

Hypothesis: There are no significant differences in infection rates of semi-sterile operative technique compared to full surgical preparation and draping technique while used in supracondylar fracture repair.

Study Design: Retrospective case-control series based on a chart review

Methods: Retrospective chart review of 336 patients with supracondylar fractures who were treated with closed reduction percutaneous pinning. Under review are four fellowship trained pediatric orthopedic surgeons. Two of the surgeons use a full preparation and draping technique whereas the other two use a semi-sterile technique. Charts were divided into two arms: semi-sterile technique versus full preparation and draping. These groups were then assessed for signs of infection at 1 week and 3 weeks postoperatively. An infection was classified as any patient prescribed antibiotics for pin site infection.

Results*:* Of 336 children, 1 (.02 %) in the full preparation and draping group developed an infection requiring antibiotics. This was a deep infection causing septic arthritis and osteomyelitis of the humerus. There were no patients in the semi-sterile operative group that were identified as having an infection.

Conclusion: Semi-sterile operative technique has a similar, if not lower infection rate in the treatment of supracondylar fracture repairs compared to full preparation and draping.

Medial Plating of Pilon Fractures Predicts Post-Operative Soft Tissue Complications Requiring Subsequent Surgery

Mark Xu, PGY4 Ted Tufescu
University of Manitoba

Background: Pilon fractures are associated with significant soft tissue injury and complications. The medial border of the distal tibia is subcutaneous and often the site of soft tissue injury. The objective of this study was to assess the link between the application of distal tibial medial plates for pilon fracture fixation, and soft tissue complications requiring either non-operative medical management or surgical management.

Hypothesis: We hypothesize that the application of medial plating for the fixation of pilon fractures is associated with an increased risk of overall soft tissue complications, and of those requiring subsequent surgical intervention.

Study design: Retrospective analysis of prospectively collected data on patients with a pilon fracture treated with open reduction and internal fixation at HSC Winnipeg (2011-2017).

Methods: Logistic regression was performed to determine the association between medial plating and: 1) the incidence of soft tissue complications and 2) the incidence of soft tissue complications requiring surgical intervention. We controlled for other independent variables by introducing them into the regression model. Other independent variables introduced into the model included: presence of open fracture, smoking status, diagnosis of diabetes, and radiological injury classification. Soft tissue complications were defined as any documented wound or skin problems including hardware irritation resulting in hardware removal. We calculated the Cox and Snell r^2 as a measure of the percentage of the explained variation. Significance was set at $p<0.05$.

Results: The study included 168 patients, 165 of whom had full data. The incidence of soft tissue complications was 29% (n=48), while 23% (n=39) required surgical treatment. Predictors of soft tissue complications were 1) presence of open fracture (OR 4.75, 95% CI 2.06-10.95, p<0.001), 2) smoking (OR 2.87, 95% CI 1.22-6.71, p=0.015), and 3) medial plating (OR 2.62, 95% CI 1.03-6.64, p=0.042). The r^2 value was 0.18. Predictors of soft tissue complications requiring surgical intervention were 1) presence of open fracture (OR 2.88, 95% CI 1.21-6.84, p=0.017) and 2) medial plating (OR 4.17, 95% CI 1.40-12.39, p=0.010). The r^2 value was 0.14.

Conclusion: Both the use of medial plating and the presence of an open pilon fracture were associated with increased incidence of soft tissue complications requiring surgical intervention. Although smoking was linked to increased risk of post-operative soft tissue complications, it did not predict a higher re-operation rate. Surgeons should consider the value of using a distal tibia medial plate, particularly when treating open pilon fractures.

Four Corner Arthrodesis with a Locking Dorsal Circular PEEK Plate - Evidence from Saskatchewan

Emmitt Hayes, Med III David Leswick, Haron Obaid, David Sauder University of Saskatchewan

Rationale: Four corner arthrodesis (FCA) is a reliable salvage procedure for advanced wrist arthritis. It involves excision of the scaphoid and fusion of the capitate, lunate, trapezium, and hamate. Osteosynthesis in FCA can be performed with k wires, screws, staples, and dorsal plates. A new radiolucent dorsal locking circular plate made of PEEK (Polyetheretherketone) (LDCPP) (Trimed Fusion Cup Plate) has shown favorable clinical and radiological outcomes in early series'. Less evidence exists for LDCPP osteosynthesis compared to other methods. We present the largest series to date examining clinical and radiological outcomes of patients undergoing FCA with a LDCPP and the first examining Canadian patients.

Methods: 41 wrists in 39 patients were re-examined at a mean follow up of 54.3 months by a trained researcher who did not participate in patients' clinical care and was blinded to the patients' clinical history. Patients completed the PRWE and QuickDash questionnaires and answered questions about pain and satisfaction with surgery. AROM and grip strength was assessed with a dynamometer and goniometer.

AP and lateral radiographs of the operative wrist were obtained at follow up and analyzed by two separate fellowship trained MSK radiologists for union, hardware complications, and degenerative lunate change. Union was defined as the consolidation of bridging bone between the lunate and capitate or hamate.

Results: Mean satisfaction was 81.8/100. Average pain decreased from 84.5/100 prior to surgery to 35.4/100 after surgery. The mean QuickDash score was 24.4 and mean PRWE score was 26. Mean grip strength was 31.8 KG or 81% of the non-operative hand. Mean flexion was 37.72 degrees, mean extension was 28.74 degrees, mean radial deviation was 14.28 degrees, and mean ulnar deviation was 17.52 degrees. 87% of wrists were fused. There were 7 cases of hardware breakage and 6 cases of hardware loosening.

Conclusion: Our results are consistent with prior literature indicating that LDCPP osteosynthesis is a reliable method of performing FCA.

Funding Source: UofS College of Medicine Dean's Summer Research P roject

The Effect of Patient Resilience and Pain Catastrophizing on Carpal Tunnel Surgical Outcomes

Sarah McLaren, PGY4 Laura Sims, Yanzhao Cheng, Raymond Kahn, David Sauder
University of Saskatchewan

Rationale: Outcomes following carpal tunnel release are generally favorable. Understanding factors that contribute to inferior outcomes may allow for strategies targeted at improving results in these patients. Our purpose was to determine if patients' underlying personality traits, specifically resiliency and catastrophization, impact their post-operative outcomes following carpal tunnel release.

Methods: A prospective case series was performed. Based on our power analysis, 102 patients were recruited. Patients completed written consent, the Boston Carpal Tunnel Questionnaire (BCTQ), the Pain Catastrophizing Scale (PCS) and the Brief Resiliency Scale (BRS). A single surgeon, or his resident under supervision, then performed an open carpal release under local anaesthetic. Our primary outcome measure was a repeat BCTQ at three- and six-months. Univariate and multivariate analysis was performed to assess the correlation between PCS and BRS scores and final BCTQ scores.

Results: Forty-three and sixty-three participants completed the BCTQ at three and six months respectively. All patients showed improvement in their symptoms ($p = 0.001$). There was no correlation between patients PCS or BRS and the amount of improvement. There was also no correlation between PCS or BRS and the patients' raw scores at baseline or follow-up.

Conclusion: Patients self-assessed resiliency and degree of pain catastrophization has no correlation with the amount of improvement they have three or six months post-operatively. Most patients improved following carpal tunnel release, and patients with low resiliency and high levels of pain catastrophization should expect comparable outcomes to patients without these features

Funding: None

CT Arthrography Versus MRI and MRI Arthrography in Intrinsic Ligament Wrist Tears

Robbie Singh, Med IV M. Clarke, B Le, M. Clay
University of Saskatchewan

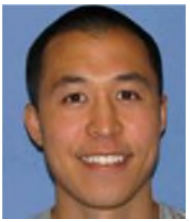
Rationale: Imaging of intrinsic wrist ligament injuries has typically been carried out by MRI and MR arthography. CT wrist arthrography is a newer technique that has many benefits over MRI however is not commonly used in practice. The purpose of this study is to provide data on the sensitivity, specificity and accuracy of CT arthography in comparison to MRI and MRI arthrography so that the diagnostic capabilities can be analyzed and potentially incorporated into everyday practice.

Methods: Through PACS and orthopedic surgeon operative reports, a retrospective chart review was carried out. Data from Twenty-two patients who had wrist arthrograms and also had undergone arthroscopic surgery was used to generate sensitivity, specificity to compare the accuracy of the imaging modalities.

Results: The overall results obtained showed that CT wrist arthography was more sensitive (94% vs. 89%) than its MRI counterpart but not as specific (75% vs. 100%). Given the limited sample size, the results were not statistically significant.

Conclusion: The preliminary data leads us to believe that given CT's inherent benefits over MR imaging, there could be a role in daily practice. More data is required in order to make definitive conclusions regarding CT arthography and its use in intrinsic ligament tears.

Funding: UofS College of Medicine Dean's Summer Research Project



Conical Versus Cylindrical Pedicle Screw Design

Jonathan Tan, PGY4 Michael Goytan
University of Manitoba

Introduction: Pedicle screws can have a conical (tapered) or cylindrical (uniform) diameter. Screw back-out of one or two revolutions is common intraoperatively. The literature has conflicting results on whether there is a significant difference in screw purchase for conical versus cylindrical screws after back-out.

Hypothesis: Since conical screws have a tapered diameter, they may be more likely to lose pullout strength than cylindrical screws after backing out.

Study Design: Biomechanical study

Methods: Pullout strength and displacement of conical and cylindrical screws were assessed following 37,800 cycles of 150 N of force. Three screws of each type were tested in accordance with ASTM standard F543-13, using normal and osteoporotic synthetic bone models validated to cadaver lumbar spines. Second, the screws were backed out one and two revolutions, and pullout strength and displacement were recorded.

Results: Screw back-out increased screw toggle and pullout strength in both conical and cylindrical screws. Cylindrical screws displaced more than conical screws in normal and mild osteopenic bone ($p < 0.05$ for all values). Average screw toggle after cyclic loading in the normal bone mode was 0.61 mm, 1.45 mm, and 2.64 mm for cylindrical screws backed out zero, one, and two revolutions respectively. Conical screws had 0.12 mm, 0.16 mm, and 0.22 mm of screw toggle. Pullout strength was reduced less in cylindrical screws than conical screws, but conical screws had greater pullout strength compared to cylindrical screws ($p < 0.05$). Pullout strength was 3585 N, 3333 N, and 3260 N for cylindrical screws and 4751 N, 4511 N, and 4340 N for conical screws.

Conclusions: Screw back-out causes more screw toggling and decreased pullout strength. Counterintuitively, conical screws had equivalent or stronger screw purchase compared to cylindrical screws after screw back-out in normal and mild osteopenic bone models.

Does Femoral Acetabular Impingement Etiology Correlate with the Location of Labral Tears?

Kristi Billard, PGY3 Haron Obaid, Jordan Buchko
University of Saskatchewan

Rationale: Femoral acetabular impingement (FAI) is a painful hip condition that affects many young people. There are many anatomic causes for FAI including femoral retroversion, CAM lesions, acetabular over-coverage (pincer), and poor biomechanics of the pelvis. FAI can cause abnormal contact in and around the hip joint, which can lead to painful labral tears. The purpose of this study is to determine whether the etiology of FAI correlates with the location of these labral tears.

Methods: In this retrospective study, 200 sequential charts were reviewed with referrals for non-arthritic hip pain. Of those individuals with FAI, 62 were found to have MRI proven labral tears. The patients were then divided into one of four groups based on the etiology of their FAI: Femoral Retroversion, CAM, Mixed (Femoral Retroversion + CAM), and Other (over-coverage/biomechanical etc). Labral tear locations as reported by radiology were recorded and categorized as Superior (10-2 o'clock) or Anterior (2 to 4 o'clock). If a tear was large, the midpoint of the tear was used to categorize it. Finally, statistical analysis was completed using chi squared and Fisher exact tests to determine if any correlation or differences between the groups existed.

Results: The results for this study are currently pending.

Conclusion: There are studies that have looked at the average location of CAM FAI labral tears but there are no studies that look at the location of labral tears in femoral retroversion. Our hypothesis is that with the entire anterior femoral neck contacting the acetabulum, the location of the tears in association with femoral retroversion should be more anterior than tears from other etiologies. This information would be helpful for surgeons as it would aid in the diagnosis of femoral retroversion. Since femoral retroversion needs 3-dimensional imaging to diagnose, the diagnosis may be missed at times and this can lead to poorer outcomes in hip arthroscopy, however if anterior labral tears do correlate with femoral retroversion it may allow for fewer missed diagnoses.

The Role of Subscapularis Repair in Reverse Shoulder Arthroplasty – A Meta-Analysis and Systematic Review

Graeme Matthewson, PGY5 Peter MacDonald
University of Manitoba

Introduction: Reverse shoulder arthroplasty (RTSA) is an effective treatment for patients with rotator cuff arthropathy, however, complications rates are relatively high (19-50%), with implant instability and infection being particularly devastating to overall outcomes. The objective of this study was to analyze the highest level of data from published literature from database inception to November 2017, comparing dislocation rates and outcomes in RTSA with and without the subscapularis tendon repaired.

Methods: The databases MEDLINE, EMBASE, and CINAHL were searched using a sensitive search strategy. Eligibility for studies included any studies or conference abstracts in which patients were treated with a RTSA where the status of subscapularis tendon could be determined. A data extraction form was developed to collect select data from the included studies. A meta-analysis and systematic review was completed, comparing the dislocation rates, post-operative forward elevation, overall complications, rate of infection, and fractures.

Results: Two independent researchers reviewed 1008 studies. Seven studies met inclusion criteria. A meta-analysis was performed on all level III studies resulting in 1309 patients being analyzed. Results demonstrated lower dislocation rates in the subscapularis repair group (OR 0.19, $P<0.001$). When analyzing dislocation rates in a lateralized design only, there was no difference in dislocation rates based on subscapularis repair (OR 0.29, $P=0.07$). On further comparison in patients without a subscapularis repair, a lateralized center of rotation (COR) resulted in a significantly lower dislocation rate compared to medialized COR (OR 0.24, $P<0.001$).

Conclusion: The results of our meta-analysis of the available data demonstrated a decrease in dislocation risk when the subscapularis tendon was repaired in all design types. When subscapularis repair is not performed, utilizing a lateralized center of rotation may reduce dislocation rates.

Complications of Superior Capsule Reconstruction for Irreparable Rotator Cuff Tears: A Systematic Review

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Background: Superior Capsule Reconstruction (SCR) is a new treatment option for patients with irreparable rotator cuff tears (IRCTs). SCR offers superior stability to the glenohumeral joint allowing restoration of shoulder function. Several case series conducted on SCR have demonstrated promising restoration of function and pain relief while others reported a high clinical failure rate. Despite the rapidly growing use of SCR, there is currently no study evaluating complication rates on a large scale, particularly when comparing dermal allograft versus facia lata autograft and graft thickness. This study aims to determine the complication rate of SCR when comparing different surgical factors as well as patient reported and surgical outcomes.

Study design: Systematic Review

Methods: A systematic review was performed by three independent reviewers using PRISMA guidelines. Medline, Embase, and PubMed databases were searched from September 2004 to June 2019. Studies investigating SCR in adults with a minimum follow-up of 6 months and that reported on post-operative outcomes were included. The studies had to report on at least one post-operative complication. Animal, cadaveric, review studies, letters to the editor, technique papers and non-English publications were excluded. Covidence platform (Veritas Health Innovation www.covidence.org) was used to streamline the screening process. A blinded combination of any two reviewers out of three determined inclusion/exclusion with conflicts resolved to consensus with a third reviewer.

Results: Two hundred and eight studies were screened, 24 full-text studies were assessed for eligibility with 11 studies excluded. In total, thirteen studies were included that were published between May 2013 and June 2019. Data extraction is on-going. Demographics, surgical parameters including graft type, graft thickness, revision, tendons, and patient parameters and outcomes will be reported. Complications to be investigated include graft rupture / tear, revision surgery, persistent pain, infection, anchor loosening, contracture, traumatic accident, and arthritis progression / humeral head elevation.

Conclusions: Having a comprehensive understanding of the complication risks of SCR will allow future research to target improvement in the technique and help determine the validity

Acromioclavicular Joint Separation: The Presence of Additional Pathology in Grade I and II Injuries

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Background: Acromioclavicular (AC) joint injuries are common, comprising 12% of shoulder girdle dislocations. AC joint injuries are typically described using the Rockwood Classification, which divides AC injuries into 6 grades based on ligamentous injury and the direction of displacement. Generally, grade I and II injuries are non-operative, grade IV to VI are operative, while grade III remains controversial. Studies show that many patients with grade I and II injuries remain symptomatic and have radiographic evidence of AC joint degeneration several years after initial injury. A study by Nemec et al used magnetic resonance imaging (MRI) and found AC joint injuries had effusions and bone marrow edema. However, these findings were not correlated with injury grade. Given the poor clinical outcome of grade I and II injuries and additional MRI findings in AC joint injuries, we aim to identify if further pathology exists in grade I and II AC injuries on MRI compared to x-ray.

Hypothesis: Rockwood grade I and II injuries have additional pathology on MRI that is not recognized on x-ray.

Study design: The study is a prospective case series.

Methods: Thirty patients with grade I or II injuries diagnosed with x-ray will be prospectively recruited from the Pan Am Minor Injury Clinic. Consenting patients will undergo MRI within 21 days of injury. These images will be interpreted by one radiologist using a standardized radiology collection form, including the following parameters: ligament status, tendinopathy, labral or muscular injury, joint effusion, and bone displacement, fracture, or contusion.

Results: Descriptive statistics will be conducted, frequency tables, and identification of trends within and between grade I and II.

Conclusions: Identifying additional pathology on MRI will contribute to the current understanding of AC joint injuries and may alter diagnostic and treatment guidelines for patients with grade I and II AC joint injuries.

Tibial Post Fracture in Total Knee Arthroplasty: Two Cases After Recent Change in Implant

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Rationale: Total knee arthroplasty is a very commonly performed orthopedic surgery. As with any surgery it does come with complications, some more common than others. At our institution two patients from two different experienced arthroplasty surgeons recently developed a tibial post fracture in a posterior stabilized knee. Both patients experienced a fracture after minor trauma. As neither surgeon had previously seen patients experience this complication it was felt this warranted further investigation.

Method: A literature review of the topic will be performed to investigate the incidence of this complication. Additionally, potential mechanisms for failure and any proposed management guidelines will be reviewed.

Conclusion: Potential factors leading to failure arise from the implant, the patient, or the surgeon. Implant factors include polyethylene material composition and processing as well as mechanical design. Patient factors would include things such as body weight, knee kinematics, and potential loads outside of the normal (ie. falling on to knee or twisting motion). Surgical factors would include implant positioning and handling.

Post fracture in posterior stabilized bearings remains an uncommon complication. It is difficult to assign a specific cause to the failure; however, any potential contributing factors are worth reviewing to guide decision making and optimize the patient outcomes as much as possible.

Controversial Topics in Total Knee Arthroplasty: A Five Year Update

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Rationale: Total knee arthroplasty (TKA) is a very commonly performed orthopedic procedure, and therefore, any improvements may have a significant beneficial effect on the patient population. Despite the frequency of total knee arthroplasty, there are marked variations in techniques with many controversies existing. This review examines updates to the literature during the past five years on numerous topics which the authors felt to have ongoing controversy. These include the use of peripheral nerve blocks and local infiltrative analgesia, epidural morphine use, patellar resurfacing, bearing designs (cruciate retaining/substituting/medial pivot), venous thromboprophylaxis, tranexamic acid usage, tourniquet usage, and wound closure techniques. This review was not intended to be a comprehensive summary for each of these specific topics, but rather to provide a compilation overview of updates to the literature from the past five years.

Methods: For each of these eight aforementioned controversial total knee arthroplasty topics, a literature search was conducted on several databases with emphasis on studies that were published in the past five years (2014-2018 inclusive). Preference was given to meta-analyses, randomized controlled trials as well as commonly utilized guideline sources. Those studies of the highest quality evidence and most relevance were given priority. A total of 80 references were included with the majority having been published within the past five years.

Results: Based on this review of recent literature, summaries of the current standing of these eight TKA topics have been created. However, many of these areas continue to have a component of ongoing discordance with no definitive conclusions developed in recent literature.

Conclusion: By analyzing recent updates to the literature surrounding the above noted controversial topics, surgeons can implement the most up-to-date evidence-based care when performing total knee replacement surgery.

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