

GUEST SPEAKER:

Dr. David Amirault

David Amirault is a graduate of the class of 1976 from Dalhousie University Medical School. He was in General Practice for 3 years in the town of Liverpool, Nova Scotia. After returning for post-graduate training in Orthopaedic Surgery, he received his Royal College certification and has been in practice in Halifax since 1985.

During his tenure, Dr. Amirault has had numerous administrative positions. He was the Chief of Surgery at the Camp Hill Medical Centre from 1990-1996. He was the Chief of Surgery at the Halifax Infirmary from 1997-2003. During that time, he was also Associate Chief of Surgery at the QEII Health Sciences Centre and Dalhousie University. He recently completed a 10-year term as the Division Head of Orthopaedic Surgery at Dalhousie University and the Capital District Health Authority.

He is a past member of the Dalhousie University Senate and recent President of the Dalhousie Medical Alumni Association.

During his career, Dr. Amirault has received a number of orthopaedic resident and undergraduate student teaching awards. In addition, he has presented at national and international conferences.



UNIVERSITY OF MANITOBA

University of Manitoba

Dr. Peter MacDonald,
Professor & Head,
Section of Orthopaedic Surgery
Dr. Tod Clark
Program Director
Dr. Jeff Leiter
Research Director

RESIDENTS

Dr. Mina Aziz
Dr. Tiffany Huynh
Dr. Gabriel Larose
Dr. Samuel Larrivee
Dr. Robert Longstaffe
Dr. Sarfraz Malleck
Dr. Kyle Martin
Dr. Graeme Matthewson
Dr. David Perrin
Dr. Mandip Singh
Dr. Jonathan Tan
Dr. Mark Xu
Dr. Yiyang Zhang



UNIVERSITY OF SASKATCHEWAN

University of Saskatchewan

Dr. David Sauder
Program Director
Dr. Jonathan Norton
Research Director

RESIDENTS

Dr. James Ardell
Dr. Sam Ibrahim
Dr. Matthew Mastel
Dr. Scott Mollison
Dr. Alexander Perreault
Dr. Kristen Pugh
Dr. Laura Sims

Resident Research Day 2016

University of Manitoba
&
University of Saskatchewan



Wednesday
November 2, 2016
Pan Am Clinic
Winnipeg, Manitoba

PROGRAM

Session Chairs— Dr. Patricia Larouche & Dr. Dave Sauder

09:30 WELCOME & INTRODUCTION

Dr. Tod Clark— U of M Program Director & Dr. Dave Sauder—U of S Program Director

09:40

Can breathing techniques decrease stress and increase performance during a simulated arthroscopy procedure

Dr. Graeme Matthewson

9:50

Effect of small to large Hill-Sachs lesions on arthroscopic bankart repair for anterior shoulder instability

Dr. Mandip Singh

10:00

Prevalence of osteoporosis, low and normal bone density in women fifty years and older who recently sustained a distal radius fracture, and their relationship to clinical features and radiographic outcomes

Dr. Alexander Perreault

10:10

Radiographic outcomes following open and arthroscopic femoroacetabular impingement correction: A systematic review

Dr. Kyle Martin

10:20 HEALTH BREAK

10:30 Guest Speaker:

Canadian Health Care, Whither Thou Goest

Dr. David Amirault

11:00

Proposal: Comparative incidence of ACL injuries in male and female tackle football players

Dr. Kristen Pugh

11:10

Cruciate ligament reconstruction: A provincial epidemiological study

Dr. Yiyang Zhang

11:20

Isolated capitate fractures: Case report and systematic literature review

Dr. Mina Aziz

11:30

Patient-rated outcomes of fragility distal radial fractures no less than 5 years post fracture in women 50 years and older

Dr. Sam Ibrahim

11:40

Characterizing rotator cuff injury and targeting repair: Implications of denervation, atrophy, fibrosis, fewer slow fibers, low vascularity, and subsequent muscle repair by satellite cell activation with nitric oxide treatment

Dr. Mark Xu

11:50

Non-operative treatment of Charcot Neuroarthropathy in a Canadian tertiary care specialty foot clinic

Dr. Tiffany Huynh

12:00- 13:00 SANDWICH LUNCHEON

Session Chairs— Dr. Eric Bohm & Dr. Jonathan Norton

13:00

Femoral subsidence rates of the Zimmer Versys Stem and the Zimmer M/L Taper Stem

Dr. Matthew Mastel

13:10

Integration of a gait analysis clinic to improve treatment to running patients: Epidemiology of our clinic

Dr. Gabriel Larose

13:20

Variability in outcome reporting for operatively managed anterior glenohumeral instability: A systematic review

Dr. Laura Sims

13:30

Short-term (1-5 Years) survivorship of the legion revision total knee arthroplasty

Dr. Sarfraz Malleck

13:40

Breaks in draping technique in sports orthopaedic surgery

Dr. Samuel Larrivee

13:50

Postoperative rehabilitation after rotator cuff repair: A web-based survey of AOSSM and AANA members

Dr. Scott Mollison

14:00 HEALTH BREAK

14:10

Professionalism in Surgery

Dr. David Amirault

14:40

Anterior cruciate ligament injuries in the National Hockey League: Impact and current treatment practices

Dr. Robert Longstaffe

14:50

Changes in motor latency during spinal decompression

Dr. James Ardell

15:00

Early clinical results of the Legion Hinge Knee: A single center study

Dr. David Perrin

15:10

The iTClamp controls junctional bleeding in a lethal swine exsanguination model

Dr. Jonathan Tan

CONCLUSION



UNIVERSITY
OF MANITOBA



UNIVERSITY OF
SASKATCHEWAN

RESIDENT ACADEMIC DAY

**November 2, 2016
Pan Am Conference Room
75 Poseidon Bay**



PROGRAM

MORNING SESSION: Dr. P Larouche & Dr. D Sauder- Chairs

9:30	Welcome & Introduction	Dr. Clark & Dr. Sauder
9:40	Can breathing techniques decrease stress and increase performance during a simulated arthroscopy procedure	Dr. Graeme Matthewson
9:50	Effect of small to large Hill-Sachs lesions on arthroscopic bankart repair for anterior shoulder instability	Dr. Mandip Singh
10:00	Prevalence of osteoporosis, low and normal bone density in women fifty years and older who recently sustained a distal radius fracture, and their relationship to clinical features and radiographic outcomes	Dr. Alexander Perreault
10:10	Radiographic outcomes following open and arthroscopic femoroacetabular impingement correction: A systematic review	Dr. Kyle Martin
10:20	HEALTH BREAK	
10:30	GUEST SPEAKER: Canadian Health Care: Whither Thou Goest	Dr. David Amirault
11:00	Proposal: Comparative incidence of ACL injuries in male and female tackle football players	Dr. Kristen Pugh
11:10	Cruciate ligament reconstruction: A provincial epidemiological study	Dr. Yiyang Zhang
11:20	Isolated capitate fractures: Case report and systematic literature review	Dr. Mina Aziz
11:30	Patient-rated outcomes of fragility distal radial fractures no less than 5 years post fracture in women 50 years and older	Dr. Sam Ibrahim
11:40	Characterizing rotator cuff injury and targeting repair: Implications of denervation, atrophy, fibrosis, fewer slow fibers, low vascularity, and subsequent muscle repair by satellite cell activation with nitric oxide treatment	Dr. Mark Xu
11:50	Non-operative treatment of Charcot Neuroarthropathy in a Canadian tertiary care specialty foot clinic	Dr. Tiffany Huynh
12:00	LUNCHEON	

AFTERNOON SESSION: Dr. E. Bohm & Dr. J. Norton – Chairs

13:00	Femoral subsidence rates of the Zimmer Versys Stem and the Zimmer M/L Taper Stem	Dr. Matthew Mastel
13:10	Integration of a gait analysis clinic to improve treatment to running patients: Epidemiology of our clinic	Dr. Gabriel Larose
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14:50	Changes in motor latency during spinal decompression	Dr. James Ardell
15:00	Early clinical results of the Legion Hinge Knee: A single center study	Dr. David Perrin
15:10	The iTCLAMP controls junctional bleeding in a lethal swine exsanguination model	Dr. Jonathan Tan
15:20	Conclusion	Dr. Tod Clark

EVENING PROGRAM:

Dinner & Awards Presentation at the Winnipeg Squash Club
275 Stradbrook Avenue

5:30 – 8:15PM



Dr. Graeme Matthewson
PGY3 - Orthopedic Surgery
University of Manitoba

Supervisor: Jeff Leiter
Graeme Matthewson, Dean Cordingley

CAN BREATHING TECHNIQUES DECREASE STRESS AND INCREASE PERFORMANCE DURING A SIMULATED ARTHROSCOPY PROCEDURE

Introduction: Focused breathing techniques have recently become a popular means of stress reduction in the health and wellness fields. With the aim of decreasing sympathetic drive and load on the central nervous system as well as increase in focus and attention, focused breathing is a practice that can easily be implemented into an individual's daily routine. Surgical training is a unique experience that provides learners with continual high stress environments while demanding high levels of focus and attention. We present a novel way to reduce stress and increase performance in an arthroscopic simulation.

Methods: Patients will be brought to the testing facility and will undergo either a 15 minute period of focused breathing or 15 minutes of resting in a similar seated position. After the pretest phase, subjects will undergo a timed arthroscopy simulation while measuring their heart rate, respiratory rate, breathing parameters, cerebral oxygenation and EMG activity of the upper trapezius and scalenes throughout the procedure. The group of patients who performed the focused breathing will then practice the breathing technique daily for 15 minutes over two weeks and both groups will repeat testing after this period.

Null Hypothesis: We predict there will be no change in physiologic parameters between the two groups being tested before or after a training period.

Results: We expect to see a decreased physiologic response and better performance times in the groups who performed focused breathing techniques with further increase following a two week training period. We will compare the two groups data using paired t tests.

Conclusions: If improvements in physiologic and scoring parameters are shown using focused breathing techniques during a simulated arthroscopy session, this would provide a novel way of controlling stress, increasing focus and attention and improving decision making in a subject prior to a real life surgical procedure.



Dr. Mandip Singh
PGY3 – Orthopaedic Surgery
University of Manitoba

Supervisor: Dr. Jason Old

EFFECT OF SMALL TO LARGE HILL-SACHS LESIONS ON ARTHROSCOPIC BANKART REPAIR FOR ANTERIOR SHOULDER INSTABILITY

Background: The concept that large Hill-Sachs lesions can adversely affect arthroscopic Bankart repair outcomes is not new. Burkhart and De Beer first discussed this in their 2000 paper stating that patients with large, engaging Hill-Sachs lesions had a significantly higher failure rate after arthroscopic repair regardless of other risk factors. This concept has been validated in several follow up studies. However there has been a failure to identify what exactly constitutes a large Hill-Sachs lesion, and studies characterizing the size and effects of smaller Hill-Sachs lesions are almost non-existent. Indeed even in Burkhart and De Beer’s paper the size of this lesion is only described as “large” or not large, without any specific dimension or guidelines. There have been several biomechanical and cadaveric studies done that attempt to demonstrate the impact of different sizes of Hill-Sachs lesions on dislocation. However many of these studies fail to include actual instability repairs in their assessment, and there have been no studies attempting to study this in a clinical setting. At this time surgeon preference largely dictates when to address Hill-Sachs lesions in instability repair. In this retrospective study we correlate Hill-Sachs lesion size with outcomes in patients who have undergone arthroscopic Bankart repair.

Methods: A retrospective chart review will be conducted of patients who have undergone an isolated arthroscopic Bankart repair for anterior shoulder instability, and who had a Hill Sachs lesion on preoperative Magnetic Resonance Imaging (MRI). The chart will be reviewed to assess for dislocations, subluxations or apprehension. An musculoskeletal (MSK) radiologist will assess preoperative imaging to determine the size of each patient’s Hill-Sachs lesion. Stepwise multiple regressions will be used to determine the predictive significance of the size of humeral head defects, age, and sports involvement.

Results: Chart review is currently in progress.



Dr. Alexander Perreault
PGY5 - Orthopaedic Surgery
University of Saskatchewan

Supervisor: Dr. Samuel Stewart, Dr. Geoffrey Johnston

PREVALENCE OF OSTEOPOROSIS, LOW AND NORMAL BONE DENSITY IN WOMEN FIFTY AND OLDER WHO RECENTLY SUSTAINED A DISTAL RADIUS FRACTURE, AND THEIR RELATIONSHIP TO CLINICAL FEATURES AND RADIOGRAPHIC OUTCOMES

Purpose: It is estimated that one in four women over 50 years of age has osteoporosis - but how can we easily predict whom it will affect? Given that distal radial fractures (DRFs) are one of the most common fractures sustained by adult women, the purpose of this analysis was to determine the prevalence and distribution of three bone densities (osteoporosis (OP), normal (NBD), and low (LBD)) in a cohort of women 50 years and older who had sustained a DRF, and to evaluate the role that bone density might play in eventual outcomes - radiographic, clinical, and patients' self-reported. Establishing a clear link between DRF and incidence of OP would allow for the use of DRF as an event that should prompt bone mineral density testing.

Methods: Clinical and radiographic data for 523 women 50 years and older who had sustained a DRF were collected prospectively. All 523 of these women had DEXA scan bone mineral density tests. Clinical outcomes of grip strength and range of motion (ROM) (dorsiflexion, palmar flexion, supination, and pronation), and Patient Related Wrist Evaluation (PRWE) scores were measured at nine, 12, 26 and 52 weeks post fracture. Radial inclination (RI), ulnar variance (UV), radial tilt (RT) were measured up to 12 weeks post-fracture from serial radiographs. Relationships between DEXA scan results and clinical and radiographic outcomes were explored for any statistically significant correlation.

Results: Overall amongst all patients 41.1% had OP, 50.5% had LBD, and 8.4% had NBD. In the 50-60 year age group the proportion of OP, LBD and NBD was 27%, 57% and 16%; in the 61-70 year age group 35%, 56% and 9%; in the 71-80 year age group 52%, 46% and 2%; and in the 81+ year old group 72%, 26% and 2%, respectively.

Femoral neck T-scores more closely correlated with the BMD than total hip and spine T-scores. Post closed reduction the degree of correction of RI was significantly less in OP patients, but the amount of correction lost over treatment did not significantly vary between the two groups.

Correction of radial tilt post-reduction was lowest in the OP group, but difference in final tilt did not reach statistical significance. And while initial ulnar variance did not differ statistically between bone density groups, the final ulnar positive variance was greater in OP.

Grip strength measurements of both the injured and uninjured limbs in patients with osteoporosis were significantly lower at nine, 12, 26 and 52 weeks post-fracture.

Although PRWE scores were not influenced by BMD at nine and 12 weeks post-fracture, scores were significantly higher in patients with osteoporosis at both six and twelve months post-fracture.

Conclusions: Over 40% of all women over 50 who sustained a DRF in our series had osteoporosis, with the proportion rising as age increased; the rate of osteoporosis was 27% in the 50-60 year old group, over 50% in the 71-80 year old group, and almost 75% in those over 80.

In those patients with osteoporosis restoration of radial inclination and volar tilt by closed reduction was least successful, and the final ulnar variance, as a measure of radial axial shortening, was greatest in osteoporosis. Grip strength measurements of both the injured and uninjured limbs in patients with osteoporosis were significantly lower at all-time points.

PRWE scores were significantly higher in patients with osteoporosis at both six and twelve months post-fracture.

Given these findings, a DRF in a woman 50 years or older should be considered a sentinel event. Bone density evaluation and appropriate management is advised.



Dr. Kyle Martin
PGY5 – Orthopaedic Surgery
University of Manitoba

Dzaja I, Kay J, Memon M, Duong A, Simunovic N, Ayeni O

RADIOGRAPHIC OUTCOMES FOLLOWING OPEN AND ARTHROSCOPIC FEMOROACETABULAR IMPINGEMENT CORRECTION: A SYSTEMATIC REVIEW

Background: Femoroacetabular impingement (FAI) is increasingly being recognized as a cause of hip pain and disability. Several radiographic findings have been described in association with FAI, however, there is a relative paucity of data related to the reporting of post-operative radiographic outcomes following surgical correction. The importance of reporting post-operative radiographic parameters has previously been demonstrated, as they may predict outcome following the index procedure, and under-correction has been identified as a leading cause of failure.

Purpose: To determine (1) how often radiographic outcomes are reported in clinical studies after open and arthroscopic FAI correction, (2) how consistently the results are reported, and (3) if there are standard radiographic values for referencing correction.

Hypothesis: Reporting of post-operative radiographic outcomes is variable and inconsistent, with limited standardized values.

Study Design: Systematic review of the literature.

Methods: Online databases (PubMed, EMBASE, and Medline) were screened for studies involving open and arthroscopic management of FAI. Full-text reviews of eligible studies were conducted. We identified 18 studies involving 1084 patients treated with open surgery and 23 eligible studies involving 1348 patients treated with arthroscopic management.

Results: In the open surgical studies, 24 different radiological outcomes were reported. CAM-type FAI was most frequently assessed using the alpha angle (61.1%) and head-neck offset/head-neck offset ratio (33.3%). Center edge angle (27.8%) and the acetabular index (22.2%) were the most commonly reported outcomes for pincer-type FAI. Fifteen different radiological outcomes were reported in the arthroscopic studies. The most commonly reported radiographic outcomes included the alpha angle (69.6%), center edge angle (34.7%), and femoral head-neck offset ratio (17.4%).

Conclusion: The reporting of post-operative radiographic outcomes is variable, and no single radiographic parameter is optimal. The clinician must use a combination of reproducible measurements, together with their clinical examination, to confirm adequate restoration of normal hip morphology.



Dr. David Amirault

David Amirault is a graduate of the class of 1976 from Dalhousie University Medical School. He was in General Practice for 3 years in the town of Liverpool, Nova Scotia. After returning for post-graduate training in Orthopaedic Surgery, he received his Royal College certification and has been in practice in Halifax since 1985.

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Dr. Kristen Pugh
PGY2 – Orthopaedic Surgery
University of Saskatchewan

Supervisor: Dr. Cole Beavis

PROPOSAL: COMPARITIVE INCIDENCE OF ACL INJURIES IN MALE & FEMALE TACKLE FOOTBALL PLAYERS

Background: The anterior cruciate ligament (ACL) is an intra-articular knee ligament which helps to limit anterior translation of the tibia on the femur.¹ It is well documented in the literature that female ACL tear incidence rates are approximately 3 times greater than males in many sports, especially soccer and basketball; however, it is not well understood as to why this is the case.^{5,6,7,8} There has been an increasing popularity of tackle football amongst American woman with more than 120,000 playing tackle football at least 26 times in 2008.⁹ However, there is only one article in the literature that explored the association between female contact football and ACL injuries.

Research Question: Our study will focus on the determination of the incidence rate of female ACL tears in contact football.

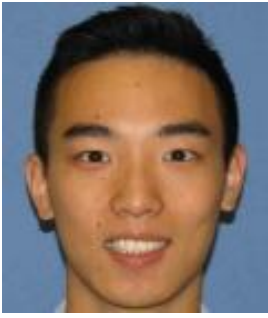
Methods: This study will be a prospective observational cohort study gathering comparative data from two local (Saskatoon) football teams, during the 2016-2017 season (and hopefully, future seasons as well) of the Western Women's Canadian Football League for female athletes and Canadian Interuniversity Sport (CIS) League for male athletes. ACL rupture will be diagnosed by the team orthopedic surgeons clinically as an initial step in diagnosis and by magnetic resonance imaging (MRI) as a secondary step if confirmation of diagnosis is needed. Associated injuries will also be documented. Additional information surrounding the ACL injury will be collected using two standardized questionnaires to look for any identifiable associations with injury. One questionnaire will be given to those with an ACL injury after the injury and the other to non-injured athletes at the end of the season. Questions will include field surface, shoe wear, bracing, menstrual cycle (including oral contraception use or not), ACL prevention program in place, and number of years of football experience. The injury questionnaire has additional questions surrounding mechanism of injury such as contact vs noncontact and practice vs game. The Spearman's rank correlation coefficient will be used to calculate statistical significance.

Results: We expect to see a statistically significant higher incidence of ACL rupture in female football players compared to male football players. We also expect our results to be comparable with the previous study in the literature.

Discussion: Not Available at this Time.

Conclusions: High ACL injury rates in female contact football players is indicative that the sport is a particularly high-risk sport for female athletes. This study will not elucidate the exact reasoning or cause for differences in ACL rupture incidence between genders, but will allow for a trend in female ACL injury risk in contact sports to be documented, as well as support the scarce previous literature. This information can serve as an important reference for female athletes considering future participation in contact football.

Recommendations: Not Available at this Time.



Dr. Yiyang Zhang
PGY2 Orthopedic Surgery
University of Manitoba

Supervisor: Dr. Peter MacDonald, Dr. Jeff Leiter

CRUCIATE LIGAMENT RECONSTRUCTION: A PROVINCIAL EPIDEMIOLOGICAL STUDY

Background: Anterior cruciate ligament reconstruction (ACL-R) is one of the most common orthopaedic procedures and is the subject of much discussion and research. To our knowledge, there have been no studies looking at the epidemiology of ACL-R in a provincial setting. Understanding the epidemiology of ACL injury and reconstruction may help identify areas that need improvement or further research.

Objective: To define epidemiological trends of ACL-R in a Canadian Province and compare to national and international trends.

Study Design and Methods: This study is a retrospective review of the data stored in the Manitoba Center for Health Policy (MCHP). De-identified, individual-level administrative records of health service used for the entire population of Manitoba (approximately 1.1 million) were used. Codes for anterior cruciate ligament and cruciate ligament repair were searched back as far as the repository permitted (approximately 1979). Patient factors investigated included age, gender, geographic area of residence, and neighbourhood income quintile.

Results: A total of 7,195 ACL-R were found within the time parameters 1979 - 2012. Gender was predominantly male with 4,670 males versus 2,525 females. The mean age at ACL-R was 30 (SD 10). Ages 16-39 accounted for 82.63% of the total ACL-R. The largest percent of patients having ACL-R fell within the fifth income quintile (24.77%). The top two quintiles accounted for 44.81% of the ACL-R.

Conclusion: The rate of ACL-R has increased in frequency since 1979. In Manitoba, patients with ACL-R were more likely to be urban males in the upper income quintiles.



Dr. Mina Aziz
PGY4 – Orthopaedic Surgery
University of Manitoba

Supervisor: Dr. Jeff Leiter, Dr. Jennifer Giuffre

ISOLATED CAPITATE FRACTURES: CASE REPORT AND SYSTEMATIC LITERATURE REVIEW

Background: Isolated capitate fractures have traditionally been thought to be rare injuries. However, due to the increasing use of advance imaging modalities such as MRI and CT, the medical community is starting to recognize the true incidence of this injury. This project seeks to highlight the unique features of this injury by presenting the case of a 27-year-old male with an isolated capitate fracture and the results of a systematic literature review.

Hypothesis: Missed capitate fractures result in increased risk of developing a non-union as well as avascular necrosis (AVN).

Study design: Case presentation and systematic literature review.

Methods: A Literature review was conducted in the following databases; Ovid Medline, Ovid EMBASE, Web of Science and SCOPUS. Exclusion criteria were age less than 18 at time of injury, the presence of concomitant carpal bone fractures and non- English language articles. The data from the selected articles was extracted and their references were cross checked against our articles. Statistical analysis was conducted included relative risk as well as the Fisher exact test.

Results: 23 original articles meet our inclusion criteria, with a total of 29 individual cases (including our case). These articles consisted predominantly of case reports and case series. There were 5 females and 24 males patients with a mean age of 26 (range 18-42). Only eight cases representing 28% of fractures were recognized on initial presentation. 11 fractures resulted in a non-union with a relative risk of 2 (P 0.39). There were 4 cases of confirmed AVN and two more cases were suspected to have AVN with a relative risk 2.35 (P 0.62).

Conclusions: There was a delay in the diagnosed of isolated capitate fractures in 72% of the cases. Increased awareness of this injury pattern will improve our understanding of the natural history of this injury and help guide future treatment plans.



Dr. Sam Ibrahim
PGY2 – Orthopaedic Surgery
University of Saskatchewan

Supervisor: Dr. G. Johnston

PATIENT-RATED OUTCOMES OF FRAGILITY DISTAL RADIAL FRACTURES NO LESS THAN 5 YEARS POST FRACTURE IN WOMEN 50 YEARS AND OLDER

Purpose: To contrast in a cohort of women 50 years and older who had experienced distal radial fragility fractures the patient-rated wrist evaluation (PRWE) scores recorded during their first post-fracture year to the PRWE scores in the same patients at an interval no less than five years post-fracture.

To evaluate the influence that the final radiographic and clinical outcomes documented in the first year post-fracture might have had on the 5-year PRWE score.

Methods: From a cohort of women fifty years or older treated for an isolated distal radial fragility fracture in a formal distal radial fracture clinic setting wherein radiographic and clinical data were recorded prospectively for up to one year post fracture all who were at least five years post-fracture were invited by telephone to participate in this study.

Participants completed and returned by mail a patient rated wrist evaluation (PRWE) questionnaire.

Their new scores were contrasted to their first year scores. The differences were documented and analyzed.

Results: 143/250 women eligible for the study were available to participate.

141/143 of these patients agreed to participate. 128 completed questionnaires were received.

The average interval between the fracture and follow-up was 6.1 years.

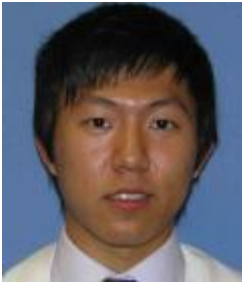
For the whole cohort the average PRWE scores at nine, 12, 26 and 52 weeks post fracture were 64, 47, 27 and 23, respectively. The average PRWE score of the study participants was 12 – Pain (5), Function (4) and Usual Activity (3). Approximately 74% of women were treated non-operatively. Their average PRWE at late follow-up was 11; it was 12 in those treated operatively.

Of the 128 respondents 95 (74%) recorded lower PRWE scores, ten (8%) recorded no change, and 24 (19%) recorded higher PRWE scores. Of 67 patients who had had one year PRWE scores 41 (61%) were improved (PRWE - average 19 points less (range: 1-79), nine (13%) were unchanged (seven had PRWE of zero at one year, one a score of 3 and one a score of 9), and 17 (25%) were worse (PRWE – average 16 points more (range: 1-109)). Of these 17 patients who had higher scores 12 (71%) had been treated non-operatively, five (29%) operatively. An additional seven patients scored higher PRWEs than they had at nine, 12 or 26 weeks post fracture.

Final ulnar variance was correlated with a higher late PRWE score. Final radial inclination and tilt did not appear to influence the late PRWE score.

Conclusion: The majority of women with a fragility DRF expressed, at a minimum of five years post fracture, via the PRWE tool, improvement in their symptoms from their first post fracture year. Significant, however, was that 25% recorded worsening of their symptoms.

There was a correlation of final radiographic outcome of ulnar variance to the PRWE score, but none to radial inclination and radial tilt.



Dr. Mark Xu
PGY1 - Orthopaedic Surgery
University of Manitoba

Supervisors: Dr. Jeff Leiter, Dr. Judy Anderson, Dr. Peter MacDonald

CHARACTERIZING ROTATOR CUFF INJURY AND TARGETING REPAIR: IMPLICATIONS OF DENERVATION, ATROPHY, FIBROSIS, FEWER SLOW FIBERS, LOW VASCULARITY, AND SUBSEQUENT MUSCLE REPAIR BY SATELLITE CELL ACTIVATION WITH NITRIC OXIDE TREATMENT

Background: Supraspinatus (SS) tears are common, but failure rates following surgical repair ranges from 30-94% in the literature. To explain the dysfunction, biological changes following rotator cuff injury (RCI) were investigated. Moreover, we investigated whether supraspinatus satellite cells (SCs) could be activated in culture by nitric oxide to repair damaged SS muscle.

Hypothesis: 1. Injured supraspinatus muscle will exhibit changes in innervation status, fiber diameter, fibrosis, fatty infiltration, fiber type composition, and vascularity. 2. Satellite cells necessary for supraspinatus muscle regeneration can be activated with nitric oxide treatment.

Study Design: Basic Science

Methods: Pathological SS and ipsilateral deltoid (control) muscles (N=27) were biopsied during arthroscopic RCI repair for pair-wise histological and protein-expression studies. Corresponding demographic and MRI (occupancy ratio, Goutallier score, tangent sign) data were obtained for each biopsy. Statistical analysis included chi-squared analysis, student paired t-tests, or 2-way analysis of variance, and correlations and linear regressions.

Results: SS exhibited significantly higher γ -AchR subunit protein expression vs control, implicating denervation ($p<0.001$). With respect to atrophy, SS exhibited smaller mean fiber diameter on H&E stain and a shift in the frequency distribution toward smaller fibers ($P<0.0001$), consistent with MRI mean occupation ratio. Fibrosis, as measured by Sirius red immunostaining intensity, atrogen-1, and dystrophin protein expression were all higher in SS ($P<0.05$). Fat quantified by Goutallier score and morphometry did not reveal significant differences between SS vs control. Vascular density as quantified using alkaline phosphatase immunostaining exhibited lower density in SS ($p<0.001$), and higher expression of vascular endothelial growth factor, VEGF ($p=0.01$). Immunostaining for MyHC1 fibers exhibited a lower proportion of slow fiber phenotypes in SS ($p<0.0001$). SS had lower baseline level of active proliferation (BrdU+/Pax7+) SCs vs control, but increased significantly ($p=0.01$) after nitric oxide donor treatment, ISDN. Additionally, areal density of Sema3A (neuro-chemorepellent secreted by activated SCs) staining in SCs was higher in SS than control ($p=.04$)

Conclusions: Detrimental changes in muscle associated with denervation, including atrophy, fibrosis, transition to fewer slow fibers, and reduced vascularity may explain the progressive loss of function after RCI, high rate of surgical failure, and can be considered in therapeutic strategies for improving functional recovery. Nitric oxide treatment can activate SCs from pathological SS muscle to promote muscle growth following RCI.



Dr. Tiffany Huynh
PGY2 - Orthopaedic Surgery
University of Manitoba

Supervisor: Dr. Brad Pilkey

NON-OPERATIVE TREATMENT OF CHARCOT NEUROARTHROPATHY IN A CANADIAN TERTIARY CARE SPECIALTY FOOT CLINIC

Background: Charcot neuroarthropathy (CN) is a significant complication in the diabetic population that leads to destruction of bone and soft tissue of the lower extremity. Current standard of treatment is predominantly based on expert opinion with a lack of descriptive literature regarding the non-operative management of patients with CN, their outcome, and their journey through the health care system.

Hypothesis: The average patient treated at the Diabetic Foot and Ankle Clinic at Health Sciences Centre has a prolonged course of treatment with many visits, total contact casts and other orthotic devices. The outcome for these patients is guarded, with a high rate of amputation above the level of the arthropathy.

Study design: Descriptive, retrospective analysis

Methods: The study is a 10-year retrospective analysis of over 300 patients presenting to the Diabetic Foot and Ankle Clinic with CN. Data regarding patient demographics, medical history, clinical presentation and intervention were collected.

Results: Preliminary results of 28 patients revealed that the majority of patients were male (58%), urban dwellers (56%), independent in their activities of daily living (94%), were employed (64%), and were dependent on insulin (75%) for their diabetic management. Mean time from diagnosis of diabetes to development of CN was 17.5 years with a mean HgbA1C of 8.9. Most patients were treated with total contact casting (72%) with follow-up visits every 2 weeks in clinic. Mean duration of non-operative treatment was 4.5 months. Surgery was performed on 5 patients, all of whom required exostectomies. CN recurred in 4 patients after a mean of 12.25 months.

Conclusions: Preliminary results demonstrate that typical CN patients are independent, employed urban-dwellers who have had poorly controlled insulin-dependent diabetes for many years. Although most patients experience resolution of CN and avoid surgery, it is only after a prolonged course of treatment.



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FEMORAL SUBSIDENCE RATES OF THE ZIMMER VERSYS STEM AND THE ZIMMER M/L TAPER STEM

Purpose: To detect and compare the rates of distal migration (subsidence) of the femoral component in patients who received a hip replacement with the Zimmer FMT vs. the Zimmer M/L Taper stem.

Methods: Chart review examining 183 consecutive total hip arthroplasties performed over 2 years at Saskatoon City Hospital. Procedures were performed by 2 senior surgeons in a similar manner. Patient's clinical history, demographics, and implant records were collected in a database. Intraoperative complications or revisions were noted.

Post-operative radiographic images in recovery and at 6 weeks and 1 year were assessed. Femoral component position was measured using an accepted standardized technique to assess for subsidence. Progression of migration was compared to the initial recovery xray. The rate of subsidence between the two implant systems was noted and compared for statistical significance.

Results: One hundred and eighty three arthroplasties met our inclusion criteria. There was statistically significant subsidence noted with both the FMT and the M/L Taper stem at 6 weeks and at 1 year. The subsidence rates between FMT and M/L Taper in our study were not statistically different at 6 weeks ($p = 0.13$) or 1 year post op ($p = 0.37$). BMI was not correlated with increased subsidence rates.

Conclusion: The subsidence rates between FMT and M/L Taper in our study were not statistically different at 6 weeks or 1 year post op. However, both FMT and M/L Taper experience subsidence from the time of surgery to at least a year and this was a significant result. The rates of revision due to subsidence were quite low and this study served as a quality assurance of the implants used at our centre.



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INTEGRATION OF A GAIT ANALYSIS CLINIC TO IMPROVE TREATMENT TO RUNNING PATIENTS: EPIDEMIOLOGY OF OUR CLINIC

Background: Running is a popular aerobic activity. The number of recreational runners has increase in the last decade [National survey USA -- www.runningusa.org]. The benefit of running are well known, however previous epidemiological studies have shown that more than 50% of the recreational runners will suffer from an injury every year [Van Mechelen 1992, Messier 2008]. Running causes repetitive impacts on the lower extremities and therefore these injuries are often due to overuse [Hreljac, 2004]. Some authors suggested that the runner's biomechanics could have a non-negligible contribution on these injuries [Messier, 2008]. Moreover, some biomechanical factors have been identified increasing the risk of injury [Ferber, 2014]. The purpose of this study is to assess the runner's population of Winnipeg with the factors identify by Ferber et al and correlate those factors with a clinical evaluation.

Method: 80 consecutives patients that consulted our running clinic were reviewed. They were assessed one physiotherapist (KS). The gait was assessed on a treadmill. A qualified kinesiologist (SF) positioned the markers using anatomic landmark. A 45 second trial was recorded using six infrared Vicon™ (Vicon Motion System, UK) cameras. The data was treated using the 3D gait system™ (Calgary, Canada).

Results: Our study population will be separated in different groups based on their pathologies. For the statistical analysis, we will extract biomechanical factors, identified in a prior study [Ferber, 2014], from our biomechanical data. An ANOVA will be used to compare the difference between the groups. Afterwards correlation between clinical and biomechanical factors will be calculated.

Discussion: The purpose of the study was to have a better knowledge of our population pathologies and biomechanics deficit to improve our treatment. Further work will need to be done to assess our impact of our treatment on the identified biomechanical deficits.



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VARIABILITY IN OUTCOME REPORTING FOR OPERATIVELY MANAGED ANTERIOR GLENOHUMERAL INSTABILITY: A SYSTEMATIC REVIEW

Purpose: The purpose of this study was to quantify the degree of variability in outcomes assessed following surgery for anterior shoulder instability in recent high impact literature.

Methods: Using PRISMA guidelines, an extensive review of the literature during a five-year period from January 2011 through December 2015 was performed across six orthopedic journals with high impact factors to identify all studies investigating outcomes following anterior shoulder instability. Studies reporting clinical outcomes for patients with anterior glenohumeral instability after surgical treatment with at least one-year follow-up were included. Several metrics were collected from each manuscript: (1) range of motion (ROM), (2) quantitative strength, (3) physical examination testing, (4) Imaging, (5) patient reported outcomes (PROs), (6) complications (including recurrent instability), (7) patient satisfaction, (8) return to pre-injury level of activity or sport. Variability in outcome measures was then qualitatively assessed.

Results: Sixty-eight studies were included for final analysis ranging from level 1-4 evidence. Fifty-nine percent reported ROM and 18% measured strength. Other clinical exam maneuvers were assessed in 44%, with 40% assessing apprehension. Imaging was used in 62%, including x-rays, magnetic resonance imaging (MRI), and computed tomography (CT) scans. On average, 2.25 PROs were assessed. In total, 28 different PROs were used to assess outcomes. The three most commonly reported PROs were the Rowe scale at 46%, the Western Ontario Shoulder Instability Index (WOSI) at 31%, and the Constant Shoulder Score at 26%. Twenty-five percent included patient satisfaction in their assessment of outcomes. Recurrence was assessed by 59% and return to pre-injury level of activity was reported by 37% of the studies.

Conclusions: There is substantial variability in outcome reporting for high impact anterior shoulder instability literature with 28 different outcome tools used, making it difficult to compare outcomes between studies. Agreeing upon a uniform measure to assess outcomes would allow for clearer interpretation of the literature as well as the potential to draw conclusions from pooled data.



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SHORT-TERM (1-5 YEARS) SURVIVORSHIP OF THE LEGION REVISION TOTAL KNEE ARTHROPLASTY

Background: Primary Total Knee Arthroplasty (TKA) has a success rate of 90-95% in 10- and 15- year survivorship studies [1]. Despite the success of primary TKAs, failed primary surgeries and prostheses at the end of their functional life require revision surgery. It is estimated that the incidence of revision TKA will increase more than 600% by 2030 (from 2005 baseline) [2]. This study seeks to investigate the short-term (1-, 2-, and 5-year follow up) clinical and radiographic survivorship of the Legion Revision TKA.

Hypothesis: Short-term survivorship of the Legion Revision TKA will meet or exceed the published long-term survivorship of primary and other revision TKAs.

Study Design: This is a retrospective survivorship study of 224 consecutive revision TKAs undertaken at one institution between April 2008 and March 2015.

Methods: Survivorship was measured clinically and radiographically. Clinical survivorship was analyzed with Kaplan-Meier curves generated at 1-, 2-, and 5-year follow-up for the endpoints (1) Revision due to aseptic loosening and (2) Reoperation for any reason [3]. Radiographical survivorship was analyzed via measurement of radiolucent lines on x-rays taken at most recent follow-up in keeping with the Knee Society Radiological Evaluation System [4]. Satisfaction levels were analyzed using the Oxford Knee scoring system.

Results: One implant in the study failed due to aseptic loosening between 2- and 5-year follow-ups, thus the survivorship for 1-, 2-, and 5-year follow-up were 100%, 100%, and 99.3% (95% CI: 95.1%-99.9%), respectively. When reoperation for any reason was considered 1-, 2-, and 5-year survivorship was **99.5%** (95% CI: 96.8% to 99.9%), **99.0%** (95% CI: 96.1% to 99.8%), and **92.4%** (95% CI: 86.0% to 95.9%), respectively. In total, 15 patients had events requiring reoperation. Radiographic analysis at most recent follow-up revealed no significant radiolucencies indicative of aseptic loosening as per the Knee Society Radiological Evaluation System.

Conclusions: Short-term survivorship of the Legion Revision system exceeds published data on the long-term survivorship of primary and revision TKAs. Clinical case and radiographic evaluation undertaken in this study also demonstrates a low incidence of aseptic loosening for the legion system.



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BREAKS IN DRAPING TECHNIQUE IN SPORTS ORTHOPEDIC SURGERY

Background: Surgical site infections (SSI) represent 12-16% of all nosocomial infections and cost 1.6 billion dollars annually in the US. This represents more than 30 000 orthopedic surgery patients. Multiple preventative measures are being used, such as the use of sterile technique in the OR. However, adequateness of surgical draping technique in orthopedic surgery has not been studied.

Aim: The aim of this prospective quality improvement study is to (1) uncover factors related to increased frequency of breaks in draping technique and (2) to provide possible approaches to reduce the frequency of breaks in draping technique.

Study Design: Prospective observational study

Methods : A consecutive sample of 30 sports orthopedic surgery recordings were reviewed by two independent assessors. Breaks in draping technique were noted as well as their associated factors: type of break, containment, reporting and person responsible for the break. Type of surgery, operating surgeon, education level of the assistants, and surgical positioning were also noted.

Results : Descriptive statistics will be used to describe the characteristics of the breaks identified, their frequency and associated factors. ANOVA and post-oc t-tests will be used to determine the significance of the different factors.

Conclusion: Recommendations will be made to improve draping technique and sterility in sports orthopedic surgeries and prevent consequential SSI.



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POSTOPERATIVE REHABILITATION AFTER ROTATOR CUFF REPAIR: A WEB-BASED SURVEY OF AOSSM AND AANA MEMBERS

Background: Postoperative rehabilitation following arthroscopic rotator cuff repair (ARCR) remains controversial and suffers from limited high quality evidence. 1,2 Therefore, appropriate use criteria must partially depend on expert opinion. 3-9

Hypothesis/Purpose: The purpose of the study was to determine and report on the standard and modified rehabilitation protocols following ARCR used by member orthopaedic surgeons of the American Orthopaedic Society for Sports Medicine (AOSSM) and the Arthroscopy Association of North America (AANA). We hypothesized that there will exist a high degree of variability among rehabilitation protocols. We also predict that surgeons will be prescribing accelerated rehabilitation.

Study Design: Cross-sectional study

Methods: A 29-question survey in English language was sent to all 3,106 associate and active members of the AOSSM and the AANA. The questionnaire consisted of four categories; standard post-operative protocol, modification to post-operative rehabilitation, operative technique, and surgeon demographic data. Via e-mail, the survey was sent on September 4, 2013.

Results: The average response rate per question was 22.7% representing an average of 704 total responses per question. The most common immobilization device was an abduction pillow sling with the arm in neutral or slight internal rotation (70%). Surgeons tended towards later unrestricted passive shoulder ROM at 6-7 weeks (35%). Strengthening exercises were most commonly prescribed between 6 weeks and 3 months (56%). Unrestricted return to activities was most commonly at 5-6 months. The majority of the respondents agreed that they would change their protocol based on differences expressed in this survey.

Conclusion: There is tremendous variability in postoperative rehabilitation protocols following ARCR. Five of ten questions regarding standard rehabilitation reached a consensus statement. Contrary to our hypothesis, there was a trend towards later mobilization.

Clinical Relevance: Many postoperative rehabilitation protocols are based upon clinical observation alone. Timing of when to initiate passive and active ROM, as well as strategies to minimize stiffness are unclear. This information helps to guide appropriate use criteria for postoperative rehabilitation following ARCR.



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ANTERIOR CRUCIATE LIGAMENT INJURIES IN THE NATIONAL HOCKEY LEAGUE: EPIDEMIOLOGY, PERFORMANCE IMPACT AND CURRENT TREATMENT PRACTICES

Background: For many athletes, a tear of the ACL represents a significant injury that requires a prolonged period away from the sport with substantial rehabilitation. While it is clear an ACL injury can have devastating consequences in sports such as football, soccer, and basketball, it is unknown as to how detrimental an ACL injury is within hockey. In fact, hockey is one of the few sports where it is felt athletes with an isolated ACL injury and minimal instability can attempt return to play through rehabilitation alone without surgical reconstruction. To date, literature surrounding ACL injuries in professional hockey has not been well defined.

Objectives:

1. To examine the incidence and performance impact of an anterior cruciate ligament injury in the National Hockey League (NHL).
2. To examine the current trends regarding treatment following an anterior cruciate ligament injury in the NHL.

Hypothesis: Performance following ACL reconstruction will be comparable to levels prior to injury.

Methods: This was a three-phase study. Phase I is a descriptive epidemiological study. Through access of the NHL electronic injury surveillance system, Athlete Health Management System (AHMS), collected data included incidence of ACL injuries over a ten-year period and man games lost (MGL). *This data was in de-identified form.* Phase II examined performance impact of an ACL injury. Players were identified through publically available data (NHL website, team websites, player profiles/biographies and press releases). Performance related data included; goals and points per season and per game, time on ice, shooting percentage, shifts/game, plus/minus, and hits/game. *This data is separate from the de-identified players in Phase I.* Phase III is a web-based questionnaire that will poll orthopaedic team surgeons regarding preferred management of an ACL injury.

Results: Through AHMS surveillance data, a total of 67 (6.7 per year) ACL injuries occurred from 2006-2016. One ACL injury occurred every 366.44 games. Total MGL was 2,192 with 196.5 MGL per season. 22.4 % had concomitant injuries (15 MCL & 4 meniscal injuries). Performance related analysis identified 61 players dating back to 1997-98. Players that had an ACL injury had a decrease in goals & points per season and per game. Phase III is currently in progress.

Conclusion: ACL injuries appear to be more common than previously thought. Most players are able to return to play following an ACL injury however performance and career length may be significantly decreased. Future research could be aimed at examining the economic burden of man games lost from an ACL injury.



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CHANGES IN MOTOR LATENCY DURING SPINAL DECOMPRESSION

Introduction: Lumbar spinal stenosis is a narrowing of the spinal canal which often presents with back and leg pain, weakness, claudication and other neurological symptoms. Surgical decompression has led to reduction in pain and improved function in patients with spinal stenosis not amenable to non-operative treatments.

Objectives: This study will explore how surgical treatment of spinal stenosis affects walking speed, and if there is a relationship between post-operative walking speed and changes in how fast motor signals are transmitted in the spinal cord intra-operatively. The study will also survey how surgery affects participants' overall quality of life.

Methods: Participants undergoing surgery for spinal stenosis will be asked to complete an SF-36 questionnaire and perform a timed 10m walking speed test at their pre-surgery visit and again at their 3 month follow-up after surgery. Intraoperative measures of motor nerve conduction and any latency decreases will be recorded.

Results: Pending

Conclusion: Pending



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EARLY CLINICAL RESULTS OF THE LEGION HINGE KNEE: A SINGLE CENTRE STUDY

Background: The hinged knee prosthesis was developed to overcome uncorrectable ligamentous imbalance, large bone defects, severe deformities and revision knee arthroplasty. The Concordia Joint Replacement Group (CJRG) was the first in Canada to use the Legion Hinge Knee (HK) design by Smith and Nephew in 2011. The objective of this study is to evaluate early clinical results of the Legion HK within the CJRG.

Hypothesis: The Legion HK design will show survival rates comparable to other hinge implants and improvement in postoperative Oxford Knee Scores.

Study design: Retrospective database review.

Methods: Patient population (N=39) included those having undergone a total knee arthroplasty (TKA) with the Legion HK design from October 2011 to February 2015 within the CJRG. We assessed clinical outcome using the Oxford Knee Scale (OKS) and patient satisfaction, which was calculated prior to surgery and at each follow-up. Changes in OKS were evaluated using t tests and survival analysis was done using the Kaplan-Meier method.

Results: In this retrospective case series, 33 patients were included in analyses and had undergone TKA with the Legion HK. The indication was revision TKA surgery in 27 and complex primary TKA in 12. Patients had a minimum follow-up of 6 months and the mean follow-up time was 19.3 months (SD=10.0). The pre-operative OKS average (M=45.67, SD=10.1) was significantly improved at 6 months (M=30.90, SD=10.4) and at 1 year (M=31.0, SD=11.2) at $p<0.05$. There were 2 failures noted in this case series.

Conclusions: This is the first study to evaluate early clinical results with the Legion HK design. Patients having undergone TKA showed improvement in OKS at 6 and 12 months. As described in prior research, the survival of these implants is comparable to those of primary and hinge knee arthroplasty. The Legion HK design is safe and shows promising early results.



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THE iTCLAMP CONTROLS JUNCTIONAL BLEEDING IN A LETHAL SWINE EXSANGUINATION MODEL

Background: Orthopaedic surgeons are at times required to manage severe hemorrhage. Depending on the location of the wound, amount of personnel or equipment, direct compression of wounds can be difficult. A novel wound closure device (iTClamp) was designed to allow rapid wound closure and clot formation while medical staff can concentrate other aspects of resuscitation.

Hypothesis: A wound closure device will cause an increased survival time and rate compared with no treatment.

Study Design / Methods: Twenty swine were enrolled in this proof-of-concept animal study. A complete excision of the femoral artery and vein was done to replicate a vascular injury. The animals were divided into four treatment groups: control (no treatment), early iTClamp treatment, late iTClamp treatment, and standard gauze treatment. Survival rate, survival time, and blood loss were the primary endpoints.

Results: All (100%) of the animals treated with the wound closure device lived through the end of the experiment, compared to 60% in standard gauze treated and 0% of untreated control animals ($p = 0.003$). iTClamp treatment groups survived significantly longer than the untreated control pigs ($p < 0.009$).

Conclusions: The iTClamp may show an equivalent or increase in survival, survival time, and estimated blood loss when compared to no treatment. The information gained from the 3D prototyping process and finite element analysis are potential areas of research in surgical planning and simulation.

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

