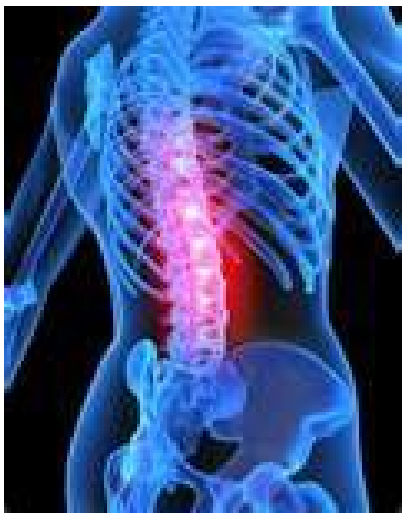
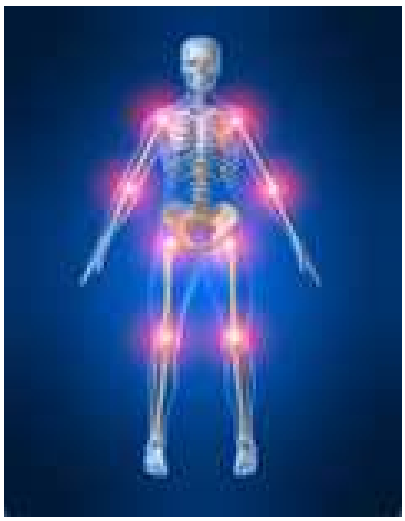
Calgary Orthopaedics
13th Annual
Resident Research Day





University of Calgary

Thursday, April 23, 2026
0700 – 1800 hours

Please see Program for specific location of events

Adjudicators:

Dr. Andrew Gray, Consultant Trauma & Orthopaedic Surgeon, South Tees NHS Trust

President Elect UK Orthopaedic Trauma Society (https://orthopaedictrauma.org.uk/)
British Orthopaedic Association Elected Trustee 2026-2028

Dr. Sarah Manske, University of Calgary

Dr. Joe Kendal, University of Calgary

Moderator: Dr. Prism Schneider, University of Calgary

Residents:

R5s	R4s	R3s	R2s	R1s
Dr. Manjot Birk	Dr. Stephanie Gibbon	Dr. Alyssa Federico*	Dr. Gurprit Girn	Dr. Cole Elaschuk
Dr. Anna-Lee Policicchio	Dr. Timothy Lasswell	Dr. Mallika Makkar	Dr. Brett Lavender	Dr. Leah Ferrie
Dr. Brodie Ritchie	Dr. Kaja Leslie	Dr. Reva Qiu	Dr. Kaela Schill	Dr. Lorena Hurtado
Dr. Ethan Sanders	Dr. Michael Leslie	Dr. Colin Rey	Dr. Jared Topham	Dr. Thomas Nixon
	Dr. Meredith Stadnyk	Dr. Gareth Ryan		Dr. Maura Rutherford
		Dr. Ben Wajda	*Away on pre-approved absence	

PROGRAM:

Time	Description / Location	Individuals
	ACADEMIC SESSION	
0610-0730 hrs	Meet at Hotel Lobby at 0610 hrs to then attend Rounds at Foothills Medical Centre	Dr. A. Gray Dr. P. Schneider
0715-0830 hrs	Breakfast at 0730 (OEB - Univ District – 4132 University Avenue NW, Calgary) *(Reservation under Prism Schneider)*	Dr. P. Schneider Dr. A. Gray Invited Guests
0830-0900 hrs	Travel to Cumming School of Medicine	Dr. P. Schneider Dr. A. Gray
0900-1030 hrs	Career Development Session – Room 1405B, HSC Dr. Gray - **"Sliding Door Moments - Early Career 'Small Decisions' Can Shape Your Future"**	All Orthopaedic Residents Dr. A. Gray Dr. P. Schneider Dr. J. Kendal
1030-1045 hrs	Group Photo by Hippocrates Statue	All Orthopaedic Residents Dr. A. Gray Dr. P. Schneider Dr. S. Manske Dr. J. Kendal
1045--1145 hrs	Lunch – HRIC Atrium	All Orthopaedic Residents Adjudicators: Dr. A. Gray, Dr. S. Manske, Dr. J. Kendal, Dr. P. Schneider Guests: Dr. J. Werle, Dr. R. Martin, Dr. A. Bois, Dr. R. Pathy, Ms. G. Elmi Assadzadeh, Ms. Z. Abdy, Ms. B. Simpson, Ms. J. Crawford Sponsor Representatives: Alberta Spine Foundation Dr. G. Swamy // Bioventus Mr. D. McArthur and Ms. N. Emami // ConMed Ms. S. Paulson and Mr. J. Reid // DePuy Sythesis J&J Mr. R. Viszlai and Mr. R. Truscott // MD Management Ms. E. Chiu and Ms. L. Cole // SCRUBS Ms. S. Kayvani // Smith & Nephew Mr. J. Wood // Solventum Ms. K. Foran // Stryker Mr. T. Duszynski, Mr. J. Innes, and Ms. R. Scott // Tactile Orthopaedics Ms. A. Kraeling // Tribe Medical Arthrex Mr. R. Kennedy // Zimmer Biomet West Mr. J Lingard
1145-1200 hrs	Short Break and congregate in Theatre 4, HSC	

SCIENTIFIC SESSION – PRESENTATIONS – THEATRE 4, HSC		
Scientific Session is open to Adjudicators, Orthopaedic Residents, Faculty, Staff, Research Coordinators, the McCaig Institute, Industry Representatives and Others		
Types of Resident Presentations (total of twenty-two presentations) **Full Podium:** 6 minutes for presentation/3 minutes Q&A/1 minute transition time (purple shading) **Abbreviated Podium:** 3 minutes for presentation (maximum of 6 slides)/1 minute transition time/there will be four presented in a row followed by 8 minutes Q&A (orange shading) **3MT Presentations:** 3 minutes for presentation (maximum of 1 slide)/1 minute transition time/there will be four presented in a row followed by 8 minutes Q&A (blue shading) **Dragon's Den - 3MT Presentations: 3** minutes for presentation (maximum of 3 slides)/4 minutes Q&A/1 minute transition time (green shading)		
1200-1205 hrs	Opening Remarks and Welcome	Dr. Prism Schneider
1205-1209 hrs	Trends in Training and Hiring of Canadian Orthopaedic Surgeons *3MT Presentation Number: **2026-3MT1***	Dr. Thomas Nixon
1209-1213 hrs	Mind the Gap: Social Determinants of Arthroplasty Access—A Scoping Review Proposal *3MT Presentation Number: **2026-3MT2***	Dr. Kaela Schill
1213-1217 hrs	A Structured Rapid Review to Support the Development of a Primary Care Foot and Ankle Orthopaedic Clinical Pathway in Alberta *3MT Presentation Number: **2026-3MT3***	Dr. Mallika Makkar
1217-1221 hrs	Mid- to Long-term Outcomes Following Acute Radial Head Fracture Fixation vs. Radial Head Arthroplasty in the Young Patient *3MT Presentation Number: **2026-3MT4***	Dr. Kaja Leslie
1221-1229 hrs	*Q&A for Session One of 3MT Presentations*	
1229-1233 hrs	Enhanced Recovery After Surgery (ERAS) Protocols in Orthopedic Oncology: A Scoping Review *Presentation Number: **2026-AP1***	Dr. Leah Ferrie
1233-1237 hrs	One Size Does Not Fit All: Ergonomic Implications for Orthopaedic Surgical Instrumentation Based on Hand Size – A Study Proposal *Presentation Number: **2026-AP2***	Dr. Gurprit Girn
1237-1241 hrs	In Vitro Comparison of Virtual Anterior Cruciate Ligament Graft Lengths during Knee Motions for Selected Femoral Tunnel Locations *Presentation Number: **2026-AP3***	Dr. Tim Lasswell
1241-1245 hrs	3D MAP: 3D-Printed Minimally Invasive Augmentation of the Pelvis. A Cadaveric Study of Minimally Invasive Augmentation for Periacetabular Bone Metastasis *Presentation Number: **2026-AP4***	Dr. Michael Leslie
1245-1253 hrs	*Q&A for Session One of Abbreviated Podium Presentations*	
1253-1318 hrs	**Local External Adjudicator Presentation: "Multi-modal Imaging to Impact Osteoarthritis "**	**Dr. Sarah Manske**
1318-1328 hrs	GLP-1 Receptor Agonists in Total Hip and Knee Arthroplasty: A Systematic Review and Meta-Analysis of Perioperative and Postoperative Outcomes *Presentation Number: **2026-FP1***	Dr. Ben Wajda
1328-1338 hrs	Arthroscopic Posterolateral Portal Viewing Enables Accurate PCL Tibial Tunnel Drilling Without Fluoroscopy in Multiligament Knee Reconstructions *Presentation Number: **2026-FP2***	Dr. Michael Leslie
1338-1348 hrs	An Evaluation of the TRiP Cast Score for Post-operative Thromboprophylaxis Recommendations for Patients with Tibia and Ankle Fractures *Presentation Number: **2026-FP3***	Dr. Meredith Stadnyk
1348-1352 hrs	Screw Hole Osteogenesis After Implant Removal: A Pilot Study *Presentation Number: **2026-AP5***	Dr. Jared Topham
1352-1356 hrs	Evaluating the Surgical Management Options for Syndesmotic Injury *Presentation Number: **2026-AP6***	Dr. Ethan Sanders
1356-1400 hrs	Non-operative Management of Fifth Metacarpal Neck Fractures: Impact of Angulation on Patient Reported Outcomes *Presentation Number: **2026-AP7***	Dr. Reva Qiu
1400-1404 hrs	Does Delayed Distal Radius Fracture Displacement Resulting in Surgical Intervention Negatively Impact Patient-reported Outcomes? An Interim Analysis *Presentation Number: **2026-AP8***	Calgary Orthopaedic Resident Research Group (CORRG)
1404-1412 hrs	*Q&A for Session Two of Abbreviated Podium Presentations*	
1412-1437 hrs	**Local Internal Adjudicator Presentation: "Do We Really Know How Our Patients Move? Measuring Recovery in the Era of Digital Orthopaedics"**	**Dr. Joe Kendal**
1437-1507 hrs	Break	

1507-1515 hrs	Dragon's Den Competition Presentation 1 *Dragon's Den Presentation Number:* ***2026-DD1***	Team 1 (TBA)
1515-1523 hrs	Dragon's Den Competition Presentation 2 *Dragon's Den Presentation Number:* ***2026-DD2***	Team 2 (TBA)
1523-1531 hrs	Dragon's Den Competition Presentation 3 *Dragon's Den Presentation Number:* ***2026-DD3***	Team 3 (TBA)
1531-1541 hrs	Defining Hypercoagulability in Patients with Surgically Managed Diaphyseal Tibia Fractures: A Pilot Study *Presentation Number:* ***2026-FP4***	Dr. Gareth Ryan
1541-1551 hrs	Delayed Surgery for Anticoagulated Patients with Hip Fractures is Associated with Increased Complications *Presentation Number:* ***2026-FP5***	Dr. Stephanie Gibbon
1551-1601 hrs	Comparison of Patient Outcomes and Retear Rates in Rotator Cuff Repair with Mechanical versus Coblation Debridement: A Prospective Randomized Controlled Trial *Presentation Number:* ***2026-FP6***	Dr. Kaja Leslie
1601-1605 hrs	Defining the Hypercoagulable State of Patients Requiring External Fixation Using Serial Thrombelastography Analysis *3MT Presentation Number:* ***2026-3MT5***	Dr. Molly Rutherford
1605-1609 hrs	Comparing Open and Arthroscopic Synovectomy for the Treatment of Diffuse Giant Cell Tumor of the Tendon Sheath of the Knee: A Retrospective Cohort Study *3MT Presentation Number:* ***2026-3MT6***	Dr. Brett Lavender
1609-1613 hrs	Investigating the Radiosensitivity of PTEN-Deficient Osteosarcoma after Treatment with a Synthetic Lethality-Based Therapy *3MT Presentation Number:* ***2026-3MT7***	Dr. Reva Qiu
1613-1617 hrs	Optimal Construct for Fixation of Femoral Neck Fractures: A Biomechanical Analysis *3MT Presentation Number:* ***2026-3MT8***	Dr. Anna-Lee Policicchio
1617-1625 hrs	*Q&A for Session Two of 3MT Presentations*	
1625-1715 hrs	**Keynote Address: "The UK Orthopaedic Trauma Society: Collaborations in Education, Research, Policy and Clinical Guidelines"**	**Dr. Andrew Gray**
1715-1720 hrs	Closing Remarks	Dr. Prism Schneider
1720-1730 hrs	Adjudicators Deliberations	

Biographies of Adjudicators and Moderator

Guest Adjudicator: Dr. Andrew Gray

Andrew Gray has been a consultant orthopaedic and trauma surgeon based in the Northeast of England for the past 17 years having completed an orthopaedic trauma fellowship in Calgary in 2008. His main specialist interest is trauma, but he also has elective arthroplasty and soft tissue knee practice. He is based in South Tees (James Cook University Hospital Major Trauma Centre) and is the current president elect for the UK Orthopaedic Trauma Society (OTS) and their communications and website lead (https://orthopaedictrauma.org.uk/).

He completed his medical and orthopaedic surgical training in Glasgow, Oxford and Edinburgh, completing a doctorate in medicine with distinction entitled "Damage Control Orthopaedics and the Clinical Effects of Fat Embolus Syndrome". He also has a first-class honours degree in Physiology and Sports Science.

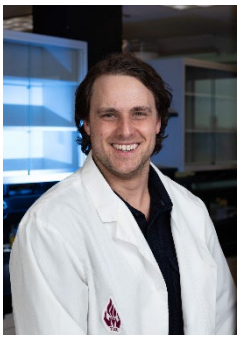
Dr. Gray was the lower limb trauma editor for the journal "Injury" 2014-2021; clinical director for South Tees Orthopaedic Department 2018-2021 and AO faculty since 2010. Over the past five years, he has worked with the global and UK Fragility Fracture Networks focusing on the four pillars of fragility fracture management – acute care, rehabilitation, secondary fracture prevention and policy. He co-chairs the Fracture Liaison Service Academy Network which is European wide and committed to improving Fracture Liaison Services.

He was elected as a trustee for the British Orthopaedic Association and will be on their executive committee 2026-2028 which corresponds with his 3-year presidential line with the Orthopaedic Trauma Society. He hopes to use this tenure to streamline and improve education and policy with regards to UK orthopaedic trauma. Improving communication to the trauma interested BOA members will be a priority. He also chairs the Northern Counties Medical Golf Society.

Local External Adjudicator: Dr. Sarah Manske

Dr. Sarah Manske, PhD, is an Associate Professor in the Department of Radiology, Cumming School of Medicine at the University of Calgary. Her work has primarily used 3D quantitative imaging, including high-resolution peripheral quantitative computed tomography (HR-pQCT), micro-computed tomography and magnetic resonance imaging to investigate the role of bone in disease. Dr. Manske has a keen interest in understanding the contribution of bone to the aetiology of musculoskeletal disease, particularly osteoporosis, osteoarthritis and rheumatoid arthritis.

Local Internal Adjudicator: Dr. Joe Kendal



Dr. Joseph Kendal is an orthopaedic oncology surgeon and Clinical Assistant Professor in the Department of Surgery at the University of Calgary. His research focuses on metastatic bone disease and sarcoma, including the co-development of ACTIVATION, a mobile platform for remote monitoring of patient recovery using mobility metrics and patient-reported outcomes. He leads the SMART Bone Program, integrating clinical and translational research in metastatic bone disease, and is an active member of the Integrated Sarcoma Research Program (iSARP).

Moderator: Dr. Prism Schneider

Dr. Prism Schneider is an Associate Professor of Orthopaedic Surgery in the Departments of Surgery and Community Health Sciences, at the University of Calgary. She also holds the positions of Orthopaedic Trauma Research Lead and the Faculty, Resident and Fellow Research Director for Orthopaedic Surgery. She obtained her MD from the University of Calgary and has completed post-graduate training including a PhD in Biomechanics and two Orthopaedic Trauma Fellowships at the University of Texas and McGill University. Dr. Schneider's research interests involve understanding the cellular and systemic inflammatory response to injury, including trauma-induced coagulopathy and post-traumatic joint contractures, clinical trials for optimizing surgical outcomes, and using advanced imaging to study the micro-architecture of fracture healing. She also has a particular interest in identifying and assisting patients who are injured due to violence in the home. Dr. Schneider has completed several multi-centre randomized controlled trials in collaboration with the Canadian Orthopaedic Trauma Society, in order to define surgical indications following injury and to determine the optimal surgical techniques to help improve patient outcomes. Dr. Schneider's trauma-induced coagulopathy research program aims to use a precision medicine approach to prevention of venous thromboembolism and is funded by the Orthopaedic Research and Education Foundation, the Canadian Institutes for Health Research, and the Canadian Foundation for Innovation.

Abstract Type: Proposal
Research Pillar: Health Services Research

Title: Trends in Training and Hiring of Canadian Orthopaedic Surgeons

Authors: Thomas Nixon and Prism Schneider

Background: To date, the population practicing orthopaedic surgery in Canada has been quantified only by sex and self-reported gender. Key characteristics including graduation year, country where medical degree was obtained, fellowship(s), fellowship training location, presence of graduate degrees, and location of practice have not been studied thus far. This creates a sizable knowledge gap regarding the experience of our orthopaedic workforce. Due to the knowledge gap, there is a significant deficiency in data available for decision-making regarding workforce planning and hiring practices, as well as for trainees who are planning for a career in orthopaedic surgery. We are proposing a descriptive study to address this deficiency in data to provide objective and novel information regarding the landscape of training and demographics of currently practicing orthopaedic surgeons in Canada. A project such as this has recently been undertaken within general surgery, including publications on pediatric general surgery, rural general surgery, and surgeon intensivists.

Methods: We propose an observational study evaluating currently practicing Canadian orthopaedic surgeons by obtaining data from provincial medical registration and institutional websites. Demographics studied will include sex, location of practice, year and location of medical degree (MD) completion, the subspecialty and country of fellowship training, and the presence of graduate degree(s). Where publicly available data is missing, a survey will be designed for data capture from the Canadian Orthopaedic Association membership. Descriptive statistics will be used to summarize our findings.

Results: Anticipated results include demographic information regarding orthopaedic surgeons in Canada. Demographics studied include sex, location of practice, year and location of medical degree (MD) completion, the subspecialty and country of fellowship training, and the presence of graduate degree(s).

Discussion: N/A

Conclusion: Compiling data which describes the current population of practicing orthopaedic surgeons will be invaluable to trainees, staff, and university and hospital administrators. Identifying trends in training and hiring practices across the nation affords trainees the opportunity to bolster their career planning and identify opportunities to engage in graduate degrees and fellowships appropriately. On the contrary, this information may be used by universities and practice groups to identify the demographics of the current cohort of orthopaedic surgeons to refine their hiring practices to ensure a diverse and inclusive workforce.
By developing a database of surgeon demographics in Canada, including their location of practice and population served, the data may be applied in a variety of manners. This includes further investigation into subspecialties and their respective demographics, including arthroplasty, trauma, pediatrics, upper extremity, and sports. By sorting the data into population size served, training demographics in both urban and rural surgeons may be described. Additionally, the data is invaluable for informing a future workforce planning project, which is timely, given the growing and aging population.

Acknowledgements: Kieran Purich, Kevin Verhoeff and Matt Strickland

COREF Funded: No

Abstract Type: Proposal
Research Pillar: Health Service Research

Title: Mind the Gap: Social Determinants of Arthroplasty Access — A Scoping Review Proposal

Authors: Kaela Schill, Mallika Makkar, Laura Morrison, Sophie Aspinall, Jinan Daqqa, Gurprit Girn and Marcia Clark

Background: While there is an increasing focus in medicine on the social determinants of health and (in)equity, research regarding the associated impact on access to and outcomes of orthopedic services remains limited. Though disparities in orthopaedic care within private healthcare systems are better described, there remains a lack of evidence pertaining to public healthcare systems, where orthopedic waitlists are under increasing pressure. A 2016 report by the Public Health Agency of Canada found that socioeconomic disparities cost the Canadian healthcare system $6.2 billion dollars annually, making up 14% of acute care costs. Therefore, identifying and mitigating inequities in healthcare services, including orthopaedic surgery, poses an important opportunity for health service planning and resource allocation. Further, as policymakers in Canada consider private-sector interventions to address orthopaedic backlogs, identifying the social determinants of arthroplasty is crucial as these have the potential to be addressed, or worsened, by changes to healthcare provision and funding.
We anticipate finding literature through our review that demonstrates inequitable access to primary arthroplasty. The purpose of this review is therefore to understand the barriers and disparities that patients face when accessing arthroplasty. The specific aims are to (1) summarize the existing evidence on the effect of the social determinants of health on access to primary hip and knee arthroplasty; and (2) to identify gaps in the literature on this topic. By identifying these barriers and existing literature gaps, this study will provide evidence necessary to guide orthopaedic resource allocation, health promotion strategies, and service implementation that protects vulnerable groups in a shifting healthcare landscape.
Methods: This study utilizes a scoping review methodology guided by the PRISMA-ScR checklist. We searched PubMed, EMBASE, MEDLINE, and CINAHL for peer-reviewed literature, and plan to conduct a Google search for relevant grey literature. Inclusion criteria include social determinants of health affecting access to primary total hip or knee arthroplasty in public healthcare settings, specifically Canada, the UK (NHS), and the US (Veterans Affairs). 3506 studies were initially captured in the literature search and have undergone two-reviewer title/abstract and full text screening. Data extraction of 36 studies is currently underway. Data analysis will involve charting study characteristics and employing inductive coding to group findings into higher-level thematic categories.
Results: The anticipated results of this scoping review will include a comprehensive summary of the extent to which the Social Determinants of Health impact arthroplasty access in public healthcare settings. We expect to identify and categorize specific barriers to equitable access, such as gender, income and geographic location, while highlighting significant knowledge gaps where further research is required.
Discussion: N/A
Conclusion: The anticipated impact of these results is significant for the evolution of orthopedic care in Canada. First, by identifying barriers to arthroplasty in a public system, this study will contribute to the evidence required for equitable orthopaedic service planning within the current Canadian healthcare context. This includes determining resource allocation and developing orthopaedic service implementation strategies. Second, by providing a framework of inequities within a publicly funded model, this work will serve as a jumping off point for policy makers to understand how existing inequities, and associated costs to the Canadian healthcare system, in arthroplasty may be addressed or worsened by introduction of private healthcare services.
Acknowledgements: Thank you to Caitlin McClurg MLIS and the staff at the University of Calgary Library for their assistance in developing a robust search strategy.
COREF Funded: No

Abstract Type: Proposal
Research Pillar: Health Services Research

Title: A Structured Rapid Review to Support the Development of a Primary Care Foot and Ankle Orthopaedic Clinical Pathway in Alberta

Authors: Mallika Makkar, Breda Eubank, Kelcie Witges and Jeremy LaMothe

Background: Foot and ankle conditions are among the most common reasons for visits to primary care providers in Alberta. Yet no standardized provincial pathway exists to guide assessment, investigation, and specialist referral. Subsequent variation in clinical practice contributes to lengthy wait times and suboptimal patient outcomes. Similar inefficiencies in the management of shoulder and knee conditions in Alberta have been previously addressed by forming standardized clinical decision-making tools. These tools have reduced unnecessary imaging, improved referral appropriateness, and streamlined access to specialist care. The Institute for Improved Health Outcomes (IIHO), in partnership with Alberta Health Services (AHS), Primary Care Alberta, and three Clinical Leads, is conducting a systematic rapid review as part of the Foot & Ankle Delphi Clinical Pathway Project. The aim of the review is to identify red flags, history and physical examination components, appropriate use criteria for imaging and laboratory investigations, and indications for specialist referral to help build an evidence-based, standardized clinical decision-making tool.
Methods: This structured rapid review will follow rapid review reporting methods according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive search of MEDLINE, EMBASE, and CINAHL, built in collaboration with a health services library scientist, was conducted from inception to February 2026, yielding 16,361 titles and abstracts. Seven reviewers are independently screening titles and abstracts in tandem using a standardized screening tool through the Covidence platform. Calibration was performed on a pilot sample of 60 titles and abstracts prior to full screening. Conflicts will be resolved through group discussion and consensus. We will include studies reporting clinical practice guidelines; relevant history and physical examination components; appropriate use criteria for diagnostic imaging or laboratory investigations; patient-flow diagrams and clinical decision algorithms; and Level 1 evidence (randomized controlled trials or systematic reviews/meta-analyses of RCTs) for management and treatment. Pharmacological, biomechanical, and cadaveric studies will be excluded in addition to review articles, commentaries, case studies, books, editorials, and conference abstracts. Following title and abstract screening, full-text review and data extraction will be performed on included studies. Evidence will be graded using the Oxford Centre of Evidence-Based Medicine (OCEBM) 2009 model. Synthesized findings will subsequently inform a modified Delphi consensus process involving a purposively selected multidisciplinary expert panel representing Family Medicine, Orthopaedic Surgery, Physiotherapy, Sports Medicine, Kinesiology, Physiatry, Radiology, and Podiatry across Alberta's five health zones.
Results: Anticipated results include a synthesized, high-quality evidence base identifying: key red flags warranting urgent referral; pertinent history and physical examination components for foot and ankle assessment in primary care; appropriate use criteria for imaging and laboratory investigations; and evidence-based indications for orthopaedic referral or surgical intervention. Findings will be organized by clinical domain — consistent with the structure of previously established provincial shoulder and knee tools — and will serve as evidence-based statements for the Delphi questionnaire. Consensus-endorsed recommendations will form the foundation of the final provincial foot and ankle primary care clinical pathway.
Discussion: N/A
Conclusion: This systematic rapid review will provide a rigorous, evidence-informed foundation for a provincial foot and ankle primary care clinical pathway in Alberta. Standardizing assessment, investigation, and referral criteria has the potential to reduce unwarranted clinical variation, improve care quality, and optimize Orthopaedic resource allocation. This methodology has demonstrated measurable impact in previous subspecialty implementations, and represents a scalable, reproducible model for evidence-based pathway development that has the potential to dismantle existing barriers to musculoskeletal care in Alberta.
Acknowledgements: N/A
COREF Funded: No

Abstract Type: Proposal
Research Pillar: Clinical Research

Title: Mid- to Long-term Outcomes Following Acute Radial Head Fracture Fixation vs. Radial Head Arthroplasty in the Young Patient

Authors: Kaja Leslie, Eduardo Torres Rangel, Catherine Betancourt Lee, Daniel You, Herman Johal and Prism Schneider

Background: Management of comminuted Mason Type III (AO-OTA 2R1C3) radial head fractures remains controversial, particularly in young patients. While open reduction and internal fixation (ORIF) has traditionally been preferred due to presumed superior postoperative outcomes, these results are largely extrapolated from older data with notable limitations. In cases where anatomic reduction cannot be achieved, ORIF may be associated with fixation failure, non-union, and loss of motion. Radial head arthroplasty (RHA) may offer a viable alternative for highly comminuted fractures, but evidence comparing RHA and ORIF in patients under 50 years of age is lacking. This study aims to evaluate the clinical, radiographic, and patient-reported outcomes, along with complication rates and economic viability, of radial head arthroplasty versus open reduction internal fixation of radial head fractures in patients aged 49 years or younger. We hypothesize that radial head arthroplasty (RHA) is a viable alternative to open reduction and internal fixation (ORIF) for the management of acute AO-OTA 2R1C3 (Mason Type III) radial head fractures in patients under 50 years of age with equivalent re-operation rates at two year follow up.

Methods: A retrospective review will be conducted of patients aged 18–49 years treated with either RHA or ORIF for Mason Type III fractures at a Level I trauma centre between 2014 and 2024. Patients will be identified via ICD-10 coding through institutional databases and a subgroup will be contacted for in-person follow-up. Demographic, clinical, and radiographic data will be extracted, including range of motion, grip strength, pain, Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH) score, and the EuroQol 5-Dimension (EQ-5D) questionnaire. The primary outcome measure will be re-operation rates within 2 years. Complications such as instability and heterotopic ossification will also be collected. Economic analysis will include estimates of direct and indirect care costs. Using a significance level of 0.05, clinical data will be analyzed via t-tests or Wilcoxon rank-sum tests, while cost-effectiveness will be modeled using a decision tree and Markov framework to estimate one-year and lifetime economic impacts.

Results: We anticipate that RHA will be a viable alternative to ORIF for comminuted radial head fractures in patients aged 49 years and younger, yielding comparable functional and radiographic outcomes. Specifically, we anticipate equivalent re-operation rates at two year follow up between the RHA and ORIF groups.

Discussion: N/A

Conclusion: This will be the first study to directly compare RHA and ORIF for comminuted AO-OTA 2R1C3 radial head fractures in patients under 50 years of age, addressing a critical evidence gap in the management of complex elbow trauma in young adults. Clarifying the optimal treatment for comminuted radial head fractures in young patients may refine surgical decision-making and improve outcomes. Should RHA demonstrate comparable functional results and longevity to ORIF, it may serve as a cost-effective single-stage alternative that reduces revision procedures, accelerates return to work, and enhances long-term elbow function. This study will also inform the design of a prospective study.

Acknowledgements: None

COREF funded: No

Abstract Type: Full
Research Pillar: Health Services Research

Title: Enhanced Recovery After Surgery (ERAS) Protocols in Orthopedic Oncology: A Scoping Review
Authors: Leah Ferrie, Alex Gamage, Khara Sauro, Michael Yang, Krista Goulding, Shannon Puloski, Michael Monument and Joseph Kendal

Background: ERAS protocols are a form of evidence-based medicine that are widely used across many disciplines. Within orthopedic hip and knee arthroplasty, there is an abundance of literature showing ERAS improves patient outcomes and shortens length of stay. However, within orthopedic oncology, there is a lack of literature, limiting the use of ERAS in clinical practice. This study aims to summarize the breadth and depth of literature on ERAS in orthopedic oncology to identify critical gaps and guide future research directions in this complex population.
Methods: Following the Arksey and O'Malley framework, a comprehensive literature search was performed. Studies meeting the following criteria were included: 1) Target population: human patients with soft tissue sarcoma, bone sarcoma, metastatic bone disease, or multiple myeloma; 2) Intervention: ERAS protocols, current practice guidelines, fast-track protocol, post-operative guidelines, or enhanced perioperative care; 3) Outcomes: at least one of length of stay (LOS), adverse events, or pain. Studies involving only benign bone tumors were excluded.
Results: Nine studies met selection criteria. Of these, six focused on primary soft tissue sarcoma or metastatic bone disease in the spine. The other three studies included patient groups with primary soft tissue sarcoma of the body and/or extremities. Preoperative, intraoperative, and postoperative ERAS elements were reported variability amongst studies, as seen in Figure 1. Most studies contained preadmission education (89%), preoperative nutritional management (89%), postoperative early mobilization (89%), intraoperative analgesia management (78%), postoperative analgesia (78%), and postoperative diet and bowel management (78%). ERAS elements least commonly included were antiemetic prophylaxis (11%) and criteria for discharge (11%). Within our nine studies, we evaluated the frequency at which common outcomes were reported, of which there was notable variability; most studies assessed LOS (100%), bleeding and intraoperative blood loss (67%), wound infection (67%), and time to ambulation (56%). However, less than 50% of studies assessed other important outcomes such as overall survival (11%) and post-operative pain medication use (11%).

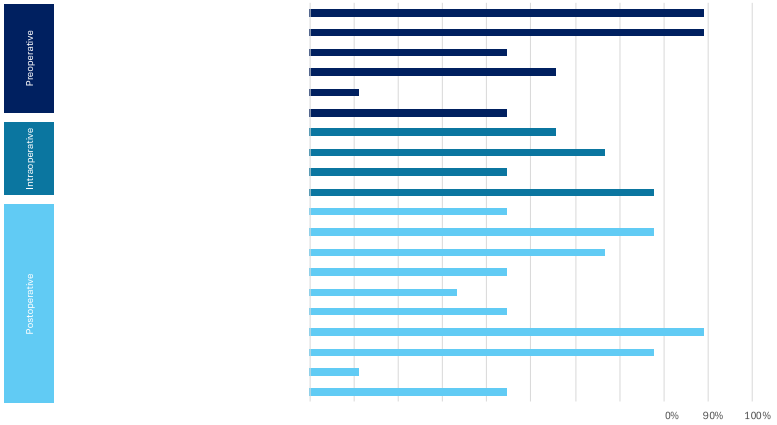


Figure 1: ERAS elements (preoperative, intraoperative, and postoperative) from included studies.

Discussion: ERAS protocols seem to be more widely used within spine orthopedic oncology, outlining a gap in the use of ERAS in non-spine orthopedic oncology. Further research investigating facilitators and barriers to ERAS in non-spine oncology should be performed to help drive the development dedicated protocols. There was notable variability between studies on which ERAS elements were implemented, as well as the patient outcomes measured. Due to a lack of standardization, it was difficult to evaluate the efficacy of individual elements across studies, ultimately serving as a barrier towards implementation in clinical practice.
Conclusions: Our scoping review highlights a lack of literature in the use of ERAS protocols in orthopedic oncology, especially in non-spine oncology. As shown from individual studies, there is evidence that implementing ERAS elements within orthopedic oncology is effective in improving clinical outcomes. This scoping review opens the door for a systematic review to help further evaluate and apply the use of ERAS protocols within orthopedic oncology.
Acknowledgement: N/A
COREF Funded: No

Abstract Type: Proposal
Research Pillar: Clinical Research

Title: One Size Does Not Fit All: Ergonomic Implications for Orthopaedic Surgical Instrumentation Based on Hand Size – A Study Proposal

Authors: Gurprit Girn, Maura Rutherford, Marla Ross, Jolene Allan, Kimberly Rondeau, Madeleine Gorman-Asal and Prism Schneider

Background: Orthopaedic surgeons take pride in restoring musculoskeletal (MSK) function, but the physical demand of their profession places them at high risk of occupational injuries. A Canadian study conducted by Alaqeel and Tanzer (2020) reported that approximately two-thirds of orthopaedic surgeons experience MSK injuries during their careers. Of these cases, an estimated 27 to 31% necessitate time away from clinical duties, ranging from brief absences of half a day to prolonged leave or even premature retirement. Despite this, relatively little research has explored the ergonomic implications of the surgical instruments routinely used in orthopaedic practice. The use of powered instruments, such as drills and reamers, can subject the surgeon's wrist to considerable torque. Hand size and grip strength may affect the ability to manipulate these instruments safely. The objective of this study is to evaluate hand size and grip strength to inform future recommendations regarding surgical instrument use and design. We hypothesize that surgeons with smaller hands will have reduced grip strength and earlier grip fatiguability. By accounting for variability in hand dimensions and grip strength among surgeons, such advancements may help mitigate the risk of occupational injury and disability while enhancing surgical efficiency, comfort, overall safety and therefore promoting career longevity.
Methods: This study will employ a prospective cohort design, with data collected at a single study time point and recorded in a custom REDCap database to facilitate secure data management and potential expansion for future research. Participants will include orthopaedic residents, fellows, and attending surgeons affiliated with the Foothills Medical Centre (FMC). Demographic variables, including sex, self-reported gender, age, and outer operating room glove size (as used in a double-gloving technique), will be documented. Hand anthropometric measurements and strength assessments will be obtained using a ruler and a dynamometer, respectively. Measurements will include hand span, hand length, thumb-to-index finger distance (cm), grip strength, and pincer strength. Fatigue will be assessed as grip strength after 10 repeated attempts. Fisher's exact tests and Kruskal-Wallis rank sum tests were used to compare fatigue testing and grip strength results by sex and by glove size.
Results: Preliminary data amongst 16 orthopaedic surgeons and residents support that glove size distribution differed by sex, with smaller sizes predominating in females and larger sizes in males (p=0.006). Males demonstrated significantly higher grip strength than females in both dominant (mean=42N [SD=8] vs.24N [SD=8]; p=0.002) and non-dominant hands (38 N [SD=7] vs 21N [SD=8]; p=0.005). Similarly, fatigue resistance was higher in males than females for both dominant (38N [SD=5] vs 25N [SD=10]; p=0.022) and non-dominant hands (38N [SD=7] vs 21N [SD=8]; $p \leq 0.005$). Larger glove sizes were also associated with greater grip strength (dominant, p=0.017; non-dominant, p=0.016)) and fatigue performance of the non-dominant hand ($p \leq 0.026$). Interestingly, there was a trend towards larger glove size having better fatigue outcomes in the dominant hand than smaller glove sizes, though not significant (p=0.081).
Conclusion: Preliminary data indicates that surgeon hand size and sex significantly influence grip strength and fatigue performance, as males and participants with larger glove sizes consistently demonstrated higher grip strength and greater resistance to fatigue compared with females and those with smaller hands. These results indicate that standard surgical instruments may not be optimally sized for all surgeons, supporting the need to consider hand size and grip strength in the design and selection of surgical instruments. Optimizing instrument ergonomics could reduce surgeon fatigue, improve comfort, and potentially lower the risk of MSK injury during procedures. This is particularly relevant as the number female orthopaedic graduates continues to increase, with estimates of equal sex representation among orthopaedic surgeons by 2060 (Frazer et al., 2025).
Discussion: Furthermore, many of the above-mentioned surgical instruments are not limited to orthopaedic surgery and are seen in specialities, such as plastic surgery and neurosurgery as well. Thus, these findings may have implications on surgeon safety and ergonomics beyond the field of orthopaedic surgery.
Acknowledgements: Jessica Duong, Victoria Claggett, Alexi Heiskanen
COREF Funded: No

Abstract Type: Full
Research Pillar: Basic Science

Title: In Vitro Comparison of Virtual Anterior Cruciate Ligament Graft Lengths during Knee Motions for selected Femoral Tunnel Locations

Authors: Tim Lasswell, Teresa Marotta, Stewart McLachlin and Ryan Martin

Background: The femoral tunnel position of the graft plays a critical role in anterior cruciate ligament reconstruction, with malposition being a top reason for graft failure. The goal of this in vitro study was to deploy a hybrid experimental-computational approach to investigate the effect of deviations in the selected femoral tunnel position on graft isometry profiles and induced graft strain during applied loads for single-bundle anterior cruciate ligament reconstructions.

Methods: Nine fresh-frozen human cadaveric knee specimens were tested using a six degree-of-freedom joint motion simulator, which can define virtual ligament models. Each specimen was tested in the following loading conditions: (1) 89 N anterior-directed force simulating anterior tibial translation, (2) 5 Nm internal torque, and (3) combined anterior-directed force and internal torque. Each loading condition was tested at three knee flexion angles (0 degrees, 30 degrees, and 90 degrees). This loading protocol was used to test five virtual graft reconstructions: a central femoral insertion location identified by a fellowship trained sports medicine surgeon and four additional femoral insertion locations were then compared at ±4.6 mm in the anterior/posterior and proximal/distal directions relative to the chosen central point. The virtual graft had a stiffness of 466.2 N/mm to simulate a quadriceps tendon graft. Change in graft length was then plotted from 0 to 90 degrees of flexion and the induced graft strain was collected during peak applied loads of each of the loading conditions. Induced graft strain under applied loads were assessed using the Friedman test and pairwise comparisons were performed using Wilcoxon signed-rank tests. Multiple comparison corrections were applied using both Holm step-down adjustment and Benjamini–Hochberg procedures. Statistical significance was defined as $p<0.05$.

Results: The graft length change during knee flexion was different across the five virtual graft conditions. An anteriorly-placed femoral tunnel produced a more isometric graft while posteriorly-placed femoral tunnel produced the greatest graft change in length over motion. Femoral tunnel position also had a significant effect on induced graft strain under the anterior tibial translation loading condition at 90 degrees of knee flexion with the posterior tunnel position producing the greatest strain and the anterior tunnel position producing the lowest strain.

Discussion: An anterior femoral tunnel position produced the most isometric graft profile during knee flexion and may be favorable for surgeons trying to minimize graft strain during knee flexion. A posterior tunnel position demonstrated more anatomic graft strain but did subject the graft to a strain value greater than 7% in some cases which may risk graft failure. Similarly, loading conditions demonstrated that anterior femoral tunnel positions had less induced graft strain compared to posterior tunnel positions. Graft properties were less affected by femoral tunnel placement deviations in the proximal and distal directions.

Conclusion: Femoral tunnel locations create significantly different induced graft strain under load and create differences in graft isometry profiles. Specifically, posterior femoral tunnel placement may put ACL graft reconstructions at higher risk of failure due to higher strain.

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COREF Funded: Yes

Abstract Type: Full
Research Pillar: Clinical Research

Title: 3D MAP: 3D-Printed Minimally Invasive Augmentation of the Pelvis. A Cadaveric Study of Minimally Invasive Augmentation for Periacetabular Bone Metastasis
Authors: Michael Leslie, Brent Benavides, Murray Wong, Shannon Puloski, Michael Monument, and Joseph Kendal

Background: Metastatic bone disease (MBD) of the pelvis is a common manifestation of advanced malignancy. Progressive periacetabular bone loss results in pain, loss of mobility, and functional decline. Surgical management aims to restore stability, relieve pain, and enable early ambulation. While open reconstructive techniques provide durable fixation, they are associated with substantial morbidity, blood loss, and prolonged recovery.
Minimally invasive screw- or pin-based cement augmentation has emerged as a lower-morbidity alternative that reinforces compromised bone through percutaneous access. However, conventional freehand or fluoroscopy-guided techniques depend heavily on surgeon experience and are prone to malposition, unsafe pelvic or joint violation, and inconsistent fixation.
Three-dimensional (3D) printing enables patient-specific surgical planning and intraoperative precision by translating CT-based trajectories into custom drill guides. These guides have the potential to improve accuracy, reproducibility, and safety while reducing radiation exposure and operative time. This cadaveric study evaluates the safety and accuracy of a novel 3D-printed, patient-specific guide for minimally invasive acetabular augmentation and fixation.

Methods: Eleven fresh-frozen human cadavers will undergo bilateral screw-based acetabular augmentation. Preoperative CT imaging is used to design iliac-crest-anchored, patient-specific guides incorporating four planned screw trajectories targeting the anterior column, posterior column, medial wall, and an anterior-to-posterior column screw. Each cadaver will receive two guided reconstructions with three or four cannulated screws. Post-procedure CT scans assess safety (intraosseous placement without acetabular breach or pelvic cavity violation) and accuracy (deviation in millimeters between planned and actual screw centerlines). Operative time and fluoroscopy use will be recorded.
A representative clinical case of metastatic renal cell carcinoma treated with a custom 3D-printed guide is also reported.

Results: So far in freehand trials, unsafe placement occurred in 3 of 15 screws (20%), involving inner-table breaches. All 15 screws placed using patient-specific guides were fully intraosseous (0% unsafe). Guided screws demonstrated improved alignment with intended column centers and greater trajectory consistency across specimens. Surgeon feedback highlighted intuitive fit, rigid fixation, and workflow efficiency. The time from CT scan acquisition to finalized guide production was consistently achievable in under two weeks, supporting clinical feasibility and rapid case turnaround.
In the current iteration of the 3D guide, enhancements have been introduced to expand capability, including options for cementoplasty and thermal ablation. These additions are being developed and are undergoing validation. In the clinical case, four percutaneous screws with cement augmentation were placed safely, with PROMIS (Patient-Reported Outcomes Measurement Information System) Pain Interference improving by 6 points and Physical Function by 12 points at six weeks—both exceeding the MCID (Minimal Clinically Important Difference).

Discussion: Preliminary results show fast, reliable, and safe pin placement into the pelvis using custom 3D printed iliac crest-based guides. Further data processing on pin accuracy will be completed prior to presentation.

Conclusion: In this cadaveric study, patient-specific 3D-printed guides enabled safe and accurate pin placement while strategically targeting established bony stability corridors of the acetabulum. The guide streamlined workflow and reduced operative time by minimizing fluoroscopy use and eliminating intraoperative trajectory adjustments. Early results demonstrated improved precision, screw safety, and shorter operative times compared to traditional freehand techniques. Ongoing trials will provide additional data and refined guide iterations at the time of presentation.

Acknowledgments: SMarT Bone, Sharpest Knife Selection Committee

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Abstract Type: Full
Research Pillar: Clinical Research

Title: GLP-1 Receptor Agonists in Total Hip and Knee Arthroplasty: A Systematic Review and Meta-Analysis of Perioperative and Postoperative Outcomes

Authors: Ben Wajda, Darren Van Essen, Sabrina Martini, Golpira Elmi Assadzadeh, Raj Sharma and Jason Werle

Background: Obesity is a major driver of demand for total hip arthroplasty (THA) and total knee arthroplasty (TKA) and is associated with increased risks of periprosthetic joint infection, wound complications, readmission, and revision surgery. Glucagon-like peptide-1 receptor agonists (GLP-1RAs) are increasingly prescribed for weight reduction and metabolic optimization; however, their perioperative safety profile and influence on arthroplasty outcomes remain incompletely defined. This systematic review and meta-analysis evaluated the association between perioperative GLP-1RA use and postoperative outcomes following primary and revision THA and TKA.

Methods: A PRISMA-compliant systematic review was conducted using PubMed, MEDLINE, and EMBASE from database inception through August 20, 2025. Studies were included if they evaluated adults undergoing primary or revision THA or TKA with perioperative GLP-1RA exposure (defined as 0–12 months preoperatively or ≤30 days postoperatively). Data on patient demographics, surgical and medical complications, and healthcare utilization were extracted at 90 days and 1–2 years. Study quality was assessed using established criteria for observational research. Pooled odds ratios (ORs) with 95% confidence intervals (CIs) were calculated using fixed- and random-effects models.

Results: Thirteen retrospective cohort studies comprising 1,408,609 patients (39,614 THA; 1,373,771 TKA) met inclusion criteria. Perioperative GLP-1RA use was associated with a reduced risk of 90-day periprosthetic joint infection (OR 0.77, 95% CI 0.66–0.89), lower 90-day all-cause revision (OR 0.88, 95% CI 0.82–0.95), and decreased 90-day readmission (OR 0.79, 95% CI 0.70–0.89). At 1 year, GLP-1RA use was associated with an increased risk of periprosthetic fracture (OR 1.49, 95% CI 1.08–2.07), predominantly in TKA cohorts. No significant associations were identified for venous thromboembolism, pulmonary embolism, acute renal failure, pneumonia, cardiac arrest, or aspiration events.

Discussion: Perioperative GLP-1RA exposure was associated with improved early postoperative outcomes, including lower rates of infection, revision, and readmission, without an increase in short-term medical or aspiration-related complications. The observed increase in 1-year periprosthetic fracture risk warrants further investigation, particularly regarding potential mechanisms related to rapid weight loss, bone metabolism, or altered biomechanics. Limitations include the retrospective design of included studies and potential confounding.

Conclusion: Perioperative GLP-1RA use in THA and TKA improves early infection, revision, and readmission outcomes without increasing short-term medical or aspiration risk. The observed 1-year fracture risk warrants further study. Prospective trials are needed to define optimal timing and patient selection.

Acknowledgements: None

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Abstract Type: Full
Research Pillar: Clinical Research

Title: Arthroscopic Posterolateral Portal Viewing Enables Accurate PCL Tibial Tunnel Drilling Without Fluoroscopy in Multiligament Knee Reconstructions

Authors: Michael Leslie, Jarrett Moore, Philippe Beachamp-Chalifour, Sarah Kerslake, Prism Schneider and Ryan Martin

Background: Most surgical technique reports recommend intraoperative fluoroscopy to ensure accuracy and safety during posterior cruciate ligament (PCL) tibial tunnel creation. However, fluoroscopy increases surgical time, radiation exposure, and the risk of surgical field contamination, and its imaging is affected by tibial rotation. While previous studies demonstrated comparable accuracy between fluoroscopic and anatomic landmark techniques in isolated PCL reconstructions, multiligament knee injuries present unique challenges. In multiligament reconstructions, increased posterior tibial sag places higher tension on posterior capsular structures, significantly impeding the visualization of anatomic landmarks. Furthermore, this posterior displacement decreases the safe distance between the neurovascular bundle and the tibial guide pin exit site. Compromised visualization can lead to tibial tunnel malpositioning, which is a recognized cause of PCL reconstruction failure. While drilling via a posterolateral portal is known to be safe, its precision regarding tunnel accuracy has yet to be fully established. The goal of this study was to evaluate the accuracy and safety of PCL tibial tunnels created under direct arthroscopic visualization using a posterolateral viewing portal, without intraoperative fluoroscopy, during multiligament knee reconstructions.

Methods: A retrospective case series evaluated 99 adult patients who underwent PCL reconstruction as part of a multiligament knee reconstruction between January 1, 2019, and December 1, 2024. Tunnels were created under direct arthroscopic visualization via a posterolateral viewing portal using a 30-degree arthroscope, without fluoroscopy. Postoperative anterior-posterior (AP) and lateral radiographs were used to measure tunnel accuracy. Tunnels were graded as ideal, good, or poor based on established radiographic criteria by two independent authors, and interrater agreement was evaluated.

Results: The 99 patients had a mean age of 42.5 years, and 75% were male. All 99 tunnels were graded as accurate: 89 (89.8%) were ideal, 10 (10.1%) were good, and there were zero poor tunnels. The sagittal tunnel angle averaged 41.65 degrees. Sagittal tunnel position demonstrated a mean depth from the joint line of 12.1 mm (SD ± 3.5), and the c/d ratio averaged 17.7%. The classification system demonstrated "near perfect" interrater agreement (Cohen's kappa = 0.89). There were no neurovascular complications. Postoperative complications included 10 superficial infections, 2 septic joints, and 1 DVT. At a mean follow-up of 1.2 years for clinical outcomes (n=73), the mean Lyscholm score was 74.41 and the Tegner score was 3.69. With an average follow-up of 6.55 years, only two patients (2%) required revision.

Discussion: PCL tibial tunnels can be created with high postoperative radiographic accuracy and an absence of neurovascular complications using arthroscopic anatomic landmark referencing via a posterolateral viewing portal. This technique is highly effective without fluoroscopy or a 70-degree arthroscope, even with increased posterior sag. Utilizing a posterolateral portal allows the release of the posterior septum, which increases the distance from the tunnel exit to neurovascular structures, improves visualization of landmarks like the champagne flute drop-off, and frees up working portals.

Conclusion: Arthroscopic creation of the PCL tibial tunnel using a posterolateral viewing portal safely achieves accurate tunnel placement without intraoperative fluoroscopy, minimizing radiation exposure and operative time. Accurate tunnel placement yields a low revision rate and favorable patient-reported outcomes in the setting of multiligament knee reconstructions.

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Abstract Type: Full
Research Pillar: Clinical Research

Title: An Evaluation of the TRiP Cast Score for Post-operative Thromboprophylaxis Recommendations for Patients with Tibia and Ankle Fractures
Authors: Meredith Stadnyk, Madeleine Gorman-Asal, Jane Kuppe, Olabisi Ebenezer, Andrew Dodd, Paul Duffy, Herman Johal, Robert Korley, Daniel You, Jessica Duong, Leslie Skeith and Prism Schneider

Background: The Trauma, Immobilisation, and Patient (TRiP) cast score is a 14-item, externally validated venous thromboembolism (VTE) risk assessment tool incorporating trauma severity, immobilization, patient demographics and medical history. A score ≥7 warrants consideration for thromboprophylaxis. However, the TRiP cast score was originally validated in a cohort where only 21% of patients underwent surgery. The tool currently assigns two points for recent surgery and an additional two points for recent hospitalization, which limits its discriminative ability in a surgical population. This study aimed to evaluate the TRiP cast score in patients with operatively treated lower extremity fractures and to assess the utility of a modified version adapted for surgical patients.
Methods: This study included operatively treated patients aged ≥18 years who sustained a tibia diaphyseal or ankle fracture, drawn from two prospective cohort studies. Demographics and medical history were collected at baseline to calculate both the original TRiP cast score and a modified TRiP cast score for each patient. The proposed modification combines the recent surgery and hospitalization items into a single two-point category rather than awarding four points. Patients were followed for up to one year post-operatively for VTE complications. Demographic characteristics, VTE incidence, and TRiP cast scores were summarized by fracture location using descriptive statistics and compared using Chi-square and two-sample t-tests.
Results: A total of 115 ankle and 25 tibia fracture patients were analyzed. Age, sex, and body mass index (BMI) were similar between groups ($p>0.05$). In real-world practice, 62.9% of participants received thromboprophylaxis at discharge. By contrast, the original TRiP cast score recommended thromboprophylaxis for 97.4% of ankle fracture patients and 100% of tibia fracture patients. Using the modified TRiP cast score, 90.4% of ankle and 84.0% of tibia fracture patients would be recommended thromboprophylaxis. The overall VTE incidence was 3.1%, comprising two events in the ankle group and one in the tibia group.
Discussion: VTE is a well-recognized and potentially fatal complication following lower extremity fractures and orthopaedic surgery. Reported VTE incidence after operatively managed tibia fractures ranges from 1.7% to 8.4%, and ankle fractures have similarly demonstrated rates of 3.0 to 3.6% in large registry studies. A key strength of examining VTE risk in this population is the opportunity to intervene. The fracture itself, surgical immobilization, hospitalization, and post-operative non-weightbearing status are all established contributors to increased VTE risk. Because these risk factors can be identified pre-operatively in patients with ankle and tibia fractures, thromboprophylaxis represents an opportunity to reduce morbidity and mortality. However, clinicians must navigate between under-treating a modifiable risk and over-treating with unnecessary anticoagulation that carries its own complications, including bleeding. Based on the results of this study, the TriP score may overestimate VTE risk in operative patients by double-counting surgical factors. The modified score may better stratify surgical lower extremity fracture patients at higher VTE risk, reducing over-treating prophylaxis while still capturing patients that would benefit.
Conclusion: The TRiP cast score may overestimate VTE risk in surgically managed tibia and ankle fracture patients, recommending thromboprophylaxis in nearly all patients, despite an observed VTE incidence of 3.1%. The modified TRiP cast score consolidates surgery and hospitalization into a single scoring category. This modification may provide more clinically meaningful thromboprophylaxis guidance for surgical fracture patients, though further prospective study is required to validate this approach.
Acknowledgements: Foothills Orthopaedic Trauma Research Team
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Abstract Type: Full
Research Pillar: Clinical Research

Title: Screw Hole Osteogenesis After Implant Removal: A Pilot Study
Authors: Brett Lavender, Jared Topham, Nebojsa Kuljic, Madeleine Gorman-Asal, Jonah Dimnik, Danielle Whittier and Prism Schneider
Background: "Thanks doctor, but when can I go back to playing soccer?" Following fracture fixation, removal of orthopaedic implants leaves residual screw holes acting as temporary stress risers, reducing torsional and bending strength until osteogenesis restores cortical continuity. These defects may predispose patients to refracture, occasionally necessitating repeat surgery. There is a paucity of data to guide safe return to work and function after implant removal. To address this knowledge gap, we propose a pilot study quantifying the timeline of screw hole osteogenesis and incorporating standardized radiographic metrics to be utilized in future studies exploring evidence-based timelines for safe weightbearing, rehabilitation, and return to activity.
Methods: We propose a single-centre prospective cohort study. Adults aged ≥18 years undergoing elective removal of orthopaedic implants after radiographically healed fractures of the distal fibula will be eligible for inclusion. The distal fibula was selected as a model site due to the high frequency of elective implant removal following ankle fracture fixation, the relatively uniform screw geometry, and the predominantly cortical bone environment that allows consistent imaging and analysis of screw hole regeneration. A feasibility cohort of 10 participants will be recruited over a 12-month period, with 6-month follow-up. A cohort of 10 participants was selected to evaluate imaging protocols, outcome measure reliability, and recruitment feasibility prior to larger-scale investigation. Participants will undergo baseline radiographs (XRs) within one week of implant removal. This will be followed by further XR and HR-pQCT (ultra-low dose CT scan) at 6-weeks, 3-months, and 6-months post-removal to quantify rate and completeness of bone regeneration within screw holes. Screw hole fill-in will be evaluated using a novel XR-based screw hole fill-in score (SHFS) developed for this study, modeled after validated fracture healing scores (e.g., RUST) but tailored to quantify fill-in of distal fibula screw tracks following implant removal. On standardized XR, screw hole lucency resolution will be graded on a four-point ordinal scale (0–3): from a sharply marginated radiolucent track (0) to hazy borders with early trabecular bridging (1), to near-complete cortical continuity with only faint lucency (2), and complete XR fill-in indistinguishable from surrounding bone (3). Six blinded observers (junior and senior residents) will independently score and re-score a representative image set to assess intra- and inter-rater reliability, evaluated using intraclass correlation coefficients (ICC). ICC values less than 0.5, between 0.5 and 0.75, between 0.75 and 0.90, and greater than 0.90 correspond to poor, moderate, good, and excellent reliability, respectively. Longitudinal imaging outcomes will be modeled using mixed-effects regression to account for repeated measures within participants. Based on institutional data, we estimate >20 participants will meet inclusion criteria; therefore, a projected enrollment rate of 50% is highly feasible.
Results: This project will explore the biological timeline of screw hole osteogenesis by quantifying progressive fill-in on HR-pQCT (% fill, BV/TV, cortical thickness) and corresponding XR grades. Preliminary evaluation of the SHFS was performed using six sample XRs independently assessed by six observers. Interobserver reliability demonstrated moderate-to-good agreement across assessments, with ICC values of 0.67 for qualitative healing, 0.78 for % fill, and 0.71 for time since hardware removal. We anticipate demonstrating early mineralization and osteogenesis by six to eight weeks, with ≥80% cortical restoration by approximately 12-16 weeks, modeled as a plateau in mixed-effects longitudinal analysis.
Discussion: Initial reviews of SHFS have been complete for a series of six sample XRs showing implant removal from the distal fibula at various timepoints. Our preliminary findings support the feasibility and reproducibility of XR evaluation of screw hole healing. Repeat reviews are ongoing. By assessing XR-based SHFS and HR-pQCT metrics, we aim to identify clinically applicable XR thresholds reflecting osteogenesis. Our feasibility data, outcome definitions, and imaging protocols will enable a larger, adequately powered study to investigate variability in osteogenesis and patient-related predictors of refracture risk, an outcome of significant importance to patients, clinicians, insurers, and employers. The prospective phase of this project is ongoing with results expected in 12 months.
Conclusion: Previous studies of screw hole fill-in have been limited to plain XR or animal models, leaving a knowledge gap in the biological timeline and completeness of cortical regeneration in humans. This pilot study introduces HR-pQCT to quantify screw hole osteogenesis in vivo, enabling precise measurement of true biological healing. Evaluating imaging protocols, reliability of outcome measures, and temporal patterns of regeneration in this feasibility cohort will lay the methodological foundation for future larger-scale trials capable of defining patient-specific healing variability and informing postoperative guidance. By validating a standardized XR scoring system, this work will position subsequent research to rigorously determine when screw holes no longer function as structural vulnerabilities.
Acknowledgements: None
COREF Funded: No

Abstract Type: Full
Research Pillar: Clinical and Health Services Research

Title: Evaluating the Surgical Management Options for Syndesmotic Injury
Authors: Ethan Sanders, Jared Topham, Andrew Dodd, Paul Duffy, Robert Korley, Kim Rondeau and Prism Schneider

Background: The optimal management of syndesmotic injuries is controversial, with wide variations in practice. The aim of this study is to evaluate the surgical and clinical outcomes of syndesmotic fixation options including syndesmotic screws (SS), flexible fixation (FF) and posterior malleolus fixation (PMF). This will provide further information to consider in surgical decision-making.
Methods: This is a retrospective analysis of a single-centre prospective cohort study of patients having undergone one of three options for the surgical management of unilateral syndesmotic injuries. Patient demographics have been collected, and outcome measures related to value-based analysis include: a) clinical outcomes including reoperation rates, surgical complications, implant failure, and return to work, and b) patient-reported outcome measures including the validated American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot, foot and ankle ability measure (FAAM), short form 12 (SF-12) questionnaires.
Results: A total of 94 patients that sustained unilateral syndesmotic injuries were included in the final analysis (Table 1). When comparing fixation groups, there was a significant difference in age, with SS patients being older (48 years, p=0.01), when compared to PMF (42 years) and FF patients (3(9 years). In addition patients undergoing PMF fixation were more likely to have AO/OTA 44B fractures n=16, p=0.01). These patients also had worse AOFAS scores at early time points, at 2 and 6 weeks post operatively (p=0.01, p=0.04). There were no other significant differences in patient reported outcome measures. The remainder of the data will be ready prior to Resident Research Day.
Discussion: Surgical management of syndesmotic injuries remains controversial. We have previously used four-dimensional CT to better understand the kinematics of the syndesmosis, and demonstrated high rates of malreduction with SS when compared to FF. This study provides further information on the clinical course of patients with syndesmotic injuries, with those undergoing PMF having worse early surgical outcomes. Furthermore, AO/OTA 44B fractures, should be examined carefully and potentially further investigated with CT to determine if posterior malleolus fixation is required.
Conclusion: In patients undergoing syndesmotic fixation, patients who undergo PMF have worse patient reported outcome measures early in the post-operative course. This provides valuable information on the recovery for these patients, and can be helpful in counselling.

Table 1

	Posterior Malleolus, N = 19	Syndesmosis Screw, N = 33	Flexible Fixation, N = 42	p-value
Age	42	48	39	***0.01***
Sex (M:F)	8:11	19:14	26:16	0.3
BMI	**26**	**29**	**29**	0.13
AO/OTA Fibular Fracture Classification				
43B- Tibia, distal end segment, partial articular	0 / 19 (0%)	1 / 33 (3.0%)	0 / 42 (0%)	
44B - Tibia/fibula, malleolar segment, transsyndesmotic fibular fracture	16 / 19 (84%)	17 / 33 (52%)	16 / 42 (38%)	***0.01***
44C - Tibia/fibula, malleolar segment, suprasyndesmotic fibula injury	3 / 19 (16%)	15 / 33 (45%)	24 / 42 (57%)	
AOFAS 2 weeks	45	39	51	***0.01***
AOFAS 6 weeks	57	66	68	***0.04***
AOFAS 3 months	74	80	80	0.5
AOFAS 6 months	83	87	87	0.8
AOFAS 12 months	93	90	91	0.3

Acknowledgements: Jessica Duong, Jolene Allan, Kimberly Rondeau
COREF Funded: Yes

Abstract Type: Full
Research Pillar: Clinical Research

Title: Non-operative Management of Fifth Metacarpal Neck Fractures: Impact of Angulation on Patient Reported Outcomes
Authors: Reva Qiu, Taryn Ludwig, Alexandra Munn, Adina Tarcea, Charley Hasselaar, Bevan Frizzell, Jevon Brown, Steven Boyd, Maleka Ramji, Eric Sayre, Neil White and Christina Hiscox

Background: Fifth metacarpal neck fractures (5MCNFs) are common hand injuries, comprising up to 18.4% of all hand fractures. Clinical decision making for these injuries relies largely on radiographic parameters, specifically, angulation in the sagittal plane. Although lateral hand X-rays provide the truest view of sagittal fracture angulation, metacarpal overlap presents a challenge for reliable and precise measurement, leading to inconsistency in inter- and intra-observer reliability. An oblique X-ray may be a valuable alternative, providing the best view of an isolated 5th metacarpal. Furthermore, data suggests normal biomechanics are altered with sagittal fracture angulation over 30° whereas more recent studies have identified satisfactory outcomes with angulation up to 70°. Between 20-70° angulation, there is no clear consensus regarding management. When managed non-operatively, data on patient outcomes is limited, creating additional uncertainty regarding optimal treatment. Expert opinion suggests there is a need for improved methods to measure fracture angulation and its correlation with function. This study aims to assess whether oblique hand X-ray is a reliable method of measuring 5MCNF angulation as well as to assess the correlation between fracture angulation and clinical outcomes and patient reported outcome measures (PROMs).
Methods: A retrospective cohort of patients aged 18 years old and older who were treated non-operatively for dorsally angulated 5MCNFs were recruited from three different centres in Calgary as identified through the AHS Data Integration, Measurement and Reporting (DIMR) database. All patients were seen for one clinical visit at least 1-year post-injury where X-rays, CT scans, clinical measurements, and PROMs (pain score (Visual Analog Scale), range of motion (ROM), grip strength, Patient-Rated Wrist Evaluation (PRWE), Disabilities of the Arm, Shoulder and Hand (DASH), and Patient-Reported Outcomes Measurement Information System (PROMIS)) were recorded. Imaging was completed at the Centre for Mobility and Joint Health (University of Calgary, McCaig Institute). Correlation between oblique X-ray and sagittal CT, and between fracture angulation and patient outcomes was assessed. Subgroup analysis was performed for fracture angulation <30°, 30-40° (inclusive), and >40°.
Results: A retrospective cohort of 24 patients was identified and seen at an average of 2.97 years from the date of injury. 87.5% sustained an injury to their dominant hand. The average DASH score was 5.66, PRWE score was 19.3, and VAS score was 16.13. PROMIS T-scores were on average 54.8 for physical function, 44.7 for anxiety, 44.5 for depression, 45.7 for fatigue, 49.7 for sleep disturbance, 60.0 for social interaction, 47.0 for pain interference, and 1.6 for pain intensity. The ICC was 0.784/0.795 when measuring CT/X-ray respectively and the inter-modal (CT vs X-ray) ICC was 0.877. On subgroup analysis, there was no significant difference in ROM or grip strength between injured and non-injured sides across the entire cohort and between subgroups. There were statistically significantly higher DASH scores (p=0.034) in the >40° subgroup vs the 30-40° subgroup and DASH Work score (p=0.005) in the >40° subgroup vs the <30° and 30-40° subgroups. There was a significant correlation in DASH Work scores with increasing angulation (p=0.018).
Discussion: With an ICC of 0.877 when using oblique X-ray versus CT, there is good agreement amongst assessors, suggesting that oblique X-ray is a valid and reliable method of accurately measuring 5MCNF sagittal angulation. With the exception of DASH and DASH work scores in the >40° subgroup, patient outcomes are not affected by fracture angulation. It is, however, important to note that the DASH and DASH Work scores were low across all groups, indicating that there is unlikely a clinically significant impact of the statistically significantly higher DASH Work and DASH scores.
Conclusion: This study provides clinical guidance for the treatment of 5MCNFs. Oblique hand X-ray is a valid and reliable method for measuring 5MCNF angulation. Furthermore, our study demonstrates that across all degrees of 5MCNF angulation, patient outcomes with non-operative management are satisfactory with high function and low disability. Thus, non-operative management should be considered for patients with simple, dorsally angulated 5MCNFs.
Acknowledgements: We would like to thank the Centre for Mobility and Joint Health for obtaining the imaging.
COREF Funded: Yes

Abstract Type: Full
Research Pillar: Clinical Research

Title: Does Delayed Distal Radius Fracture Displacement Resulting in Surgical Intervention Negatively Impact Patient-reported Outcomes? An Interim Analysis
Authors: Calgary Orthopaedic Resident Research Group (CORR-G), Madeleine Gorman-Asal and Prism Schneider

Background: Distal radius fractures (DRFs) are common injuries that represent 17% of all adult upper extremity fractures. Some fractures initially deemed appropriate for nonsurgical management exhibit delayed secondary displacement, occurring greater than two weeks from injury, and require surgical intervention. This can lead to delayed rehabilitation and poor functional outcomes. Our institution recently completed a case-control retrospective cohort study of patients who required surgery for a DRF due to delayed displacement. This retrospective analysis identified several radiographic parameters capable of predicting this outcome. The overall purpose of this study is to prospectively develop a predictive model utilizing these radiographic features in addition to other baseline clinical parameters to determine which patients may go on to experience delayed secondary displacement.

Methods: This is a prospective pilot cohort study of 50 patients aged 18 to 60 years, who present to the Foothills Medical Centre with an acute DRF. Patients will be followed at two weeks, six weeks, 12 weeks, and six months. Baseline data including age, sex, self-reported gender, handedness, employment status, comorbidities, mechanism and classification of injury will be obtained. Radiographic analysis includes pre- and post-reduction volar tilt, radial inclination, ulnar variance and radial height, as identified in the previous retrospective study. The primary outcome measure is failed non-operative treatment, as indicated by delayed displacement requiring surgical intervention following a minimum of two orthopaedic assessments. A random forest model will be developed based on the clinical and radiographic variables and evaluated using a training and test dataset, evaluated using AUC. A preliminary analysis compares the three groups (non-operative, early failed non-operative, and late failed non-operative) by demographics, injury characteristics, and patient-reported outcome measures (PROMs). PROMs included: Quick Disability of the Arm, Shoulder and Hand (QuickDASH); Patient-Reported Outcomes Measurement Information System (PROMIS) Upper Extremity; Patient-Rated Wrist Evaluation (PRWE); and Numeric Pain Rating Scale (NPRS). Groups were compared using Chi-square and Kruskal-Wallis tests.

Results: There was a total of 50 patients in the preliminary analysis: 25, 15, and 10 in the non-operative, early failed, and late failed groups, respectively. The preliminary cohort had an overall mean age of 55.4 years (SD=13.5) and were 88.0% female. On average, patients in the late-failure group were 8.0 years older and had a BMI 3.3 units higher than those in the non-operative group. The late failed group also had a greater incidence of complete articular injuries (80.0%) compared to the non-operative (39.1%) and early failed groups (53.3%). All mean PROM responses also suggest the late failed group had consistently worse functional and pain outcomes across all timepoints than the early failed and non-operative groups.

Discussion: While underpowered to detect meaningful statistical differences in this preliminary analysis, early results are consistent with previous literature and demonstrate that the late failed group is generally older with more complex injury types. Future predictive analyses that consider more than demographic and injury characteristics, but also leverage radiographic analysis variables, may offer an opportunity for proactive, data-driven, personalized care to mitigate poor patient outcomes associated with delayed displacement.

Conclusion: Early results suggest that individuals with a DRF who are in the late failed group are demographically and clinically distinct from both the non-operative and early failed operative groups. This will be further investigated by layering these results with radiographic analysis variables in forthcoming analyses.

Acknowledgements: Workers Compensation Board, Kim Rondeau, Department of Orthopaedic Surgery - Cumming School of Medicine

COREF Funded: Yes

Abstract Type: Full
Research Pillar: Clinical Research

Title: Defining Hypercoagulability in Patients with Surgically Managed Diaphyseal Tibia Fractures: A Pilot Study
Authors: Gareth Ryan, Haley Johnstone, Andrew Dodd, Paul Duffy, Robert Korley, Herman Johal, Daniel You and Prism Schneider

Background: The incidence of venous thromboembolism (VTE) following tibia fracture is up to 12% with thromboprophylaxis and 60% without. Despite this, most guidelines recommend against routine thromboprophylaxis for isolated fractures below the knee. Thrombelastography (TEG) allows rapid assessment of coagulopathy and has yet to be utilized in patients with tibia fractures. The goal of this study is to define the extent and duration of coagulopathy in patients with surgically managed diaphyseal tibia fractures using TEG.

Methods: This prospective pilot study included patients aged 18 to 65 undergoing internal fixation of diaphyseal tibia fractures. Baseline demographics, injury, and surgical variables were recorded. Pragmatic thromboprophylaxis was permitted. Blood samples were collected from admission until discharge, and postoperatively until 12 weeks. Hypercoagulability was defined as a maximal amplitude (MA – a measure of clot strength) ≥65mm, measured using a TEG6s hemostasis analyzer. Analyses included descriptive statistics and t-tests between the hypercoagulability threshold and mean MA at each timepoint.

Results: Thirty patients were included (47% female, mean age 40 years [SD=14]). Most injuries were isolated (87%) and closed fractures (80%). The most common mechanisms of injury were falls (37%) and motor-vehicle accidents (27%). Intramedullary nailing was performed in 90% of cases. All patients received postoperative thromboprophylaxis, with inpatient tinzaparin followed by two weeks of outpatient acetylsalicylic acid being the most common regimen. Mean MA was significantly lower than 65mm on admission and greater than 65mm from postoperative day three until two weeks postoperatively (p<0.001). All patients were hypercoagulable at two weeks, with over 40% remaining hypercoagulable at six and 12 weeks. One patient developed a pulmonary embolism on postoperative day one despite thromboprophylaxis (3% VTE rate).

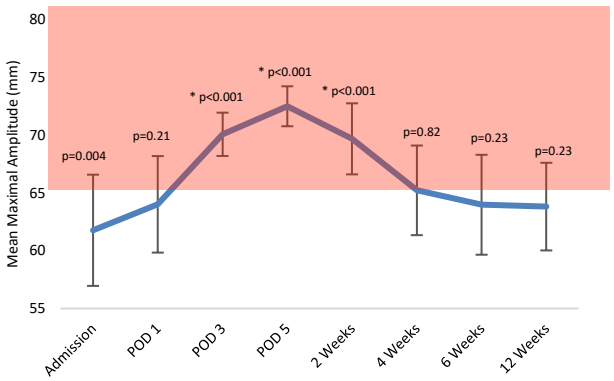

Figure 1: Mean MA value at each timepoint. Red area indicates hypercoagulable state.

Discussion: This is the first study to quantify coagulopathy in patients with tibia fractures using serial TEG analysis. Over 40% of patients demonstrated a hypercoagulable state at six and 12 weeks postoperatively based on TEG analysis. This study is limited by our small sample size; however, our findings will inform ongoing studies and may help healthcare providers balance the risks and benefits of postoperative thromboprophylaxis.

Conclusion: Patients with diaphyseal tibia fractures experienced a prolonged period of hypercoagulability postoperatively persisting beyond the duration of routine thromboprophylaxis. Further research is needed to better define the role of routine thromboprophylaxis in this patient population.

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COREF Funded: Yes

Abstract Type: Full
Research Pillar: Clinical Research

Title: Delayed Surgery for Anticoagulated Patients with Hip Fractures is Associated with Increased Complications

Authors: Stephanie Gibbon, Casandra Tan, Golpira Elmi Assadzadeh, Jessica Duong, Andrew Dodd, Paul Duffy, Robert Korley, Daniel You and Prism Schneider

Background: Anticoagulation use for prevention of thrombotic and embolic adverse events is increasingly common. As the global population ages, hip fracture incidence is also increasing. Up to 40% of patients with hip fractures are taking an oral anticoagulant (OAC) at the time of their injury. Pre-injury OAC use can result in delayed time-to-surgery (TTS) and increased complications and mortality. However, anesthetic and bleeding considerations must also be balanced. We have previously reported that patients with hip fractures on pre-injury OAC who have normal renal function are able to have negligible residual OAC levels at 24 hours following the last OAC dose. Despite this, there are currently no guidelines for safe and timely surgical management of hip fracture patients receiving pre-injury OAC. The aim of this study was to compare TTS, complications, and mortality rates between hip fracture patients who are anticoagulated or not.

Methods: This is an *a priori* subgroup analysis of an ongoing single centre, prospective cohort study, where adult patients 50 years or older presenting with a hip fracture requiring urgent surgical intervention and on pre-injury OAC were included. Following informed or surrogate consent, participants were enrolled, and baseline data and TTS was captured. The primary outcome measure was complication rates including venous thromboembolism events (VTE), cardiovascular events, pulmonary events, infections, and 90-day mortality. Comorbidities, post-operative adverse events, and blood transfusions were collected. Chi-squared, Mann-Whitney U, and independent samples t-tests were used to compare between groups.

Results: A total of 332 patients met inclusion criteria. Thirteen percent (n=43) were receiving pre-injury OAC. Sex distribution was not significantly different between groups (p=0.645). Those who were receiving pre-injury OAC were significantly older (84.3 [±8.9] years) compared to those who were not (77.2 [±11.2] years; p <0.001). Despite this, baseline clinical frailty scale (p=0.107) was not significantly different. AO/OTA fracture classification was likewise not different between groups (p=0.086). Notably, TTS was significantly delayed for the OAC group (median = 48.0 hours [IQR = 24.0 to 48.0] compared to those not receiving OAC (24.4 [IQR = 18.7 to 35.8]; p = <0.001). In addition to delayed TTS, the OAC group had significantly more cardiovascular (p<0.001), pulmonary (0.031), and infectious-related complications (p<0.001). There was no statistically significant difference in VTE between those receiving OAC (n = 11; 4.7%) and those who were not (n = 2; 3.8%; p=0.679), transfusion rate (18.6% in those receiving OAC, and 16.9% in those not; p = 0.962), or 90-day mortality rate (7.0% vs. 3.1%; p=0.193).

Discussion: There was an overall complication rate of 44.2% in the pre-injury OAC group, compared with 4.8% in the non-OAC group. This study supports that individuals on pre-injury OAC experienced delayed TTS and had increased cardiovascular, pulmonary, and infectious complication rates. As baseline demographics between groups were comparable, outside of age differences, these results support the need for ongoing evaluation of TTS for patients on OAC, as this could result in reduced complication rates for this population.

Conclusion: Safe and timely surgical care of hip fracture patients on OACs is a priority given the potential to decrease morbidity and mortality. This study supports that further investigation is warranted to evaluate appropriate TTS for individuals on pre-injury OAC to aim for improved patient outcomes.

Acknowledgements: Foothills Orthopaedic Trauma Research Team

COREF Funded: No

Abstract Type: Full
Research Pillar: Clinical Research

Title: Comparison of Patient Outcomes and Retear Rates in Rotator Cuff Repair with Mechanical versus Coblation Debridement: A Prospective Randomized Controlled Trial

Authors: Kaja Leslie, Stephanie Gibbon, Ylan Tran, Kristie More, Randa Berdusco, Justin LeBlanc, Deanne Meredyk, Foad Mohamed, Ian Lo

Background: The prevalence of rotator cuff abnormalities increases substantially with age, affecting over 60% of individuals over 80. While arthroscopic repair is the gold standard for symptomatic tears, postoperative re-tear rates remain high (13–31%). Successful tendon-to-bone healing depends heavily on footprint preparation. Traditionally, mechanical debridement (shavers and burrs) has been used to create a biologically conducive surface, though these tools are often limited by variable precision and longer operative time.
Radiofrequency (RF) coblation has emerged as an efficient alternative, potentially offering more controlled debridement. However, its clinical impact is debated – while some studies suggest RF is safe for subchondral bone, animal models indicate it may weaken the fibrocartilage transition zone and reduce load-to-failure strength compared to mechanical burring. Evidence remains sparse regarding how these modalities directly influence human re-tear rates and clinical outcomes.

Methods: This double-blind, randomized trial included patients with full-thickness rotator cuff tears. Upon confirming a reparable tear intra-operatively, patients were randomly assigned to either coblation or mechanical debridement of the humeral footprint following a standardized protocol. Patients underwent a standardized post-operative rehabilitation protocol. The primary outcome measure was the Western Ontario Rotator Cuff Outcome Measure (WORC) score at 12-months post-operative. Secondary outcomes included WORC scores at three- and six-months post-operative as well as re-tear rates at 12-months post-operative assessed via MRI. ANOVA was used to evaluate differences in WORC scores, with secondary outcomes analyzed via chi-square tests and multivariate regression ($P<0.05$).

Results: Ninety-two patients were enrolled in the study. WORC scores improved significantly from baseline to 12-month follow-up ($p<0.001$) and were not different between groups ($p = 0.26$). Thirty-three percent of patients had evidence of a re-tear on the 12-month MRI, however the rate of re-tears was not different between groups ($p = 0.253$). Pre-operative Patte classification ($p=0.011$) and Goutallier grading ($p=0.041$), both correlated significantly with worse postoperative tendon integrity. Coblation debridement was significantly faster than mechanical debridement ($p<0.001$) despite overall comparable surgical times ($p = 0.90$).

Discussion: This randomized trial suggests that RF coblation is a safe, efficient alternative to mechanical debridement for rotator cuff footprint preparation. While the RF group showed lower baseline WORC scores by chance, 12-month clinical outcomes and re-tear rates were comparable between groups, with no thermal complications. Consistent with existing literature, preoperative Patte and Goutallier grades—rather than debridement method—strongly predicted re-tears. Notably, RF coblation significantly reduced footprint preparation time ($p<0.0001$), though total operative duration remained similar. Ultimately, RF technology offers surgical efficiency without compromising tendon-to-bone healing or patient-reported functional gains.

Conclusion: Coblation debridement yields similar clinical and anatomic outcomes to mechanical debridement while being a significantly faster technique, making it a viable method for preparing the humeral footprint in rotator cuff repair.

Acknowledgements: None

COREF Funded: No

Abstract Type: Proposal
Research Pillar: Clinical Research
Title: Defining the Hypercoagulable State of Patients Requiring External Fixation Using Serial Thrombelastography Analysis
Authors: Molly Rutherford, Paul Cantle, Andrew Dodd, Paul Duffy, Herman Johal, Robert Korley, Gareth Ryan, Leslie Skeith, Daniel You and Prism Schneider
Background: Venous thromboembolism (VTE) is a well-established complication among orthopaedic trauma patients, particularly amid patients with lower-extremity long bone fractures (i.e., tibia and femur)[1–3]. These fractures often require external fixation in the trauma setting, rendering these patients high-risk for VTE while awaiting definitive fixation. This increased risk is compounded by the already hypercoagulable state of trauma patients; however, the extent, duration, and implications of this state for VTE risk remain poorly understood.
Thrombelastography (TEG) is a point-of-care tool used to assess coagulopathy via measures of clot formation, clot strength, and fibrinolysis. TEG analysis has been used to guide resuscitation of critical care patients[4], and to assess hypercoagulability among patients with femur and hip fractures[5,6]. To date, the extent and duration that a patient is hypercoagulable, and at a higher risk of VTE, following the application of lower extremity external fixation is unknown.
There is increasing evidence supporting the use of antiplatelet agents for thromboprophylaxis; however, the underlying contribution of platelets to hypercoagulability remains poorly understood. TEG-based platelet mapping (PLM) analysis can assess platelet activity through the arachidonic acid pathway, which is specifically inhibited by the antiplatelet agent aspirin. Similarly, the contribution of platelet activity to hypercoagulability among this population is also unknown.
This study will be the first to use serial TEG and PLM analysis to quantify the extent and duration of hypercoagulability and platelet activity among patients in lower extremity external fixation devices. We hypothesize that these patients will demonstrate increased hypercoagulability and platelet activity during the period of external fixation and in the postoperative period compared with patients who do not undergo temporizing external fixation.
Methods: *Study Design & Participants:* This will be a single centre, observational cohort pilot study of a convenient sample of 10 participants aged 18 years and older with lower extremity injuries requiring temporizing external fixation. Exclusion criteria are known bleeding or clotting disorders, pregnancy, or previous VTE events. *Data Collection:* Informed or surrogate consent will be obtained from patients, or via a substitute decision maker, if applicable. Blood samples for TEG analysis will be collected pre-operatively, 1, 3, 5 and 7 days post-operatively and 2, 4, 6 weeks post-operatively (from definitive fixation). These data points will be collected regardless of duration of external fixator use and timing of definitive surgical management (i.e., removal of external fixation), both of which will be documented. Whole blood samples will be analyzed using a TEG6s Hemostasis Analyzer (Haemonetics Corp; Boston, MA). The TEG6s Hemostasis analyzer uses resonant frequency evaluation to measure coagulation variables including reaction time (R-time), kinetic time (K-time), alpha angle (α-angle), activated clotting time (ACT), maximum amplitude (MA; a measure of clot strength), and clot lysis time (LY30). Heparinized samples will be analyzed using PLM cartridges to calculate arachidonic acid pathway MA (AA-MA), and percent platelet inhibition and aggregation. Using a pragmatic approach, the incidence of blood product administration, bleeding events, and thromboprophylaxis regimen will be documented. *Statistical Analysis:* Patient demographics will be summarized using descriptive statistics in both the external fixation patients and the age- and sex- matched controls without external fixation from an existing study to verify comparability between cohorts. MA values and the proportion of patients who are hypercoagulable (expressed as percentage) will also be compared to age- and sex-matched patients using t-tests (or Wilcoxon rank sum test if data is non-normal) at each timepoint. Analysis will be completed with the guidance of a biostatistician.
Results: We expect that patients who require temporizing external fixation of a lower extremity injury will remain hypercoagulable (MA ≥65mm) and demonstrate platelet hyperactivity (AA-MA ≥55mm) for the duration of external fixator use and up to 6-weeks post-operatively when compared to trauma patients who underwent early definitive fixation.
Discussion: None.
Conclusion: Trauma patients with high-energy injuries requiring temporizing external fixation as part of staged approach are at high risk of VTE. This study will provide novel information regarding the extent and duration of hypercoagulable state among patients in external fixation awaiting definitive management. Data from this pilot study will be used to inform a larger, prospective study designed to provide clinical data from which healthcare providers can make informed decisions regarding thromboprophylaxis treatment in patients immobilized in temporary external fixators.
Acknowledgements: N/A
COREF Funded: Yes
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Abstract Type: Proposal
Research Pillar: Clinical Research

Title: Comparing Open and Arthroscopic Synovectomy for the Treatment of Diffuse Giant Cell Tumor of the Tendon Sheath of the Knee: A Retrospective Cohort Study
Authors: Brett Lavender, Michael Leslie, Prism Schneider, Shannon Puloski, Michael Monument, Joseph Kendal and Ryan Martin

Background: Tenosynovial giant cell tumor (TGCT), also known as pigmented villonodular synovitis (PVNS), is a rare, locally aggressive synovial proliferation marked by hyperplastic synovium and hemosiderin deposition.[1] TGCT is classified as localized (LTGCT) or diffuse (DTGCT).[1] LTGCT presents as a discrete mass within otherwise normal synovium, whereas DTGCT involves extensive synovial infiltration. DTGCT is more challenging to manage due to higher recurrence rates and greater surgical morbidity from aggressive synovectomy. TGCT most commonly involves the knee (~80%).[1]
DTGCT is concerning for recurrence, reported between 8–64% when excision is incomplete.[1,2] If untreated, synovitis, hemarthrosis, and osteoarthritis can result.[1] Surgical management includes arthroscopic, open, or combined techniques. Open synovectomy has traditionally been favored for lower recurrence,[1,2] though some studies report no difference between approaches.[2] Current standard of care addresses both anterior and posterior compartments, typically with arthroscopic anterior and open posterior synovectomy.[1] Arthroscopy reduces anterior morbidity, while open posterior approaches improve visualization and protect neurovascular structures but are limited by restricted capsular views and are associated with hospitalization, drains, infection risk, and stiffness.[2] We developed an arthroscopic posterior transseptal approach to access the posterior knee, previously used for sports procedures such as posterior cruciate ligament reconstruction, and applied it to posterior DTGCT. A recent review of practice has shown this portal to be safe, reliable, and offers improved visualization compared with open capsulotomy.[3] We aim to compare outcomes between arthroscopic transseptal and open posterior synovectomy, hypothesizing lower one-year recurrence and improved clinical outcomes with the arthroscopic approach.
Methods: Study Design: Retrospective cohort study of patients treated between 2004–2024.
Study Population: Inclusion criteria: Adults ≥18 years with posterior synovectomy for DTGCT, with MRI follow up at 1 year.
Data Collection: Data will be extracted from electronic medical records. Demographic variables (age, sex, BMI, smoking), surgical details, complications, and follow-up MRI findings will be collected and stored in a secure de-identified database.
Statistical Analysis: All eligible patients ($n \approx 100$ based on an estimate from PI for patient volume in the past 10 years - additional patients to be included if data available) will be included. Continuous variables will be described as means, whereas categorical variables will be described as proportions. Recurrence will be analyzed as a dichotomous variable using logistic regression. Stepwise logistic regression will be applied (entry $p<0.2$, retention $p<0.05$) with adjustment for confounders (age, sex, BMI, smoking, tumor size). Secondary outcomes will be compared using t-tests or non-parametric equivalents for continuous data, and chi-square/Fisher's exact tests will be used for categorical data. Significance will be set at $p \leq 0.05$. Analyses will be performed using SAS v9.4.
Results: Primary: Recurrence of TGCT at any follow-up time point (all patients expected to have MRI at 1 year).
Secondary: Postoperative knee ROM, infection, DVT, neurovascular injury, LOS, drain use, and opioid use.
Discussion: N/A
Conclusion: To our knowledge, this will be the largest study to directly compare posterior transseptal arthroscopic versus open synovectomy to treat DTGCT of the knee. If arthroscopic posterior synovectomy demonstrates improved outcomes, it could reduce hospital stay, morbidity, and complications. The results may directly influence surgical practice and establish arthroscopy as the preferred approach for DTGCT involving the posterior compartment.
Acknowledgements: None
COREF Funded: No
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3. Philippe Beauchamp-Chalifour, Michael Leslie, Brett Lavender, David Longino, Prism Schneider, Ryan Martin. Safe and reproducible knee posterolateral portal development using an arthroscopic inside-out technique: A technical note and retrospective case series of current technique. Journal of ISAKOS 16 (2026) 101057.

Abstract Type: Proposal
Research Pillar: Basic Science

Title: Investigating the Radiosensitivity of PTEN-Deficient Osteosarcoma after Treatment with a Synthetic Lethality-Based Therapy
Authors: Reva Qiu, Jaden Lei, Michael Monument, Frank Jirik and Joseph Kendal

Background: Osteosarcoma (OS) is the most common primary bone malignancy. Conventional management typically involves multiagent cytotoxic chemotherapy and aggressive surgical resection with reconstruction. Treatment paradigms have remained largely unchanged since the 1980s and outcomes have not significantly improved in decades, thus presenting an opportunity for the development of new treatment targets and modalities. Over 60% of OS cases involve the loss of the tumor suppressor gene phosphatase and tensin homolog (PTEN). PTEN-deficient OS is typically more aggressive and resistant to chemotherapy with higher rates of lung metastasis and lower overall survival. PTEN-deficient cells rely on alternative survival pathways, such as via polynucleotide kinase 3'-phosphatase (PNKP), a DNA repair enzyme. Synthetic lethality exists between these genes whereby loss of one of the genes does not affect cell function, but disruption of both genes induces cell death. This vulnerability presents a novel target for therapy in PTEN-deficient OS. PNKP inhibition has been demonstrated to be a promising target pathway in the treatment of aggressive, PTEN-deficient colorectal cancers. Furthermore, several PTEN-deficient cancers have exhibited increased sensitivity to ionizing radiation after treatment with the small-molecule PNKP inhibitor A12B4C3 (A12) in-vitro. In our lab, we have demonstrated that A12 can induce cell death in PTEN-deficient cells while preserving viability in PTEN-competent cells in-vitro. This study will investigate whether treatment with A12 can enhance the radiosensitivity of PTEN-deficient OS.
Methods: Three PTEN-deficient human OS cell lines (143b, SaOS-2, and U2OS) and one PTEN-positive mouse OS cell line (LM8) (positive control) will be used. CRISPR technology was used to generate a PTEN-deficient LM8 line as a controlled comparison to wildtype LM8. Cells will be irradiated using the Precision XRAY SmART+ system with single (8 Gy) or hypofractionated (8 Gy x 3) doses. After treatment with A12 and radiation therapy (RT), the Clonogenic and Alamar Blue assays will assess colony formation and cell viability, respectively. DNA damage will be assessed through immunofluorescence microscopy and the comet assay. Apoptosis will be assessed through caspase-3/7 activity and flow cytometry. Orthotopic mouse OS models will be created through intra-tibial injections of LM8 cells into C3HeB/FeJ mice and 143b, SaOS-2, and U2OS cells into NOD SCID mice. Mice will be randomized to receive A12 or vehicle control once intra-tumorally seven days following tumour engraftment. Hindlimbs will be irradiated 10 days after tumour engraftment with the same single or hypo-fractionated doses as above. Tumour volume will be measured with calipers and bioluminescence imaging twice per week, and health condition and survival will be monitored every other week. Ethics has been obtained for this study through the Animal Care Committee: Protocol ID AC24-0202.
Results: The treatment of PTEN-deficient OS cells with combined A12 and RT is expected to reduce cell viability and colony formation and increase DNA damage and apoptosis levels. Similarly, treatment with A12 and RT is expected to reduce in-vivo tumour size and improve overall survival compared to treatment with either A12 or RT alone.
Discussion: N/A
Conclusion: PNKP inhibition in PTEN-deficient environments is a novel concept that has not yet been explored in OS. A12 will be the first drug of its kind to be implemented in an OS setting. Furthermore, leveraging PNKP inhibition to sensitize OS to RT has not been previously studied and offers an additional treatment pathway. Patients with metastatic OS often have poor outcomes due to the limited treatment options for aggressive, unresectable tumours. By administering A12 and RT in combination, surgery may become a viable option for these tumours. Additionally, orthotopic murine models of OS have not been previously established at the University of Calgary. Generating these mouse models will equip the lab with valuable surgical skills while also creating a reproducible model that can expand and advance research in this field. With promising results in other aggressive PTEN-deficient cancers, this study presents a unique opportunity to identify viable combination therapies, potentially transforming the standard of care for patients with metastatic OS.
Acknowledgements: N/A
COREF Funded: Yes

Abstract Type: Full
Research Pillar: Basic Science

Title: Optimal Construct for Fixation of Femoral Neck Fractures: A Biomechanical Analysis

Authors: Anna-Lee Policicchio, Helena Greene, Scott Willms, Andrew Caines, William Oliver, Paul Duffy, Robert Korley, Andrew Dodd, Richard Buckley, Herman Johal, Brent Edwards, Josh Mang, Jessica Duong, Golpira Elmi Assadzadeh, Kelcie Witges and Prism Schneider

Background: Femoral neck fractures (FNFs) in younger adults are commonly unstable vertical shear injuries with high fixation failure rates. Augmented fixation constructs are frequently used to improve stability, yet comparative cadaveric biomechanical data remain limited. This study compared the biomechanical performance of commonly used augmented fixation constructs for unstable FNFs.

Methods: T wenty-four cadaveric proximal femurs were osteotomized to simulate unstable AO/OTA 31B2 FNFs with a posterior calcar wedge. Specimens were randomized by bone mineral content into six fixation constructs: (1) cannulated screws with a Pauwels screw (CS+PS), (2) cannulated screws with an inferior buttress plate (CS+IBP), (3) dynamic hip screw with a Pauwels screw (DHS+PS), (4) dynamic hip screw with an inferior buttress plate (DHS+IBP), (5) Femoral Neck System (FNS), and (6) FNS with an inferior buttress plate (FNS+IBP). Constructs underwent non-destructive cyclic loading in a simulated weightbearing position, consisting of 10,000 cycles at 2× body weight (low-load testing) followed by 5,000 cycles at 3.5× body weight (high-load testing). Axial stiffness degradation and torque stiffness were measured. Failure was defined as total axial displacement greater than 15 millimeters. Statistical analysis included one-way ANOVA and paired comparisons.

Results: Mean specimen age was 66.7 (± 13.7) years; bone mineral content did not differ between groups ($p = 0.998$). All constructs demonstrated stiffness degradation with cyclic loading. No significant differences in axial stiffness degradation were observed between constructs at either loading condition ($p = 0.989$ at 2× and $p = 0.980$ at 3.5× body weight). Notably, only two constructs reached failure during initial low-load testing including the FNS and FNS+IBP construct. The remaining constructs failed with further high-load testing seen in 50% of CS+PS, 75% of CS+IBP, 66.7% of DHS+PS, 75% of DHS+IBP, 50% of FNS, and 50% of FNS+IBP constructs. Failure did not occur in 50% of CS+PS, 25% of CS+IBP, 33% of DHS+PS, 25% of DHS+IPB, 50% of FNS and 20% of FNS+IBP. No significant differences in torque stiffness were identified following testing

Discussion: This is the first biomechanical study using cadaveric specimens to compare different augmented FNF fixation constructs. Within this unique subset of younger patients with hip fractures, the choice of fixation construct is a critical determinant of fracture healing and clinical outcome. The results of this study will inform a future prospective study and may help guide surgical decision-making.

Conclusion: No augmented fixation construct demonstrated superior axial or torsional stiffness under physiologic cyclic loading for unstable FNFs. Overall, the addition of an IBP did not improve any construct failure rate. These findings highlight the persistent biomechanical challenges of FNF fixation and support the need for larger biomechanical and clinical studies to guide optimal construct selection.

Acknowledgements: Biomechanics Lab in the McCaig Institute for Bone and Joint Health, Calgary Surgical Research and Development Fund, Foothills Orthopaedic Trauma Research Team.

COREF Funded: Yes