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**OREF MIDWEST REGION  
RESIDENT RESEARCH SYMPOSIUM  
Monday, May 15, 2023**

Rush University Medical Center  
Searle Conference Center  
Billings-Herrick Room  
1725 W. Harrison Street, 5<sup>th</sup> Floor  
Chicago, IL 60612

**Hosted by:**

**Joshua J. Jacobs, MD**  
William A. Hark, MD/Susanne G. Swift Professor  
Chair of the Department of Orthopaedic Surgery  
and Vice Dean for Research at Rush Medical College  
Rush University Medical Center



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### About OREF:

The Orthopaedic Research and Education Foundation (OREF) is a charitable 501(c)(3) organization committed to improving lives by supporting excellence in orthopaedic research through its grant funding and research education programs. As an independent nonprofit, OREF strives to improve clinical care and patient outcomes by advancing innovative research, developing new investigators, and uniting the orthopaedic community in promoting musculoskeletal health. Visit [oref.org](http://oref.org) or follow OREF on Twitter (@OREFtoday).

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**OREF MIDWEST REGION RESIDENT RESEARCH SYMPOSIUM  
SUMMARY AGENDA  
Monday, May 15, 2023**

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- Noon – 1:00 p.m.      **Registration and Lunch**  
Rush University Medical Center  
Searle Conference Center  
Billings-Herrick Room  
1725 W. Harrison Street, 5<sup>th</sup> Floor  
Chicago, IL
- 1:00 p.m. – 1:05 p.m.      **Welcome and Introductions**  
Joshua J. Jacobs, MD  
William A. Hark, MD/Susanne G. Swift Professor  
Chair of the Department of Orthopaedic Surgery and  
Vice Dean for Research at Rush Medical College  
Rush University Medical Center
- 1:05 p.m. – 1:10 p.m.      **OREF Welcome**  
Lee Grossman  
Chief Executive Officer  
Orthopaedic Research and Education Foundation
- 1:10 p.m. – 1:50 p.m.      **Session I – Resident Research Presentations & Discussion  
Sports Medicine and Upper Extremity**  
**Moderator: Markus A. Wimmer, PhD**
- 1:50 p.m. – 2:25 p.m.      **Session II – Resident Research Presentations & Discussion  
Trauma**  
**Moderator: Monica Kogan, MD**
- Break – Please submit your scores from Session I and II to OREF staff.*
- 2:35 p.m. – 3:10 p.m.      **Session III – Resident Research Presentations & Discussion  
Spine and Education Research**  
**Moderator: Dino Samartzis, DSc**
- 3:10 p.m. – 3:45 p.m.      **Session IV – Resident Research Presentations & Discussion  
Adult Reconstruction**  
**Moderator: Joshua J. Jacobs, MD**
- Break – Please submit your scores from Session III and IV to OREF staff.*
- 3:55 p.m. – 4:00 p.m.      **Introduction of Keynote Speaker**
- 4:00 p.m. – 4:45 p.m.      **Keynote Address**  
*Metal on Metal THR: Lessons Learned?*  
Joshua J. Jacobs, MD  
William A. Hark, MD/Susanne G. Swift Professor  
Chair of the Department of Orthopaedic Surgery and  
Vice Dean for Research at Rush Medical College  
Rush University Medical Center
- 5:00 p.m. – 6:00 p.m.      **Reception**  
Awards Presentation and Closing Remarks

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## KEYNOTE SPEAKER

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### Joshua J. Jacobs, MD

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William A. Hark, MD/Susanne G. Swift Professor  
Chair of the Department of Orthopaedic Surgery  
and Vice Dean for Research at Rush Medical College  
Rush University Medical Center

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Joshua J. Jacobs, MD, received a Bachelor of Science degree in Materials Science and Engineering from Northwestern University and graduated from the University of Illinois Medical School. Dr. Jacobs completed his residency training at the Combined Harvard Orthopaedic Residency Program followed by a fellowship in Adult Reconstructive Orthopaedic Surgery at Rush University Medical Center under the direction of Dr. Jorge Galante. Dr. Jacobs has remained at Rush since his fellowship training, and since 2008 is the William A. Hark, MD/Susanne G. Swift Professor and Chair of the Department of Orthopaedic Surgery and Vice Dean for Research at Rush Medical College in Chicago.

Dr. Jacobs has published more than 280 peer-reviewed manuscripts, most of which focus on the biological consequences of material degradation from joint replacement implants. He is a Multiple Principal Investigator on two large NIH awards including the University of Chicago/Rush University Clinical and Translational Science Award from NCATS and the Acute to Chronic Pain Signature (A2CPS) consortium of the NIH Common Fund's Helping End Addiction Long-term (HEAL) initiative. Dr. Jacobs has received several research awards including a Career Development Award from the OREF, the Otto Aufranc Award from The Hip Society, the Ann Doner Vaughan Kappa Delta Award from the AAOS, the Mark Coventry Award from the Knee Society and the ORS/OREF Distinguished Investigator Award.

Dr. Jacobs has served in leadership positions in several professional organizations related to orthopaedic surgery. He is a Past President of the AAOS, ORS, the United States Bone and Joint Decade, and The Hip Society. Dr. Jacobs currently serves as a Director of the American Board of Orthopaedic Surgery, the President-Elect of the Board of Trustees of the OREF and the Chairman of Board of Trustees of the Journal of Bone and Joint Surgery.





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## Judges

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Navya Dandu, MD  
University of Illinois @ Chicago

Nabil Mehta, MD  
Rush University Medical Center

Andrew Rizzi, MD  
The University of Chicago

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## Moderators

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Joshua J. Jacobs, MD  
Rush University Medical Center

Monica Kogan, MD  
Rush University Medical Center

Dino Samartzis, DSc  
Rush University Medical Center

Markus D. Wimmer, PhD  
Rush University Medical Center



**OREF Midwest Region Resident Research Symposium  
DETAILED AGENDA  
Monday, May 15, 2023**

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- 1:00 p.m. – 1:05 p.m.     **Welcome and Introductions**  
**Joshua J. Jacobs, MD**  
William A. Hark, MD/Susanne G. Swift Professor  
Chair of the Department of Orthopaedic Surgery  
and Vice Dean for Research at Rush Medical College  
Rush University Medical Center
- 1:05 p.m. – 1:10 p.m.     **OREF Welcome**  
**Lee Grossman**  
Chief Executive Officer  
Orthopaedic Research and Education Foundation
- Session I – Resident Research Presentations & Discussion**  
**Sports Medicine and Upper Extremity**  
**Moderator: Markus D. Wimmer, PhD**
- 1:10 p.m. – 1:15 p.m.     *Elevated Synovial MMP-1 and CCL-2 Predict Failure after Arthroscopic Knee Chondroplasty*  
Johnathon R. McCormick, MD, Rush University Medical Center
- 1:15 p.m. – 1:20 p.m.     *Clinical and Biomechanical Comparisons Between Youth Pitchers With and Without a History of Throwing Arm Pain or Injury*  
Adam Hadro, MD, Medical College of Wisconsin
- 1:20 p.m. – 1:25 p.m.     *Culture Expansion Affects Stem Cell Secretome*  
Ryan Furdock, MD, Case Western Reserve University/University Hospitals  
Cleveland Medical Center
- 1:25 p.m. – 1:30 p.m.     *Thirty-Day Morbidity and Mortality for Surgical Treatment of Tennis and Golfer's Elbow*  
Anthony P. Trenga, MD, Medical College of Wisconsin
- 1:30 p.m. – 1:35 p.m.     *Long Head of the Biceps Autograft Performs Biomechanically Similar to Human Dermal Allograft for Superior Capsule Reconstruction After Rotator Cuff Tear*  
Cody Lee, MD, University of Chicago
- 1:35 p.m. – 1:40 p.m.     *Inter-Specialty Variation in Peri-Operative Healthcare Resource Utilization for Carpal Tunnel Release*  
Azeem Tariq Malik, MD, Ohio State University
- 1:40 p.m. – 1:50 p.m.     Questions and Discussions
- Session II – Resident Research Presentations & Discussion**  
**Trauma**  
**Moderator: Monica Kogan, MD**
- 1:50 p.m. – 1:55 p.m.     *Socioeconomic Deprivation is Predictive of Incomplete Postoperative Follow-Up in Patients with Tibial Shaft Fractures*  
Fehmi Berkay, MD, Wright State University Boonshoft School of Medicine
- 1:55 p.m. – 2:00 p.m.     *Reoperation for Pelvic and Lower Extremity Fractures is Common in Patients Undergoing Pelvic Angiography and Embolization for Life-Threatening Hemorrhage*  
Robert Matar, MD, University of Cincinnati

**OREF Midwest Region Resident Research Symposium  
DETAILED AGENDA (continued)  
Monday, May 15, 2023**

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- 2:00 p.m.- 2:05 p.m.     *Subperiosteal Elevation of the Ulnar Nerve is a Safe and Effective Way to Minimize Post-Operative Ulnar Neuritis in Distal Humerus Fractures*  
Margaret Sinkler, MD, University Hospitals, Case Western Reserve
- 2:05 p.m. – 2:10 p.m.     *Does the CDC Surgical Wound Classification Adequately Predict Post-Operative Infection in Orthopaedic Trauma*  
Elizabeth Cho, MD, Loyola University Medical Center
- 2:10 p.m. – 2:15 p.m.     *Intra-Articular Air and Hip Joint Radiodensity Correlate with Posterior Wall Acetabulum Fracture Instability*  
Jonathan Ellis, MD, University of Cincinnati
- 2:15 p.m. – 2:25 p.m.     Questions and Discussions
- 2:25 p.m. – 2:35 p.m.     Break

**Session III – Resident Research Presentations and Discussion  
Spine and Education Research  
Moderator: Dino Samarzis, DSc**

- 2:35 p.m. – 2:40 p.m.     *Civilian Lumbosacral Ballistic Fractures and Their Associated Injuries*  
Christopher Johnson, MD University of Chicago
- 2:40 p.m. – 2:45 p.m.     *Outpatient Spine Surgery in the Medicare Population: Trends in Hospital Outpatient and Ambulatory Surgical Center Utilization, 2010-2021*  
Alex Kane Miller, MD, Beaumont Hospital Royal Oak
- 2:45 p.m. – 2:50 p.m.     *Sequential Correction of Sagittal Vertical Alignment and Lumbar Lordosis in Adult Flatback Deformity*  
Ashley MacConnell, MD, Loyola University Medical Center
- 2:50 p.m. – 2:55 p.m.     *Research Productivity After Implementation of a Dedicated Research Track*  
Matthew D. Thomas, MD, Wright State University
- 2:55 p.m. – 3:00 p.m.     *Attrition Among Residents Entering US Orthopedic Surgery Residency Programs: Analysis of National GME Census Data*  
Kathy Gerull, MD, Washington University in St. Louis
- 3:00 p.m. – 3:10 p.m.     Questions and Discussions

**Session IV – Resident Research Presentations and Discussion  
Adult Reconstruction  
Moderator: Joshua J. Jacobs, MD**

- 3:10 p.m. – 3:15 p.m.     *Ca<sup>2+</sup>/Calmodulin-Dependent Protein Kinase Kinase 2 plays a Key Role in Pathogenesis of Osteoarthritis and its Inhibition Protects Against Chondrocyte Death and Cartilage Degradation in Human Articular Cartilage*  
Julian Dilley, MD, Indiana University School of Medicine
- 3:15 p.m. – 3:20 p.m.     *Total Knee Arthroplasty Can Decrease Pain Catastrophizing Scores and Increase Range of Motion in Patients Prone to Catastrophic Thinking: A Prospective Analysis*  
Michael Patetta, MD, University of Illinois at Chicago

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**OREF Midwest Region Resident Research Symposium  
DETAILED AGENDA (continued)  
Monday, May 15, 2023**

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- 3:20 p.m. – 3:35 p.m.     *Elevated Skin Surface Temperature Associated with Decreased Range of Motion After Total Knee Arthroplasty*  
Ye (Crystal) Lin, MD, University of Illinois at Chicago
- 3:25 p.m. – 3:30 p.m.     *Gluteus Maximus Transfer for Irreparable Hip Abductor Deficiency: A Systematic Review and Meta-Analysis*  
Bryant M. Song, MD, Washington University in St. Louis
- 3:30 p.m. – 3:35 p.m.     *Clinical Outcomes and Survivorship of Lateral Unicompartmental Knee Arthroplasty: A Large Single Surgeon Cohort*  
William Harkin, MD, Rush University Medical Center
- 3:35 p.m. – 3:45 p.m.     Questions and Discussions
- 3:45 p.m. – 3:55 p.m.     *Break*
- 3:55 p.m. – 4:00 p.m.     **Introduction of Keynote Speaker**
- 4:00 p.m. – 4:45 p.m.     **Keynote Address**  
*Metal on Metal THR: Lessons Learned?*  
**Joshua J. Jacobs, MD**  
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## **Elevated Synovial MMP-1 and CCL-2 Predict Failure after Arthroscopic Knee Chondroplasty**

**Johnathon R. McCormick, MD**  
Rush University Medical Center

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**Purpose:** To investigate the correlation between synovial cytokines and patient outcomes after arthroscopic knee chondroplasty.

**Significance:** Management of cartilage lesions in the knee oftentimes begins with arthroscopic chondroplasty, yet accurate predictors of treatment failure are lacking.

**Methods:** 44 patients undergoing chondroplasty with >1-year follow-up were included. Failure was defined as subsequent knee surgery. Multiplex ELISA analyzed intraoperative synovial fluid for PDGF, CCL-5, MMP-3, MMP-1, EGF, VEGF, IL-1a, FGF, CCL-2, BMP-2, and aggrecan. Cytokine concentrations, PROs, and defect characteristics were compared between failure and non-failure groups and multivariate regression models were created.

**Results:** The failure group (n=16 patients; 13 osteochondral allografts, 1 subchondral stabilization, 2 TKA) had a mean time to failure of  $9.09 \pm 10.73$  months. The failure group had larger defect areas ( $p=0.026$ ), and concentrations of MMP-1 ( $p=0.002$ ), VEGF ( $p=0.024$ ), IL-1a ( $p=0.012$ ), and CCL-2 ( $p=0.019$ ). The failure group had significantly worse PROs (IKDC and all KOOS subscores) at 2 and 6 weeks postoperatively. Multivariate modeling showed higher synovial concentrations of MMP-1 ( $p=0.008$ ) and CCL-2 ( $p=0.018$ ) were independent predictors of failure.

**Conclusion:** Elevated synovial CCL-2 and MMP-1 at the time of index surgery are independently predictive of future failure for patients undergoing arthroscopic knee chondroplasty.

# **Clinical and Biomechanical Comparisons Between Youth Pitchers With and Without a History of Throwing Arm Pain or Injury**

**Adam Hadro, MD**  
Medical College of Wisconsin

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**Purpose:** This study aimed to determine if there are clinical and kinematic differences in the throwing arm of youth pitchers with a self-reported history of throwing arm pain or injury (PI) to those without (NPI).

**Significance:** Sports medicine physicians are concerned over the increasing number of overuse injuries in youth sports, and baseball is at the forefront.

**Methods:** Forty male baseball pitchers ages 9 to 14 years old were divided into a PI group (n=20) and a NPI group (n=20). Clinical data and measurements were collected, along with throwing arm kinematics via a motion capture system.

**Results:** When comparing PI and NPI, significant physical differences were observed, with a greater presence of axillary hair, increased forearm length and decreased shoulder internal rotation strength in PI.

**Conclusion:** When considering youth pitchers, evidence of physical maturity, arm length, and strength could be important factors in developing pain or injury.

## **Culture Expansion Affects Stem Cell Secretome**

**Ryan Furdock, MD**

Case Western Reserve University/University Hospitals  
Cleveland Medical Center

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**Purpose:** We sought to characterize the production of osteoarthritis (OA) relevant cytokines and growth factors in culture expanded bone-marrow mesenchymal stem cells (BM-MSCs) preparations.

**Significance:** Little is known about the cytokine profile (secretome) of culture expanded BM-MSCs. Cytokine production is a major contributor to BM-MSCs' potential efficacy in treatment of OA.

**Methods:** Two different BM-MSC sources were grown from passage 1 through passage 4 ( $P_1 \rightarrow P_4$ ) and followed for their specific secretome phenotype with time. Luminex Multiplexing was utilized to document the change in secretome with each passage to determine the importance of culture conditions and phenotype of purified BM-MSCs.

**Results:** There was significant difference between the two different hMSC preparations, which may be defined by their growth conditions. BM-MSCs grown in medium C sustained their phenotype and immunomodulatory potential. BM-MSCs grown in R medium secreted fewer anti-inflammatory cytokines and lost their secretome profile with subculture.

**Conclusion:** Cytokines and growth factors are a major component of BM-MSC function that have been overlooked in much of the current literature. Our study is among the first to characterize the OA relevant cytokine and growth factor profiles of this injectable therapeutic option.



## **Thirty-Day Morbidity and Mortality for Surgical Treatment of Tennis and Golfer's Elbow**

**Anthony P. Trenga, MD**  
Medical College of Wisconsin

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**Purpose:** Our purpose is to identify risk factors and 30-day complications using a large nationwide database. We hypothesize that higher preoperative ASA score and multiple medical comorbidities will be associated with more complications.

**Significance:** Non-operative treatment is the mainstay of treatment for epicondylitis, however surgery is also successful in those refractory to non-operative treatment.

**Methods:** The NSQIP Database was queried from 2015-2018 for patients undergoing lateral or medial epicondyle debridement (CPT 24359, 24358). We identified 1436 cases: 712 (49.6%) without tendon repair and 724 (50.4%) with tendon repair. 51.3% female, 48.7% male. 81% performed under general anesthesia.

**Results:** 8 patients required return to OR (0.6%), there were no cases of 30-day mortality. One case of deep infection (0.1%), 3 cases of superficial infection (0.2%). Incidence of DVT, PE, pneumonia, and sepsis were all 0.1%. One incidence of MI; no instances of stroke or cardiac arrest. There were no differences in complications when comparing ASA grade or anesthetic technique.

**Conclusions:** Open treatment of lateral and medial epicondylitis is very safe. There is no difference in outcomes based on anesthetic technique or ASA grade. Ultimately it is reasonable to surgically treat epicondylitis in patients with multiple medical comorbidities using the surgeons preferred anesthetic technique.

# **Long Head of the Biceps Autograft Performs Biomechanically Similar to Human Dermal Allograft for Superior Capsule Reconstruction After Rotator Cuff Tear**

**Cody Lee, MD**  
University of Chicago

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**Purpose:** To provide a biomechanical comparison between human dermal (HD) allograft and long head of biceps tendon (LHBT) autograft with and without posterior side-to-side suturing for superior capsule reconstruction (SCR).

**Significance:** While use of HD allograft has promising results, optimal graft choice for SCR remains unclear.

**Methods:** Eight fresh-frozen cadaveric shoulder specimens were tested in 5 conditions: (1) intact, (2) complete supraspinatus tear, (3) LHBT, (4) LHBT with side-to-side suturing, and (5) HD allograft with side-to-side suturing. Functional abduction force, superior translation of humeral head, translational range of motion, and rotational range of motion were tested at 0°, 30°, 60°, and 90° of abduction within each condition.

**Results:** Functional abduction force in the LHBT, LHBT + suture, and HD + suture conditions was significantly increased compared with the supraspinatus tear condition at abduction angles of 30°, 60°, and 90°. In addition, superior translation of the humeral head in the LHBT, LHBT + suture, and HD + suture conditions was significantly decreased compared with the tear condition at abduction angles of 30° and 60°. All 3 reconstructive techniques were statistically identical to the intact rotator cuff condition regarding translational and rotational range of motion.

**Conclusion:** SCR with LHBT autograft without side-to-side suturing, LHBT with posterior side-to-side suturing, and HD allograft with posterior side-to-side suturing all equivalently restore functional abduction force and decrease superior translation of the humeral head after a complete supraspinatus tear.

# Inter-Specialty Variation in Peri-Operative Healthcare Resource Utilization for Carpal Tunnel Release

Azeem Tariq Malik, MD  
Ohio State University

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**Purpose:** The purpose of the current study was to investigate whether any inter-specialty variation exists, with regards to peri-operative healthcare resource utilization, in CTRs.

**Significance:** Carpal tunnel release (CTR), whether done endoscopically or open, remains one of the most common procedures done within the realm of hand surgery. Although CTRs are typically performed by orthopaedic hand surgeons or plastic surgeons, neurosurgeons (with specialization in peripheral nerve surgery) and general surgeons are also known to perform this procedure. With the advent of prospective payment models in hand surgery, understanding and minimizing variation in resource utilization (both pre- and post-operatively) between providers will help in establishing value associated with this procedure.

**Methods:** The 2010 to 2021 Pearl Diver Mariner Patient Claims Database was queried using Current Procedural Terminology codes to identify patients undergoing open and endoscopic primary carpal tunnel releases. Physician specialty IDs were used to identify the operative specialty of the surgeon – orthopaedic vs. plastic vs. general surgery vs. neurosurgery. Pre-operative resource use included physical/occupational therapy, electrodiagnostic studies (EDS), opioids, oral steroids, steroid injections and NSAIDs within 6 months prior to surgery. Additional operative resource uses that were assessed included utilization of antibiotic prophylaxis and peripheral nerve blocks prior to surgery. Post-operative resource use included use of muscle relaxants, gabapentin, opioids, formal physical/occupational therapy and emergency department (ED) visits within 30 days of the surgery. Multivariate logistic regression analysis was used to identify whether there was any inter-specialty variation between the use of the beforementioned healthcare resources. All comparisons were carried out using orthopaedic surgery as a reference.

**Results:** A total of 908,671 patients undergoing carpal tunnel release were included in the study, out of which 556,339 (61.2%) were by orthopaedic surgeons, 297,047 (32.7%) by plastic surgeons, 44,118 (4.9%) by neurosurgeons and 11,257 (1.2%) by general surgeons. Patients treated by plastic surgeons were less likely to have received opioids (OR 0.94;  $p < 0.001$ ), NSAIDs (OR 0.93;  $p < 0.001$ ), oral steroids (OR 0.94;  $p < 0.001$ ) and pre-operative antibiotic prophylaxis (OR 0.66;  $p < 0.001$ ), but were more likely to have received peripheral/regional nerve blocks (OR 1.59;  $p < 0.001$ ) on day of surgery, steroid injections (OR 1.41;  $p < 0.001$ ) and electrodiagnostic studies (OR 1.04;  $p < 0.001$ ) within 6 months prior the surgery. Patients treated by neurosurgeons were more likely to have received pre-operative opioids (OR 1.37;  $p < 0.001$ ), gabapentin (OR 1.70;  $p < 0.001$ ), oral steroids (OR 1.13;  $p < 0.001$ ), pre-operative antibiotic prophylaxis (OR 1.63;  $p < 0.001$ ), electrodiagnostic studies (OR 1.40;  $p < 0.001$ ) and formal pre-operative physical/occupational therapy (OR 1.10;  $p < 0.001$ ), but were less likely to have received steroid injections (OR 0.21;  $p < 0.001$ ). Patients treated by general surgeons were less likely to receive oral steroids (OR 0.80;  $p < 0.001$ ), steroid injections (OR 0.54;  $p < 0.001$ ), electrodiagnostic studies (OR 0.90;  $p < 0.001$ ) pre-operative formal physical therapy (OR 0.74;  $p < 0.001$ ), pre-operative antibiotic prophylaxis (OR 0.89;  $p < 0.001$ ), but were more likely to prescribe gabapentin (OR 1.17;  $p < 0.001$ ). In comparison to orthopaedic hand surgeons, patients treated by plastic surgeons were less likely to have an ED visit (OR 0.94;  $p < 0.001$ ), but more likely to receive formal physical therapy (OR 1.41;  $p < 0.001$ ) within 30 days after the surgery. Patients treated by neurosurgeons were more likely to receive opioids (OR 1.33;  $p < 0.001$ ) but were less likely to receive formal physical therapy (OR 0.48;  $p < 0.001$ ). Lastly, patients treated by general surgeons had higher number of ED visits (OR 1.26;  $p < 0.001$ ), were less likely to receive formal physical therapy (OR 0.60;  $p < 0.001$ ).

Conclusion: There exists significant variation in peri-operative healthcare resource utilization between different surgeon specialties. Understanding reasons behind such variation would be paramount in minimizing differences in how care is practiced for minor elective hand procedures. Furthermore, cross-training of different specialties may be warranted to better control variation and improve value of hand surgical care.

# Socioeconomic Deprivation is Predictive of Incomplete Postoperative Follow-Up in Patients with Tibial Shaft Fractures

**Fehmi Berkay, MD**  
Wright State University  
Boonshoft School of Medicine

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**Purpose:** Area Deprivation Index (ADI) quantifies socioeconomic disadvantage. Patients with traumatic tibial shaft fractures are at risk for complications with inadequate postoperative follow-up. The purpose of this study was to determine if ADI predicts noncompliance with follow-up visits.

**Significance:** Identification of patients that would benefit from increased education, assistance with transportation and other costs associated with follow-up visits, to recognize complications earlier.

**Methods:** Retrospective review of patients who underwent intramedullary nailing for extra-articular tibial fractures at our Level 1 Trauma center between 2015-2022 was performed. Demographics collected included age, race, sex, BMI, and distance from institution. ADI was assigned based on home mailing addresses. Logistic regression analysis assessed relationships between length of stay, discharge disposition, Charlson comorbidity index and ADI with follow-up noncompliance.

**Results:** 263 Patients were included in the final analysis. Compared to T1 (least deprived), there was a significantly higher risk of incomplete follow-up in T2 (RR=1.75, 95% CI: 1.20-2.56) and T3 (most deprived) (RR=1.88, 95% CI: 1.30-2.74). A marginal difference was present between T2 and T3 (RR=1.08, 95% CI: 0.82-1.42).

**Conclusion:** Socioeconomically deprived patients are more likely to have incomplete follow-up and greater risk of complications recognized later after tibial shaft fractures treated with intramedullary nailing.

# **Reoperation for Pelvic and Lower Extremity Fractures is Common in Patients Undergoing Pelvic Angiography and Embolization for Life-Threatening Hemorrhage**

**Robert Matar, MD**  
University of Cincinnati

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**Purpose:** To determine the reoperation rates and complications for pelvis and lower extremity fractures in patients undergoing pelvic angiographic and embolization (PAE).

**Significance:** This correlation has not been studied and may support a trend away from nonselective embolization.

**Methods:** Data from 7 trauma centers in the US and Europe was collected for patients who underwent PAE and had a pelvis/acetabulum fracture with or without an associated lower extremity fracture that required surgical treatment.

**Results:** A total of 144 patients underwent PAE for pelvis fractures; 83 also had operative lower extremity fractures. Among the entire cohort, 31 (22%) had a reoperation to the pelvis after surgery. In patients who also sustained a lower extremity fracture, 28 (34%) had a reoperation to an extremity. There was no significant difference in reoperation rate, surgical site infection, or nonunion in patients who underwent selective versus nonselective PAE, nor based on which vessel was embolized. Coil embolization predicted the need for pelvis fracture reoperation ( $p < 0.05$ ). Open fractures predicted reoperation for an associated extremity fracture ( $p < 0.05$ ).

**Conclusion:** While PAE will continue to be a mainstay of treatment for life-threatening hemorrhage, surgeons should be aware that complications and the need for reoperation are common- not just for fractures around the pelvis but also for fractures downstream from vascular intervention.

# **Subperiosteal Elevation of the Ulnar Nerve is a Safe and Effective Way to Minimize Post-Operative Ulnar Neuritis in Distal Humerus Fractures**

**Margaret Sinkler, MD**  
University Hospitals, Case Western Reserve

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**Purpose:** Our aim is to compare ulnar neuritis rates during fixation of distal humerus fractures (DHF) with in situ decompression (ISD), anterior transposition (AT), or subperiosteal elevation (SE).

**Significance:** DHFs are associated with a high rate of ulnar neuritis.

**Methods:** 125 DHFs underwent ORIF. The patients were grouped based on intra-operative management of the ulnar nerve. SE is performed by identifying the ulnar nerve within the cubital tunnel where it is then raised off the ulna subperiosteally and mobilized to protect the nerve throughout the entire procedure while maintaining the soft tissue envelope.

**Results:** Thirty-five patients received SE, 63 ISD, and 27 AT of the ulnar nerve. Twelve (34%) SE patients had pre-operative ulnar neuropathy of which 100% resolved with 2(6%) new cases of post-operative neuritis. For the 63 ISD, 13(21%) had pre-operative ulnar neuropathy, of which nine (69%) resolved with 5(8%) new cases post-operatively. Of the 27 AT of the ulnar nerve, 9 had pre-operative ulnar neuropathy of which 3(33%) resolved by post-operative evaluation with 7(26%) cases of new onset post-operative neuritis. Compared to AT, SE had fewer cases of new post-operative ulnar neuritis ( $p=0.019$ ) and more pre-operative symptom resolution ( $p=0.002$ ) while SE performed similarly to ISD ( $p>0.05$ ). AT was an independent risk factor for post operative neuropathy on regression(OR=5.2,  $p=0.023$ )

**Conclusion:** Intra-operative management of the ulnar nerve with SE an effective way to minimize ulnar neuritis during distal humerus fracture fixation while AT should be avoided.

# Does the CDC Surgical Wound Classification Adequately Predict Post-Operative Infection in Orthopaedic Trauma?

**Elizabeth Cho, MD**

Loyola University Medical Center

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**Purpose:** The CDC Surgical Wound Classification (SWC) is used in hospitals as a risk stratification model for surgical site infection (SSI), however its utility within orthopaedics remains unknown.

**Methods:** Adult patients with leg fractures treated operatively at our level I academic trauma center were identified. 2,792 definitive surgical encounters were included. Chart review for presence of 90-day SSI was performed among patients having repeated procedures, open fracture, abscess or wound debridement, intra-operative cultures, or infectious disease consultation (n=551).

**Results:** In this cohort, overall infection rate was 2.26% (n=63). Higher SWC was significantly associated with increased infection rate (I: 0.94%, II: 3.85%, III: 6.45%, IV: 9.87%,  $p<0.001$ ). When compared with Class I, Classes II through IV had increased odds of infection (OR II: 4.23,  $p:0.002$ ; OR III: 7.28, OR IV: 11.56,  $p<0.001$ ). When comparing groups II and III, there is no difference in odds of infection. When stratifying open versus closed fractures, there is no association between SWC and odds of infection.

**Conclusion:** The CDC SWC has limitations for orthopaedic trauma patients, with ambiguity of classification assignment and decreased discriminatory ability within central categories. While overall SWC correlates with infection, the relationship breaks down for subgroups such as open fractures.



## **Intra-Articular Air and Hip Joint Radiodensity Correlate With Posterior Wall Acetabulum Fracture Instability**

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**Purpose:** Determine if intra-articular air (IAA) and lower hip joint radiodensity (HJRD) correlates with posterior wall (PW) acetabulum fracture instability on examination under anesthesia (EUA).

**Significance:** There are no reliable indicators of PW fracture stability on CT. IAA is oftentimes noted on computed tomography (CT) after hip dislocations.

**Methods:** Retrospective analysis of PW fractures that underwent EUA. CTs reviewed for IAA, HJRD, acetabulum features (version, etc.), and fracture characteristics (Calkins ratio, etc.). Fisher's exact tests compared variables in EUA positive and negative groups.

**Results:** There were 12 (28.6%) positive and 30 (71.4%) negative EUAs. The positive EUA group had significantly more patients with IAA (66.7% vs 16.7%,  $p=0.003$ ), HJRD less than -200 Hounsfield units (HUs) (66.7% vs 10.0%,  $p<0.001$ ), HJRD of at least 100 HUs lower than contralateral hip (50.0 vs 10.0%,  $p=0.009$ ), Calkins ratio greater than 0.2 (83.3 vs 43.3%,  $p=0.039$ ), and >5 mm fracture displacement (83.3 vs 33.3%,  $p=0.003$ ).

**Conclusion:** Unstable PW acetabulum fractures have significantly increased rates of IAA, HJRD less than -200 HUs, HJRD of 100 HUs less than contralateral hip, Calkins ratio >0.2, and >5 mm fracture displacement. When these characteristics are seen on CT, EUA should be considered.

# **Civilian Lumbar Ballistic Fractures and Their Associated Injuries**

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**Purpose:** Characterize lumbar ballistic fracture patterns and resulting neurological injuries

**Significance:** Civilian gunshot wounds to the spine are an increasingly common injury that do not fit into traditional classification schema.

**Methods:** An IRB approved retrospective analysis was performed to include all patients that sustained a ballistic fracture to the lumbar spine (L1-S2 level). Fracture patterns and neurological injuries were characterized. Associated injuries and surgical procedures were also recorded.

**Results:** 149 patients were identified. A fracture map was created detailing fracture characteristics. Trans-canal trajectory was observed in 31% of cases with 15% of this group having no neurological deficit. 82 patients (55%) had a neurologic deficit with 21 injuries being unilateral and 11 being root injuries. 11 patients underwent surgical decompression, 9 of which included fusion, and 7 included foreign body removal. 110 patients (74%) underwent emergent exploratory laparotomy upon presentation.

**Conclusion:** This is the largest reported cohort of civilian lumbar spine ballistic fractures. These fractures are largely stable (99.3% in our cohort). Patients are often polytraumatized, necessitating emergent exploratory, which can significantly delay both diagnosis and treatment. These are complex injury patterns that do not often correlate to traditional fracture or neurologic injury classification systems.

# **Outpatient Spine Surgery in the Medicare Population: Trends in Hospital Outpatient and Ambulatory Surgical Center Utilization 2010 - 2021**

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**Purpose:** To demonstrate procedural trends in outpatient spine surgery within the Medicare population and to quantify changes in outpatient volume after removal of a procedure from the “inpatient-only” list.

**Significance:** Recent emphasis has been placed on transitioning appropriately selected surgical procedures to hospital outpatient department (HOPD) and ambulatory surgical center (ASC) settings for improved efficiency.

**Methods:** The Medicare Physician Supplier Procedure Summary public-use files from 2010-2021 were queried for spine procedures within Healthcare Common Procedure Coding System (HCPCS) ranges 22010-22899 and 62380-63103. Procedures were referenced to each year’s Medicare ASC Covered Procedures List. Annual totals and changes in volume were calculated.

**Results:** A total of 12 procedure codes in the above range were included on the ASC list in 2010, which expanded to 58 in 2021. Within this timeframe, the compound annual growth rate (CAGR) of these procedures was 15.7% per year at ASCs and 9.9% per year for HOPDs. High growth of outpatient cervical surgery was observed after lifting inpatient-only restrictions; for HCPCS 22551 (anterior cervical discectomy and fusion, first interspace), growth of 383% and 303% was observed in HOPDs and ASCs, respectively.

**Conclusion:** A transition of previously inpatient-only procedures has contributed to recent growth of outpatient spine surgery in the Medicare population.

# Sequential Correction of Sagittal Vertical Alignment and Lumbar Lordosis in Adult Flatback Deformity

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**Introduction:** Flatback deformity, or hypolordosis of the lumbar spine, causes forward inclination of the trunk, leading to progressive back pain, fatigue, and clinical debilitation as patients compensate to remain upright. Surgical correction through osteotomies and interbody fusion techniques can restore sagittal balance and relieve symptoms. However, biomechanical data on the correction obtained with each technique and thus their effectiveness is currently lacking. The purpose of this study was to delineate the degree of correction of sagittal vertical alignment (SVA) and lumbar lordosis achieved through sequential procedures on human spine specimens.

**Methods:** Thirteen (13) fresh-frozen human thoracolumbar (T10-sacrum) spine specimens were CT scanned with fiducial markers embedded in each vertebra to allow specimen-specific kinematic assessment of 3D vertebral position and motion. Specimens were separated into degenerative or iatrogenic groups based on the initial amount of disc collapse at L4-L5 and/or L5-S1. Treatment for the degenerative lumbar flatback specimens was as follows: anterior lumbar interbody fusion (ALIF) cage at L5-S1, followed by ALIF cage at L4-5, lateral lumbar interbody fusion (LLIF) cages at L2-3 and L3-4, and finally posterior column osteotomy (PCO) at L2-3 and L3-4. Iatrogenic lumbar flatback specimens were treated with posterior fusion at L4-S1, then hypolordotic fusion at L4-S1 created by distraction across the pedicle screws, LLIF cages at L2-3 and L3-4, and PCO at L2-3 and L3-4. Lordosis between L1-S1 and anterior offsets of L1 and T10 vertebrae from the center of S1 superior endplate (L1-S1 and T10-S1 sagittal vertical axis SVA) were recorded initially and after each stepwise procedure. Pairwise comparisons were performed between two consecutive steps and between the initial and final values. The level of significance was set at  $\alpha=.01$  to account for multiple comparisons.

**Results:** For the specimens with degenerative flatback, statistically significant corrections in SVA and lordosis were noted after the L5-S1 ALIF, L4-5 ALIF, and PCO. (Figure 1) A statistically significant difference was also noted in overall correction when comparing preoperative values to those after completion of the PCO; in the final corrected posture, average T10-S1 SVA was  $-32.1 \pm 21.5$  mm ( $P=.000002$ ), average L1-S1 SVA was  $-8.5 \pm 14.6$  mm ( $P=.000001$ ), and average L1-S1 lordosis was  $58.7 \pm 11.3$  degrees ( $P=.0002$ ). For the iatrogenic group, a statistically significant change was only noted in all three parameters with performance of the hypolordotic fusion across L4-S1. (Figure 2) Corrections with each successive procedure and overall correction in SVA and lordosis were not statistically significant ( $P>0.01$ ).

**Conclusions:** ALIF cages in the lower lumbar segments and PCO achieved improvements in sagittal alignment parameters in adult flatback deformity. LLIF cages in the upper lumbar segments were not effective in significantly correcting SVA or enhancing lumbar lordosis. LLIF cages in conjunction with PCO improved the alignment parameters in the iatrogenic specimens, allowing for correction of their sagittal alignment parameters approaching the baseline values.

## **Research Productivity After Implementation of a Dedicated Research Track**

**Matthew D. Thomas, MD**  
Wright State University

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**Purpose:** The purpose of this study is to compare research productivity of residents before and after the implementation of the dual dedicated dual research track.

**Significance:** This study demonstrates that a dedicated research track is a viable and practical way to increase an institution's research productivity for small to midsize residency programs.

**Methods:** We reviewed all published journal articles indexed in PubMed from former residents in our program from the years 1992-2020 and compared the pre-research track to the dual track residents.

**Results:** We found 86% of all residents in the dual track had at least one published project, which was a significant increase from 52% in the pre-research track. Additionally, the dual research track produced on average 0.27 more publication-per-resident year (PPRY) compared to pre-research track.

**Conclusion:** The data in this study shows that the implementation of a research track increased the likelihood that our residents would produce a published project during residency and significantly increased the number of PPRY. The addition of a research track is a viable way to increase academic productivity of a residency program. We hope this can serve as a model for similar residency programs searching to increase academic contributions.

# **Attrition Among Residents Entering US Orthopedic Surgery Residency Programs: Analysis of National GME Census Data**

**Kathy Gerull, MD**

Washington University in St. Louis

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**Purpose:** We aimed to identify the overall rate of attrition amongst orthopedic surgery residents nationally, what specialties the residents who experience attrition from orthopedics ultimately pursue, and which risk factors are significantly associated with attrition from orthopedic surgery residency.

**Significance:** It is important for Graduate Medical Education (GME) programs to have insight into the rate of resident attrition and risk factors for attrition, so that trainee attrition can be avoided if possible.

**Methods:** We analyzed data from a national cohort of matriculating US medical students from 1993 to 2001 who entered orthopedic surgery GME and subsequently obtained ABMS board certification in Orthopaedics (retention) or obtained board certification in another specialty (attrition). Using a multivariable logistic regression, we identified variables independently associated with attrition from (vs. retention in) Orthopaedics.

**Results:** The overall rate of attrition from orthopedic residencies was 5.5%. Residents who experienced attrition often became board certified in other surgical disciplines, most commonly plastic surgery or general surgery. Women, first-generation college graduates and residents with an Asian/Pacific Islander ethnicity had increased risk of attrition.

**Conclusion:** The overall rate of attrition from orthopedic GME is comparable to other surgical subspecialties. Underrepresented residents are at greater risk of attrition than their peers.

# Ca<sup>2+</sup>/Calmodulin-Dependent Protein Kinase Kinase 2 plays a Key Role in Pathogenesis of Osteoarthritis and its Inhibition Protects Against Chondrocyte Death and Cartilage Degradation in Human Articular Cartilage

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**Purpose:** We hypothesize that a serine-threonine protein kinase, Ca<sup>2+</sup>/CaM dependent protein kinase kinase 2 (CAMKK2), is upregulated in human osteoarthritic samples, and that its blockade will reduce inflammation and apoptosis in inflamed human articular chondrocytes.

**Significance:** Osteoarthritis (OA) is a leading cause of disability. To date, there are no effective treatments to prevent or mitigate the progression of OA. Inflammation and chondrocyte apoptosis play central roles in the development of OA. We previously reported that CAMKK2 may play a key role in OA-associated inflammatory process in chondrocytes. Chondrocyte apoptosis progresses more rapidly in early OA. Increased chondrocyte apoptosis is associated with proteoglycan depletion and cartilage catabolism<sup>4</sup> and precedes changes in subchondral bone remodeling.

**Methods:** Human osteochondral samples were collected from patients undergoing total hip arthroplasty for primary OA. Paired osteochondral plugs were extracted from damaged and intact portions of each femoral head (Figure 1). Samples were either flash frozen in liquid nitrogen for RNA isolation and gene expression analysis of *CAMKK2*, *MMP13*, *COL2*, and *ACAN* or fixed in, decalcified, and embedded in paraffin for histology and immunohistochemistry (IHC). Sections were stained with Safranin O and graded for OA severity using OARSI scoring or immunostained for CAMKK2, COL2 and MMP13 levels by IHC. Terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) was used to assess apoptosis. Articular chondrocytes isolated from OA and healthier portions of the same femoral head were treated for 24 hours with or without 2 μM STO-609, an inhibitor of CAMKK2, and analyzed using flow cytometry to measure cellular apoptosis following Annexin V staining. Healthy donor cartilage procured from National Disease Research Interchange (NDRI) was used to isolate primary human articular chondrocytes for transfection with a pool of 4 *CAMKK2* siRNAs (to reduce off target interactions) or scrambled siRNA (Control) or infection with Lentiviruses (control, (WT)-CAMKK2, or kinase-dead mutant CAMKK2 D311A). After 72 h, protein lysates prepared from the chondrocytes underwent immunoblotting to assess protein levels of CAMKK2, pAMPK, AMPK, BAX, BCL2, MMP-13, pSTAT3, STAT3, and ACTIN. Statistical comparisons between 2 groups were analyzed by 2-tailed Student's *t* test. *P*-values <0.05 were set for statistical significance.

**Results:** We observed 2-fold higher *CAMKK2* mRNA in OA cartilage compared to the intact tissue. *MMP-13* mRNA levels were elevated whereas those of the anabolic markers *ACAN* and *COL1A1* were diminished in the OA cartilage compared to controls. OARSI grading indicated higher cartilage degradation in the OA osteochondral plus compared to matched intact samples from the same femoral heads, OA cartilage also possessed elevated TUNEL positivity as well as higher CAMKK2 and MMP13, and lower COL2. Primary articular chondrocytes isolated from OA portions displayed higher percentage of apoptosis. Inhibition of CAMKK2 with STO-609 decreased apoptosis in OA chondrocytes. Overexpression WT CAMKK2, but not the D311A mutant, upregulated whereas its knockdown downregulated the levels of pro-apoptotic BAX, pro-inflammatory pSTAT3 and pro-catabolic MMP13 human articular chondrocytes.

**Conclusion:** CAMKK2 mRNA and protein levels were elevated in human OA cartilage. OA cartilage also possessed diminished anabolic protein levels, and enhanced levels of MMP13 and chondrocyte apoptosis. Inhibition of CaMKK2 function using STO-609 conferred protection from cell death in OA articular chondrocytes. Modulation of CAMKK2 in primary chondrocytes lead to

concordant changes in levels of pro-apoptotic, and catabolic proteins. Specifically, only the intact but the kinase-dead mutant elevated BAX, pSTAT3 and MMP13 levels when over-expressed, indicating that the kinase activity of CaMKK2 is important for its role in chondrocytes. Taken together, our results identify CAMKK2 as a pro-catabolic and pro-apoptotic mediator that promotes chondrocyte death and cartilage degradation. STO-609 may be potentially novel therapeutic against human OA.



# **Total Knee Arthroplasty Can Decrease Pain Catastrophizing Scores and Increase Range of Motion in Patients Prone to Catastrophic Thinking: A Prospective Analysis**

**Michael Patetta, MD**

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**Purpose:** Pain catastrophizing, measured by the pain catastrophizing scale (PCS), is the tendency to magnify the harmful aspects of pain. We compared the range of motion (ROM) pre- and post-total knee arthroplasty (TKA) for patients with and without catastrophized pain.

**Methods:** This study prospectively enrolled patients scheduled for primary, elective TKA at an urban, university hospital starting August 2021. The PCS is a 13-question instrument that measures rumination, magnification, and helplessness. Differences in ROM between those who do (PCS > 30) and do not catastrophize pain were determined using Wilcoxon sum rank tests.

**Results:** 37 were included. Non-catastrophizers had greater preoperative active ROM compared to pain catastrophizers ( $101.7^{\circ} \pm 12.3^{\circ}$  vs  $80.7^{\circ} \pm 26.4^{\circ}$ ,  $p=0.016$ ) but no difference in ROM under anesthesia ( $p>0.9$ ). There was no difference in final ROM between non-catastrophizers and pain catastrophizers ( $p>0.9$ ). Active ROM preoperatively and at the final postoperative visit between groups differed ( $p=0.008$ ), with pain catastrophizers having, on average, 30% more active ROM after TKA. Pain catastrophizers improved their PCS score between the preoperative visit and final postoperative visit by an average of 2.5 points (38.18).

**Conclusion:** Increased personal perception of pain may influence the patient's use of their affected extremity. Ninety days after TKA, pain catastrophizers had improved their PCS score and had a relative increase in active ROM to levels similar to that of non-pain catastrophizers.

**Significance:** While preoperative pain catastrophizing limits ROM, this data suggest that TKA may help patients with high levels of pain catastrophizing improve their perceptions of pain and ROM.

# **Elevated Skin Surface Temperature Associated with Decreased Range of Motion After Total Knee Arthroplasty**

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**Purpose:** We prospectively investigated the relationship between skin surface temperature (SST) and range of motion (ROM) after total knee arthroplasty (TKA).

**Significance:** Elevated SST has been correlated to the severity of knee pain secondary to increased inflammation and blood flow, but the relationship between SST and ROM is unknown.

**Methods:** We enrolled 25 patients undergoing TKA. A FLIR ONE Pro infrared camera was used to photograph bilateral knees preoperatively and postoperatively. Using the FLIR Thermal Studio software, we measured the SST (unit: SSTavg) of each knee and computed average temperatures at the joint. Active ROM was measured at each encounter. Univariate linear regressions described the relationship between SST and ROM.

**Results:** 31 measurements were obtained from 18 female and 7 male participants. Average preoperative and postoperative active ROM was  $90.3^{\circ}\pm 16.8^{\circ}$  and  $86.8^{\circ}\pm 21.2^{\circ}$ , respectively, at an average follow up of  $54\pm 48$  days. Average SSTavg was  $2.53^{\circ}\text{C}\pm 1.11^{\circ}\text{C}$ . There was a negative correlation between ROM and SSTavg ( $R^2=0.14$ ,  $p=0.037$ ).

**Conclusion:** Inflammatory processes which lead to elevated SST may also promote arthrofibrosis thereby leading to decreased postoperative motion. Thermal imaging to assess skin surface temperature may serve as a point-of-care tool to inform clinical decision-making.

# **Gluteus Maximus Transfer for Irreparable Hip Abductor Deficiency: A Systematic Review and Meta-Analysis**

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**Purpose:** The purpose of this study was to systematically review outcomes following gluteus maximus tendon transfer for hip abductor deficiency.

**Significance:** Gluteus maximus tendon transfer has recently been described as a treatment option for irreparable abductor tendon tears in limited case series.

**Methods:** The published literature was queried for outcomes following gluteus maximus transfer in accordance with the PRISMA guidelines. Outcomes of interest included functional scores, resolution of pain and gait abnormalities, postoperative rehabilitation protocols, surgical complications and reoperations.

**Results:** In total, 10 studies with a total of 125 patients (76% female, mean age =  $66.7 \pm 4.3$  years) were identified for inclusion. Modified Harris Hip Score ( $+30.1 \pm 6.6$ ) and Visual Analog Scale for pain ( $-4.1 \pm 1.1$ ) were improved following gluteus maximus transfer. No significant improvement was noted in abduction strength and 33% of patients demonstrated a residual Trendelenburg gait post-operatively. The overall complication rate was 5.6% (7/125), with a reoperation rate of 1.6% (2/125).

**Conclusion:** Gluteus maximus tendon transfer for abductor insufficiency has demonstrated reliable outcomes at 3 years, with improvement in hip function and pain. However, patients demonstrate modest improvements in abduction strength, and a significant subset will continue to demonstrate a Trendelenburg gait postoperatively.

# **Clinical Outcomes and Survivorship of Lateral Unicompartmental Knee Arthroplasty: A Large Single Surgeon Cohort**

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**Purpose:** We hypothesized that long term follow up would demonstrate good clinical outcomes and survivorship of lateral unicompartmental knee arthroplasty.

**Significance:** Lateral UKA has been shown to be an effective treatment of isolated lateral compartment osteoarthritis, however long-term outcomes and survivorship are poorly understood. The aim of this study is to characterize the clinical outcomes of lateral UKA.

**Methodology:** We retrospectively reviewed a series of patients who underwent lateral UKA by a single fellowship trained arthroplasty surgeon from 2004 – 2020 with minimum two year follow up. Patient demographics, complications, radiographic findings, and need for revision surgery were evaluated.

**Results:** 62 knees in 60 patients (average age 70.8 years) met inclusion criteria, with a mean follow up of 6.14 years. At final follow up, four of 62 knees (6.5%) had undergone repeat surgical procedure. Three were revised due to medial compartment osteoarthritis progression, two had ipsilateral medial UKA and one was converted to TKA. One UKA was complicated by acute prosthetic joint infection treated with surgical debridement and polyethylene exchange.

**Conclusion:** Lateral UKA showed high survivorship with low rates of complications and revision surgery. Lateral UKA should be seen as a durable treatment option for isolated lateral compartment osteoarthritis.

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