UNIVERSITY OF MANITOBA

UNIVERSITY OF SASKATCHEWAN

RESIDENT ACADEMIC DAY

September 19, 2018
Pan Am Clinic Conference Room
75 Poseidon Bay

PROGRAM

MORNING SESSION: Chairs: Drs. Mike Johnson and Thomas Turgeon

9:30	Welcome & Introduction	Dr. Ted Tufescu
9:40	Fully Automatic Planning Of Total Shoulder Arthroplasty: A Deep Learning Based Approach	Dr. Paul Kulyk
9:50	Pedicle Screw Pullout Strength And Fatigue Loading In Different Bone Densities And Screw Designs	Dr. Jonathan Tan
10:00	Musculoskeletal Ultrasound Curriculum For Orthopaedic Surgery Residents	Dr. Samuel Larrivée
10:10	Supracondylar Fractures: Comparing Infection Rate In Full Surgical Preparation And Draping Vs Semi-Sterile Technique	Dr. Ian Laxdal
10:20	**Health Break**	
10:40	**Guest Speaker: Fostering Research Through Collaboration**	Dr. Dan Borschneck
11:10	Radioulnar Interval Narrowing In Distal Radius Fractures And Its Relationship To Radial Inclination	Dr. Matthew Mastel
11:20	Patient Tendencies Regarding Resiliency And Catastrophizing As It Relates To Carpal Tunnel Surgical Outcomes	Dr. Sarah McLaren
11:30	Clinical And Radiographic Outcomes Of A Hybrid Fixation Revision Total Knee Arthroplasty System At Short- To Mid-Term Follow-Up	Dr. Kevin Stockwell
11:40	Wrist Accelerometry As A Method For Objective Measurement Of Shoulder Activity	Ms. Emma Avery
12:00	**LUNCHEON**	

AFTERNOON SESSION: Chairs: Dr. Mike Johnson and Thomas Turgeon

13:00	Patient Factors Affecting Soft Tissue Complications In Operative Treatment Of Intra-Articular Calcaneal Fractures	Dr. Ryan Vidal
13:10	The Treatment Gap In Fragility Hip Fractures In Saskatoon	Dr. Scott Willms
13:20	Impact Of Pre-Surgical Self-Reported Exercise On Post-Surgical Outcomes In Patients With Cervical Pathology	Dr. Mark Xu
13:30	Incidence Of Total Knee Replacement In Patients With Previous Anterior Cruciate Ligament Reconstruction	Dr. Yiyang Zhang
13:40	Transitory Stiffness After Bicruciate-Retaining TKA: A Prospective RCT	Dr. Sophie Zhu
14:00	HEALTH BREAK	
14:10	**GUESTS SPEAKER: My Current Philosophy on Scoliosis Surgery**	Dr. Dan Borschneck
15:20	Conclusion	Dr. Ted Tufescu

EVENING PROGRAM:

Dinner & Awards Presentation at the Winnipeg Squash Club 5:30 – 8:15PM
275 Stradbrook Avenue

Paul Kulyk
Orthopaedic Surgery PGY-4
University of Saskatchewan

Guoyan Zheng and Matthias Zumstein (University of Bern)

FULLY AUTOMATIC PLANNING OF TOTAL SHOULDER ARTHROPLASTY: A DEEP LEARNING BASED APPROACH

Introduction: In total shoulder arthroplasty (TSA) a humeral resection is performed along the articular marginal plane (AMP) or anatomic neck. The AMP also defines the orientation, position and size of the prosthetic humeral head. Current manual preoperative planning methods to determine these values are time consuming and subject to error. We present a deep learning based method for automatically determining the position and orientation of the AMP utilizing computer tomography (CT) images without segmentation or hand-crafted features.

Methods: The process is broken down into a 3-stage fully convolutional neural network. Stage 1 determines a coarse estimation of the AMP center by sampling patches over the entire volume and combining the predictions with a novel kernel density estimation (KDE) method. Stage 2 utilizes the estimate from stage 1 to focus on a smaller sampling region at a higher image resolution to obtain a refined prediction of the AMP center. Stage 3 focuses patch sampling on center obtained at stage 2 and regresses the tip of a vector normal to the AMP, yielding the orientation of the plane.

Results: The system was trained and evaluated on 27 upper arm CTs. In a 4-fold cross-validation the mean error in estimating the AMP center was 1.30 ± 0.65mm and the angular error for estimating the normal vector was $4.68 \pm 2.84°$.

Discussion: Previous methods have relied on more traditional computer vision techniques which required manual feature definition. Our method applies a convolutional neural network which optimizes the parameters automatically and requires no segmentation or feature definition. Using this technique, we obtained state-of-the-art accuracy surpassing the previous published best results. Expanding a similar technique to define the humeral axis and combining with existing methods has the potential to yield fully automated preoperative planning for TSA.

Dr. Samuel Larrivee
PGY4 - Orthopedic Surgery
University of Manitoba

Supervisor: Jeff Leiter
Co-authors: Robyn Rodger, Patricia Larouche and Tomislav Jelic

MUSCULOSKELETAL ULTRASOUND CURRICULUM FOR ORTHOPAEDIC SURGERY RESIDENTS

Background: Musculoskeletal ultrasound (MSK-US) can have many uses for orthopaedic surgeons. However, proficiency in sonography is not a requirement for Royal College certification, and orthopaedic trainees are rarely exposed to this modality. The purpose of this project was to assess the usefulness in clinical education of a newly implemented MSK-US course in an orthopaedic surgery program.
Hypothesis: We hypothesize that written scores, subjective comfort using ultrasound and frequency of use will improve significantly after the course and be maintained at six months.
Study design: Prospective non-randomized study
Methods: An MSK-US course for orthopaedic surgery residents was developed including online videos to be viewed by residents prior to a half-day long practical course. An online survey was filled by the participants prior to the course. Resident's knowledge acquisition was measured with a written pre-course, same-day post-course and six-month follow-up tests. Residents were also scored on a practical shoulder examination immediately after the course and at six-month follow-up. Change in written test scores were calculated using an ANOVA with Bonferroni correction, while all other variables were computed using a Wilcoxon signed-rank test.
Results: Ten orthopaedic surgery residents underwent the MSK-US curriculum. Written test scores improved significantly from 50.7 ± 17.0% to 84.0 ± 10.7% immediately after the course ($p<0.001$) and suffered no significant drop at six months (score 75.0 ± 8.7%; $p=0.303$). Average post-course practical exam score was 78.8 ± 3.1% and decreased to 66.2 ± 11.3% at six months ($p=0.012$). Residents significantly improved their subjective comfort level with all aspects of ultrasound use at six months ($p=0.007$-0.018) but did not significantly increase clinical usage frequency.
Conclusion: An MSK-US curriculum was successfully developed and implemented. The course improved the residents' knowledge, skills, and comfort with MSK-the US. This improvement was maintained at six months on the written test, but did not result in higher frequency of use by the residents.

Dr. Ian Laxdal
PGY-2 Orthopedic Surgery
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Supervisor: Dr. Paul Jellicoe

SUPRACONDYLAR FRACTURES: COMPARING INFECTION RATE IN FULL SURGICAL PREPARATION AND DRAPING VS SEMI-STERILE TECHNIQUE

Background: Both semi-sterile and full preparation with draping techniques are used in supracondylar fracture repair. Current literature states full preparation and draping has infection rates of 1-3% whereas a semi-sterile technique has infection rates up to 7%. There are no studies that directly compare 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 Chart Review

Methods: The method of this study will be to complete a retrospective chart review of 336 patients with supracondylar fractures who were treated with closed reduction percutaneous pinning. Under review there will be four pediatric orthopedic surgeons practicing out of Health Sciences Center. Two of the surgeons use a full preparation and draping technique whereas the other two use a semi-sterile technique.

Charts will be divided into two arms: semi-sterile technique versus full preparation and draping. These groups will then be assessed for signs of infection at 1 week and 3 weeks postoperatively. The study will be looking for patients that were prescribed antibiotics for pin site infection.

Results: We are expecting the two arms of the study to conclude a non-significant difference of infection. A sample size of 336 patients are required to be 80% sure that the limits of a two-sided 90% confidence interval will exclude a difference between the standard and experimental group of more than 5%. The percentage 'success' in both control and experimental group used for sample calculation is 2.5% with an equivalence limit of 5%.

Conclusion: If the data supports our hypothesis then surgeons are able to use a semi sterile technique for supracondylar fracture repairs which will reduce operating room time and cost while ensuring patients receive equivalent outcomes.

Matthew Mastel
PGY-4 Orthopedic Surgery
University of Saskatchewan

Supervisor: Dr. Geoffrey Johnston

RADIOULNAR INTERVAL NARROWING IN DISTAL RADIUS FRACTURES AND ITS RELATIONSHIP TO RADIAL INCLINATION

Background: Traditionally, one of the deformities associated with distal radius fractures (DRFs) is radial displacement of the DRF fragment in the coronal plane. This so-called radial translation has been identified and implicated in post-DRF distal radioulnar joint instability. However, anatomically, it is actually ulnar translation of the radial shaft that occurs, rather than radial translation of the distal fragment. This is more than an argument of semantics, as treatment of the former neglects to formally address radioulnar interval narrowing.

Hypothesis: Radioulnar interval narrowing (ulnar translation of the radial shaft) in DRFs has a significant association with the degree of change in radial inclination.

Study Design: Retrospective Case Series

Methods: On the postero-anterior (PA) DRF radiographs a number of angular and linear measurements were defined. All were then measured and recorded from the DRF radiographs (at either 9 or 12 weeks post fracture) in 398 women fifty years and older with a DRF for which closed reduction had been performed, and from the radiograph of the opposite distal radius from the DRF in 32 women (controls).

Results: Statistical analysis of original and standardized data confirmed that ulnar translation of the radial shaft in DRFs does occur. The correlation between measurements of the radial axis to the ulnar head and the resultant radial inclination is statistically significant ($p<0.0001$). Pearson correlation coefficient analysis demonstrated this relationship to be linear (R^2 0.354), as was the distance from the head of capitate to the radial axis (R^2 0.697).

Conclusions: Ulnar translation of the radial shaft in DRFs has been identified and quantified. It is closely associated with the degree of change in radial inclination and radial translation of the proximal head of the capitate. This suggests that DRF management include formal restoration of the radioulnar interval.

Sarah McLaren, University of Saskatchewan
Raymond Kahn, David Sauder

PATIENT TENDENCIES REGARDING RESILIENCY AND CATASTROPHIZING AS IT RELATES TO CARPAL TUNNEL SURGICAL OUTCOMES

Purpose: To examine the impact of catastrophic thinking and resiliency on patients pain and disability from carpal tunnel syndrome and how this impacts surgical outcomes.

Methods: This is a prospective questionnaire based study. Participants were invited to participate at the time of presentation for surgery. They were consented and completed a series of questionnaires prior to surgery. This included Patient Information and Demographics, the Boston Carpal Tunnel Syndrome Questionnaire (BCTQ), the Pain Catastrophizing Scale (PCS) and the Brief Resiliency Scale (BRS). A single surgeon or his resident, under supervision, performed the surgery. At 3- and 6-months post-op participants were contacted and asked to re-complete the BCTQ. univariate and multivariate analysis was performed.

Results: 102 participants were recruited to participate. 5 withdrew or had incomplete intake information. 43 participants completed the 3 month BCTQ. At 3 month follow up all patients showed improvement. There was no correlation between patients PCS or BRS and the amount of improvement. Analysis of additional patient factors were consistent with previous literature. At 3 month follow up non-diabetic patients and those with postgraduate education had greater improvements in symptoms according to the BCTQ. When patients had surgery performed on their dominant hand they greater improvements in their function.

Discussion: At 3 month follow up pain catastrophising and resiliency do not appear to affect surgical outcomes. At 3 months patients are still having gradual improvement in their symptoms so we will potentially see more differentiation at the 6 month follow up. In general most patients were satisfied with the outcomes of their surgical procedure regardless of the patient factors that we assessed for. Further investigation into the unsatisfied patients may reveal additional factors not assessed here.

Kevin Stockwell
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Supervisor: Thomas Turgeon

CLINICAL AND RADIOGRAPHIC OUTCOMES OF A HYBRID FIXATION REVISION TOTAL KNEE ARTHROPLASTY SYSTEM AT SHORT- TO MID-TERM FOLLOW-UP

Background: The need for revision total knee arthroplasty (rTKA) is expected to increase more than 600% by 2030 (from 2005 rates) to 268,200 annual operations in the United States. In contrast to primary TKA, revision TKA is associated with inferior functional outcomes and lower survivorship. Hybrid fixation systems consist of press-fit diaphyseal stems and cemented metaphyseal tibial and femoral components. They are used to improve stability of the components and to overcome the challenge of reduced bone stock.
Aims: We seek to answer the following questions regarding a single hybrid fixation revision total knee arthroplasty (rTKA) system at short- and mid-term follow-up:
1) What are the clinical outcomes and patient satisfaction rates?
2) Are there radiographic changes suggesting premature failure? Does this correlate with outcomes?
3) Has neutral mechanical knee alignment been achieved? Does this correlate with outcomes?
4) What is the survivorship at short to mid-term follow-up?
Materials and Methods: A consecutive cohort of 234 rTKAs was identified. Patient outcomes measures were the Oxford Knee Score (OKS) and patient reported satisfaction. Radiographs were assessed in accordance with the Knee Society radiographic scoring system. Mechanical alignment was assessed on 3-ft standing radiographs. Survival analysis was assessed for aseptic loosening and any-cause failure.
Results: OKS improved from pre-op (average 18.8) to 1-year (average 31.7), 2-years (average 30.7), and mid-term (average 30.6) follow-up ($p<0.001$ for all). At these intervals patient satisfaction exceeded 70%. One component (0.4%) failed radiographically and was later revised. Neutral mechanical alignment was achieved in 83% of cases, the others were in varus (10%) or valgus (7%). No consistent relationship between radiographs or mechanical alignment and clinical outcomes was noted. Aseptic survivorship at 1-year, 2-years, and 5-years was 100%, 100%, and 99.1%, respectively. Any-cause survival at 1-, 2-, and 5-years was 99.6%, 98.7%, and 92.3%, respectively.
Conclusion: The clinical, radiographic, and survivorship outcomes of the single rTKA system studied are equivalent or superior to other hybrid fixation rTKA systems reviewed in the literature at similar follow-up.

Emma Avery
3rd year medical student
University of Manitoba

Supervisor: Jeff Leiter

Co-author: Samuel Larrivée

WRIST ACCELEROMETRY AS A METHOD FOR OBJECTIVE MEASUREMENT OF SHOULDER ACTIVITY

Background: The effect of rotator cuff tears (RCT) and subsequent arthroscopic repair on shoulder and upper extremity activity is not well known, and there are no validated tools to measure daily upper extremity activity. The purpose of this study was to validate wrist accelerometry as an objective proxy for shoulder use and activity.

Hypothesis: We hypothesize that a valid threshold for detection of upper extremity activity can be found using wrist accelerometry, with acceptable sensitivity and specificity.

Study design: Biomechanical, cross-sectional study

Methods: Healthy volunteers wore accelerometers placed at both wrists, the dominant upper arm, and the chest while performing standardized activities. Activities were classified as shoulder activities (brushing teeth, combing hair, etc.) or non-shoulder activities (walking, running, etc.). The accelerometer recorded tridimensional acceleration, which was computed as the sum of vector magnitudes (SVM) for multiple epochs. Receiver operating characteristics (ROC) curves were built to determine the optimal epoch to classify shoulder-type activities. A threshold for detection of shoulder activity was determined with the minimal square sum technique, and the sensitivity and specificity of this threshold were calculated. Activities recorded with all the accelerometers were reclassified with the threshold and correlated to the activity performed using Pearson's test.

Results: Ten (10) healthy volunteers were recruited. The area under the ROC curve was optimal for the 5s epoch (AUC=0.779). The SVM threshold for detection of shoulder activities at the 5s epoch was determined to be 49.13 with a sensitivity of 91.6% and a specificity of 67.5%. Using this threshold, the dominant wrist accelerometer had the highest correlation with actual performed activity at 0.620 ($p<0.001$) in comparison to the other accelerometers positions.

Conclusion: A wrist-based accelerometer can classify shoulder and non-shoulder activities with excellent sensitivity and good specificity. Wrist accelerometry could be used as a valid objective proxy of shoulder activity during unconstrained real-world follow-up of RCT patients.

Dr. Jonathan Tan
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Supervisor: Dr M. Goytan

PEDICLE SCREW PULLOUT STRENGTH AND FATIGUE LOADING IN DIFFERENT BONE DENSITIES AND SCREW DESIGNS

Background: Pedicle screws are more likely to loosen in osteoporotic bone. We designed a novel test method to evaluate pullout strength after cyclic loading with different bone densities and screw designs. To our knowledge, there are no previous studies on pullout strength after cyclic loading with different screw designs and bone densities.
Hypothesis: Our first hypothesis is that osteoporotic bone will be comparatively weaker in pullout strength and fatigue loading than normal bone. Our second hypothesis is that there will be a significant difference in comparing pullout strength before and after cyclic loading. Our third hypothesis is that a cylindrical, V-shaped thread design would result in improved resistance to pullout and cyclic loading in osteoporotic bone.
Study Design: Biomechanical study
Methods: We will evaluate pullout strength following cyclic loading and standard pullout strength as per ASTM standard F543-13. It will be performed in normal and osteoporotic synthetic bone models that have been validated to cadaver lumbar spines (Nagaraja 2016).
Results: As bone density decreased, there was a proportionate decrease in pullout strength (mild OP ~ 75% of normal, moderate OP ~ 50% of normal, severe OP ~ 25% of normal). Cyclic loading significantly altered the pullout strength for each of the screws tested, especially in osteoporotic bone. The cylindrical V thread design outperformed the conical V-to-square thread design after cyclic loading.
Conclusions: Osteoporotic bone requires increased fixation, as decreased bone density directly reduces pullout strength. Current standards for assessing pedicle screw design should be re-evaluated due to the significant differences noted in testing pullout strength before and after cyclic loading. Our study proposes a novel, but simple test method for that purpose. Finally, we conclude that a cylindrical V thread design results in improved pullout strength after cyclic loading compared to a conical V-to-square thread design

Dr. Ryan Vidal
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Supervisor: Dr. Ted Tufescu

PATIENT FACTORS AFFECTING SOFT TISSUE COMPLICATIONS IN OPERATIVE TREATMENT OF INTRA-ARTICULAR CALCANEAL FRACTURES

Background: Fractures of the calcaneus account for approximately 2% of all fractures.[1,2] 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.[2] Our main objective will be to review operative calcaneal fixation to determine patient factors that predict soft tissue complications.

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[3] 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. 2) Quality of Reduction is equal between the extensive lateral approach and minimally invasive techniques.

Study Design: Retrospective case series

Methods: Cases will be identified from a prospective database of patients treated at a level one trauma canter from 2011 to 2018. There are no current exclusion criteria. There are 357 cases eligible for review. Chart review to identify patients with open versus closed injuries, a history of diabetes, smoking or intravenous drug user and type of work will be undertaken. Radiographic review of Sander's classification[3] as well pre and post operative Bohlers and cruciate angles will be done to assess the quality of reduction. The university of Manitoba statistical services will be utilized to build a linear regression model to determine the relationship between the above patient factors and soft tissue complications. We will include 1 parameter per 15 cases as a starting point when building the regressing model.

Results: Odds ratios determined by the linear regression model will be reported.

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 will be used as a clinical tool to direct patient care.

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Supervisor: Dr. G. Johnston

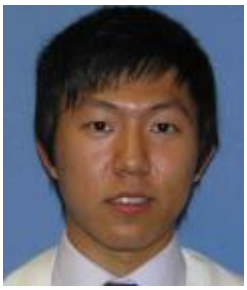
THE TREATMENT GAP IN FRAGILITY HIP FRACTURES IN SASKATOON

INTRODUCTION: According to the 2010 Canadian Osteoporotic guidelines, there is strong evidence to suggest that patients greater than the age of 50 with prior fragility hip fractures should be treated with anti-osteoporotic medication. These guidelines also suggest that despite this evidence, less that 20% of these people are on the medications they need to be on to prevent further fractures. This study was designed to discover what this treatment gap in the hip fractures seen in Saskatoon actually is as the beginning phase of a quality improvement project.

METHODS: The current use of anti-osteoporosis medication post fragility hip fracture was assessed during the time period of January to June 2017. This consisted of 242 patients, all who 50 years of age or older, had a hip fracture and had a mechanism consistent with a fragility fracture. Data including pre and post fracture osteoporotic medication, vitamin D, and calcium along with risk factors for falls and prior fracture history was collected during a retrospective chart review performed in August 2018.

RESULTS: It was discovered that only 14% of patients were on an anti-osteoporotic medication post hip fracture. When the patients who were on medication prior to the fracture were excluded, this number dropped to 6%. It was also determined that 37 patients had a prior indication to be on a medication while another 18 had prior warning signs that they should have been evaluated for osteoporosis prior to the fracture.

CONCLUSION: Saskatoon is no different, if not worse, than the rest of Canada when it comes to treating post hip fragility fractures with anti-osteoporotic medication despite the good evidence in support of this. This leaves a lot of room for improvement and further work needs to be undertaken to ensure that the standard of care is risen.



Dr. Mark Xu
PGY3 - Orthopaedic Surgery
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Supervisors: Mohammad Zarrabian, Michael Johnson

IMPACT OF PRE-SURGICAL SELF-REPORTED EXERCISE ON POST-SURGICAL OUTCOMES IN PATIENTS WITH CERVICAL PATHOLOGY

Background: There is evidence that preoperative physical fitness impacts surgical outcomes, specifically preceding abdominal, cardiovascular and spine surgery. To our knowledge, there are no papers on self-reported exercise frequency as a predictor of cervical spine surgery outcomes.

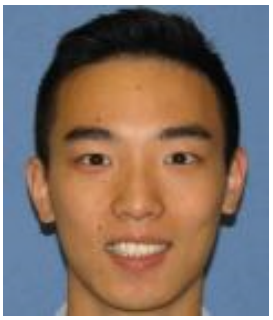
Hypothesis: We hypothesize that patients who report exercise prior to surgical intervention will demonstrate less pain, improved health state and/or less disability following surgery compared to patients who do not exercise.

Study Design: Retrospective review of prospectively collected data from the Canadian Spine Outcomes and Research Network (CSORN).

Methods: Inclusion criteria: all adult elective cervical surgery patients with degenerative pathology and completed pre/post-operative outcome measures up to 24 months post-surgery (n=460). Outcome measures: visual analog scales (VAS) for neck and arm pain, Neck Disability Index (NDI), and EuroQOL score at baseline and 3, 12 and 24 months post-op. Statistics: student's t-tests to compare the mean scores of the outcome measures, and ANOVA for subgroup comparisons ($p<0.05$).

Results: 56% of patients reported exercise prior to surgery, of which 73% exercised twice or more per week. Of the 44% reporting no exercise, 74% could not due to physical limitations. Those who exercised demonstrated more favorable VAS neck and arm pain scores pre-operatively (neck: 5.55 vs 6.11, $p<0.001$) (arm: 5.69 vs 6.04, $p=0.011$), but no difference at 3 and 24 months post-operatively. Significantly improved NDI and EuroQOL Index scores were seen in the exercise group versus no exercise group pre-operatively (NDI: 39 vs 48, $p<0.001$) (EuroQOL: 0.60 vs 0.50 $p<0.001$) and up to 24 months post-op (NDI: 24 vs 31, $p=0.007$) (EuroQOL: 0.75 vs 0.68, $p=0.001$). Compared to the "no exercise due to physical limitation" group, the "twice or more" exercise group showed favorable NDI and EuroQOL scores up to 24 months post-op (NDI: 24.32 vs 32.33, $p=0.001$) (EuroQOL: 0.76 vs 0.66, $p=0.001$), whereas the "once or less times per week" group no longer demonstrated significant difference at 24 months (NDI: 28.79 vs 32.33, $p=1$) (EuroQOL: 0.73 vs 0.66, $p=0.269$).

Conclusion: Self-reported exercise prior to cervical spine surgery does not predict improved long-term neck and arm pain at 2 years post-op. However, self-reported exercise does demonstrate less disability and improved health state at baseline and up to 2 years post-op and this relationship is dose dependent.



Dr. Yiyang Zhang
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Supervisor: Peter B. MacDonald M.D., FRCSC

Incidence of Total Knee Replacement in Patients with Previous Anterior Cruciate Ligament Reconstruction

Background: Anterior cruciate ligament reconstruction (ACL-R) is one of the most commonly performed Orthopedic procedures. ACL deficient knees are at an increased risk of developing of osteoarthritis (OA). Total knee replacement (TKR) treats end stage OA, and therefore, can be used as a surrogate measure to gauge the clinical severity of knee degeneration after ACL-R.

Objective: (1) Determine the rate of total knee replacement after anterior cruciate ligament reconstruction compared to the general population.
(2) Determine from our database whether there are other risk factors that increase risk of TKR after ACL-R.

Method: This is a retrospective review of data stored in the Manitoba Center for Health Policy Database. Surgical and physician billing codes were used to identify ACL-R surgeries performed on Manitoba residents between 16-60 from 1980 to 2015. Patient factors gathered at time of surgery included: age, gender, urban or rural residence, neighbourhood income quintile, and resource utilization band. Each person was matched with up to five people from the general population who had never had ACL-R and had not had a TKR at the time of the case ACL-R.

Results: Overall from 1980-2015, 8,500 ACL-R were identified within the 16-60 age group and time frame with a resultant 42,497 population matches. Gender was predominantly male. The mean age at the time of ACL-R that went on to have a TKR was 36.9 (SD 10.2), while the population that also had ACL-R, but not TKR was 29.2 (SD 9.9), $P<0.0001$. The mean age of Case group at the time of TKR was 53.7, while the mean age for matched cohort was 58.2, $p<0.001$. Those with ACL-R were 4.85 times more likely to go on to have TKR after adjusting for age, sex, year of case surgery, region of residence and income quintile. When the timeline from ACL-R was broken down to five year increments, it seems that the peak incidence for TKR after ACL-R for men and women was in the tenth year and twentieth year, respectively. Apart from age, no other risk factors examined (location, year of surgery, place of inhabitance, income quintile, RUB) appeared to increase risk of TKR after ACL-R.

Conclusion: Cruciate ligament reconstruction is one of the most commonly performed Orthopaedic procedures. We found that patients who underwent anterior cruciate ligament reconstruction were five times more likely to undergo total knee replacement with older age. No other identifiable factors in our database were risk factors for future total knee replacements.

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Supervisor : Frédéric Lavoie MD MSc FRCSC
Université de Montréal

TRANSITORY STIFFNESS AFTER BICRUCIATE-RETAINING TKA: A PROSPECTIVE RCT

Background: There is a resurgence of popularity in performing bicruciate-retaining (2C) total knee arthroplasty (TKA) as opposed to the more common posterior-stabilized (PS). 2C TKA restores knee kinematics better than other prosthetic designs. However there are reports that knees with a 2C implant were on average stiffer and more painful than with a PS. No study conducted yet shows clear clinical differences between 2C and PS TKA. This study aims to clarify this point of contention.

Hypothesis: We hypothesize that clinically there is no significant differences between 2C and PS TKA.

Study Design: Randomized control trial

Methods: The study was conducted at the Centre Hospitalier de l'Université de Montréal. Two surgeons operated using gap-balancing technique with initial tibial cut and spacer blocks. Hermes implants (Ceraver Osteal) were used in 77 knees on 47 patients, either the 2C (38 knees) or the PS (39 knees). Clinical parameters and scores (KOOS and Knee Society (KS)) were obtained at the preoperative visit and the postoperative follow-ups up to 2 years plus.

Results: 2C knees had worse KOOS scores for pain and symptoms at six weeks but equalized with PS knees in subsequent follow-ups. The KS Knee and Function scores showed no differences at every step. Postoperative stiffening was more pronounced for 2C knees: while significantly inferior at the six-week, six-month, and one-year follow-ups in the 2C knees, maximal knee flexion equalized with PS after 2 years. Complications were similar for the two implants except knee mobilization under anesthesia (MUA) that was performed more often for 2C knees.

Conclusions: A transitory postoperative stiffening phenomenon was observed for 2C knees. The two-year outcome was however similar to that of PS knees for all the measured parameters making 2C TKAs a viable surgical option. However the transitory stiffening phenomenon's etiology and solution need to be further investigated to improve the outcome of this tissue-preserving arthroplasty alternative.

The Section of Orthopaedic Surgery would like to thank the contributor to this event: