

2025 PODIUM & POSTER ABSTRACTS

2025 MAOA Annual Meeting

THURSDAY, APRIL 11

First Plenary Session

Breakout Session #1	Knee Arthroplasty
Breakout Session #2	Trauma
Breakout Session #3	Hip Arthroplasty
Breakout Session #4	Sports/Knee Arthroscopy
Breakout Session #5	Pediatrics Orthopedics

FRIDAY, APRIL 12

Breakout Session #6	Shoulder & Elbow
Breakout Session #7	Foot & Ankle
Breakout Session #8	Knee Arthroplasty
Breakout Session #9	Hip Arthroplasty
Breakout Session #10	Sports/Hip Arthroscopy
Breakout Session #11	Hand & Wrist

SATURDAY, APRIL 13

Breakout Session #12	Trauma, Physiology & Nutrition
Breakout Session #13	Shoulder & Elbow/Topics in Training
Breakout Session #14	Knee Arthroplasty, Practice Management, Miscellaneous
Breakout Session #15	Arthroplasty, Hip Preservation, Patience Perspective
Breakout Session #16	Oncology & Spine
Breakout Session #17	Sports

POSTERS 1 – 119

DISCLOSURE INFORMATION

42nd MAOA Annual Meeting
April 9 – 13, 2024
La Cantera Resort | San Antonio, Texas

Edward D. Henderson, M.D. Award Presentation**Prospective, Randomized, Controlled Trial of an Opioid-Sparing Protocol vs. Standard Opioid-Based Protocol Following Open Reduction Internal Fixation of Distal Radius Fractures****Paper 001**

David W. Cooper, M.D. / Carmel, IN**Co-Authors:**

David W. Cooper, M.D. / Carmel, IN

William J. Weller, M.D. / Memphis, TN

Norfleet B. Thompson, M.D. / Memphis, TN

Benjamin M. Mauck, M.D. / Memphis, TN

OBJECTIVE: The purpose of this study was to determine if a postoperative opioid-sparing pain medication regimen would yield similar patient reported pain scores and satisfaction after surgical fixation of distal radius fractures while reducing the volume of opioid medications consumed.

METHODS: Prospective, randomized, controlled trial conducted at one institution between December 2021 and January 2024. Patients presenting with closed distal radius fractures meeting criteria for open reduction internal fixation with a volar locking plate in an outpatient setting were invited to participate in the study and were randomized to either a traditional opioid-based (acetaminophen and oxycodone) or opioid-sparing (acetaminophen, gabapentin, celecoxib) postoperative pain control regimen. All patients were administered an upper extremity block by an anesthesia provider prior to the operation and the opioid-sparing group was given ten oxycodone pills for rescue pain relief. All operations were done by one of three fellowship trained hand surgeons. The Visual analog scale (VAS) pain scores and opioid consumption (total pills and oral morphine equivalent) were recorded at days 1-7 and 2, 6, and 12 weeks postoperatively. Patient satisfaction was recorded at 1, 2, 6, and 12 weeks.

RESULTS: Seventy-two patients were randomized to the opioid-sparing (n=37) and opioid-based (n=35) postoperative pain control groups. The groups were not statistically different with regard to demographics, dominant vs. non-dominant hand affected, or type of fractures treated (intra-articular vs. extra-articular). The two groups did not differ significantly with regard to postoperative VAS scores or patient satisfaction at any time. An 80% reduction in total opioid pill consumption was seen in the opioid-sparing group at the two, six, and twelve week follow up visits ($p<0.005$). The opioid-sparing group consumed less oral morphine equivalents (OME) at all time points ($p<0.005$). One-week postoperatively, 86% of the opioid-sparing patients had stopped using opioid pills compared to 60% of the opioid-based group ($p<0.005$).

CONCLUSIONS: This study shows an 80% decrease in both OME and total opioid pills consumed after fixation of distal radius fractures in the opioid-sparing pain management group. Significantly more of the opioid-sparing cohort had discontinued opioid pain medications by one-week postoperatively. There were no significant differences between the two groups with respect to patient satisfaction or VAS pain scores at any time point.

E. W. Johnson, Jr., M.D. Award Presentation**Outcomes Following Early Weight Bearing in Syndesmotic Injuries: A Randomized Controlled Trial****Paper 002**

Elizabeth Durante, M.D. / Columbia, MO**Co-Authors:**

Elizabeth Durante, M.D. / Columbia, MO

Mubinah I. Khaleel, D.O. / Columbia, MO

Sam Hawkins, B.S. / Columbia, MO

James P. Stannard, M.D. / Columbia, MO

Gregory John Della Rocca, M.D., Ph.D. / Columbia, MO

Brett D. Crist, M.D. / Columbia, MO

Kyle Schweser, M.D. / Columbia, MO

OBJECTIVE: Syndesmotic injuries occur in 10% of ankle fractures. Restoration and maintenance of the distal tibiofibular stability is crucial. The literature regarding time to weight bearing is scarce, with the majority recommending greater than 6 weeks of non-weight bearing. No studies examine whether early weight bearing as tolerated is safe in syndesmotic injuries, and current early weight bearing studies after ankle fractures typically exclude syndesmotic injuries. The purpose of this randomized controlled trial is to measure differences between early weight bearing at 2 weeks and delayed weight bearing at 6 weeks in terms of outcomes, hardware failure, and loss of reduction at 1 year.

METHODS: All rotational ankle fractures in patients over 18 were enrolled preoperatively. Only those who received syndesmotic fixation were randomized postoperatively to early vs delayed weight bearing. No fracture types were excluded. All syndesmotic fixation utilized suture buttons. A total of 39 patients were enrolled. Primary outcome was maintenance of reduction at 1 year comparing postoperative and 1 year CT scan of both ankles. Secondary outcomes included pain scores, surgical experience (SSQ-8), AAOS Foot and Ankle, range of motion, and complications. Data was analyzed using unpaired t-test and Fishers exact. Statistical significance was set at $p < 0.05$.

RESULTS: 16 patients were randomized to early weight bearing and 23 patients to delayed. The early weight bearing group had a significantly higher pain score (4.69 ± 2.84 vs 2.87 ± 2.31 , $p = 0.039$) at the baseline 2 week visit. At 1 year, dorsiflexion in the early weight bearing group was significantly higher ($14.2^\circ \pm 3.97^\circ$ vs $7.71^\circ \pm 4.46^\circ$) than the delayed group ($p = 0.017$). There was no significant difference in syndesmotic malreduction, loss of reduction, pain scores, PROs, development of arthritis or complication rates at any other timepoint.

CONCLUSION: Early weight bearing is safe following syndesmotic fixation in ankle fractures, at least in those receiving suture button fixation.

Carl L. Nelson, M.D. Award Presentation

Repeat Exposure to Mesh-Glue Dressing is Associated with Allergic Contact Dermatitis: A Prospective Cohort Study

Paper 003

Conor M. Jones, M.D. / Chicago, IL

Co-Authors:

Conor M. Jones, M.D. / Chicago, IL

Robert A. Burnett, M.D. / Chicago, IL

Myles Atkins, M.D. / Chicago, IL

Amr Turkmani, B.S. / Chicago, IL

Craig J. Della Valle, M.D. / Chicago, IL

Brett R. Levine, M.D., M.S. / Chicago, IL

Richard A. Berger, M.D. / Chicago, IL

Vasili Karas, M.D., M.S. / Chicago, IL

INTRODUCTION: Certain dressing types have been associated with allergic contact dermatitis (ACD), presenting as a peri-incisional eczematous skin reaction. The purpose of this study was to compare rates of ACD following arthroplasty between patients with prior exposure and those naïve to a specific dressing type (2-octyl cyanoacrylate liquid adhesive and a self-adhesive polyester mesh).

METHODS: 206 Patients undergoing 236 procedures (157 TKA, 67 THA, 12 UKA) between August 2023 and April 2024 at a single institution were prospectively evaluated. Patients were categorized as “Exposed” or “Naïve” based on prior exposure to the studied dressing. Patients were excluded if they had a previous skin reaction to the surgical mesh dressing. Skin checks were performed at postoperative day 7 and 14. The primary outcome of the study was ACD requiring treatment. Baseline demographics, comorbidities and 90-day complications were compared. Multivariate logistic regression analysis was utilized to determine the independent risk of dressing exposure on ACD.

RESULTS: 82 Patients were “Exposed” and 154 were “Naïve”. There were no differences in age, gender, smoking status, BMI, or Charlson Comorbidity Index (CCI) between the two cohorts ($p > 0.05$). ACD was more common in “Exposed” patients (7/82; 8.54%) compared to “Naïve” patients (3/154; 1.95%; $p = 0.028$). After controlling for sex, age at surgery, and CCI, patients with prior dressing exposure were more likely to experience ACD (Odds Ratio: 5.45, 95% Confidence Interval: 1.33-22.35, $p = 0.019$). At 90 day follow-up, there was no difference in emergency department visits, readmissions, or reoperation rates between the two groups.

CONCLUSIONS: Previous exposure to the mesh dressing increases risk of ACD by 5-fold as compared to naïve patients. This is likely through a Type IV delayed hypersensitivity reaction. Although symptoms uniformly resolved with treatment, clinicians should weigh the benefits of repeat use of this dressing given the risk of ACD.

Dallas B. Phemister, M.D. Award Presentation**Effect of Antibiotic Use on Tissue Culture Results in Patients with Periprosthetic Joint Infection****Paper 004**

Merrick T. Ducharme, B.A. / Rochester, MN**Co-Authors:**

Merrick T. Ducharme, B.A. / Rochester, MN

Khaled A. Elmenawi, B.S. / Rochester, MN

Herve Poilvache, M.D. / Rochester, MN

Ryan B. Khodadadi, M.D. / Rochester, MN

Said El Zein, M.D. / Rochester, MN

Brian D. Lahr, M.S. / Rochester, MN

Elie F. Berbari, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

INTRODUCTION: Patients with PJI are often on antibiotics prior to surgery, and it is not well-known how long antibiotics must be discontinued to optimize culture results. The purpose of this study was to determine the impact of antibiotic exposure and timing of antibiotic discontinuation on intraoperative culture results in patients with PJI.

METHODS: We identified 926 PJIs (312 hips & 614 knees) in 832 patients that were surgically treated for their infection at a single institution between 2013-2022. All patients met 2013 Musculoskeletal Infection Society (MSIS) criteria for PJI. In total, 60% of PJIs (n=551) had antibiotic exposure within 60 days of the initial PJI surgery. Of the patients with antibiotic exposure, 44% (n=244) discontinued antibiotics at least one day prior to surgery. The association of antibiotic exposure and the duration of time following discontinuation of antibiotics with positive intraoperative culture was evaluated using logistic regression.

RESULTS: Overall, intraoperative cultures were positive in 89% of PJI surgery. The rate of positive intraoperative culture did not differ between patients with and without prior antibiotic exposure (88% vs 89%, p=0.54). Of those with antibiotic exposure prior to surgery, the odds of positive culture were higher in patients who stopped antibiotics preoperatively (OR = 1.9, 95% confidence interval 1.1-3.4). Tissue culture positivity rates did not differ based upon the timing of antibiotic discontinuation, with positive cultures obtained in 92% for 1-2 days, 94% for 3-12 days, 94% for 13-22 days and 88% for 23-58 days.

CONCLUSIONS: Utilizing contemporary culture techniques for patients with PJI, intraoperative cultures were positive for almost 90% of cases regardless of antibiotic exposure. Prolonged antibiotic-free periods did not noticeably increase rates of positive intraoperative cultures in patients with PJI.

Improvement in PROMs After Revision TKA is Comparable to Primaries in Some Diagnoses, But Not Others

Paper 005

Austin Darden, B.S. / Noblesville, IN

Co-Authors:

Austin Darden, B.S. / Indianapolis, IN

Evan R. Deckard, B.S.E / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Patient-reported outcome measures (PROMs) are becoming increasingly important for reimbursement after primary total knee arthroplasty (TKA) and likely soon to follow for revision TKA. Therefore, as the Centers for Medicare and Medicaid Services (CMS) establish criteria for minimal clinically important differences (MCID), substantial clinical benefit (SCB), and patient acceptable symptom state (PASS) metrics, it is critical to understand which patients have the greatest propensity for clinical improvement after revision TKA. The study purpose was to compare PROMs of revision TKA by diagnosis compared to primary TKA.

METHODS: A total of 2,308 primary and 340 aseptic revision TKAs using consistent clinical protocols were retrospectively reviewed. Study data and revision diagnosis were extracted from patient health records. Modern PROMs and their associated MCID, SCB, and PASS thresholds were evaluated with $P < 0.05$ as significant.

RESULTS: Mean age and BMI were 66 and 34, respectively. 67% of patients were female and mean follow-up was 27.1 months. Primary and revision TKA cohorts were not different with respect to age, BMI, or sex ($P \geq 0.100$); however primaries had slightly longer follow-up (mean 5 months, $P < 0.001$). Satisfaction for cases revised for aseptic loosening (81%) and polyethylene wear/osteolysis (72%) was not different compared to primary TKAs (84%, $P \geq 0.190$) with numbers available. Mean improvement in UCLA Activity Level and pain with level walking were not different comparing primary TKAs and cases revised for aseptic loosening ($P \geq 0.728$). Primary TKAs achieved MCID, SCB, and PASS thresholds most often (range, 60-90%) followed by revisions for aseptic loosening and wear/osteolysis (range, 48-81%); and arthrofibrosis and instability (range, 33-70%) ($P \leq 0.009$).

CONCLUSION: Study results show that revision TKAs for aseptic loosening and polyethylene wear/osteolysis may have comparable clinical improvement and outcomes compared to primary TKA. Study results provide data to help CMS set rational metrics for reimbursement and set appropriate expectations for patients and surgeons.

Synovial Fluid Metal Ion Levels Show Promise as Biomarkers for Aseptic Loosening Following Total Knee Arthroplasty: A Prospective Study

Paper 006

Courtney Baker, M.D. / Nashville, TN

Co-Authors:

Aleksander P. Mika, M.D. / Nashville, TN

Courtney Baker, M.D. / Nashville, TN

Jacob M. Wilson, M.D. / Nashville, TN

Stephen M. Engstrom, M.D. / Nashville, TN

Gregory G. Polkowski, M.D. / Nashville, TN

J. Ryan Martin, M.D. / Nashville, TN

INTRODUCTION: Diagnosing aseptic loosening following primary cemented total knee arthroplasty (TKA) remains a challenging clinical dilemma. Radiographic features may be absent, and no reliable preoperative test exists to confirm the diagnosis. The purpose of this study was to examine if synovial fluid metal ion levels could be used to diagnose aseptic loosening.

METHODS: We prospectively enrolled forty-three patients (mean age = 66.6 years, 51% female) undergoing revision of a cemented TKA. Revisions for any indication were included. Synovial fluid was obtained at the time of revision surgery and was analyzed for concentrations, in parts per billion (ppb), of Barium, Zirconium, Titanium, Cobalt and Chromium. The diagnostic utility of each ion for detecting loosening was assessed with area under the curve (AUC) and 95% confidence intervals.

RESULTS: Twenty (47%) patients had intraoperatively confirmed aseptic loosening. Patients with aseptic loosening had elevated levels of zirconium (median levels: 8.6 ppb vs 0.0 ppb, $p = 0.004$) and cobalt (median levels: 13.9 ppb vs 1.5 ppb, $p < 0.001$) compared to patients without loosening. The most accurate synovial metal ion levels for diagnosing aseptic loosening were Cobalt (AUC=0.82 (0.67-0.92), $p < 0.001$) and Zirconium (AUC=0.75 (0.59-0.87); $p = 0.001$). In patients with known or suspected Zirconium-based bone cement, the AUC increased to 0.84 (95%CI=0.62-0.96); $p < 0.001$). Barium, Titanium and Chromium levels were not diagnostic of aseptic loosening.

DISCUSSION: Synovial fluid Cobalt and Zirconium levels appear to be valuable indicators of aseptic loosening. In the absence of available confirmatory tests, synovial fluid analysis appears to offer a promising diagnostic modality. To further improve the reliability and accuracy of this diagnostic approach, the study will be expanded to include a larger patient cohort. Ultimately, this could lead to better patient outcomes and more effective detection of aseptic loosening following primary cemented TKA.

Unicompartmental Knee Arthroplasty Conversions to Total Knee Arthroplasty: Modest Outcomes at Five Years

Paper 007

Andrew D. Pumford, B.A. / Rochester, MN

Co-Authors:

Andrew D. Pumford, B.A. / Rochester, MN

Harold I. Salmons, M. D. / Rochester, MN

Cameron K. Ledford / Jacksonville, FL

Rafael J. Sierra, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

INTRODUCTION: Data on unicompartmental knee arthroplasty (UKA) conversion to total knee arthroplasty (TKA) are limited by low patient numbers and short-term follow-up. This study evaluated mid-term outcomes of UKA conversions to TKAs, focusing on implant survivorship, radiographic results, and clinical outcomes in a very large series.

METHODS: We identified 248 UKA to TKA conversions performed between 1995-2021 utilizing our institutional total joint registry. Mean age was 65 years, mean BMI was 32 kg/m², and 50% were female. The most common indications for conversion were progression of arthritis in adjacent compartments (36%), aseptic loosening (36%), and unexplained pain (20%). The mean time from UKA to conversion was 6 years. Posterior-stabilized constructs were utilized in 79% of conversions, varus-valgus constrained in 14%, and cruciate-retaining in 6%. Metaphyseal fixation was used in 7% of cases and augments in 31%. Kaplan-Meier survival analyses were performed, radiographs reviewed, and clinical outcomes were measured with Knee Society scores (KSS). Mean follow-up was 6 years.

RESULTS: The 5-year survivorship free of any revision was 93%. There were 17 revisions with aseptic loosening (n=7), periprosthetic joint infection (n=4), and unexplained pain (n=3) being the most common indications. The 5-year survivorship free of any reoperation was 88%. Arthrofibrosis (n=5) and patellar clunk/crepitus (n=4) were the most common indications for reoperation. There were 3 intraoperative complications including medial femoral condyle fracture (n=2) and common peroneal nerve neuropraxia (n=1). There were 30 postoperative complications, most commonly arthrofibrosis (n=9), wound complications (n=9), and flexion instability (n=5). Two unrevised TKAs showed signs of radiographic loosening. All other unrevised TKAs appeared well fixed. KSS improved from 37 to 77 (p<0.001).

CONCLUSIONS: In this large series of 248 UKA to TKA conversions, the 5-year survivorship free of revision was reasonable at 93%. Arthrofibrosis was the most common complication and indication for reoperation, occurring in 6%.

Summary Statement: This large series of UKA to TKA conversions demonstrated modest outcomes with 5-year survivorship free of revision was 93%. Aseptic loosening was the most common indication for revision.

In Robotic TKA is Non-Weightbearing Imaging the Best Approach for Planning?

Paper 008

Maria T. Schwabe, M.D., MPHS / St. Louis, MO

Co-Authors:

Maria T. Schwabe, M.D., M.P.H.S. / St. Louis, MO

Caroline J. Granger, M.D. / St. Louis, MO

Ryan M. Nunley, M.D. / St. Louis, MO

Robert L. Barrack, M.D. / St. Louis, MO

Charles P. Hannon, M.D., M.B.A / Rochester, MN

INTRODUCTION: Some robotic-assisted total knee arthroplasties (RA-TKA) utilize non-weightbearing computer tomography (CT) for surgical planning. However, preoperative plans may be affected by weightbearing status and lower extremity rotation. Alternatively, weightbearing 3-Dimensional (3D) EOS imaging has been proven to be useful for preoperative assessment of alignment. The purpose of this study was to compare planned resections during RA-TKA for neutral mechanical alignment between a non-weightbearing CT-based robotic system and 3D weightbearing EOS imaging.

METHODS: We performed a single-center retrospective review of 62 patients who underwent RA-TKA between 2021–2022. Planned resections to achieve neutral limb alignment were recorded from the CT-based robotic system including the medial distal femur (MDF), lateral distal femur (LDF), medial proximal tibia (MPT), and lateral proximal tibia (LPT) resections. Thickness of these planned resections were then compared with resections planned from preoperative EOS weightbearing imaging to similarly achieve a neutral limb alignment. Overall limb alignment was also recorded from the robotic system and compared to the preoperative EOS radiographs. All preoperative and postoperative radiographic measurements were independently performed by two investigators.

RESULTS: The mean absolute difference between MDF resection on the robotic system and preoperative EOS was $3.10\text{mm} \pm 1.71\text{mm}$ ($p=0.09$). The mean absolute difference for LDF resections was $1.44\text{mm} \pm 1.14\text{mm}$ ($p<0.01$). For the proximal tibia resections, the mean absolute difference for MPT resections was $1.11\text{mm} \pm 0.91\text{mm}$ ($p<0.01$). Mean absolute difference for LPT resections was $1.05\text{mm} \pm 0.64\text{mm}$ (<0.05). Mean absolute difference for preoperative limb alignment was $3.36^\circ \pm 3.24^\circ$ (<0.01).

CONCLUSION: The planned resections to achieve neutral limb alignment in a non-weightbearing CT-based robotic system were significantly different than planned resections using weightbearing 3D imaging, by up to 3mm. Weightbearing and rotation may affect planned bone resection measurements and subsequently implant position in RA-TKA, but the clinical impact of this remains unknown.

What is the Safest and Most Effective Dose of IV Dexamethasone in TKA? A Multicenter Randomized Controlled Trial

Paper 009

Anne DeBenedetti, M.Sc / Chicago, IL

Co-Authors:

Charles P. Hannon, M.D. / Rochester, MN
Anne DeBenedetti, MSc / Chicago, IL
Robert L. Barrack, M.D. / St. Louis, MO
Young-Min Kwon, M.D., Ph.D. / Boston, MA
Jess H. Lonner, M.D. / Philadelphia, PA

Rafael Sierra, M.D. / Rochester, MN
James I. Huddleston III, M.D. / Stanford, CA
Charles Nelson, M.D. / Philadelphia, PA
Ran Schwarzkopf, M.D., M.S.c / New York, NY
Gwo Chin Lee, M.D. / New York, NY

INTRODUCTION: The purpose of this multicenter, double-blinded prospective randomized controlled trial was to determine the safest and most effective dose of intravenous (IV) dexamethasone administered during primary total knee arthroplasty (TKA).

METHODS: Four hundred and four patients undergoing inpatient primary TKA were randomized across 11 centers to receive 4mg (n=138), 8mg (n=137), or 16mg (n=129) of IV dexamethasone intraoperatively. All sites utilized the same perioperative multimodal protocol. Opioid consumption measured in morphine milligram equivalents (MME), pain scores, nausea scores, vomiting episodes, and sleep duration were collected for 7 days postoperatively. Glucose levels were measured on postoperative day (POD) 1. The mean age was 68 years, mean body mass index was 33 kg/m², and 62% were female. Independent sample t-tests were used for continuous data and Chi-squared and Fisher's exact tests were used for discrete data. An a priori power analysis determined that 114 patients were needed per group to detect a 25% difference in cumulative 48-hour opioid consumption. Demographic characteristics were comparable between groups, suggesting successful randomization.

RESULTS: Patients who received 16mg IV dexamethasone consumed less MME on POD1 (38 v. 37 v. 27 MME; p=0.047) and had fewer vomiting episodes (p=0.02). There were no differences in cumulative opioid consumption within the first 48 hours (p=0.24) or pain with activity on POD1 (p=0.49). The 8mg group demonstrated the lowest glucose levels at 48 hours (p<0.001). There were no differences in nausea or sleep within the first 24 hours, length of stay, cumulative opioid consumption or pain scores with activity over 7 days, or 90-day complication rates between groups.

CONCLUSION: High dose (16mg) IV dexamethasone in TKA leads to reduced opioid consumption and vomiting in the first 24 hours after surgery. However, outcomes including total opioid consumption, sleep, and nausea are comparable beyond 24 hours for all doses.

SUMMARY: High dose (16mg) IV dexamethasone leads to improved opioid consumption and vomiting within 24 hours after TKA, however no differences in outcomes persist compared to 4mg and 8mg beyond 24 hours.

LEVEL OF EVIDENCE: I. Prospective randomized controlled trial.

Increased Complications and Revision Rates Amongst Patients Who Undergo Unicompartmental Knee Arthroplasty by Non-Adult Reconstruction Trained Surgeons

Paper 010

Enrico M. Forlenza, M.D. / Chicago, IL

Co-Authors:

Enrico M. Forlenza, M.D. / Chicago, IL

Robert A. Burnett III, M.D. / Chicago, IL

Amr Turkmani BS / Chicago, IL

Tad L. Gerlinger, M.D. / Chicago, IL

Brett R. Levine, M.D., M.S. / Chicago, IL

Craig J. Della Valle, M.D. / Chicago, IL

BACKGROUND: The purpose of this study was to compare outcomes for patients undergoing unicompartmental knee arthroplasty (UKA) by adult-reconstruction fellowship-trained surgeons and non-fellowship-trained surgeons.

METHODS: A large administrative claims database was queried for patients undergoing primary, elective UKA between 2010-2019 with a minimum of 5-year follow up. Patients who underwent UKA by a surgeon who was fellowship-trained in adult reconstruction were matched 1:1 based on age, Elixhauser Comorbidity Index, obesity, osteoporosis, tobacco use, alcohol use and insurance plan to patients who underwent UKA by a non-adult reconstruction fellowship-trained surgeon. The incidence of 90-day medical and surgical complications as well as 2- and 5-year complication and reoperation rates was identified via ICD coding and compared between matched groups.

RESULTS: The final cohort included 25,278 matched pairs of patients who underwent UKA either by a fellowship-trained or non-fellowship-trained surgeon. There were no statistically significant differences in 90-day medical and surgical complication rates between cohorts (all $p > 0.05$). At both 2- and 5-year follow-up, patients who underwent UKA by an adult reconstruction fellowship-trained surgeon were less likely to develop a periprosthetic fracture (2-years: OR: 0.58 [0.37-0.90], $p = 0.018$; 5-years: OR: 0.62 [0.42-0.90]; $p = 0.013$), aseptic loosening (2-years: OR: 0.78 [0.61-0.98]; $p = 0.031$; 5-years: OR: 0.71 [0.60-0.85], $p < 0.001$), implant failure (2-years: OR: 0.39 [0.23-0.63]; $p < 0.001$; 5-years: OR: 0.52 [0.36-0.75], $p < 0.001$), mechanical complications (2-years: OR: 0.77 [0.63-0.94]; $p = 0.010$; 5-years: OR: 0.81 [0.69-0.95], $p = 0.009$) and undergo revision to total knee arthroplasty (TKA) (2-years: OR: 0.69 [0.59-0.82]; $p < 0.001$; 5-years: OR: 0.69 [0.61-0.78], $p < 0.001$).

CONCLUSIONS: These data suggest that surgeons who had fellowship training in adult reconstruction demonstrated significantly lower rates of complications and revision to TKA when performing UKA. Non-adult reconstruction fellowship-trained surgeons wishing to incorporate UKA into their practice may consider pursuing additional training to better understand the indications and surgical techniques associated with this procedure to optimize outcomes.

Evaluating the Inflation on Medicare Reimbursement Trends for Total Knee Arthroplasty (2006-2022)

Paper 011

Apurva Choubey, M.D. / Chicago, IL

Co-Authors:

Apurva Choubey, M.D. / Chicago, IL
Brett Drake, B.S. / Chicago, IL
Jibreel Hussain, MBA / Chicago, IL
Nasiruddin Shaik / Chicago, IL
Nezar Abunnur, B.S. / Chicago, IL

Luke Zabawa, M.D. / Chicago, IL
Nirav K. Mungalpara, M.D. / Chicago, IL
Yasser Farid, M.D. / Chicago, IL
Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

INTRODUCTION: Total knee arthroplasty (TKA) has significantly evolved with innovations aimed at improving patient outcomes. Despite advancements, surgeon compensation for orthopedic procedures has declined, raising concerns about the sustainability of current reimbursement models. Understanding these trends is crucial, especially amid changing payment structures and economic shifts. Post-COVID-19, U.S. inflation rates peaked at 9.2% in June 2022, emphasizing the need to assess Medicare reimbursement rates for TKA and revision TKA (rTKA). This study examines Medicare reimbursement data for TKA and rTKA from 2006 to 2022, adjusted for inflation, to analyze changes over this 16-year period.

METHODS: We analyzed Medicare reimbursement data for TKA and rTKA from 2006 to 2022, adjusting for inflation. Data from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) and the Medicare Physician Payment Schedule were used to calculate Relative Value Units (RVUs) and procedural reimbursements. Current Procedural Terminology (CPT) codes identified TKA and rTKA surgeries. Nominal values were converted to real values using 2022 dollars, with the U.S. Consumer Price Index for inflation adjustment.

We calculated the average number of RVUs for the CPT codes through NSQIP and used these metrics to determine the average reimbursement per case, both nominal and inflation-adjusted. Total Percentage Change and Compound Annual Growth Rate (CAGR) for each CPT code were calculated from 2006 to 2022. The CAGR value allowed for forecasting future reimbursement rates, projecting trends to 2030.

RESULTS: Reimbursements for TKA procedures significantly declined when adjusted for inflation. Primary TKA reimbursements decreased by 43.52% since 2006 with a negative 3.51% CAGR, while rTKA reimbursements declined by 33.58% with a negative 2.52% CAGR. Projected reimbursement rates for 2030 suggest further decreases if current trends persist. The forecasted physician reimbursement for a primary TKA in 2030 is \$509.82 (in 2022 dollars), reflecting a 57.55% decrease from 2006. For rTKA, the projected reimbursement in 2030 is \$764.68 (in 2022 dollars), reflecting a 45.87% decrease from 2006.

CONCLUSION: The findings highlight a concerning disparity between surgeon compensation and procedural complexity, particularly for revision surgeries. Medicare reimbursements do not adequately account for case time and complexity, potentially disincentivizing surgeons from performing necessary procedures. As the demand for arthroplasty grows, fair and adequate compensation is essential to sustain quality care delivery. In the wake of post-pandemic economic challenges and soaring inflation rates, revisiting Medicare reimbursement policies for arthroplasty is imperative.

Total Knee Arthroplasty After Ipsilateral Knee Arthroscopy: Expectations and Satisfaction

Paper 012

Lasun O. Oladeji, M.D., Ph.D. / Homer Glen, IL

Co-Authors:

Lasun O. Oladeji, M.D., Ph.D. / New York, NY

James A. Keeney, M.D. / Columbia, MO

OBJECTIVE: Previous studies suggest that knee arthroplasty patients with a history of knee arthroscopy are more likely to experience postoperative complications and failure. Much of the research on this subject matter has focused on complications so there remains a limited understanding of the impact of prior knee arthroscopy on preoperative patient expectations and postoperative patient satisfaction. This study sought to characterize how prior knee arthroscopy impacts preoperative expectations and postoperative satisfaction following total knee arthroplasty with contemporary implant systems.

METHODS: We evaluated TKA patients prospectively enrolled in an institutional joint replacement registry with a minimum of 1 year clinical follow up after their TKA surgery. Additional inclusion criteria were: radiographic imaging studies to assess preoperative disease severity, preoperative patient expectation level of improvement for a successful joint arthroplasty experience (5-100%, 4- 75 to 99%, 3- 50 to 75%, 2- 25 to 50%, 1- <25%), and postoperative satisfaction level (5- highly satisfied, 4- a little satisfied, 3- neither satisfied nor dissatisfied, 2- a little dissatisfied, 1- highly dissatisfied). Patients were segregated into cohorts based on prior ipsilateral knee arthroscopy.

RESULTS: There were 320 TKAs performed in patients without a history of previous surgery and 145 TKAs performed in patients with a history of ipsilateral knee arthroscopy. The arthroscopy cohort was significantly younger (62.2 ± 7.5 vs. 65.5 ± 8.5 , $p < 0.001$), otherwise there were no differences in demographic factors. Patients with a history of knee arthroscopy had a significantly higher preoperative expectation for improvement (3.9 ± 0.7 vs. 3.7 ± 0.9 , $p = 0.02$). Further, postoperatively this cohort also demonstrated statistically higher UCLA Activity (5.4 ± 1.7 vs. 4.9 ± 1.7 , $p = 0.01$) and PROMIS Mental Health (52.6 ± 8.5 vs. 50.6 ± 8.8 , $p = 0.03$) scores. Overall, there were no significant differences between the two groups with respect to patient satisfaction (4.6 ± 0.9 vs. 4.5 ± 1.1 , $p = 0.58$). However, a subgroup analysis revealed that patients with a history of arthroscopy were significantly more likely to report that they were “very dissatisfied” (6.3% vs. 1.6%, $p = 0.015$) and significantly less likely to report “a little satisfied” (12.6% vs. 18.4%, $p = 0.004$).

CONCLUSIONS: Previous studies have demonstrated that patients with a prior arthroscopy are more likely to experience complications following an arthroplasty, which might suggest lower satisfaction. Despite having significantly higher preoperative expectations, patients in this study with a history of arthroscopy experienced equivalent or better postoperative functional outcomes. Further, there were no differences in postoperative patient satisfaction.

Preoperative Joints Education Class Decreases Length of Stay After Total Knee Arthroplasty

Paper 013

Ali Mehaidli, M.D. / Dearborn Heights, MI

Co-Authors:

Ali Mehaidli, M.D. / Detroit MI

Tahsin Rahman, M.D / Detroit MI

Noah Hodson, M.D. / Detroit MI

Mary Hennekes / Detroit, MI

BACKGROUND: Preoperative education programs are increasingly recognized for their role in improving outcomes following total knee arthroplasty (TKA). This study examines the impact of such programs on postoperative outcomes, including length of stay, discharge disposition, and complication rates in a large, urban hospital setting.

METHODS: This retrospective cohort study analyzed 18,541 primary elective TKAs performed between 2014 and 2020. We compared postoperative outcomes between patients who attended a preoperative joints education class and those who did not, using univariate and multivariate analyses to assess the impact of preoperative education on length of stay, discharge disposition, and postoperative complications.

RESULTS: Of the patients, 78.9% attended the preoperative education class. Attendance was significantly associated with a shorter postoperative length of stay (1.52 ± 1.3 days vs. 1.70 ± 1.7 days, $p < 0.001$), higher likelihood of discharge to home, and lower incidence of pulmonary embolism. The odds of being discharged to a post-acute care facility were significantly reduced among those who attended the class. No significant differences in other major postoperative complications were observed.

CONCLUSION: Engagement in preoperative joints education classes prior to TKA is associated with beneficial outcomes, including reduced hospital length of stay and improved discharge disposition. These findings support the integration of preoperative education into patient care protocols to enhance recovery and reduce healthcare utilization following TKA. The data suggest a clear advantage to including such educational interventions as standard preoperative practice in orthopedic surgery.

Intraosseous Vancomycin Reduces the Rate of Periprosthetic Joint Infection Following Aseptic Revision Total Knee Arthroplasty

Paper 014

Kwan J. Park, M.D. / Houston, TX

Co-Authors:

Colin A. McNamara, M.D. / Miami, FL
Austin E. Wininger, M.D. / Houston, TX
Thomas C. Sullivan, B.S. / Houston, TX
Timothy S. Brown, M.D. / Houston, TX
Terry A. Clyburn, M.D. / Houston, TX
Stephen J. Incavo, M.D. / Houston, TX
Kwan J. Park / Houston, TX

OBJECTIVE: Periprosthetic joint infection (PJI) is a devastating complication following total knee arthroplasty (TKA). Prior literature supports the intraosseous (IO) delivery of vancomycin as a safe and effective technique for primary TKA. The purpose of this study was to evaluate its efficacy for aseptic revision TKA.

METHODS: A single-institution retrospective review was performed on patients who underwent aseptic revision TKA from May 2016 to October 2023. Vancomycin was administered through an intravenous (IV) route in 386 cases and via an IO infusion in 333 cases. The IV cohort received a 15mg/kg dose of vancomycin prior to skin incision. The IO cohort received a 500mg dose of vancomycin infused into the tibia after tourniquet inflation. All patients also received a weight-based dose of IV cefazolin perioperatively. Patient characteristics, surgical details, and infection-related data were extracted during chart review. PJI diagnosis was based on the 2018 Musculoskeletal Infection Society criteria. Fisher's exact tests and chi-square analyses were used to compare categorical outcomes.

RESULTS: The incidence of PJI was significantly lower in the IO cohort compared to the IV cohort at 30-day (0.3% vs 2.1%, $P = 0.03$), 90-day (0.9% vs 3.1%, $P = 0.04$), and 1-year follow-up (1.6% vs 4.9%, $P = 0.04$). There were no reported adverse reactions to vancomycin. There were no differences in the incidence of acute kidney injury (2.7% vs 2.9%, $P = 0.90$), deep venous thrombosis (1.2% vs 1.8%, $P = 0.56$), or pulmonary embolism (0% vs 0.3%, $P = 1.0$) between groups.

CONCLUSIONS: Intraosseous vancomycin infusion is a safe and effective alternative to IV administration for patients undergoing aseptic revision TKA. Furthermore, IO vancomycin optimized the efficiency of vancomycin administration in this high-risk surgical cohort and resulted in a significant reduction in the rate of PJI through 1-year follow-up.

Cement Articulating Spacers vs. All-Polyethylene Tibial Spacers with a Metal Femoral Component in the Treatment of Periprosthetic Knee Infections

Paper 015

Garrett Hawkins, M.D. / Huntsville, AL

Co-Authors:

Sameer, Naranje, M.D. / Birmingham, AL
Matthew, McCrosson, M.D. / Lake Worth, FL
Mila, Scheinberg, M.D. / New Orleans, LA
Francis Cruz, B.S. / Birmingham, AL
Jose Ayala-Ortiz, M.D. / Birmingham, AL
Garrett Hawkins, M.D. / Huntsville, AL

OBJECTIVE: Periprosthetic joint infection (PJI) following total knee arthroplasty (TKA) is commonly treated with a two-stage revision with an articulating spacer. However, limited research has compared the clinical effectiveness of different articulating spacers. This retrospective study aimed to compare the outcomes of all-cement articulating spacers and all-polyethylene tibial spacers with a metal femoral component for PJI following TKA.

METHODS: Between 2015 and 2023, 139 patients (47 patients were in the all-cement spacer group and 92 in the all-polyethylene tibial spacer group) underwent the first stage of a planned two-stage revision for PJI following TKA in a large regional referral center. Spacer type was at the surgeons' discretion. All surgeons used a medial parapatellar approach with minimal variation of implant extraction technique. Age, sex, comorbidities, pathogens, estimated blood loss (EBL), transfusions, and complications were retrieved from the medical records. Patient satisfaction after the first surgery was determined by a simple survey asking the patient if they were satisfied with their knee, unsatisfied, or indifferent. Bivariate and multivariate analyses were performed to compare outcomes of the two treatments.

RESULTS: Patients in the all-cement group exhibited a lower EBL (mean EBL: 280.00 vs 367.39 ml; $p=0.026$) and decreased perioperative blood transfusions (mean transfusions: 0.38 vs 0.82 units; $p=0.012$) compared to the all-polyethylene group. Following stage 1 surgery, the all-poly tibia group demonstrated higher patient satisfaction prior to the second stage ($p<0.0001$) and a decreased rate of unplanned reoperation (16.3 vs 34.0; $p=0.030$) and deep infection (13.0 vs 34.0; $p=0.007$). No significant differences were seen in the stage 1 PJI species or rate of positive intraoperative cultures during stage 2 ($p=1.000$).

CONCLUSION: This study found that all-poly tibia patients had an overall reduced rate of reoperations and deep infections prior to stage 2 while also demonstrating increased patient satisfaction. Considering these factors, the all-polyethylene tibial spacer with a metal femoral component is the preferred implant during the 2-stage treatment of knee PJI.

Does Matching the Native Coronal Plane Alignment of the Knee (CPAK) Improve Outcomes in Primary TKA?

Paper 016

Kent R. Kraus, M.D. / Fishers, IN

Co-Authors:

Kent R. Kraus, M.D. / Indianapolis, IN

Evan R. Deckard, B.S.E / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

John B. Meding, M.D. / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: The Coronal Plane Alignment of the Knee (CPAK) classification system was developed to assess personalized alignment strategies, such as kinematic alignment, in total knee arthroplasty (TKA). However, CPAK has not been studied with regard to patient-reported outcomes measures (PROMs). This study evaluated whether incidentally matching a patient's native preoperative CPAK classification with TKA implant position meaningfully impacted postoperative PROMs.

METHODS: A retrospective review of 2,427 primary TKAs was performed. The cohort was 67% female with mean age and BMI of 66 years and 34 kg/m², respectively. Knees were classified using the CPAK classification on standardized preoperative and postoperative short-leg radiographs using a 5-degree adjustment for the lateral distal femoral angle based on available literature. Surgeries were performed using adjusted mechanical alignment strategies with a three-degree boundary. Patients who had a matching preoperative and postoperative CPAK were compared to all other combinations. Modern PROMs and minimal clinically important differences were analyzed utilizing univariate and multivariate analyses.

RESULTS: 94.5% of native knees classified as CPAK-I to III, like published CPAK distributions. The distribution of postoperative CPAK classification was significantly different with 25.6% of TKAs classified as CPAK-I to III ($P < 0.001$) and in only 11.5% ($N = 266$) did postoperative CPAK match the native preoperative classification. CPAK was not associated with preoperative ($P > 0.208$) or postoperative PROMs ($P > 0.085$), except CPAK-I had significantly higher preoperative pain with level walking compared to CPAK-III ($P = 0.027$). Patients in which matching preoperative and postoperative CPAK was achieved demonstrated no difference in PROMs at a mean of 28-months follow-up ($P > 0.143$). Statistical power was $\geq 93.6\%$.

CONCLUSION: Study results demonstrate that matching a patient's native knee coronal alignment classified by CPAK was not predictive of PROMs. This supports prior research that suggests TKA outcomes are multifactorial and related to complex interactions between implant position in three-dimensions as well as soft-tissue balance and kinematics.

Does Patella Osteoarthritis Affect Outcomes of Selectively Unresurfaced Patellae in Primary TKA?

Paper 017

Taylor G. Landis, M.D. / Indianapolis, IN

Co-Authors:

Zachary J. Gunderson, M.D. / Indianapolis, IN

Ruba Sokrab, M.D. / Indianapolis, IN

Taylor G. Landis, M.D. / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

Evan R. Deckard BSE / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Not resurfacing the patella during primary total knee arthroplasty (TKA) has steadily increased over the last decade as implants and techniques have improved. However, limited data exist on the degree of patella arthritis acceptable to leave the patella unresurfaced and the subsequent effect on patient-reported outcome measures (PROMs). This study evaluated PROMs in case-control matched cohorts of primary TKAs with unresurfaced and resurfaced-patellae.

METHODS: 1,935 consecutive primary TKAs were retrospectively reviewed. 871 of patellae were selectively unresurfaced, of which 667 (76%) had an aggressive lateral facetectomy. The remaining 1,064 TKA patellae were resurfaced. TKAs without patella resurfacing were case-control matched to resurfaced-patella based on age, BMI, sex, ASA, Kellgren-Lawrence osteoarthritis grade, OARSI osteophyte grade and patellofemoral joint space narrowing grade measured radiographically (all ≤ 1 and ≥ 2 matched exactly). Whether a lateral facetectomy was performed on an unresurfaced patella was documented. PROMs were evaluated at a mean of 2.7 years (range, 1-10) with a significance level of 0.05.

RESULTS: 140 TKAs with unresurfaced patellae were matched to 140 TKAs with resurfaced patellae. Unresurfaced and resurfaced-patella groups did not differ by demographics ($P \geq 0.334$) or osteoarthritis severity grades ($P \geq 0.999$). At latest follow-up, the matched groups did not differ in any PROM ($P \geq 0.225$) nor improvement from preoperative baseline ($P \geq 0.193$). A higher proportion of unresurfaced-patellae with lateral facetectomy achieved MCIDs for KOOS JR (94, 89, 86%) and decreased stair climbing pain (88, 85, 81%) compared to resurfaced patellae and unresurfaced without lateral facetectomy, with numbers available.

CONCLUSION: Study results show that patients with unresurfaced and resurfaced patellae have similar PROMs after primary TKA regardless of patellofemoral osteoarthritis severity. An aggressive lateral patellar facetectomy should be performed when selectively leaving a patella unresurfaced to achieve PROM MCIDs more frequently. Long term studies on resurfaced and unresurfaced patellae in contemporary TKA remain warranted.

Supplemental Fibula Fixation is Associated with a Higher Rate of Short-Term Reoperation After Pilon Fracture Open Reduction Internal Fixation

Paper 018

Rachel Bergman, M.D. / Chicago, IL

Co-Authors:

Mark A. Plantz, M.D. / Chicago, IL
Rachel Bergman, M.D. / Chicago, IL
Michael Peabody, M.D. / Chicago, IL
Tyler Compton, M.D. / Chicago, IL
Erik B. Gerlach, M.D. / Chicago, IL

Jasmin Vargas, B.S. / Chicago, IL
Muhammad Mutawakkil, M.D. / Chicago, IL
Milap Patel, D.O. / Chicago, IL
Bennet Butler, M.D. / Chicago, IL
Anish Kadakia, M.D. / Chicago, IL

OBJECTIVE: There is a lack of consensus regarding indications for fibula fixation in pilon fractures. Reduction of the fibula fracture can assist with restoring lateral column length and reduction of the tibial plafond during pilon ORIF. However, there are theoretical concerns with wound complications and soft tissue insult. The purpose of this study is to compare short-term outcome measures after tibial plafond ORIF with and without supplemental fibula fixation using a validated national database.

MATERIALS AND

METHODS: The American College of Surgeons' NSQIP database was utilized to identify all patients undergoing tibial plafond ORIF with and without fibula fixation between January 1, 2015 and December 31, 2020 using Current Procedural Terminology (CPT) codes 27827 and 27828, respectively. Open fractures and cases with concurrent open procedures were excluded from analysis. Demographic data, medical comorbidities, surgical variables, and various 30-day outcome measures were compared between the two groups. Multivariate logistic regression was used to identify independent variables associated with various outcome measure of interest.

RESULTS: A total of 3,120 patients were included in the final cohort: 1,530 patients underwent tibia fixation alone and 1,590 patients underwent both tibia and fibula fixation. Patients in the supplemental fibula fixation group were more often female (39.9% vs. 55.3%, $p<0.001$), more likely to be over 60+ years-old (22.0% vs. 27.1%, $p<0.001$), more likely to be underweight (5.6% vs. 7.5%, $p=0.029$), and more likely to have ASA class 3 (22.0% vs. 25.9%, $p=0.011$). The supplemental fibula fixation group had a higher rate of reoperation (2.3% vs. 1.1%, $p=0.013$) and non-home discharge (14.8% vs. 11.2%, $p=0.003$). The rate of surgical site infection was comparable between groups (2.2% vs. 2.4%, $p=0.663$). On multivariate regression analysis, supplemental fibula fixation was independently associated with unplanned reoperation (RR: 1.939 [1.081 – 3.477], $p=0.026$). Additionally, age, ASA class, and various medical comorbidities were associated with various complications and outcome measures of interest.

CONCLUSIONS: Patients undergoing supplemental fibula fixation during tibial plafond ORIF had a higher rate of 30-day reoperation and non-home discharge. Supplemental fibula fixation during pilon fracture ORIF was independently associated with a higher rate of 30-day reoperation. There was no difference in the rates of surgical site infection or wound dehiscence between the two groups. Additionally, older age, ASA class, and various medical comorbidities were associated with poor short-term outcomes in this cohort.

Comminuted Suprasyndesmotic Ankle Fractures are Associated with a High Rate of Anterolateral Plafond Involvement

Paper 019

Brian Wahlig / Rochester, MN

Co-Authors:

Brian D. Wahlig, M.D. / Rochester, MN

Ankur Khanna, B.S. / Rochester, MN

Bailey R. MacInnis, M.D. / Rochester, MN

Jonathan Copp, M.D. / Hattiesburg, M.S.

Krystin A. Hidden, M.D. / Rochester, MN

INTRODUCTION: Comminuted suprasyndesmotic ankle fractures (AO/OTA 44C2) are often due to pronation abduction mechanisms where axial loading of the lateral ankle structures causes compression failure of the fibula. This is the counterpart to the supination adduction mechanism where axial loading medially can cause anteromedial plafond impaction. However, no literature exists describing the rate of anterolateral plafond involvement in patients with AO/OTA 44C2 ankle fractures and what affect this has on clinical outcomes. The aim of this study was to analyze the association between AO/OTA 44C2 ankle fractures and anterolateral plafond involvement, as well as the affect anterolateral plafond involvement has on reoperation rate, development of osteoarthritis, and patient reported outcome measures.

METHODS: 491 surgically managed suprasyndesmotic ankle fractures (AO/OTA 44C) treated at a single academic Level 1 trauma center between January 2005 and December 2021 were retrospectively reviewed. Injury x-rays identified 140 patients (29%) with suprasyndesmotic multi-fragmentary or comminuted fibula fractures (AO/OTA 44C2). Of these, 53 (38%) had preoperative computed tomography (CT) scans which were reviewed for anterolateral plafond impaction or a displaced Tillaux-Chaput anterolateral plafond fragment. Thirty-eight patients (72%) had at least 6-month follow-up and were included in postoperative outcome analysis. The primary outcome measure was the incidence of anterolateral plafond impaction or a displaced Tillaux-Chaput fracture on injury CT. Secondary outcome measures included reoperation rate (excluding hardware removal), rate of new-onset ankle osteoarthritis (Kellgren-Lawrence grade 3 or 4), Single Assessment Numeric Evaluation (SANE) score, and the Olerud Molander Ankle Score (OMAS).

RESULTS: The anterolateral plafond was involved in 26 of 53 patients (49%), including anterolateral plafond impaction in 11 (21%) and a displaced Tillaux-Chaput fragment in 15 (28%). Patients with anterolateral plafond impaction had a higher reoperation rate compared to those without any anterolateral plafond involvement (HR = 8.3, 95% CI: 1.4-15.3, p=0.022) as well as a higher rate of new-onset ankle osteoarthritis (83% vs 23%, p=0.013). There were no significant differences in the rate of reoperation or new-onset osteoarthritis between patients with anterolateral plafond impaction and patients with Tillaux-Chaput fragments or patients with Tillaux-Chaput fragments and patients with no anterolateral plafond involvement. There were no differences in SANE or OMAS scores across all groups.

CONCLUSION: CT evaluation is recommended in patients with comminuted suprasyndesmotic fibula fractures (AO/OTA 44C2) given their high association with anterolateral plafond impaction or Tillaux-Chaput fracture. Patients with anterolateral plafond impaction have a higher rate of reoperation and new-onset ankle osteoarthritis compared to those without anterolateral plafond involvement.

Rates of Postoperative Complications Following Internal Fixation of Periprosthetic Tibia Fractures

Paper 020

Garrett Hawkins, B.S. / Huntsville, AL

Co-Authors:

Garrett N. Hawkins, B.S. / Birmingham, AL

Matthew T. Yeager, B.A. / Birmingham, AL

Austin Atkins, M.D. / Birmingham, AL

Clay A. Spitler, M.D. / Birmingham, AL

Joey P. Johnson, M.D. / Birmingham, AL

OBJECTIVE: Periprosthetic fractures are likely to increase as total knee arthroplasty (TKA) becomes more common in the general population. The purpose of this study is to describe how the choice of fixation construct impacts the rates of complications encountered in the postoperative period following periprosthetic tibia fractures.

METHODS: This was a retrospective cohort study conducted at a single level 1 trauma center (2013-2022). Inclusion was limited to those older than 18. Current Procedural Terminology (CPT) codes were used to identify patients with periprosthetic tibia fractures. Initial constructs were limited to both TKA and partial knee arthroplasty. Initial constructs were further described based on the presence of a standard, metaphyseal, or diaphyseal fit tibia stem. Inclusion was limited to those fractures treated with a plate, nail, or revision TKA (rTKA). The Electronic Medical Record was used to collect perioperative characteristics, fracture details, demographics, and comorbidities. Fracture groups were separated by type of fixation and analyzed for differences in both postoperative surgical and systemic complications.

RESULTS: A total of 57 fractures (40 female) were included with an average age of 66 years. Plates were the most common method of definitive fixation (72%), followed by nails (19%), and rTKAs (9%). There was a significant difference in all-cause reoperations in fractures treated with IMNs (0%), plates (34%), and rTKAs (60%) ($p=0.027$). On post-hoc analysis, fractures treated with a plate ($p=0.025$) or rTKA ($p=0.018$) were associated with increased rates of all-cause reoperations than those treated with nails. There were no significant differences in reoperation for bone healing ($p=0.280$), wound dehiscence ($p=0.170$), reoperation for infection ($p=0.129$), amputations ($p=0.141$), or implant loosening or breakage ($p=0.361$) in fractures treated with plates, nails, or rTKAs.

CONCLUSION: Periprosthetic tibia fractures are complex injuries and are likely to increase as TKA becomes more common along with the increasing age of the general population. This study demonstrates that nails have lower all-cause reoperation rates and should be considered for the treatment of periprosthetic tibia fractures when possible.

Age and Posterior Malleolus Size are Associated with Displacement of Trimalleolar Ankle Fracture-Dislocations

Paper 021

Joshua A. Ungar, M.D. / St Louis, MO

Co-Authors:

Achraf H. Jardaly, M.D. / St Louis, MO

Karsen Corn, M.D. / St Louis, MO

Alexander Hoffman, B.S. / St Louis, MO

Allison Shildt, B.S. / St Louis, MO

Thomas Revak, D.O. / St Louis, MO

INTRODUCTION: Trimalleolar ankle fracture-dislocations present a unique challenge in that many of them are unstable. There are not clear guidelines currently to determine which trimalleolar ankle fractures would benefit from external fixation while awaiting definitive open reduction internal fixation. In our experience, it is difficult to determine which of these fractures will displace in a splint while awaiting definitive fixation.

METHODS: This retrospective review evaluated trimalleolar ankle fracture-dislocations that underwent fixation at our level 1 trauma center. Patients were initially treated with closed reduction and splinting until operative management. Patients were divided into two groups: those who maintained a stable reduction vs. those who had displacement in the splint. Displacement was defined as a talar shift of at least 3 mm on the AP radiograph and/or a central plumb line not bisecting the talar dome.

RESULTS: The study included 53 patients with adequate alignment after closed reduction. The rate of displacement in the splint was 41.5% (22 patients). Patients with displacement had a similar BMI as well as similar rates of smoking, diabetes, and neuropathy compared to patients with a stable reduction. These patients were older, with an average age of 53.1 ± 12.5 years compared to 44.8 ± 12.5 years for patients with a stable reduction. Furthermore, these patients had a larger posterior malleolar fragment, with an average of $28.9 \pm 9.4\%$ compared to $23.7 \pm 9.0\%$.

ROC analysis showed area under the curve was 0.69 for age and 0.65 for posterior malleolar size . Cutoffs for displacement showed an age of 50 years would have a sensitivity of 64% and specificity of 32%. Posterior malleolus size cutoff of 20% and 25% had sensitivities of 82% and 64%, respectively, and specificities of 68% and 48%, respectively. The odds ratio of displacing in the splint was 4.57 (95% CI: 1.11 to 18.76) for those either older than 50 years or those with a posterior malleolar fragment greater than 25% of the articular surface.

DISCUSSION AND CONCLUSION: A significant portion of patients with trimalleolar fracture-dislocations had displacement in the splint. Displacement was associated with older age and larger posterior malleolar fragments. Patients younger than 50 and those with a posterior malleolus fragment less than 20-25% of the articular surface would most likely maintain a stable reduction. Patients with these risk factors may benefit from temporizing external fixation to minimize complications associated with loss of reduction such as treatment delay and skin complications.

Interprosthetic Femur Fractures: A Multi-Center Retrospective Study

Paper 022

Lisa K. Cannada, M.D. / Jacksonville, FL

Co-Authors:

Lisa K. Cannada, M.D. / Jacksonville, FL

Sam Landoch / Lexington, KY

PURPOSE: Patients with ipsilateral TKA and THA are at a higher risk for interprosthetic femur fractures (IFF) which gives the surgeon the challenge of treating a periprosthetic hip and distal femur fracture simultaneously. The purpose of our study is to identify practices and determine factors that positively impact patient results.

METHODS: An IRB approved retrospective study was performed of patients that underwent ORIF of IFF's from 2011-2021 at 15 trauma centers. Patient demographics, comorbidities, treatments, and outcomes were collected and analyzed using descriptive statistics and univariate measures.

RESULTS: 143 patients met inclusion criteria with 113 (79%) females and median age 78 [57-90]. 86% of patients had primary a THA (24% cemented stem) and 89% had a primary TKA (12% cemented). Distal one-third fractures were most common and occurred in 68% of cases. 7.3% occurred within the first 90 days of THA or TKA. All patients underwent ORIF with 7% treated with 2 plates and 8% treated with plate/IMN combination. 50% of patients were NWB with 2 months the average to FWB. 20% of patients were FWB after surgery. Dual plate combination was the fastest time to FWB ($p < 0.001$). 82% of patients were discharged to a rehab facility. 61% of patients returned to baseline. Patients treated with either dual plate or plate/IMN combinations healed faster ($p < 0.001$) and had improved rates of returning to baseline function ($p < 0.034$). All patients that underwent IMN fixation returned to baseline ($p = 0.001$). Overall complication rate was 29%. 10% of patients developed malunion/nonunion and 8% had hardware failure. The deep infection rate was very low at 3.6%. There were 14% patients who underwent additional procedures for complications. Patients that underwent single plate fixation were least likely to require additional surgeries at 16% ($p < 0.05$). The mortality rate was 13.1% and associated with >1 comorbidity ($p = 0.002$).

CONCLUSIONS: In the largest study to date, ORIF with spanning lateral plate remains the most common treatment for IFF. 20% of patients underwent dual fixation and 8% were treated with plate/IMN combination. Patients with dual fixation had higher rates of union and return to baseline ambulatory status, particularly IMN fixation. 14% of patients needed additional surgery. Patients who had plate fixation were least likely to require additional surgeries. The deep infection rate was much lower than previously reported. Mortality rates at one year were lower than hip fracture data, but not insignificant. Greater comorbidity burden was associated with higher mortality rate. The information gathered can help guide treatment principles and permit realistic expectations regarding IFF treatment.

Nail-Plate Fixation vs. Distal Femoral Replacement for Periprosthetic Distal Femur Fractures

Paper 023

Shelby Cate Hodges, B.S. / Birmingham, AL

Co-Authors:

Matthew McCrosson, M.D. / Lake Worth, FL

Shelby Cate Hodges, B.S. / Birmingham, AL

Matthew Yeager, B.S. / Birmingham, AL

Sameer, Naranje, M.D. / Birmingham, AL

Scott, Mabry, M.D. / Birmingham, AL

Collier, Campbell, M.D. / Birmingham, AL

Jose, Ayala-Ortiz, M.D. / Birmingham, AL

OBJECTIVE: Distal periprosthetic femur fractures (DPFF) pose significant management challenges, often resulting in malunion, nonunion, or hardware revisions. Nail-plating (NP) is an increasingly popular technique to treat these injuries, but little is known about its comparative effectiveness. This retrospective study aimed to compare complication rates and patient-reported outcomes (PROs) between DPFFs treated with NP and those treated with distal femoral replacement (DFR).

METHODS: Consecutive patients with DPFFs and treated with either NP or DFR between 2018-2022 at a single level-one trauma center were identified using CPT Codes 27506, 27486, and 27487 and their electronic medical records were reviewed. Patients were excluded for having bilateral DPFFs, ipsilateral lower extremity trauma, or follow up of less than two weeks. Intraoperative variables, postoperative complications, and PROs using the PROMIS scoring system were collected. Bivariate analyses were performed to compare outcomes of the 2 treatments.

RESULTS: Over the study period, 36 patients were treated with DFR (mean age 75.1 SD (12.6)) and 23 were treated with NP (mean age 75.1 SD (12.0)) and met the inclusion/exclusion criteria. DFR patients had a mean operative time of 133 minutes with an estimated blood loss (EBL) of 351 ml compared to NP patients taking 149 minutes with an EBL of 298 (p=0.21 and p=0.32, respectively). 26 (72%) DFR patients and 14 (61%) NP patients were immediately weight bearing as tolerated postoperatively (p=0.32). Nine DFR patients (25%) had a deep infection compared to two (9%) NP patients (p=0.17). Ten DFR patients (28%) had revision surgery compared to four NP patients (17%) (p=0.36). 16 DFR patients (44%) had at least one complication, whereas six NP patients (26%) did (p=0.16). DFR patients had lower PROMIS Physical Function (PF) scores (29.5) and higher Pain Interference (PI) (66.1) and Depression (D) (57.8) than NP patients (35.3, [p=0.077]; 64.1, [p=0.445]; and 57.2, [p=0.889]).

CONCLUSION: In conclusion, while no statistically significant differences were observed in complication rates and PROs between the DFR and NP cohorts, the NP group had a lower complication rate in each category. These findings support the use NP constructs as an alternative treatment of DPFFs.

Surgical Outcomes for Periprosthetic Distal Femur Fractures After Total Knee Arthroplasty

Paper 024

Brandon J. Yuan, M.D. / Rochester, MN

Co-Authors:

Mark Wu, M.D. / Rochester, MN

Brett R. Bukowski, M.D. / Rochester, MN

Joel A. Hickman / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

William W. Cross III, M.D. / Rochester, MN

S. Andrew Sems, M.D. / Rochester, MN

Brandon J. Yuan, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

OBJECTIVE: Literature on periprosthetic distal femur fractures are limited by small cohorts and meta-analyses with heterogeneous cases. We investigated outcomes of a large cohort of patients treated with either locked plating or retrograde intramedullary nailing (IMN) at a single institution, and also compared outcomes of retrograde IMN to locked plating for periprosthetic distal femur fractures.

METHODS: We reviewed 197 subjects treated with locked plating and 44 treated with a retrograde IMN. Mean age was 77 years, 78% were female, and mean BMI was 32 kg/m². There were 27% Su I, 40% Su II, and 31% Su III fractures. There were 89% primary TKAs and 11% revision TKAs. Mean follow-up was 3 years.

RESULTS: The overall nonunion rate was 10% and 5-year survivorship free of any reoperation was 71%, with the most common reasons being nonunion (8%), infection (4%), and hardware removal (4%). Patients with a prior TKA infection (HR 3; p=0.02) and revision TKA (HR 4; p=0.001) were at increased risk of revision after fixation. Those with locked plating had a higher rate of osteoporosis (70% vs. 51%; p=0.02), prior revision TKA (13% vs. 0%; p=0.04), and trended toward having more Su Type III fractures (34% vs. 16%, p=0.07). There was also trend toward higher non-union rate in the locked plating group (11% vs. 2%; p=0.07). The 5-year survivorships free of any reoperation for locked plating and retrograde IMN were 73% and 60%, respectively, with no significant difference in reoperation or revision rates at final follow up.

CONCLUSIONS: Periprosthetic distal femur fractures after TKA are a challenging complication, and both locked plating and retrograde IMN are viable fixation options. Those treated with locked plating had higher rates of osteoporosis, prior revision TKA, and trended toward having more distal fractures, but did not demonstrate an increased risk for subsequent reoperation or revision.

Comparative Analysis of Fixation Accuracy Between Tibial intermedullary Nailing Approaches Using New 3D Reconstruction Software

Paper 025

Vladislav A. Husyev, B.S. / Columbia, MO

Co-Authors:

Samuel D. Hawkins B.S. / Columbia, MO

Vladislav A. Husyev, B.S. / Columbia, MO

Mark I. Doss, B.S. / Columbia, MO

Gregory Della Rocca, M.D., Ph.D. / Columbia, MO

Kyle M. Schweser M.D. / Columbia, MO

Brett D. Crist, M.D. / Columbia, MO

INTRODUCTION: Intramedullary nailing (IMN) is the gold standard for fixation of tibial fractures and can be performed through several approaches. The traditionally used transpatellar technique may lead to a higher rate of iatrogenic tibial rotational malalignment due to the knee being flexed during nail placement. Thus, suprapatellar and parapatellar methods in the semi-extended position have been gaining popularity. These newer techniques are hypothesized to provide benefits for alignment and intraoperative radiographic imaging. Accuracy of nailing is important since inadequate fixation can lead to significant functional compromise for the patient. The aim of this study is to use a newly validated 3D reconstruction imaging software to compare tibial alignment, including torsion, following different surgical approaches for tibial IMN.

METHODS: A retrospective review was performed on 1007 patients treated with an intramedullary nail for tibial fractures at a single institution between 2009-2023. Tibial torsion measurements were derived from the validated Femora application which utilizes a statistical shape model that combines data from anteroposterior and lateral radiographs producing measurable 3D reconstructions. Lateral Distal Tibial Angle (LDTA), varus/valgus, and apex angulation were also measured. Demographics, comorbidities, complications, and radiographic measurements were compared between surgical approaches. Data analysis was performed using one-way ANOVA and Pearson's Chi-Squared Test with statistical significance set at an alpha (α) of ≤ 0.05 .

RESULTS: After all exclusion criteria were applied 672 patients were included in final analysis. All subgroup characteristics were similar besides proportions of diaphyseal and distal fractures. Our cohort primarily included diaphyseal fractures at 96.4%. Whole cohort average postoperative tibial torsion was 27.8° of external rotation. There was no significant difference in any measured outcome including tibial torsion, LDTA, varus/valgus, or apex angulation between groups postoperatively; $p=0.909$, $p=0.394$, $p=0.680$, and $p=0.083$ respectively.

DISCUSSION: Rotational alignment of the tibia can be difficult to achieve with plain radiographs alone, especially in the presence of a concomitant fibular fracture where rotational alignment clues can be lost. Utilizing the Femora application allowed for a valid measurement of tibial torsion from readily available two-view x-ray images. Our data indicates that all surgical approaches used obtain similar alignment. Without significant differences in fixation quality, it is reasonable to select an operative approach based on other factors such as postoperative knee pain and preservation mobility.

ORIF of 105 Vancouver B1 Periprosthetic Femur Fractures After THA: High Mortality at Five Years

Paper 026

Nicolas A. Selemon, M.D. / Rochester, MN

Co-Authors:

Rachel L. Honig, M.D. / Rochester, MN

Nicolas A. Selemon, M.D. / Rochester, MN

Krystin A. Hidden, M.D. / Rochester, MN

Matthew P Abdel, M.D. / Rochester, MN

Brandon J Yuan, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

INTRODUCTION: Periprosthetic femur fractures around well-fixed femoral components in total hip arthroplasty (THA) remain challenging injuries to treat. The purpose of this study was to report the outcomes of a large series of operatively treated Vancouver B1 periprosthetic femur fractures in regards to implant survivorship, radiographic union, and patient mortality.

METHODS: We identified 105 Vancouver B1 fractures treated with open reduction internal fixation (ORIF) between 2000-2021. Most fractures (71%) occurred after primary THA and around uncemented femoral components (75%). Fractures were treated with various combinations of cables, lag screws, lateral locking plates, and allograft cortical struts. The cumulative incidences of revision and reoperation accounting for death as a competing risk were calculated, time to radiographic union was assessed, and mortality was recorded. Mean follow up was 3 years.

RESULTS: The 5-year cumulative incidences of any revision and any reoperation were 11% and 16%, respectively. There were 12 revisions including 3 revision ORIFs for nonunion, 3 for periprosthetic joint infection, 3 hardware removals for painful hardware, 1 acetabular liner exchange for dislocation, 1 femoral component revision for loosening at 3 months, and 1 distal femur fracture below the lateral locking plate requiring a distal femoral replacement. In addition to the above 12 revisions, there were 5 additional reoperations, all for superficial wound complications. The 90 day and 2-year cumulative probabilities of radiographic union were 50% and 92%, respectively. Patient mortality was 8% at 90 days and 46% at 5 years.

CONCLUSION: In patients who sustained a Vancouver B1 periprosthetic fracture the 5-year cumulative incidences of any revision and any reoperation were 11% and 16%, respectively. The most common causes of revision were revision ORIF for nonunion and infection. Over 90% of fractures were healed at 2 years. However, mortality was nearly 50% at 5 years.

Increased Social Deprivation Correlates with Worse Postoperative Pain and Anxiety PROMIS Scores in Distal Femur Fractures

Paper 027

Nichelle Enata, M.D. / Saint Louis, MO

Co-Authors:

Ndéye F. Guissé, M.D. / Saint Louis, MO

Arakua Welbeck, M.D. / Saint Louis, MO

Nichelle Enata, M.D. / Saint Louis, MO

Susan Thapa, Ph.D. / Saint Louis, MO

Anna N. Miller, M.D. / Saint Louis, MO

OBJECTIVE: The area deprivation index (ADI) is a valuable measure to contribute to the holistic assessment of patient risk profiles. There is limited research focusing on area deprivation and patient reported outcomes in adult orthopedic trauma patients following surgical intervention. The purpose of this study is to assess how predictive ADI is for objective and subjective patient outcomes after surgical treatment of distal femur fractures.

METHODS: This was a retrospective chart review of patients aged 18-80 years of age presenting to our level-one trauma center with traumatic distal femur fractures that were subsequently treated operatively over a 7-year period. Patient information collected included patient age, sex, race, BMI, tobacco and substance use history, significant medical comorbidities, and insurance status (private, public, or uninsured/self-pay). ADI was collected through the Neighborhood Atlas website categorizing patients as most deprived (>85th percentile) or less deprived (<85th percentile). Patient-reported outcomes (physical function, anxiety, pain intensity, and depression) were collected at the 0-3 months, 3-9 months, and 9-12 months postoperative time points. Objective outcomes collected included complications, readmissions, reoperations, and 1-year mortality.

RESULTS: We found a total of 107 patients, 58 females and 49 males with mean age 53.8 years. The most deprived group (over the 85th percentile) was younger (48.2 vs. 57.9 years) and had more Black patients (62.2% vs. 14.5%) compared to the less deprived group, which had majority White patients (83.9% vs. 35.6%). Private insurance was less common in the most deprived group (11.9% vs. 31.7%), and more were uninsured (19.1% vs. 5%). Both groups showed significant improvements in physical function PROMIS scores postoperatively (0-3 months) and at one year. However, the most deprived group had significantly higher anxiety and pain scores at three months, with anxiety equalizing at six months, but pain remaining higher at one year postoperative.

CONCLUSIONS: We found an increase in patient reported pain and anxiety scores in the most socially deprived group despite comparable objective outcomes. These findings should arm orthopedic traumatologists with more insight on caring for patients with higher social deprivation in a more nuanced approach that prioritizes their risk profiles with a heightened focus on mental health and pain management modalities.

Orthopedic Trauma Patients Respond to Patient Reported Outcomes Surveys at Lower Rates than All Other Orthopedic Subspecialties

Paper 028

Nicolas Jozefowski / Arlington Heights, IL

Co-Authors:

Nicolas Jozefowski / Chicago, IL

Carlo Eikani, M.D. / Chicago, IL

Robert Hand / Chicago, IL

Joseph Cohen, M.D. / Chicago, IL

Hobie Summers, M.D. / Chicago, IL

Ashley E. Levack, M.D. / Chicago, IL

OBJECTIVE: The purpose of this study was to compare response rates to standardized PRO collection efforts across a variety of orthopedic subspecialties.

METHODS: This was a retrospective study of prospectively collected data at a single level 1 academic center. Standardized PRO data collection is automated across all orthopedic subspecialties using CareSense (MedTrak, Inc.) data capture. Patients undergoing orthopedic surgical procedures are mapped to sub-specialty specific pathways and sent electronic PRO surveys at 6 weeks, 3 months, 6 months and 1 year postoperatively. Demographic variables were obtained from the electronic health record. Multivariable logistic regression models were fitted using generalized estimating equations to estimate the effect of subspecialty and demographic variables on odds of receiving a survey response.

RESULTS: Patients undergoing 4,992 orthopedic procedures received PRO surveys between 10/2021 and 2/2023. Response rates for trauma patients ranged from 30-40%, and were statistically significantly lower than all other sub-specialties through 6 months . On multivariable analysis, Hispanic/Latino ethnicity, increasing area deprivation index, and Medicare, Medicaid or self-pay insurance status was associated with significantly lower odds of responding.

CONCLUSIONS: Orthopaedic trauma patients are less likely to complete PRO surveys compared to all other orthopedic subspecialties. Targeted efforts aimed at demographics of low responders may help improve data collection efforts.

Is Pelvic Arterial Angioembolization Associated with an Increased Rate of Postoperative Infection in Patients with an Operatively Treated Pelvic Fracture?

Paper 029

David May, M.S.E. / Knoxville, TN

Co-Authors:

Phillip C. McKegg, M.S. / Baltimore, MD

Amber I. Park, B.S. / Knoxville, TN

David May, M.S.E / New Orleans, LA

William Brigode, M.D. / Chicago, IL

Joel Williams, M.D. / Chicago, IL

OBJECTIVE: Pelvic fracture associated arterial bleeding is a rare clinical scenario and requires prompt identification and intervention to prevent complications and mortality. Few studies exist examining this clinical scenario. We hypothesized pelvic arterial embolization in patients would result in increased rates of postoperative infection compared to those who did not require angioembolization.

METHODS: The American College of Surgeons – Trauma Quality Improvement Program (TQIP) database was queried using ICD10 procedure codes to identify patients undergoing operative fixation of a pelvic fracture from 2017-2021. The patient cohort was stratified into three groups: no angioembolization, angiography with no embolization, and angiography + embolization. Our primary outcome measure was pooled infection rate, which included deep surgical site infection (dSSI), organ space infection, osteomyelitis, and superficial surgical site infection (sSSI). Secondary outcome measures included independent analyses of the infections that comprised the pooled infection and other postoperative sequela. All continuous covariates were described using medians and interquartile ranges. Demographics, comorbidities, and outcome measures between the two cohorts were compared using chi-square and Fisher's exact test.

RESULTS: A total of 107,748 patients undergoing pelvic fixation were identified. Furthermore, 93,865 patients did not undergo angiography or embolization, 5,164 underwent angiography alone, and 8,719 underwent angiography plus embolization. Patients on anticoagulant therapy, those with a bleeding disorder, cirrhosis, chronic obstructive pulmonary disease (COPD), cerebral vascular accident (CVA), dementia, diabetes, functionally dependent health status, congestive heart failure (CHF), peripheral arterial disease (PAD), renal disease, and steroid use at the time of presentation were more likely to require embolization ($p < 0.05$). Patients undergoing angiography or angiography + embolization experienced higher rates of overall infection, as well as the higher rates of dSSI, sSSI, organ space infection, and osteomyelitis ($p < 0.001$).

CONCLUSIONS: Pelvic arterial bleeding requiring embolization occurred in 8% of patients in this cohort of patients operatively treated pelvic fractures. Our data suggests embolization is associated with an increased rate of postoperative infections, as well as other complications in the acute postoperative window.

Salvage of Failed Subtrochanteric Fracture Fixation in the Elderly: Revision Internal Fixation or Hip Arthroplasty?

Paper 030

Megan L. Anderson, B.A. / Rochester, MN

Co-Authors:

Ankur Khanna, B.S. / Rochester, MN

Bailey R. MacInnis, M.D. / Rochester, MN

Megan L. Anderson, B.A. / Rochester, MN

William W. Cross III, M.D. / Rochester, MN

S. Andrew Sems, M.D. / Rochester, MN

Jennifer Tangtiphaiboonana, M.D. / Rochester, MN

Krystin A. Hidden, M.D. / Rochester, MN

Brandon J. Yuan, M.D. / Rochester, MN

INTRODUCTION: This study aimed to compare reoperation rate and clinical outcomes between revision open reduction and internal fixation (ORIF) and hip arthroplasty following failed subtrochanteric fracture fixation.

METHODS: A retrospective review was conducted of all patients > 50 years old treated for failed fixation of subtrochanteric fractures with revision ORIF or hip arthroplasty between 2003 and 2023. The primary outcome measures were the rate of fracture union and reoperations for any reason after initial salvage therapy. Secondary outcomes included complications (infection, dislocation, bursitis, implant prominence, implant failure, nonunion), pain, and gait-aid requirements by final follow-up.

RESULTS: Forty-four patients were identified: 34 were treated with revision ORIF and 10 with hip arthroplasty. The arthroplasty cohort was older (75.4 vs 66.0 years, $p=0.016$) but did not differ from the ORIF cohort in sex, type of initial fixation, or reason for fixation failure ($p>0.05$). Mean patient follow-up was 18 ± 10 months. There was no significant difference between patients treated with revision ORIF versus patients treated with arthroplasty in fracture union (85.3% vs 80.0%, $p=0.772$) or reoperation (35.3% vs 30.0%, $p=0.710$). There was also no significant difference in rate of postoperative complications (35.3% vs 70.0%, $p=0.118$). However, the arthroplasty cohort achieved full weightbearing in significantly shorter time than the revision ORIF cohort (3.8 vs 6.8 weeks, $p=0.005$).

CONCLUSIONS: Both revision ORIF and hip arthroplasty are acceptable options for salvage of failed subtrochanteric fracture fixation in patients greater than 50 years old, but patients should be counseled that although the rate of fracture union is high whether revision ORIF or hip arthroplasty is selected, the rate of reoperation can exceed 1-in-4 patients.

Constrained Liners Implanted Simultaneously at the Time of Acetabular Revision with a Contemporary Shell Design

Paper 031

Alexander C. Hayden, M.D. / Rochester, MN

Co-Authors:

Adrián E. González-Bravo, B.S. / Rochester, MN

Alexander C. Hayden, M.D. / Rochester, MN

James-Roland R. Markos, M.D. / Rochester, MN

Charles P. Hannon, M.D., M.B.A. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

INTRODUCTION: Due to concerns for early acetabular component loosening surgeons may be reluctant to utilize a constrained liner at the time of acetabular component revision. We have previously demonstrated this can be safely done with a highly porous tantalum shell, numerous screws and cemented constrained liner. However, it is not known whether similar outcomes can be achieved with uncemented contemporary modular acetabular components.

METHODS: A retrospective review of our institutional total joint registry from 2000-2021 identified 38 cases of revision total hip arthroplasty (THA) in which a constrained liner was inserted into a contemporary revision acetabular component placed during the same surgery. A mean of 4 screws were used to supplement fixation. Mean age at revision THA was 66 years, 74% of patients were female and mean BMI was 31 kg/m². The most common indications for index revision THA were recurrent dislocation (50%), aseptic loosening (16%), and two-stage reimplantation (24%). The mean follow-up was 3 years.

RESULTS: There was only 1 acetabular component revised for aseptic loosening at 9 years, resulting in a 10-year survivorship free from acetabular revision for aseptic loosening of 97%. The 10-year survivorship free from any acetabular revision and free from any reoperation were 95% and 79%, respectively. There were a total of 7 re-revisions of the constrained liner-revision shell construct that were performed for dislocation (n=4), periprosthetic joint infection (n=2), aseptic loosening (n=1), and periprosthetic fracture (n=1). The 10-year survivorship free from dislocation was 92%. Review of radiographs did not identify evidence of acetabular loosening in unrevised cases.

CONCLUSIONS: Selective use of a constrained liner at the time of acetabular revision to contemporary acetabular component with multiple screws augmenting fixation had a low rate of aseptic loosening at 10 years. These results suggest that if needed, constrained liners can be utilized at the time of acetabular revision assuming a stable cup is achieved during implantation and robust supplement screw fixation is utilized.

LEVEL OF EVIDENCE: Level IV

Creating an MRI Classification System for Hip Abductor Musculature Atrophy

Paper 032

Megan N. Baughman, B.S. / Madison, WI

Co-Authors:

Megan N. Baughman, B.S. / Madison, WI
Donna G. Blankenbaker, M.D. / Madison, WI
Samuel J. Mosiman, M.S. / Madison, WI
Reagan S.H. Beyer, B.S. / Madison, WI
Anchal P. Dhawan, B.S. / Madison, WI
Ariel H. Kim, B.A. / Madison, WI
Andrea M. Spiker, M.D. / Madison, WI

OBJECTIVE: Fatty atrophy of hip abductors is negatively associated with surgical outcomes in abductor repairs, however, there is no standardized system for its classification. This study aimed to create a simple, reliable, and reproducible MRI classification system for fatty infiltration specific to hip abductors and examine the correlation between fatty infiltration grades and hip pathology.

METHODS: We retrospectively identified 100 patients who underwent bony pelvic MRI with no infection, fracture, tumor, or prior history of hip surgery. Using these images, fatty infiltration of the gluteus medius (GMed) and gluteus minimus (GMin) of both hips were graded according to the new system we created. Grades consisted of a whole number (-2 to 2) corresponding to muscle thickness with respect to average, a decimal number (0-0.4) representing the ratio of fat-to-muscle cross-sectional area, and a letter (A, P, or B) indicating location of fat within the muscle. For ease of grade determination, we developed an open access, online calculator. Demographic information and details of hip pathology were collected for each patient, and descriptive data was compiled. Wilcoxon rank sums were used to determine if grade values were significantly different for those who did and did not have certain hip pathologies.

RESULTS: Interquartile ranges for muscle thickness and fatty atrophy were [-1,0] and [0.1,0.2] for GMin and [-1,0] and [0,0.1] for GMed, respectively. Fat was most often localized to the anterior portion of the muscle in both the GMed and GMin. Fat located in the posterior portion or throughout the GMin was ubiquitously associated with pathology. Higher grades for fatty atrophy in the GMin and GMed correlated with tendon tear, tendinitis, and intra-articular hip cartilage loss (GMin: $p < 0.0001$, $p = 0.0017$, $p < 0.0001$; GMed: $p = 0.0248$, $p = 0.0001$, $p = 0.005$). Higher fatty atrophy grades in the GMin were separately associated with labral tear ($p = 0.0251$), while the same relationship was found between the GMed and greater trochanteric bursitis ($p = 0.0154$). Analysis of muscle thickness displayed a positive association between width of the GMed and incidence of tendon tear, tendinitis, and cartilage loss ($p = 0.0055$, $p = 0.0064$, $p = 0.0473$).

CONCLUSIONS: This classification system offers a simple way to grade fatty atrophy in hip abductor muscles and proved to correlate with various hip pathologies.

Comparing Highly Crossed-Linked Polyethylene Wear with Functional Activity in Young THA Patients

Paper 033

Sergio F. Guarin Perez, M.D. / Rochester, MN

Co-Authors:

Sergio F. Guarin Perez, M.D. / Rochester, MN

Michael B. Stuart, M.D. / Rochester, MN

Sheng-Hsun Lee, M.D. / Rochester, MN

Diego J. Restrepo, M.D. / Rochester, MN

Robert T. Trousdale, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

BACKGROUND: Total hip arthroplasty (THA) has been shown to effectively restore mobility, reduce pain, and enhance the quality of life of patients across various age groups. Despite its benefits, concerns remain regarding the long-term effects of high-impact activities and sports on implant longevity, particularly in younger patients. This study aimed to investigate the long-term clinical and radiographic outcomes of highly cross-linked polyethylene (HXLPE) compared to activity levels in young patients undergoing THA.

METHODS: Between 1999 and 2008, 785 patients aged ≤ 50 years underwent primary THA at our institution using HXLPE liners. Functional activity and participation questionnaires Hip Osteoarthritis Outcome Score Junior (HOOS Jr.), University of California, Los Angeles Activity Scale (UCLA), high-activity arthroplasty score (HAAS), and American Association of Hip and Knee Surgeons (AAHKS) activity recommendations after THA were obtained between 2018- 2019. Radiographic linear wear was measured using ROMAN software in those who had completed questionnaires and radiographs at least 10 years apart. Multivariate analyses were performed to determine the relationship between HXLPE wear and activity scores.

RESULTS: 249 patients met the inclusion criteria (mean age, 43 years; 56% female). The mean duration between surgery and the survey was 14.8 years, while the interval between radiographs was 16.1 years. Functional activity scores, assessed using the HAAS score, revealed median scores of 4 for walking (on a scale of 0-5), 1 for running (0-4), and 6 for the overall activity level (1-11). According to the post-THA activity participation consensus of The Hip Society and AAHKS members, approximately 10% of the participants engaged in non-allowed activities. The mean radiographic linear wear rate was 0.036 mm/year (SD 0.026). In terms of wear, no significant correlations were observed for walking ($p = 0.73$), running ($p = 0.36$), activity level ($p = 0.26$), or activity participation ($p = 0.18$)

CONCLUSION: Patients aged ≤ 50 years who underwent primary THA with HXLPE liners did not experience significant linear wear even a decade after surgery. Linear wear was not related to functional activity or participation in high-impact activities.

Does Replicating the Native Hip Center, Femoral Offset and Leg Lengths Improve PROMs After THA?

Paper 034

MacKenzie Molina, B.S. / Indianapolis, IN

Co-Authors:

Andrew Schneider, M.D. / Indianapolis, IN

MacKenzie Molina, B.S. / Indianapolis, IN

Lauren I. Pitz-Gonçalves, M.D. / Indianapolis, IN

Braeden W. Estes, M.D. / Indianapolis, IN

Evan R. Deckard BSE / Indianapolis, IN

Kevin A. Sonn, M.D. / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Enabling technology, such as computer navigation and robotics, provides more precise implant position, which allows surgeons the ability for personalized alignment in total hip arthroplasty (THA). To date, THA implant position studies have focused on dislocation rates, rather than on patient-reported outcome measures (PROMs). This study's purpose was to evaluate the impact of THA component position on clinically significant differences in PROMs.

METHODS: 1,682 consecutive primary THAs were retrospectively reviewed. Acetabular and femoral component position as well as femoral offset and leg length difference (LLD) were measured on all preoperative and postoperative radiographs. HOOS Jr, UCLA Activity Level, and patient satisfaction scores were collected on all patients. Minimal clinically important difference (MCID), substantial clinical benefit (SCB), and patient acceptable symptom state (PASS) values were assessed for all PROMs. Univariate and multivariate statistical analyses were performed with $P < 0.05$ as significant.

RESULTS: Mean age and BMI of the cohort was 62.5 years and 30.6, respectively. Mean clinical follow up was 21.9 months. In multivariate analysis, acetabular component position closer to the native hip center of rotation was associated with greater probability of achieving HOOS JR MCID of 6, SCB of 15, and PASS of 76.7 ($P \leq 0.008$). Increase in postoperative femoral offset was associated with achieving the UCLA Activity Level MCID of 0.92 and patients being 'very satisfied or satisfied' after THA ($P \leq 0.004$). The mean postoperative LLD was 3.8 mm (range, 24.5 mm short - 36.6mm long); however, postoperative LLD was NOT a predictor of PROMs ($P \geq 0.167$) with statistical power $\geq 87\%$.

CONCLUSION: Study results demonstrated that replicating native center of rotation and optimizing femoral offset were associated with clinically significant improvements in PROMs. Interestingly, in this large cohort leg length inequality was not associated with PROMs. Further research is warranted on THA component position including spinopelvic parameters and PROMs.

GLP-1 Agonist Use is an independent Risk Factor for All-Cause Readmission After Primary THA and TKA

Paper 035

Sarah T. Levey, M.D. / Fishers, IN

Co-Authors:

Sarah T. Levey, M.D. / Indianapolis, IN

Kevin A. Sonn, M.D. / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

Evan R. Deckard, B.S.E / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Glucagon-like peptide-1 (GLP-1) agonists are novel medications first introduced for diabetes management that have recently been popularized for weight loss. However, there is limited data regarding their effect on complications following total hip (THA) and total knee arthroplasty (TKA). This study evaluated readmission rates after THA and TKA in diabetic patients on and those not on GLP-1 agonists with a body mass index (BMI) ≥ 35 .

METHODS: A retrospective review of 1,841 patients who underwent primary THA or TKA at a suburban academic institution was performed. Robust perioperative optimization was performed for all patients by an internal medicine specialist focusing exclusively on arthroplasty patients. Manual chart review of clinical data, use of GLP-1 agonists; and complications and readmissions within 90-days was performed. Univariate and multivariate analyses were performed with $p > 0.05$ indicating statistical significance.

RESULTS: GLP-1 agonists were used in 3.6% (67 of 1,841) of patients and all-cause 90-day readmission rate was 4.3% (80 of 1,841). 9.0% (N=166) of patients had diabetes and a BMI ≥ 35 , and covariates of those taking GLP-1 agonist did not differ compared to patients not taking it ($P \geq 0.087$). GLP-1 agonist use was associated with a significantly higher 90-day readmission rate (10.3 vs. 1.6%, $P = 0.028$). In multivariate analysis, independent risk factors for readmission within 90-days were GLP-1 agonist use (odds ratio [OR] 5.2) and inflammatory arthritis (OR 6.3) with numbers available. Area under the receiver operating characteristic curve was 0.785.

CONCLUSION: Study results show the use of GLP-1 agonists may be associated with an increased risk of readmission within 90-days of THA and TKA for patients who have diabetes and BMI > 35 . These results contradict the limited database studies reporting lower readmission rates for patients taking GLP-1 agonists, warranting further study.

Closed incision Negative Pressure-Therapy Does Not Decrease Wound Complications Following Revision Total Hip Arthroplasty: A Randomized Controlled Trial

Paper 036

JaeWon Yang, M.D. / Chicago, IL

Co-Authors:

JaeWon Yang, M.D. / Chicago, IL

Alexander J. Acuna, M.D. / Chicago, IL

Anne DeBenedetti, M.S.c / Chicago, IL

Craig J. Della Valle, M.D. / Chicago, IL

Vasili Karas, M.D., M.S. / Chicago, IL

Brett R. Levine, M.D., M.S. / Chicago, IL

Tad L. Gerlinger, M.D. / Chicago, IL

Denis Nam, M.D. / Chicago, IL

INTRODUCTION: Wound complications following revision total hip arthroplasty (rTHA) are associated with an increased risk of superficial and deep infections. Closed incision negative-pressure therapy (ciNPT) has been reported to decrease wound complications. The purpose of this study was to assess if ciNPT decreases the rate of wound complications following rTHA versus a conventional, silver-impregnated dressing.

METHODS: This was a single center, randomized controlled trial of patients undergoing both aseptic and septic rTHA. Patients received either ciNPT or a silver-impregnated dressing (control) for 7 days. Minimum follow-up was 90 days. Wound complications during these 90 days were recorded, including: surgical site infection (SSI), periprosthetic joint infection (PJI), prolonged drainage > 5 days, superficial wound healing delay treated with antibiotics, and hematoma formation.

RESULTS: Between 2017 and 2024, 200 patients were enrolled: 105 (52.5%) ciNPT and 95 (47.5%) control. Four (2.0%) patients were excluded as they were lost to follow-up. There were no differences in patient demographics, operative approach, wound closure method, intraoperative estimated blood loss, or postoperative anticoagulation ($p=0.10-1.0$). Two (1.0%) revisions were performed via a lateral approach; all others were performed via a posterior approach. Twelve patients in both the ciNPT (11.7%) and control (12.9%) cohorts sustained a wound complication ($p=0.95$). There was no difference in the type of wound complications observed ($p=1.0$). Four (3.9%) patients in the ciNPT cohort underwent re-operation for wound-related complications (2 PJI, 1 SSI, 1 prolonged drainage) versus 1 (1.1%) in the control cohort (1 PJI) ($p=0.37$).

CONCLUSION: Prior smaller, non-randomized studies have shown ciNPT to be effective in decreasing the rate of wound complications. This randomized controlled study found no differences in wound complications or reoperations performed for wound-related etiologies in rTHA patients. Further research is required to evaluate the potential clinical advantages of ciNPT to justify their increased cost compared to conventional dressings.

Long-Term Outcomes of Total Hip Arthroplasty with Subtrochanteric Osteotomy for Crowe IV Dysplasia

Paper 037

Joshua R. Labott, M.D. / Rochester, MN

Co-Authors:

Anthony C.-J. DeNovio, M.D. / Rochester, MN

Joshua R. Labott, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Robert T. Trousdale, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

OBJECTIVE: Cementless total hip arthroplasty (THA) with subtrochanteric shortening osteotomy (SSO) is a well-established treatment for Crowe IV developmental dysplasia of the hip (DDH). However, series to date are limited by mid-term follow-up. The purpose of this study was to evaluate the long-term implant survivorship, radiographic results, and clinical outcomes of our previously published series.

METHODS: We retrospectively reviewed 28 hips (22 patients) that underwent cementless THA with SSO for Crowe IV DDH between 1992 – 2005 using our institutional total joint registry. The mean age at the time of THA was 48 years, 77% were female and the mean BMI was 27 kg/m². Since the original study, 5 patients died including a patient with bilateral THAs, 5 hips were revised, 2 withdrew from the study, and 1 was lost to follow-up. As such, 14 hips were available for follow-up at a mean of 18 years (range, 12 – 28 years). Kaplan-Meier survivorship curves were calculated, radiographs were reviewed, and clinical outcomes were evaluated via Harris hip score (HHS).

RESULTS: Survivorship free of any revision was 79% at 20 years. There were 5 revisions including 2 for aseptic loosening of the femoral stem at 10 months and 2 years, 1 for stem fracture at 1.8 years, 1 for aseptic loosening of the acetabular component at 1 year, and 1 for polyethylene liner dissociation at 6 years. There were no new revisions or reoperations after 6 years. All unrevised hips were radiographically well-fixed at most recent follow-up. The mean HHS was 73 at a mean of 15 years, which decreased from 86 at 10 years ($p < 0.001$).

CONCLUSIONS: Cementless THA with SSO for Crowe IV DDH provides excellent implant survivorship with durable fixation and reliable clinical outcomes at long-term follow-up. In this series, femoral aseptic loosening was rare.

Patients with Posterior Total Hip Arthroplasty on One Side and Anterior Total Hip Arthroplasty on the Other: Which Approach Do They Prefer and Why?

Paper 038

Matthew T. Weintraub, M.D. / Rochester, MN

Co-Authors:

Matthew T. Weintraub, M.D. / Rochester, MN

Harold I. Salmons, M. D. / Rochester, MN

Michael J. Taunton, M.D. / Rochester, MN

Robert T. Trousdale, M.D. / Rochester, MN

OBJECTIVE: While direct anterior approach (DAA) total hip arthroplasty (THA) may provide improved early outcomes vs. posterior approach (PA), there are no clear differences in long-term objective outcomes. Studies evaluating subjective outcomes are lacking. This study sought to identify motivations for pursuing DAA, report whether preoperative expectations were met, and compare subjective postoperative experiences between approaches.

METHODS: A 22-question survey was administered to 33 patients who underwent primary PA THA by a PA-only surgeon, then contralateral primary DAA THA by a different surgeon between 2003-2023 at a single institution. Subjective outcomes were evaluated in patients with objectively successful THAs (exclusion criteria included major postoperative complications). Mean time between PA and DAA to survey was 12 and 5 years, respectively. Seventeen (51.5%) patients requested contralateral DAA because they expected improved outcomes vs. PA, while 16 (48.5%) patients underwent DAA for scheduling reasons. Mean satisfaction was not different between approaches ($P=0.12$).

RESULTS: Twenty-eight (84.8%) patients preferred DAA. There were no dislocations, infections, or reoperations after either approach. Five patients preferring PA reported the following in their DAA hip: anterior groin pain ($n=2$), lateral femoral cutaneous nerve hyperalgesia ($n=1$), delayed wound healing/less subjective stability ($n=1$), lower satisfaction ($n=1$). More patients reported faster recovery after DAA vs. PA ($n=26$ [78.8%] vs. $n=1$ [3.0%]); six (18.2%) patients reported no difference. More patients reported less pain after DAA vs. PA ($n=17$ [51.5%] vs. $n=3$ [9.1%]); 13 (39.4%) patients reported no difference. Of the 17 patients requesting DAA, 100% had preoperative expectations met and 88.2% (15 patients) recommended DAA. Forgotten joint score (FJS) was not different between approaches ($P=0.29$).

CONCLUSIONS: Of those that requested DAA, 88% recommended DAA over PA, although FJS was equivalent. Postoperative recovery time appeared to be valued by patients and may have influenced satisfaction, perceived outcomes, and motivation to request a new surgeon.

Patient-Reported Outcome Measure (PROM) Collection per CMS Mandatory Requirements Remains Difficult Despite the Resources of a Multicenter Academic Institution

Paper 039

Alexander Driessche / Detroit, MI

Co-Authors:

Hamza Raja, B.S. / Detroit, MI

Alexander Driessche, M.S.E / Detroit, MI

Phillip C. McKegg, M.S. / Detroit, MI

Trevor North, M.D. / Detroit, MI

Michael A. Charters, M.D. / Detroit, MI

OBJECTIVE: The Centers for Medicare and Medicaid Services (CMS) begins a mandatory requirement to report patient-reported outcome measures (PROMs) for inpatient hip and knee arthroplasty procedures on 7/1/2024, comprising of a 0-90 day preoperative score and a 300-425 day postoperative score. The requirement urges collection of preoperative and postoperative PROMs for at least 50% of all the fee-for-service part A claims, including non-orthopedic claims. Our institution has collected PROMs as required by Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) since 2018 and as a department since June 2020. This study analyzes the success rates of collection of the CMS-required PROMs at multicenter academic institution committed to collecting PROMs.

METHODS: Patients who underwent total knee arthroplasty (TKA) or total hip arthroplasty (THA) were identified, and data was retrospectively collected from MARCQI over a two-year period (2021-2022) at a multicenter academic institution. PROMs, comprising of a KOOS-JR (Knee injury and Osteoarthritis Outcome Score-Joint Replacement) score for TKA and a HOOS-JR (Hip disability and Osteoarthritis Outcome Score-Joint Replacement) score for THA, were extracted from the electronic medical record. The intervals for PROMs collection were defined per the CMS requirement of 0-90 days preoperative and several postoperative periods including: 0-30 days, 31-120 days, 121-299 days, and 300-425 days. Analysis included counts and percentages of cases with completed PROMs for both the TKA and THA groups across these intervals, assessing trends over time.

RESULTS:

TKA: In 2021, there were 1,460 TKA cases, with 306 patients (21.0%) meeting the CMS requirement by completing both a 0-90 day preoperative and 300-425 day postoperative PROMs. In 2022, the number of TKA cases increased to 1,654 TKAs, with 531 (32.1%) patients meeting the requirement.

THA: In 2021, there were 901 THA cases, with 150 (16.6%) patients meeting the CMS requirement by completing both a 0-90 day preoperative and 300-425 day postoperative PROMs. In 2022, the number of THA cases increased to 1,049 THAs, with 336 (32.0%) patients meeting requirement.

Collection of PROMs decreases throughout the postoperative period.

CONCLUSION: Despite the resources committed to PROMs collection by our multicenter academic institution, we have been unable to meet the 50% PROMs collection requirement set by CMS. PROM collection rates decrease throughout the entire postoperative period.

Prior Hip Arthroscopy Impacts Long-Term Outcomes of Total Hip Arthroplasty: A Propensity-Matched Study with a Minimum 10-Year Follow-Up

Paper 040

Roger Quesada-Jimenez, M.D. / Chicago, IL

Co-Authors:

Benjamin G. Domb, M.D. / Des Plaines, IL

Elizabeth G. Walsh, B.S. / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Tyler R. McCarroll, M.D. / Des Plaines, IL

Drashti Sikligar, MEng / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

BACKGROUND: Previous hip arthroscopy may influence the outcomes of subsequent total hip arthroplasty (THA). The objective of this study is to perform a long-term comparative analysis of patients who underwent THA with a history of previous ipsilateral hip arthroscopy (PA) to a benchmark matched control group of primary THA with no prior hip arthroscopy (NPA).

METHODS: Data was retrospectively analyzed from patients who underwent primary THA between 2010 and 2013. Patients included had completed postoperative patient reported outcomes (PRO) and visual analog scale (VAS) pain scale with a minimum 10-year follow-up. PA patients were matched in a 1:1 ratio based on age at the THA, body mass index (BMI), sex, adjuvant technology, approach, and laterality to a benchmark control group of NPA patients. Clinically meaningful thresholds, complications, and revision surgery rates were compared between cohorts. A Kaplan-Meier analysis was performed to assess survivorship.

RESULTS: A total of 108 patients were included in the study. The groups displayed comparable and sustainable mean values at minimum 10-year follow up, for modified Harris Hip Score (mHHS), Harris Hip Score (HHS), Hip dysfunction and Osteoarthritis Outcome Score for Joint Replacement (HOOS-JR), Forgotten Joint Score (FJS), VAS, and patient satisfaction ($p > 0.05$). The two groups reached PASS for FJS, HHS, and HOOS-JR at similar rates ($p > 0.05$). PA patients exhibited a higher complication rate, with a relative risk of 2.8 ($P < 0.05$), as well as an elevated risk for revision surgery, with a relative risk of 4.5 ($P < 0.05$).

CONCLUSION: Patients in the PA group showed comparable and sustainable functional outcomes, displayed high patient satisfaction, and favorable FJS scores compared to the benchmark control group at long-term follow-up. However, it is crucial to highlight those individuals with prior hip arthroscopy exhibited a 2.8-fold increased risk of developing complications and a 4.5-fold higher risk of undergoing revision THA.

Surgical Site Fat Thickness is Better Associated with Postoperative Wound and Infection-Related Complications than Body Mass Index Following Total Hip Arthroplasty

Paper 041

Bryant M. Song, M.D. / St. Louis, MO

Co-Authors:

Bryant M. Song, M.D. / St. Louis, MO

Syed Adil, M.D. / St. Louis, MO

Andrew Schneider, M.D. / St. Louis, MO

Ilya Bendich, M.D. / St. Louis, MO

INTRODUCTION: Body Mass Index (BMI) is widely utilized to counsel patients on complication risk following total hip arthroplasty (THA). However, BMI is unable to account for fat distribution. The existing literature is sparse regarding the effect of surgical site fat distribution on perioperative risk in THA. The purpose of the present study is to compare the association of BMI and surgical site fat thickness with acute postoperative complications following THA.

METHODS: A retrospective review of 167 consecutive posterior approach robotic-arm assisted THAs for osteoarthritis between 05/2022-05/2024 at single, academic institution was performed. Demographics were collected. Computed Tomography (CT) scans were available for all cases. On the axial CT, at the level of the vastus ridge of the operative side, the fat thickness from fascia to skin was measured in millimeters (mm). Chart review was performed for perioperative variables and acute (within 90-days postoperatively) surgical complications, reoperations, and revisions. T-tests, multivariate regression, and receiver operating characteristic (ROC) curve analyses were performed.

RESULTS: Mean BMI was 33.1 kg/m^2 (range: 18.9-44.3); mean fat thickness was 52.7mm (range: 8mm-99mm). Within first 90-days, there 15 (9%) complications, all of which were wound or infection-related. Seven (4.2%) were managed with reoperation; eight (4.8%) were managed nonoperatively. Of the reoperations, four (2.4%) underwent debridement, antibiotics, implant retention (DAIR) and three (1.8%) had superficial incision and drainage. There were no revisions. On univariate analysis, fat thickness was associated with complication ($p < 0.001$), reoperation ($p = 0.002$), and DAIR ($p = 0.022$); BMI was associated with complications ($p < 0.02$), however was not associated with reoperations or DAIR ($p > 0.05$ for both). On multivariate analysis, fat thickness was associated with complications ($p = 0.03$, OR 1.08) and reoperations ($p = 0.04$, OR 1.05), while BMI was not ($p > 0.05$) Area under curve (AUC) for fat thickness was 0.72 (cutoff 51.5mm) and 0.80 (cutoff 64.5mm) for complication and reoperation, respectively.

CONCLUSION: Compared to BMI, surgical site fat thickness is better associated with postoperative wound and infection-related complications following THA and may be a more reliable measure used to counsel patients on acute postoperative complication risk.

Defining Patient-Acceptable Symptom State for HHS, mHHS, FJS, HOOS-JR in Total Hip Arthroplasty at 10 Years

Paper 042

Elizabeth G. Walsh, B.S. / Chicago, IL

Co-Authors:

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Elizabeth G. Walsh, B.S. / Des Plaines, IL

Andrew R. Schab, B.S. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

INTRODUCTION: Clinimetric outcome thresholds have been used to provide insight into postoperative functional status and patient satisfaction in total hip arthroplasty (THA) specific patient reported outcome measures (PROM), as statistical improvement does not necessarily equate to clinical benefit. The aim of this study was to define and evaluate patient acceptable symptomatic state (PASS) at the 10-year follow-up timepoint for modified Harris Hip Score (mHHS), Harris Hip Score (HHS), Forgotten Joint Score (FJS), and Hip Disability and Osteoarthritis Outcome Score – Joint Replacement (HOOS-JR).

METHODS: Prospectively collected data was retrospectively reviewed for all patients who underwent primary THA between 2008 and 2015. Patients were included in the study if they had complete PROMs with anchor questions at the 10-year timepoint. The PASS thresholds were then defined using the anchor-based method for mHHS, HHS, FJS, and HOOS-JR.

RESULTS: A total of 176 hips were included in the study, with 101 female patients (57.4%). The average age, body mass index, and follow up time were 58.1 ± 8.2 years, 29.4 ± 5.1 kg/m², and 124.9 ± 6.9 months. Area under the curves were as follows: mHHS 0.870, HHS 0.870, FJS 0.709, and HOOS-JR 0.873; indicated acceptable to excellent discrimination for all defined thresholds. The threshold for achieving PASS were as follows: mHHS 79.5, HHS 81.345, FJS 76.042, and HOOS-JR 75.124.

CONCLUSION: This study provides PASS, an important clinical threshold, for mHHS, HHS, FJS, and HOOS-JR at the 10-year timepoint following primary THA.

Contemporary Cup-Cage Constructs for Major Acetabular Defects

Paper 043

Brett R. Bukowski, M.D. / Rochester, MN

Co-Authors:

Mark Wu, M.D. / Rochester, MN

Brett R. Bukowski, M.D. / Rochester, MN

Joel A. Hickman / Rochester, MN

Cory G. Couch, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

David G. Lewallen, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

OBJECTIVE: Major acetabular defects such as pelvic discontinuities pose a challenge in revision total hip arthroplasty and may require use of a cup-cage reconstruction. Given the limited outcome data on cup-cage constructs, and even less with “half” cup-cage constructs, we analyzed contemporary outcomes of patients treated with these reconstructions.

METHODS: We reviewed 64 cup-cage constructs in 62 patients performed between 2012 – 2021 at a single institution. There were 6 full cup-cage and 58 half cup-cage constructs. The mean age was 67 years, 70% were female, and the mean BMI was 32 kg/m². Indication for surgery was aseptic loosening in 81% and reimplantation after periprosthetic joint infection (PJI) in 14%. Paprosky acetabular bone loss was 3B in 73%, 3A in 19% and 2B/2C in 8%. Sixty-seven percent had an associated pelvic discontinuity. Acetabular distraction technique was used in 33%. Mean follow-up was 3 years.

RESULTS: The 5-year survivorship free of aseptic cup-cage revision, any re-revision, and any reoperation were 89%, 75%, and 73%, respectively. Of the 15 who underwent any re-revision, 13 were aseptic, including 6 for aseptic acetabular loosening and 5 for instability. Two patients developed PJI at final follow-up and 50% of these had a PJI history. Older patients (HR 0.95, p=0.02) and those with higher Charlson Comorbidity Index (HR 0.52, p=0.007) had decreased risk of aseptic cup-cage revision. On radiographic review, 88% healed their discontinuity. Re-revision and reoperation rates did not vary between subgroups (p>0.05).

CONCLUSIONS: In patients with massive acetabular bone loss (including pelvic discontinuity in 2/3rds), cup-cage constructs with selective use of acetabular distraction resulted in a 5-year survivorship free of aseptic cup-cage revision of 89%. Older age and higher comorbidity score were associated with a lower risk of aseptic cup-cage revision.

Influence of Graft Choice on Return to Sport Following Primary Anterior Cruciate Ligament (ACL) Reconstruction in Athletes

Paper 044

Elle M. McCormick, BBA / Iowa City, IA

Co-Authors:

Elle M. McCormick, BBA / Iowa City, IA

Kyle R. Duchman, M.D. / Iowa City, IA

Qiang An, MBBS, MPH / Iowa City, IA

Natalie A. Glass, Ph.D. / Iowa City, IA

Yumeng Gao, M.S. / Iowa City, IA

Kyle Geiger, M.D. / Iowa City, IA

Jeffrey Fleming, DPT, OCS, ATC, CSCS / Iowa City, IA

Steven Leary, M.D. / Iowa City, IA

Robert Westermann, M.D. / Iowa City, IA

BACKGROUND: Anterior Cruciate Ligament (ACL) injuries commonly occur in athletes. ACL reconstruction following ACL injury can predictably allow athletes to return to sport. However, time to return to sport can be variable and dependent on a variety of patient and surgical factors.

PURPOSE: To evaluate the impact of hamstring tendon (HT), quadriceps tendon (QT), and bone-patellar tendon-bone (BPTB) autograft choice on return to sport (RTS) data for athletes following primary ACL reconstruction.

METHODS: Recreational and competitive athletes ages 13-24 from 2010-2022 undergoing primary ACL reconstruction were included in the study. Sport, age, activity level, graft type, RTS rates, RTS clearance time, reinjury rates, among other variables were collected. HT autografts were used as the reference. Kruskal-Wallis and Wilcoxon rank sum tests with Bonferroni correction were used for continuous variables. Chi-square statistics were used for categorical variables. Statistical significance was set to $p < 0.05$.

RESULTS: HT athletes were cleared at 25.4 weeks postoperatively while BPTB and QT athletes were cleared at 41.1 and 37.6 weeks, respectively ($p < 0.001$). Of 55 HT athletes, 53 (96.4%) returned to competition. 43 of 43 (100%) of BPTB athletes and 22 of 22 (100%) of QT athletes returned to competition. 34 of 88 (38.6%) of HT autografts, 8 of 83 (9.6%) BPTB autografts, and 3 of 28 (10.7%) QT autografts had a subsequent ACL graft failure ($p < 0.001$).

CONCLUSIONS: Hamstring tendon autograft patients on average were cleared sooner and were more likely to suffer an ACL graft tear compared to BPTB or QT patients. However, all three graft choices demonstrated similar return to sport rates. Regardless of graft type, delaying return to sport may decrease ACL retear rates. This study is important for shared decision-making between orthopedic surgeons and athletes when determining the optimal, patient-specific graft for ACL reconstruction.

Increased and Earlier Progression to Total Knee Arthroplasty but Noninferior Anterior Cruciate Ligament Reconstruction Graft Survival in Patients with Systemic Inflammatory Disease: A Propensity Matched Cohort Study

Paper 045

Xuankang Pan, B.S. / Rochester, MN

Co-Authors:

Xuankang Pan, B.S. / Rochester, MN

Allen S. Wang, M.D. / Rochester, MN

Quinn J. Johnson, M.D. / Rochester, MN

Sean C. Clark, M.S. / Rochester, MN

Christopher L. Camp, M.D. / Rochester, MN

Kelechi R. Okoroha, M.D. / Rochester, MN

Daniel B.F. Saris, M.D., Ph.D. / Rochester, MN

Adam J. Tagliero, M.D. / Rochester, MN

Mario Hevesi, M.D. Ph.D. / Rochester, MN

Aaron J. Krych, M.D. / Rochester, MN

OBJECTIVE: Anterior Cruciate Ligament Reconstruction (ACLR) is one of the most common orthopedic procedures and one of the most well studied. Despite extensive research dedicated to ACLR, there is limited understanding of how chronic inflammatory systemic diseases (CIDs) such as rheumatoid arthritis and systemic lupus erythematosus affect outcomes. Thus, the purpose was to compare the outcomes of ACLR in a cohort of patients with CID to a cohort of noninflammatory patients.

METHODS: A retrospective query of a regional database for all patients who underwent ACLR from 1990-2021 for traumatic ACL rupture was conducted. All patients with CID were identified and subsequently propensity matched to noninflammatory patients in a 1:4 ratio. Baseline characteristics and clinical outcomes were identified through retrospective chart review, and eligible patients were contacted for subjective outcomes.

RESULTS: A total of 30 ACLR patients with a diagnosis of CID were identified and propensity matched to 120 noninflammatory patients. Baseline demographic and surgical characteristics demonstrated no statistical differences. The CID cohort demonstrated a higher arthrofibrosis rate (16.7% vs. 4.3%, $p = 0.031$), higher osteoarthritis rate (33.3% vs. 16.7%, $p = 0.041$), higher TKA rate (16.7% vs. 3.3%, $p = 0.016$), and earlier time to TKA (14.7 years vs. 23.5 years, $p = 0.032$). Knee range of motion (ROM), infection rate, retear rate, time to retear, and time to osteoarthritis were not statistically different between the two cohorts. The CID cohort demonstrated higher VAS pain scores (mean 2.00 vs 1.20, $p = 0.043$) but there were no differences in pre-injury Tegner, postoperative Tegner, change in Tegner, or IKDC scores. The CID cohort demonstrated a hazard ratio (HR) for retear of 1.43 (95% confidence interval [CI] 0.46-4.51; $p = 0.537$). The CID cohort demonstrated an HR for TKA of 3.94 (95% CI 1.05-14.8; $p = 0.042$).

CONCLUSIONS: CID significantly increases the risk for arthrofibrosis, osteoarthritis, and TKA in those undergoing ACLR. Patients with CID also undergo TKA significantly sooner than noninflammatory counterparts. Notably, the majority of PROMs are no worse in patients who have a CID diagnosis. Thus, ACLR constructs themselves may not necessarily fare worse in CID patients. Nonetheless, these patients need to be cautiously counseled on the clinical outlook following their ACLR.

Impact of Utilizing a Nerve Block in Quadriceps Tendon Autograft ACL Reconstruction on Six-Month Return-to-Sport Strength Testing

Paper 046

Seth M. Borchard, MHA / Iowa City, IA

Co-Authors:

Seth M. Borchard, MHA / Iowa City, IA

Nicholas J. Pitcher, B.S. / Iowa City, IA

Elle M McCormick, BBA / Iowa City, IA

Robert W. Westermann, M.D. / Iowa City, IA

OBJECTIVE: Existing research on ACL reconstruction involving patellar tendon (BTB) and hamstring autografts indicate a link between nerve blocks and decreased functional strength at six months in return-to-sport (RTS) testing. There has been a growing usage of quadriceps tendon (QT) grafts in ACL reconstruction in recent years with studies showing increased hamstring stability and improved graft durability, while the effect of nerve blocks on postoperative muscle strength is unknown. This research aimed to compare RTS muscle strength testing in athletes six months following a quadriceps tendon ACL reconstruction performed with or without a nerve block.

METHODS: This was a retrospective analysis of RTS strength testing in competitive or recreational athletes who had a QT ACL reconstruction at a Midwest academic referral center. There were 182 participants ranging from 12 to 29 years of age with a mean age of 16.9 years old. Patients were stratified into two groups based on whether they received an intraoperative nerve (adductor canal) block. Relevant tests performed during RTS testing included isokinetic quadriceps and hamstring strength (ISOK) in addition to limb symmetry and self-reported psychological readiness. Most patients underwent multiple RTS tests; for this study we used the data from their initial test typically done in the six months postoperative timeframe.

RESULTS: 43 patients had an intraoperative nerve block, while 139 did not have a block. There were no statistically significant differences in quadriceps or hamstring strength when comparing the median scores of the nerve block and no-block groups across the major quantitative categories of isokinetic muscle strength or limb symmetry. Isokinetic quadriceps strength performed at 60 degrees/second showed a marginally significant increase in no-block patients though this was not seen when tested at 300 degrees/second.

CONCLUSIONS: No significant differences in functional strength testing at six months were seen in ACL reconstruction involving quadriceps tendon grafts based on block status. There is marginally significant data indicating that there may be increased quadriceps strength at 60 degrees/second for patients not receiving a block. This research strengthens the case for leveraging an adductor canal block in QT ACL reconstruction involving young athletes as an effective tool for pain management without compromising muscle strength or RTS readiness.

Revision Anterior Cruciate Ligament Reconstruction: Reasons for Failure

Paper 047

Tarik A. Taoufik, B.S. / Columbus, OH

Co-Authors:

Tarik A. Taoufik, B.S. / Columbus, OH

Robert A. Magnussen, M.D., M.P.H. / Columbus, OH

David C. Flanigan, M.D. / Columbus, OH

Parker A. Cavendish, M.D. / Columbus, OH

Eric M. Milliron, M.D. / Columbus, OH

James C. Kirven, M.D. / Columbus, OH

Noah T. Mallory, M.D. / Columbus, OH

OBJECTIVE: The reasons for failure of revision anterior cruciate ligament (ACL) reconstruction are not as well studied as those for primary ACL reconstruction, where technical error has been identified as the most frequent cause of failure. The purpose of this study was to evaluate reasons for failure of revision ACL reconstructions and explore patient specific factors that contribute to failure risk.

METHODS: A retrospective chart review was performed of patients who underwent revision ACL reconstruction at an academic medical center from 1993 to 2021. Within this cohort, the patients who sustained failure of revision ACL were identified. Causes of failure were determined using the patient's history, physical evaluation, radiographs, and arthroscopic evaluation. Primary failure modes were categorized as technical error, trauma, biological failure, or a combination of these. Patient demographics (age, sex, and BMI), previous ACL reconstruction methods, associated injuries, and previous graft choices were recorded. Posterior tibial slope was calculated using lateral knee radiographs for all patients. The percentage of patients in each mode of failure that had an outlier tibial slope ($\geq 12^\circ$) was identified.

RESULTS: Four hundred sixty-nine patients who underwent revision ACL reconstruction were identified. Thirty-five (7.5%) patients (median age, 35 years; 57% Male; mean BMI, 28.7 kg/m^2) experienced subsequent failure. Thirty-two (91%) patients decided to undergo a re-revision ACL reconstruction and three patients (9%) did not. The mode of failure was technical error (20%), trauma (51%), biological failure (0%), and combination (29%). The graft present at failure was 54% allograft, 37% autograft, and 9% hybrid (autograft and allograft combination). Associated injuries were found in 31 (89%) patients. Twenty-three (66%) patients had an outlier tibial slope ($\geq 12^\circ$) and twelve (34%) patients did not. The patients with an outlier tibial slope were further categorized: 5 (22%) patients' mode of failure was technical error, 12 (52%) patients' mode of failure was trauma, and 6 (23%) patients' mode of failure was a combination.

CONCLUSIONS: In contrast to prior work that has identified technical error among the most common causes of failure of primary ACL reconstruction, there is a low prevalence of technical error and a high prevalence of elevated tibial slope among patients who experience revision ACL reconstruction failure.

Fewer Patients Over 40 Years Old Met Minimal Clinically Important Difference After ACL Reconstruction

Paper 048

Jhamal Wallace, B.S. / Detroit, MI

Co-Authors:

Michael A. Gaudiani, M.D. / Detroit, MI

Joshua P. Castle, M.D. / Detroit, MI

Brittaney Pratt, B.S / Detroit, MI

Carter Dunaway, B.S / Detroit, MI

Jhamal J. Wallace, B.S. / Detroit, MI

T. Sean Lynch, M.D. / Detroit, MI

Vasilios Moutzouros, M.D. / Detroit, MI

INTRODUCTION: Anterior cruciate ligament reconstruction (ACLR) has been increasing over the past couple decades particularly in patients over the age of 40 years. The purpose of this study is to compare the patient recorded outcomes and percentage achieving minimally clinical important difference (MCID) between ACLR patients over 40 years of age to those under 40 years utilizing Patient-Reported Outcome Measurement Information System (PROMIS) scores.

METHODS: This is a retrospective review of patients undergoing primary ACLR from one health system from 2020 to 2023. Patients excluded were revision ACLR, history of previous knee surgery, and multi-ligamentous knee injuries. Demographic data including age, sex, body mass index (BMI), race, ethnicity, smoking history, employment, and insurance type was collected from the electronic medical record (EMR). Patient-Reported Outcome Measurement Information System (PROMIS) scores for Physical Function (PROMIS-PF) and Pain Interference (PROMIS-PI) were collected preoperatively and at multiple postoperative time points. Percent achieving minimum clinically important difference (MCID) was calculated and compared between cohorts. Patients 40 years old and older (≥ 40) were compared to patients 39 years and younger (< 40).

RESULTS: A total of 398 patients were included with 53 patients ≥ 40 years old and 345 < 40 years old. Significantly more patients were female (62% vs 42%; $P = 0.0083$), current smokers (11% vs. 7%), longer time to presentation (6.9 [3.1, 12.9] weeks vs. 3.9 [2.6, 7.1]; $P = 0.0024$), and Hispanic or Latino (0% vs. 6.4%; $P = 0.0173$). Amongst patients ≥ 40 years old, significantly more hamstring and quad autografts and fewer bone tendon bone grafts were utilized compared to patients < 40 years old. No differences were found in preoperative PROMIS-PF, PROMIS-PI, and percentage meeting patient acceptable symptom state between cohorts. Significantly fewer patients ≥ 40 years old met MCID for PROMIS-PF at 3 months (13% vs. 39%; $P = 0.0022$) and 1 year (51% vs. 83%; $P = 0.0002$) postoperatively. No significant differences were found in proportion meeting MCID for PROMIS PI at 3 months, 6 months, and 1 year postoperative follow up.

CONCLUSION: Our study found fewer patients ≥ 40 years old met MCID for physical function at one year follow up compared to patients < 40 years. Patients ≥ 40 years old were more likely to be female, smokers, Hispanic or Latino, receive a soft tissue graft, and have a more chronic presentation. Excellent outcome scores were achieved in patients ≥ 40 years old using autografts.

Medial Meniscus Root Repair Failure: Is Age a Factor?

Paper 049

Alexandra C. Stevens, B.S. / Columbus, OH

Co-Authors:

Alexandra C. Stevens, B.S. / Columbus, OH

Parker Cavendish, M.D. / Columbus, OH

Eric Milliron, M.D. / Columbus, OH

James Kirven, M.D. / Columbus, OH

Noah Mallory, M.D. / Columbus, OH

David Flanigan, M.D. / Columbus, OH

Robert Magnussen, M.D., MPH / Columbus, OH

OBJECTIVE: Meniscus root tear repair has been shown to lead to better long-term outcomes when compared to partial meniscectomy. It is unknown; however, whether age at the time of repair influences outcomes. The purpose of this study was to determine whether older age groups had higher repair failure rates of medial meniscus root tears than younger groups.

METHODS: A retrospective review of patients who underwent medial meniscus root tear repair by four surgeons at one tertiary academic institution between 2012-2019 was performed. Patients were included if they were over 12 years of age and underwent medial meniscus root repair. Data were collected regarding patient demographics, surgical information (affected knee and concomitant procedures performed), and outcomes including repair failure (defined as surgeon statement of failure or repeat surgery to the same meniscus). The subsequent performance of unicompartmental arthroplasty (UKA) or total knee arthroplasty (TKA) was also recorded. Meniscus repair failure risk was calculated for patients based on age (by decade). Failure risk between groups was compared based on age greater or less than 60 years at the time of surgery.

RESULTS: 107 eligible patients were identified (62.6%% female, average age 49.0 ± 12.4 years). At average follow-up of 3.3 ± 2.3 years, known meniscus root repair failure occurred in 10 patients (9.3%). Inclusion of UKA or TKA increased the number of failures to 14 (13.1%) The risk of failure for patients greater than 60 years was 15.0% (3/20), whereas the risk for those younger than 60 was 8.0% (7/87), $p = 0.40$. When including patients who required UKA and TKA as failures, the failure risk for those 60 and older remained 15.0% (3/20) and increased to 12.6% (11/87) for those younger than 60 years ($p = 0.72$).

CONCLUSION: Both the rate of meniscus repair failure and the expanded rate including those requiring UKA/TKA were greater for patients older than 60 years. However, this difference was not found to be statistically significant in this underpowered study. Further study is warranted to increase the sample size as well as to assess whether outcomes including radiographic changes to the knee and patient reported outcome measures (PROMs) differ by age group.

Efficacy of Blood Flow Restriction Therapy After Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Paper 050

Derrick M. Knapik, M.D. / St. Louis, MO

Co-Authors:

Varun Gopinath, B.S. / St. Louis, MO

Jose R. Garcia, B.S. / Chicago, IL

Isabel K. Reid / Chicago, IL

Derrick M. Knapik, M.D. / St. Louis, MO

Nikhil N. Verma / Chicago, IL

Jorge Chahla, M.D. Ph.D. / Chicago, IL

OBJECTIVE: The purpose of this study is to perform a systematic review and meta-analysis of randomized controlled trials (RCTs) evaluating the efficacy of BFR after ACLR.

METHODS: A literature search was performed according to the 2020 Preferred Reporting Items for Systematic Reviews and Meta Analyses guidelines by querying PubMed, MEDLINE, Scopus, the Cochrane Database for Systematic Review, and the Cochrane Central Register for Controlled Trials databases from inception through December 2023 to identify RCTs evaluating outcomes of BFR training after ACLR compared to non-BFR rehabilitation. A meta-analysis was performed using random-effects models with standardized mean difference (SMD) for pain, muscle strength, muscle volume, while mean difference (MD) was used for standardized patient-reported outcome measures.

RESULTS: Eight RCTs, consisting of 245 patients, meeting inclusion criteria. 115 patients underwent non-BFR rehabilitation while 130 patients underwent BFR after ACLR. The mean patient age was 27.2 ± 6.7 years, and the majority of patients being male (63.3%, $n=138/218$). The length of the BFR rehabilitation protocol was most commonly between 8-12 weeks (range, 14 days – 16 weeks). The most common limb/arterial occlusion pressure in the BFR group at 80%. Time from surgery to beginning of the BFR protocol ranged from 2 days to 10 weeks. Compared to non-BFR rehabilitation, BFR resulted in significant improvement in isokinetic muscle strength (SMD: 0.77, $p=0.02$, I²: 58%), IKDC score (MD: 10.97, $p<.00001$, I²: 77%), and pain (SMD: 1.52, $p=.04$, I²: 87%), but not quadriceps muscle volume (SMD: 0.28, $p=0.43$, I²: 76%).

CONCLUSION: The primary findings from this study were that incorporation of BFR after ACLR was associated with improvements in isokinetic muscle strength, IKDC scores, and pain, when compared to non-BFR rehabilitation, with no significant difference in quadriceps muscle volume. High heterogeneity of BFR protocols exists among studies, and further research is necessary to develop standardized protocols for clinical use.

Is Posterior Tibial Slope a Predictor of Hamstring Autograft Failure in Primary ACLR

Paper 051

Michael D. Dubé, M.D. / Southfield, MI

Co-Authors:

Michael D. Dubé, M.D. / Southfield, MI

Lafi S. Khalil, M.D. / Flint, MI

Connor Hoban, M.D. / Cleveland, OH

Sercan Yalcin, M.D. / Boston, MA

Mei Li, Ph.D. / Cleveland, OH

William Zaylor, Ph.D. / Cleveland, OH

Carl Winalski, M.D. / Cleveland, OH

Lutul Farrow, M.D. / Cleveland, OH

Kurt Spindler, M.D. / Weston, FL

BACKGROUND: An increasing interest among orthopedic surgeons is emerging in evaluating tibial slope as a risk factor for ACLR failure, with several studies reporting posterior tibial slope greater than 12 degrees may predict risk of ACLR graft rupture and be an indication for slope-reducing osteotomies in revision settings. The majority of these studies utilize clinical lateral radiographs, which have been shown in the literature to not be interchangeable with MRI and may even overestimate tibial slopes by 3-4 degrees compared to MRI.

METHODS: Prospective data was collected for patients undergoing primary ACLR from February 2015 to February 2018 within a single institution. The contribution of age, sex, BMI, MARX activity score, hamstring diameter, and medial and lateral tibial slope on graft failure and subsequent surgery was studied via mixed effect modeling and analyzed using multivariable linear regression. Two-year outcomes were collected. Tibial slope was measured utilizing the two-circle technique published by Hudek et al in 2009 in CORR.

RESULTS: There was 90.4% follow up at minimum 2 years, resulting in 376 patients with 332 independent knees having adequate MRIs for evaluation. Median age was 23, median BMI was 25.5, and mean medial and lateral tibial slopes were 6 degrees . A total of 58 patients (15.4%) had subsequent ipsilateral surgery and 27 patients (7.2%) had revision ACLR within 2 years . Multivariable model for ipsilateral subsequent surgery within 2 years demonstrated only decreasing age was predictive of ACL revision surgery and only increased baseline MARX score was predictive of any surgery . The correlation coefficient of medial and lateral tibial slopes was 0.96. Two standard deviations of this cohort had tibial slopes less than 12 degrees .

CONCLUSION: In patients with two-year follow-up after ACL reconstruction using hamstring autograft, age and baseline activity were the only predictive factors of graft failure and subsequent surgery. Medial and lateral tibial slopes were not independently predictive of ACL graft failure or subsequent surgery when controlling for other established patient characteristics. There is a high correlation between medial and lateral tibial slope measurements on MRI.

Adolescent Anterior Cruciate Ligament Revision Risk: Influence of Hamstring Autograft Diameter in Primary Reconstruction

Paper 052

Lauren Hyemee Han / Mason, OH

Co-Authors:

Lauren Hyemee Han / Columbus, OH

Teonna Sharpe / Columbus, OH

Tyler Barker, Ph.D. / Columbus, OH

Angela Pedroza, MPH / Columbus, OH

David Flanigan, M.D. / Columbus, OH

Christopher Kaeding, M.D. / Columbus, OH

James Kirven, M.D. / Columbus, OH

Parker Cavendish, M.D. / Columbus, OH

Eric Milliron, M.D. / Columbus, OH

Robert Magnussen, M.D. / Columbus, OH

OBJECTIVE: Anterior cruciate ligament reconstruction (ACLR) is often performed to restore knee function in athletes and active individuals. Reconstruction with larger diameter hamstring grafts has been shown in some studies to reduce revision risk compared to smaller hamstring grafts, but these results have been inconsistent. This study investigates the relationship between hamstring autograft diameter and ACL revision risks in adolescents.

METHODS: A retrospective chart review was conducted for adolescent patients (ages 13-19) who underwent primary ACLR with hamstring autograft from 2013 to 2022. Data on patient demographics (age, BMI, height, weight), graft diameter, concurrent procedures (meniscal treatment, chondroplasty), and subsequent revision surgery were obtained by chart review. A total of 471 patients were included in the analysis. ACL revision, the primary outcome, was tracked through in-network and external records. Patients were divided into two groups by graft diameter: <8.5 mm and ≥ 8.5 mm. Failure risk was compared between the two groups. Further independent analysis of male and female patients was also completed.

RESULTS: The overall revision risk was 9.8% (46/471 patients). No significant difference in revision risk was found between graft diameter groups <8.5 mm and ≥ 8.5 mm (9.3% vs 10.2%, $p=0.76$). There were no significant differences in other demographic or surgical factors between the two graft size groups. However, a longer mean follow-up time (1.7 ± 0.1 years) was noted in the <8.5 mm group when compared to the ≥ 8.5 mm group (1.4 ± 0.1 years) ($p=0.025$). Female revision risk was 9.9% for <8.5 mm and 7.5% for ≥ 8.5 mm grafts ($p=0.64$). Male revision risk was 8.4% for <8.5 mm and 11.8% for ≥ 8.5 mm grafts ($p=0.52$).

CONCLUSION: This study found no significant difference in ACL revision risks between different hamstring autograft diameter groups in adolescent patients.

Return to Sport After Osteochondral Allograft Transplantation: A Systematic Review and Meta-Analysis

Paper 053

Derrick M. Knapik, M.D. / St. Louis, MO

Co-Authors:

Daniel C. Touhey, M.D. / St. Louis, MO

Nikko D. Beady / Johnson City, TN

D. Sina Tartibi / Houston, TX

Robert H. Brophy, M.D. / St. Louis, MO

Matthew J. Matava, M.D. / St. Louis, MO

Matthew V. Smith, M.D. / St. Louis, MO

Derrick M. Knapik, M.D. / St. Louis, MO

OBJECTIVE: Osteochondral defects of the knee lead to pain, swelling, and an increased risk for early-onset osteoarthritis. Clinical management of osteochondral defects remains challenging due to the limited inherent vascularity and healing potential of articular cartilage. Osteochondral allograft transplantation (OCA) has been reported to yield satisfactory results in appropriately indicated patients, however, the impact of OCA on athletes seeking return to sport (RTS) remains largely unknown. The purpose of this study was to systematically review the literature to identify studies to better understand outcomes following OCA, focusing on the RTS rate, and the incidence of postoperative complications.

METHODS: Studies published in PubMed, EMBASE, and the Cochrane Library reporting on athletes participating at the recreational, high school, collegiate, and professional levels undergoing OCA for osteochondral defects in the knee from inception to April 2024 were identified. Inclusion criteria included studies reporting on patients identified as athletes undergoing OCA with a reported mechanism of injury, lesion characteristics (size, location) complications, reoperations, RTS rate, as well as any patient-reported outcomes.

RESULTS: A total of 14 studies, consisting of 371 athletes undergoing OCA with a weighted mean follow-up of 50.9 months, were identified. The weighted mean patient age was 31.4 years (range, 15 – 69 years), with 64% of patients being male. Lesion etiology was reported in 62% of patients ($n = 230/371$), with osteochondritis dissecans reported in 43% ($n = 100/230$) of patients. The medial femoral condyle was the most common defect location (42%, $n = 70/167$). Lesions ranged in size from 1 – 13.94 cm². A total of 20% of patients ($n = 75/371$) were classified as professional athletes, with the most commonly reported sport being basketball ($n = 26$). Complications were reported in 10% of patients ($n = 37/371$), with OCA graft failure accounting for 57% ($n=21/37$) of reported complications. RTS rates were reported in 77% of patients ($n = 284/371$), with 81% of patients ($n = 231/284$) returning at an equal or higher level of play at a weighted mean of 9.6 months following OCA.

CONCLUSIONS: For athletic patients undergoing OCA transplantation to the knee, osteochondritis dissecans is the most commonly reported etiology, with the medial femoral condyle being most commonly affected. Graft failure represents the most common complication, while a high rate of RTS is reported following OCA.

Multi-Ligament Knee Injuries in National Football League Athletes

Paper 054

Tyler Kallman, M.D. / Omaha, NE

Co-Authors:

Tyler Kallman, M.D / Omaha, NE

Elizbath Lyden, Ph.D. / Omaha, NE

Justin Greiner, M.D. / Omaha, NE

OBJECTIVE: This study aims to characterize the mechanism of multi-ligament knee injury (MLKI) sustained during an NFL game and the differences in injury mechanisms between different types of MLKI.

METHODS: A retrospective video analysis of official NFL game footage spanning 1997-2022 was performed. Players with MLKIs were identified and grouped into categories based on injury pattern (Group 1: ACL+MCL, Group 2: ACL+LCL or ACL+PCL, Group 3: ACL+MCL+PCL or ACL+LCL+PCL). Video analysis of the injury was performed using NFL+. Injuries were categorized based on the mechanism of contact (non-contact, indirect, or direct contact) while determining the hip, knee, and foot position at the time of injury. Player, game, and injury characteristics were collected for comparison.

RESULTS: 35 MLKIs were analyzed. MLKIs most frequently resulted from direct contact to the affected limb (80%), followed by indirect contact (14.3%). All three ligament injuries (100%) occurred from direct contact. The most common MLKI was Group 1 (65%), with Group 2 and Group 3 accounting for 20% and 15%, respectively. Quarterbacks and receivers were the most commonly injured positions (17.5% each). MLKIs occurred evenly throughout the season, all during dry weather. Significant differences were noted in the location of contact, and hip/knee positions by injury category.

CONCLUSIONS: Multi-ligament knee injuries in the NFL occur mostly from direct contact forces, often while a ball carrier is being tackled. Differences in hip and knee position were identified between MLKI categories. Combined ACL and MCL injury was the most common MLKI with knee flexion, valgus, and external rotation of the tibia.

Meniscus Root Repairs are More Likely to Fail with Concurrent Focal Medial Condyle Articular Cartilage Defects

Paper 055

Matthew D. Benson, B.A. / Park Rapids, MN

Co-Authors:

Matthew D. Benson, B.A. / Iowa City, IA

Austin C. Benson, M.D. / Iowa City, IA

Benjamin D. Packard, M.D. / Iowa City, IA

Steven M. Leary, M.D. / Iowa City, IA

Kyle R. Duchman, M.D. / Iowa City, IA

Brian R. Wolf, M.D. / Iowa City, IA

Robert W. Westermann, M.D. / Iowa City, IA

INTRODUCTION: The meniscus is a critical component of the knee. When injured, significant disability can result. Successful meniscus repair provides consistent improvement in knee function while also restoring the chondral protection within the joint. However, it remains unclear whether cartilage defects existing on the weight bearing surface of the knee cause isolated meniscus root repairs to have an increased failure rate. This study aims to identify whether cartilage defects existing on the weight bearing portion of the knee increase isolated meniscal root repair re-tear rates.

METHODS: We retrospectively reviewed meniscus repairs from 2012-2022 at the author's institution. Non-root repairs and cases with cartilage restoration, osteotomy, or other concurrent ligament repair or reconstruction were excluded. We analyzed a total of 66 isolated meniscus repairs (63 medial, 3 lateral) of which 49 (74.2%) had existing cartilage defects and 17 (25.8%) did not. Cartilage defects were defined as any abnormal finding in the condylar cartilage of the medial weight bearing compartment. Subsequent meniscectomy defined as reoperation (7.6%, 5/66) or clinical evidence of re-tear with MRI confirmation (9.1%, 6/66) were used to define failure rate (9.1%, 6/66) and classified as medial (100%, 6/6) or lateral (0%, 0/6). Subsequent total knee arthroplasty (TKA) on the ipsilateral knee (4.5%, 3/66) was also recorded. Fisher's two-tailed exact test was used to determine significance set to $p < 0.05$.

RESULTS: Isolated meniscus root repairs with an existing cartilage defect had a failure rate of 10.2% (5/49), reoperation rate of 8.2% (4/49), clinical re-tear rate of 10.2% (5/49), and subsequent TKA rate of 6.1% (3/49). Isolated meniscus root repairs without any cartilage defects had a failure rate of 5.9% (1/17), reoperation rate of 5.9% (1/17), clinical re-tear rate of 5.9% (1/17), and subsequent TKA rate of 0% (0/17). There was no significant difference in failure rate (10.2% vs. 5.9%, $p = 1.000$), reoperation rate (8.2% vs. 5.9%, $p = 1.000$), clinical re-tear rate (10.2% vs. 5.9%, $p = 1.000$), or subsequent TKA rate (6.1% vs. 0%, $p = 0.563$) with or without existing cartilage defects at the time of repair, respectively.

CONCLUSIONS: No statistically significant difference in isolated meniscal root repair failure, re-tear, reoperation, or subsequent TKA rates was found between repairs with or without existing cartilage defects. Further investigation of repaired meniscus root tears with articular cartilage defects is needed to help reduce failure rates.

How Successful are Meniscal Repair All-Inside Implants During Deployment?

Paper 056

Emma L. Flanigan / Columbus, OH

Co-Authors:

Emma L. Flanigan / Columbus, OH

Sonu (Kyle) Bae / Columbus, OH

Robert Magnussen, M.D. / Columbus, OH

Tyler Barker, Ph.D. / Columbus, OH

David C. Flanigan / Columbus, OH

OBJECTIVE: Meniscal tears are one of the most common knee injuries. Symptomatic tears are routinely treated by meniscectomies, which can lead to knee osteoarthritis, or by meniscal repairs that preserve the meniscus but potentially increase reoperation risk. An all-inside meniscus repair utilizes implants to fixate the meniscus at a higher cost than traditional inside out or outside in suturing technique. The success rate of these meniscal implants, however, is unknown. The purpose of this study was to determine the percentage of implants successfully deployed during arthroscopic all-inside repair.

METHODS: A data query of meniscus repair (CPT codes: 29882 and 29883) procedures was performed at a single institution. The query was limited to include procedures performed between June 1, 2020 and June 1, 2023. Multiple different manufacturer implants were used by 5 sports medicine fellowship trained orthopedic surgeons. The number of implants successfully used and number of implants wasted due to intraoperative failure during meniscal repair were found on EPIC and documented for each procedure. Success rate of meniscal implants was determined by dividing the number of implants wasted by the total amount of implants used.

RESULTS: The query identified 1026 patients that underwent meniscus repair. From this cohort, 3,867 total meniscal implants for an average of 3.77 implants per case. Overall, all inside meniscus repair was found to have a low implant failure or waste rate (1.03% [n = 40]). The highest failure rates were found with JuggerStitch™ Curved (9.38%), NOVOSTITCH™ Cartridge 0 Suture (2.44%), and TRUESPANTM 12 Degrees (2.11%) implants.

CONCLUSIONS: The most important finding was that the overall failure rate of meniscal implants is low. Implants with higher waste rates should be addressed by industry and considered by surgeons when selecting surgical implants. These preliminary findings establish the necessity to further examine implant failure rate and associated costs of meniscus repair.

Rigid Intramedullary Nailing of Adolescent Tibia Fractures: Less Angulation and Unplanned Implant Removal Rates with Equivalent Patient Reported Outcomes Compared to Flexible Intramedullary Nails

Paper 057

Ndéye F. Guissé, M.D. / Saint Louis, MO

Co-Authors:

Ndéye F. Guissé, M.D. / Saint Louis, MO

Daniel E. Pereira, M.D. / Saint Louis, MO

Pooya Hosseinzadeh, M.D. / Saint Louis, MO

Mark Miller, M.D. / Saint Louis, MO

J. Eric Gordon, M.D. / Saint Louis, MO

Zachary I. Meyer, M.D. / Saint Louis, MO

OBJECTIVE: Adolescent tibial shaft fractures may be treated with flexible or rigid intramedullary nails. Flexible intramedullary nails (FIN) avoid the proximal tibial physis but may provide inadequate stability for unstable fracture patterns. Rigid intramedullary nails (RIN) provide stable fixation; however insertion may injure the proximal tibial physis. The purpose of this study is to compare patient-reported outcomes, clinical outcomes, and skeletal maturity/age of adolescents aged 11-16 undergoing flexible and rigid intramedullary nailing of tibial shaft fractures.

METHODS: 11-16 year-old patients who underwent tibial intramedullary nailing at a pediatric level one trauma center between 2011 and 2021 were identified. Age, mechanism of injury, complications, angulation, operating room (OR) trips, and skeletal age were recorded. Skeletal age was determined utilizing the modified Fels scoring system. Patient-reported pain interference and mobility scores were collected utilizing the Patient Reported Outcome Measurement Information System (PROMIS) for all patients beginning in 2015.

RESULTS: 37 patients underwent FIN and 23 patients underwent RIN. Average age was greater in RIN patients (15.2 years vs 13.2 years, $p<.001$). Chronologic age did not differ from skeletal age in either group. 100% of RIN patients had partial or complete closure of the proximal tibial physis compared to 21.6% of FIN patients. Absolute coronal and sagittal angulation at final follow up were greater in the FIN group ($p=.049$, $p=.002$). Implant removal was more common in the FIN group than the RIN group (75% vs 13%, $p<.001$). There were 20 (54%) unplanned implant removals in the FIN group compared to 3 (13%) in the RIN group ($p=0.0015$). OR trips, complication rates, and time to weight bear did not differ significantly between groups. Subgroup analysis of only partially closed physes showed persistently increased skeletal age and decreased overall implant removal rates in the RIN group. There was no difference in unplanned implant removal rates, malunion, complications, or time to weightbearing. There was a not significant differences in PROMIS scores between groups at each visit

CONCLUSIONS: Rigid intramedullary nailing of tibial shaft fractures in adolescent patients provides equivalent patient-reported pain and mobility scores with potentially less angulation and unplanned implant removal rates compared to flexible intramedullary nailing. Additional studies are needed to determine the degree of skeletal maturity at which RIN can be performed without causing clinically significant physeal injury.

Classroom Comeback: Expectations for Post-Surgical AIS Patients and Their Families Regarding Return to Full School Days

Paper 058

Erica Olfson, M.S. / Fort Worth, TX

Co-Authors:

Anne Boeckmann, BESS / Fort Worth, TX

Erica Olfson, M.S. / Fort Worth, TX

Megan Johnson, M.D. / Dallas, TX

Amy McIntosh, M.D. / Dallas, TX

BACKGROUND: Patients with Adolescent Idiopathic Scoliosis (AIS) who undergo posterior spinal fusion miss significant time from school, sports, and other recreational activities. Literature exists on the impact of total levels fused on return to school time, but a gap exists when comparing the differences between AIS patients that underwent selective thoracic fusion (STF) vs. those fused into the lower lumbar spine. The aims of this study were twofold: 1) to compare the expected and actual timelines for returning to school as reported by patients and their families, and 2) to determine the duration until full-time return to school between scoliosis patients who underwent STF and those who did not.

METHODS: This IRB approved prospective study surveyed the parents of 89 patients who underwent PSF for AIS. The first survey, given at the preoperative appointment, collected data on school setting, homebound program usage, and expected school absence duration. The second survey, conducted postoperatively, recorded the actual return-to-school date.

RESULTS: 89 patients (mean age 14.21 ± 1.88 years; 73 females, 13 males) completed the preoperative survey. The cohort included patients with adolescent idiopathic scoliosis (AIS) ($n=75$), AIS-like conditions ($n=9$), and juvenile idiopathic scoliosis (JIS) ($n=2$). 79 attended public school, 5 attended private school, and 2 were homeschooled. Individuals reported an average expected school absence of 4.41 weeks, with a standard deviation of 2.08 weeks. Regarding awareness of the homebound program, 3 reported being unaware, 23 were unsure, 58 were aware, and 2 (homeschooled) replied "N/A." Of the 58 aware, 4 reported they were not going to use it, 4 were unsure, and 50 planned on using homebound. The average expected school absence was 4.37 weeks (SD 2.06). Out of 89 patients, 55 completed the postoperative survey, showing an average return-to-school time of 6.10 weeks. Among them, 31 had selective thoracic fusion and 24 had non-selective thoracic fusion. The average return time was 6.21 weeks for non-selective and 6.02 weeks for selective thoracic fusion.

CONCLUSION: The study findings demonstrated that patients who undergo PSF return to full in person school days an average of 6 weeks. Notably, 27.1% (23 out of 85) of the sample were unaware of the homebound program, indicating a need for better family education. Additionally, there was no statistical difference in return-to-school timelines between selective and non-selective thoracic fusion cohorts. This information is helpful to set realistic expectations and guide patients and their families during the recovery process.

Providence Brace Treatment in Juvenile Idiopathic Scoliosis (JIS)

Paper 059

Charles T. Cush, B.S. / Dayton, OH

Co-Authors:

Charles T. Cush, B.S. / Dayton OH

Joseph Stefko / Dayton, OH

Madelyn J. Hill, MPH / Dayton, OH

Shobhan Vachhrajani, Ph.D., M.D. / Dayton, OH

Michael C. Albert, M.D. / Dayton, OH

OBJECTIVE: The use of Providence brace orthoses in the treatment of juvenile idiopathic scoliosis (JIS) has seldom been explored; most literature is limited to adolescent idiopathic scoliosis (AIS). This study describes the outcomes of Providence bracing for treatment of JIS.

METHODS: Patients with JIS between ages 5-10 years treated with a Providence brace at a single institution between 2016-2020 were reviewed. Age, sex, duration of brace use, and self-reported hours of brace wear were examined. Curve progression was measured by primary curve magnitudes, as determined on x-ray between brace initiation and end of bracing. Primary outcomes were brace discontinuation by the treating physician or need for surgery. Descriptive analyses were employed.

RESULTS: The study included 44 patients with mean age of 8.8 (± 1.5) years at the time of bracing. The average major cobb angle magnitude at brace initiation was $28.0^\circ \pm 6.7^\circ$. The average length of brace wear for all patients was 33.0 ± 20.6 months. The majority of patients (54.5%) reported using the brace between 8-12 hours/night at first follow-up. Surgery was required in 18 (41%) patients, whereas 24 (54.5%) required no surgery, and 2 (4.5%) were lost to follow-up. One patient required a change from a Providence to a Boston style brace. Patients requiring surgical intervention were 8.8 (± 1.1) years old and those who completed bracing were 9.0 (± 1.7) years old at time of bracing. Surgical patients had an average major cobb angle magnitude of $30.9^\circ \pm 6.5^\circ$ at bracing, $54.0^\circ \pm 16.8^\circ$ at surgery, and $22.8^\circ \pm 8.2^\circ$ after surgery. Patients managed with bracing only had an average major cobb angle magnitude of $25.9^\circ \pm 7.0^\circ$ at bracing and $21.0^\circ \pm 12.9^\circ$ at final follow-up.

CONCLUSIONS: JIS with moderate curve magnitudes ($>25.0^\circ$) have a higher risk of progression due to the significant growth remaining. Although comparison of low-profile braces vs. nighttime braces exists in treatment of AIS, no such studies exist for JIS. This study demonstrates that nighttime bracing with the Providence brace was effective in preventing surgery in more than half of JIS patients followed to maturity. Regardless of study limitations it appears that patients with a higher cobb angle at presentation ($>31.0^\circ$) were more likely to progress to surgery despite bracing.

Perioperative Pathway for Spinal Fusion in Adolescent Idiopathic Scoliosis: A QI Project

Paper 060

Kenzie D. Lundqvist, M.D. / Akron, OH

Co-Authors:

Lorena V. Floccari, M.D. / Akron, OH

Michael Bigham, M.D. / Akron, OH

Matthew B. Holloway, M.D. / Akron, OH

Kenzie D. Lundqvist, M.D. / Akron, OH

Richard P. Steiner, Ph.D. / Akron, OH

Alexandria Rundell, B.S. / Akron, OH

Todd F. Ritzman, M.D. / Akron, OH

OBJECTIVE: Prior studies have shown that implementation of a rapid recovery pathway after posterior spinal fusion (PSF) for adolescent idiopathic scoliosis (AIS) can reduce LOS without increasing complications, but there is little evidence on the sustainability and longitudinal outcomes of these implementations. The purpose of this study was to establish and continually improve a perioperative pathway for AIS patients undergoing PSF.

METHODS: Implementation of the AIS care pathway at a single freestanding tertiary children's hospital was initiated in January 2016 and updated in September 2021. AIS patients who underwent PSF prior to 2016 were compared to patients post-implementation during Phase 1 (2016-August 2021) and Phase 2 (after September 2021). The AIS pathway involves preoperative optimization, standardized antibiotics, inpatient care, standardized bowel and pain regimen with early transition to oral pain medications, and early and frequent mobilization.

RESULTS: 436 AIS patients (86 pre-implementation, 257 Phase 1, 93 Phase 2) who underwent PSF were included. Baseline patient characteristics were similar, including age, gender, body mass index, and Cobb angles (all $p > 0.05$). The estimated blood loss decreased for each phase (815 vs 563 vs 490mL, $p < 0.001$) as did operative time (237 vs 229 vs 212, $p = 0.002$). Hospital LOS decreased from 5.1 days pre-implementation to 2.3 days during Phase 2 in a stepwise fashion corresponding with pathway modifications. Patients requiring an intensive care unit (ICU) stay decreased dramatically from 100% at baseline to $< 10\%$ at Phase 1 initiation and eventually to 0% during Phase 2. Preoperative and postoperative order set compliance both increased from 0% at baseline to 100% during pathway implementation. Incidence of 30-day postoperative emergency department (ED) visits, 30-day readmissions, and 90-day reoperations increased during Phase 1 ($p < 0.001$) but then returned to baseline during Phase 2. Cost comparisons demonstrated an 11.3% decrease in median direct costs in Phase 2 vs pre-implementation (\$5,854.95 savings per case), not accounting for inflation.

CONCLUSIONS: This study demonstrates successful implementation of a multidisciplinary perioperative pathway for AIS patients undergoing PSF. Hospital LOS was shortened by 55%, ICU admissions decreased to 0%, perioperative order set compliance increased to 100%, and direct costs reduced by 11.3%. There was an initial increase in early ED visits and reoperations, but this decreased to baseline during Phase 2. Periodic revision of the multidisciplinary pathway resulted in continuous improvement of care for AIS patients with shorter LOS and cost reduction.

Comparison of Medial/Lateral Pinning vs. All Lateral Pinning in Treatment of Pediatric Supracondylar Humerus Fractures

Paper 061

Nicole Lange / Dayton, OH

Co-Authors:

Nicole Lange / Lewisburg, WV

Brandon Zakeri, M.D. / Dayton, OH

Madelyn Hill, MPH / Dayton, OH

Michael C. Albert, M.D. / Dayton, OH

OBJECTIVE: Supracondylar humerus fractures are common injuries sustained in the pediatric population. Percutaneous pinning, whether all lateral or medial/lateral, is the mainstay of operative management for these injuries. Though there has been much debate on the safety of medial-sided pinning, the literature remains equivocal on the incidence of iatrogenic ulnar nerve injury sustained during medial-sided pinning. Thus, the goal of our study is to describe the rates of ulnar nerve injury for the medial/lateral supracondylar pinning technique and describe the rates of nerve injuries (radial, median, ulnar, and anterior interosseous nerve (AIN)) between all lateral and medial/lateral treatment groups.

METHODS: Patients aged 1-18 years that presented at a pediatric hospital for supracondylar humerus fractures and treated with percutaneous pinning between 2018-2023 were reviewed. Patients with concurrent surgical treatment at the time of pinning, poly-traumatized, or sustained the injury due to non-accidental trauma were excluded. Age, sex, fracture classification, pinning method, nerve injury complications, and duration of follow-up were collected. Descriptive statistics were analyzed for variables of interest.

RESULTS: A total of 428 pediatric patients had a supracondylar fracture treated with percutaneous pinning. Average age of presentation was 5.8 (± 2.3) years old with 182 (42.5%) patients presenting with a type 2 fracture and 246 (57.4%) with type 3 or 4. There were 139 (32.5%) patients treated with a medial/lateral pinning approach and 289 (67.5%) patients treated with an all-lateral pinning approach. Patients treated with a medial/lateral pinning approach experienced an AIN specific injury ($n=1$) and no ulnar nerve injury postoperatively. The average follow-up for patients treated with a medial/lateral pinning approach was 2.8 (± 2.1) months. Patients treated with all-lateral pinning approach experienced radial nerve injury ($n=1$), median nerve injury ($n=1$), AIN specific injury ($n=3$), and no ulnar nerve injury postoperatively. The all-lateral pinning approach patients had an average follow-up of 2.3 (± 1.6) months. New nerve injuries following medial/lateral and all-lateral pinning were resolved at the time of the final follow-up.

CONCLUSIONS: This study demonstrates the lack of iatrogenic ulnar nerve injury when utilizing the medial entry pins in treatment of supracondylar fractures. Strict adherence to surgical principles pertaining to medial entry pins is crucial to avoid ulnar nerve injury and should be included in every orthopedic surgeon's armamentarium when treating unstable supracondylar fractures.

Upper Extremity Fracture Detection Using a Convolutional Neural Network with Multiview Incorporation

Paper 062

Lainey G. Bukowiec, M.D. / Rochester, MN

Co-Authors:

Lainey G. Bukowiec, M.D. / Rochester, MN

Julia Todderud / Rochester, MN

Austin F. Grove / Rochester, MN

Anish Kanabar, M.S. / Rochester, MN

Bardia Khosravi, M.D. / Rochester, MN

A. Noelle Larson, M.D. / Rochester, MN

INTRODUCTION: Detecting fractures in pediatric radiographs using vision-based artificial intelligence (AI) and machine learning (ML) techniques can be particularly challenging due to the presence of physes. These physes appear as gaps or radiolucent regions in the bone on radiographic images, making it difficult for the model to distinguish them from potential fractures. Furthermore, the appearance and location of physes can vary depending on the stage of skeletal development.

To address these challenges, researchers have explored various strategies, such as incorporating prior knowledge about the location and appearance of physes into the ML models or developing specialized algorithms that can differentiate between physes and fractures based on their unique characteristics. The availability of large, well-annotated datasets of pediatric radiographs is critical for training accurate and robust ML models for fracture detection in this population. The current study aimed to develop a convolutional neural network (CNN)-based deep learning (DL) algorithm that utilizes multiple views of the forearm, elbow and humerus for the automated detection of upper extremity fractures in pediatric patients.

METHODS: A total of 3507 upper extremity radiographs were reviewed. Individual patients with multiple views of the upper extremity, including anteroposterior and lateral forearm, elbow and humerus radiographs as well as internal and external oblique elbow radiographs were stratified into training, validation or testing cohorts using a 75-8-17 split. There were 206 fractures and 378 normal radiographs within the testing set. Images were resized to 512x512 and augmented using random flipping, rotation, translation, and addition of Gaussian noise. Ground truth was determined by three reviewers within the orthopedic surgery department at a major academic institution. Classification was performed by a DL model with a ConvNeXt-V2-tiny (28M parameter) backbone pre-trained on ImageNet-1k for feature extraction.

RESULTS: Measured output metrics include precision, recall and F1 score. The model obtained >0.99 performance for all of these metrics. The model obtained >99% accuracy in detecting the presence of a fracture in the 584 test images.

DISCUSSION AND CONCLUSION: A fracture detection DL approach was developed to detect fractures within forearm, elbow and humerus radiographs with high accuracy. The classification system focuses on upper extremity radiography, specifically in the context of pediatric patients. The variable nature of the appearance of bones and joints at various stages of a child's development demands a methodological approach that not only automates the accurate categorization of radiographs but also accounts for the inherent variability in image quality due to factors such as patient positioning and diverse image acquisition techniques. Despite the profound medico-legal and long-term clinical implications for missed fractures in children, the majority of research and commercial efforts have focused on the use of AI for fracture detection in adults. As such, the current study is novel and addresses an important gap in the pediatric trauma workup. The objectives of the classification algorithm include accurately interpreting radiographs of the elbow, upper arm, and forearm to identify fractures. This aims to address the challenges of missed fractures in emergency departments, which can lead to severe consequences for pediatric patients, such as compartment syndrome, and delays in appropriate care. Automated radiograph interpretation can also reduce the burden of manual interpretation, mitigate issues with noisy metadata, and handle variability in image acquisition techniques.

Associated Urogenital Injuries Following Pelvic Trauma in Pediatrics, a 15-Year Single-Center Retrospective Study

Paper 063

Colin Van Wagoner, B.S. / Auburn Hills, MI

Co-Authors:

Colin Van Wagoner, B.S. / Auburn Hills, MI

Ehab Saleh, M.D. / Royal Oak, MI

Sazid Hasan, M.D. / Royal Oak, MI

OBJECTIVE: The association between pelvic trauma and urogenital injuries in adult patients is well-established, whereas literature concerning pediatric patients is sparse. The purpose of this study was to determine the association between pelvic trauma and urogenital injuries in the pediatric population including incidence, and trends in injury modality, treatment patterns, imaging, and outcome.

METHODS: This was a single-center, retrospective chart review. Patients aged 0-16 years admitted for pelvic fracture, pelvic dislocation, proximal femur fracture, and injury of urinary and pelvic organs over a 15-year period were included. Primary outcomes included fracture diagnosis, urogenital injury diagnosis, treatment modalities, and mechanism of injury. Secondary outcomes included patient demographics, length of hospital stay, length of ICU stay, imaging modalities, foley placement, and other associated injuries. Charts for 371 patients were reviewed, and following additional exclusion criteria, data from 303 patients was analyzed using ANOVA and Chi-Square analysis where appropriate.

RESULTS: 303 patients were divided into three groups based on primary fracture diagnosis: pelvic ring fracture n = 149 (49.2%), femur fracture n = 128 (42.2%), and acetabular fracture/hip dislocation n = 26 (8.6%). Associated urogenital injuries were classified in the following groups, with injury rates listed in order of pelvic ring fracture patients, femur fracture patients, and acetabular fracture/hip dislocation patients: no associated injury n = 122, 116, 26 (81.9%, 90.6%, 100%), hematuria n = 10, 1, 0 (6.7%, 0.8%, 0.0%), superficial injury n = 5, 1, 0 (3.4%, 0.8%, 0.0%), urethral or bladder injury n = 3, 0, 0 (2.0%, 0.0%, 0.0%), urinary retention or incontinence n = 8, 8, 0 (5.4%, 6.3%, 0.0%), and other n = 1, 2, 0 (0.7%, 1.6%, 0.0%) (p = 0.0690). Treatment of pelvic ring fractures was predominantly non-operative n = 133 (89.3%), whereas treatment of femur fractures (operative n = 73 (57.5%), non-operative n = 53 (41.7%)) and acetabular fractures/hip dislocations (operative n = 11 (42.3%), non-operative n = 15 (57.7%)) was more balanced (p = <.0001).

CONCLUSIONS: In contrast to the adult population, there is not a clinically significant association between pelvic trauma and urogenital injuries in pediatric patients. Most pediatric pelvic ring trauma was treated conservatively, without the need for surgery, whereas the adult population more often requires surgical repair.

Perioperative Isotretinoin Use and the Risk of Complications in Pediatric Orthopedic Surgery Patients

Paper 064

Alyssa Basdavanos, M.D. / Akron, OH

Co-Authors:

Kenzie D. Lundqvist, M.D. / Akron, OH

Alyssa Basdavanos, M.D. / Torrance, CA

Catherine Hord, B.S. / Rootstown, OH

Richard P. Steiner, Ph.D. / Akron, OH

Lorena V. Floccari, M.D. / Akron, OH

OBJECTIVE: Isotretinoin, commonly known by its trade name Accutane, is a retinoid medication used to treat dermatologic conditions including acne vulgaris. There are concerns regarding the effects of isotretinoin on wound healing and bone healing, and therefore it is commonly discouraged against to be taken 6 to 12 months prior to surgery. The evidence to support these concerns is lacking, so the purpose of this study was to evaluate the safety and complications of perioperative isotretinoin use in pediatric patients undergoing orthopedic surgery.

METHODS: This was a retrospective matched case-control study performed at a single freestanding tertiary children's hospital. Patients who were ≤ 18 years old and prescribed isotretinoin within 12 months of orthopedic surgery were included. These patients were then matched 1:5 to control patients who underwent orthopedic surgery between 2012 and 2020 and had no history of isotretinoin use. Matching criteria included age (± 1 year), gender, and same procedure type.

RESULTS: Nineteen orthopedic surgeries were performed on 16 patients (3 patients had two separate surgeries), who were successfully matched to 90 control patients. Each surgery was matched to a control group, except for one patient who had two surgeries within two days and was therefore matched to just one control group. There was no significant difference between groups in demographics, including age, gender, or body mass index. In the isotretinoin group, 21.0% ($n=4$) presented with a complication vs. 16.7% ($n=15$) in the control group ($p=0.263$). The patients in the isotretinoin group who experienced a complication were all prescribed isotretinoin postoperatively. They started taking isotretinoin 2.3 months after surgery compared to 5.5 months for those who did not experience a complication ($p=0.524$). Complications included hip labral re-tear, failed ligament repair, delayed osteotomy healing, and a metatarsal non-union. There were no issues with wound healing or infection.

CONCLUSIONS: While prevalence of complications was higher in the patients who received isotretinoin perioperatively compared to the control group, the difference was not statistically significant. Those who did experience complications in the isotretinoin group started taking isotretinoin 2.3 months postoperatively. Given that there are theoretic concerns about the effects of isotretinoin on wound and bone healing, future studies with larger cohorts would be helpful in further determining if perioperative isotretinoin use affects complication rates in pediatric orthopedic patients.

Providence Nighttime Bracing as an Effective Alternative to Treating Adolescent Idiopathic Scoliosis

Paper 065

Kelly A. Jenkins, M.D. / Akron, OH

Co-Authors:

Kelly A. Jenkins, M.D. / Louisville, Kentucky

Kenzie D. Lundqvist, M.D. / Akron, OH

Jared B. Hinton, B.S. / Rootstown, OH

Richard P. Steiner, Ph.D. / Akron, OH

Todd F. Ritzman, M.D. / Akron, OH

Lorena V. Floccari, M.D. / Akron, OH

OBJECTIVE: The Boston thoracolumbar orthosis is widely considered the gold standard brace for reducing the risk of curve progression in adolescent idiopathic scoliosis (AIS), but many surgeons and families instead opt for Providence nighttime bracing due to perceived increased compliance. The purpose of this study was to compare outcomes of Boston and Providence bracing in AIS patients to evaluate curve progression and surgical conversion.

METHODS: This retrospective comparative study was conducted at a single freestanding tertiary children's hospital. Patients with idiopathic scoliosis who were prescribed a spinal orthosis between 2013 and 2020 were included. Exclusion criteria included incomplete pre-brace, in-brace, or follow-up radiographs, as well as a lack of 2-year clinical follow-up from the date of the brace prescription.

RESULTS: A total of 128 total patients (49 Boston, 79 Providence) were included. There were no significant differences in mean body mass index, gender, or duration of follow-up ($p > 0.1$). Patients with a Boston brace were on average one year younger than those with a Providence brace (12.5 vs 13.3 years, $p = 0.010$) and were less skeletally mature. Patients with Risser scores of 0 or 1 comprised 81.2% of the Boston group vs. 58.2% of the Providence group ($p = 0.027$). Patients with thoracic curves were more often prescribed a Boston brace (54.0% vs 46.0%), while patients with thoracolumbar (87.5% vs 12.5%) or double curves (60.9% vs 39.1%) were more often prescribed a Providence brace (all $p < 0.001$). Thoracolumbar curves were significantly larger in the Boston group (31.2 vs 27.3 degrees, $p = 0.004$), but thoracic curve size was similar between Boston and Providence (31.4° vs 30.1°, $p = 0.425$). Reported brace compliance was significantly higher in the Providence brace group (85.7% vs. 62.5%, $p = 0.004$), though compliance monitors were not utilized. There were no significant differences between Boston and Providence braces in curve progression for thoracic (5.9° vs 3.1°, $p = 0.165$) or lumbar (4.7° vs 3.4°, $p = 0.367$) curves, and there was a similar prevalence of conversion to surgery (34.7% vs 24.0%, $p = 0.196$).

CONCLUSIONS: Providence bracing demonstrated similar efficacy as the gold standard Boston bracing. Factors such as patient age, curve location, and curve severity were considered when determining which brace to order for patients. Providence bracing demonstrated similar efficacy in terms of curve progression and instances of conversion to surgery. Future prospective studies may help determine if one brace type is superior to the other for certain curve characteristics.

Image-Guided Injection for Adolescent Spondylolysis Pain

Paper 066

Jared Hinton, B.S. / Akron, OH

Co-Authors:

Matthew B. Holloway, M.D. / Akron, OH

Colin Rhoads, DO / Warrensville Heights, OH

Jared Hinton, B.S. / Akron, OH

Kenzie D. Lundqvist, M.D. / Akron, OH

Richard P. Steiner, Ph.D. / Akron, OH

Lorena V. Floccari, M.D. / Akron, OH

OBJECTIVE: Isthmic spondylolysis is a common cause of low back pain in adolescents. Treatment is conservative at first, but surgery may be indicated if pain is unremitting. In the adult population, a corticosteroid/anesthetic injection is first trialed prior to converting to surgery. However, there is limited evidence on this treatment for spondylolysis in the pediatric population. The purpose of this study was to review the clinical outcomes of image-guided corticosteroid/anesthetic injections into the pars interarticularis in pediatric patients.

METHODS: This retrospective study was conducted at a single freestanding tertiary children's hospital and included consecutive patients who were diagnosed with spondylolysis and underwent image-guided corticosteroid and/or anesthetic injections from 2012-2023. Gathered data included patient demographics, radiation dosage, type of medication injected, visual analogue scale (VAS) pain scores, and surgical conversion.

RESULTS: Nineteen patients (13F, 6M) with 20 image-guided injections were included, most of whom (90%) were athletes. The average age at injection was 16.3 years (range 14.6 – 20.4). Bilateral involvement was noted in 80% of cases, and low-grade spondylolisthesis was associated in 45%. The guided-imaging modality for 84% of injections was 3D Cone CT with a mean effective radiation dosage of 15.9 mSv. Fluoroscopic guidance alone was used in 11% and exposed patients to less radiation on average (0.44 mSv). Injections were a combination of 40mg/mL Kenalog (20-40mg) and 0.25% bupivacaine (2-4mL). The median VAS score pre-injection was 5 (range 0 – 8), immediately post-injection was 1.5 (range 0 – 7), and the median final score was 3 (range 0 – 7). Eighty-two percent of patients had >50% pain relief at their first follow-up. Seven (35%) patients converted to surgery, and of these, 5/7 had post-injection pain relief with an average decrease of 1.83 VAS points. Patients who did not convert to surgery had an average decrease of 3.09 VAS points post-injection.

CONCLUSIONS: Image-guided corticosteroid/anesthetic injections were effective in decreasing pain for this patient cohort. Most patients had significantly decreased pain at their first follow-up and continued to have pain resolution. Results suggest that patients who have a more significant improvement in their initial VAS scores are less likely to convert to surgery. CT-guided injections expose patients to 15.9 mSv of radiation, which is over 5 times the exposure of annual background radiation. Future larger studies may be helpful in determining if image modality affects results and how response to injections may predict surgical conversion and success.

One-Tenth of the Top 50 Pediatric Orthopedic Hospitals Provide Compliant Price Transparency Information for Common Pediatric Orthopedic Procedures

Paper 067

Nicholas G. Belt / Cleveland, OH

Co-Authors:

Nicholas G. Belt / Cleveland, OH

Austin J. Lee / Cleveland, OH

Victoria Nedder / Cleveland, OH

Andrew Moyal, M.D. / Cleveland, OH

Robert J. Burkhart, IV, M.D. / Cleveland, OH

Raymond W. Liu, M.D. / Cleveland, OH

BACKGROUND: In 2019, Centers for Medicare and Medicaid Services (CMS) mandated hospitals to provide publicly available chargemasters to aid in transparency of pricing for hospital procedures. Despite the mandate, many orthopedic hospitals remain incompliant with guidelines set by CMS. The goals of this study are to: (1) assess the rate of compliancy among the top 50 US children's orthopedic hospitals with the CMS mandate, and (2) analyze variation in pricing for common orthopedic procedures among these same hospitals.

METHODS: The top 50 pediatric orthopedic hospitals within the US were selected based on US news and world reports. 15 common pediatric orthopedic procedures were then selected based on literature and internal institutional volume. The website of each hospital was searched for the required downloadable charge master and/or a user-friendly online tool to provide pricing for each procedure. Compliance was assessed by the ability to find payer-negotiated charges, gross charges, and cash-based cost for each procedure. Hospitals were deemed compliant if they met all guidelines, pseudocompliant if they met any of the above guidelines, and noncompliant if they met no guidelines.

RESULTS: Only 10% (5 of 50) of the hospitals were compliant for all 15 procedures, and an additional 32% of hospitals (16 of 50) were pseudocompliant for at least one of the specific procedures searched. Seven total hospitals listed cash prices, 10 hospitals listed gross charges, and 12 hospitals listed payer-negotiated charges. The widest range for gross charge was CPT 23462 (arthroscopic Bankart repair), ranging from \$3,012 to \$109,320. The range of charges dramatically differed from gross price for all procedures.

CONCLUSIONS: Only 10% of the top 50 pediatric orthopedic hospitals in the US are compliant with the CMS mandate for price transparency. Furthermore, the cost of each procedure varied widely depending on hospital and type of price reported (gross, cash, payer-negotiated). These substantial shortcomings call for an evaluation of the current strategies being employed to improve price transparency in healthcare.

Operative vs. Non-operative Treatment of Z-Type Clavicle Shaft Fractures in Adolescents: A Retrospective Study

Paper 068

Iulia Dobrin / Auburn Hills, MI

Co-Authors:

Iulia Dobrin, B.A. / Rochester, MI

Colin Van Wagoner, B.S. / Rochester, MI

Ehab Saleh, M.D. / Royal Oak, MI

OBJECTIVE: Clavicle fractures are common in both adult and pediatric populations.¹ Yet, the literature describes differences regarding treatment in such fractures between these populations, favoring operative treatment for adults and nonoperative treatment for pediatric patients.² There is particular uncertainty for treating a subgroup of adolescent clavicle fractures known as the Z-type comminuted fracture which, being a completely displaced and complex fracture pattern, can prove to have different healing rates than other midshaft clavicle fractures. Because of concerns about healing and bony prominences, these types of fractures are commonly treated surgically, despite an increasing body of literature indicating equivalent outcomes in treating adolescent clavicle fractures surgically or nonsurgically.³ However, there is still some controversy in the literature regarding appropriate treatment of completely displaced adolescent clavicle fractures.⁴ Thus, this study aims to determine outcome differences between surgical or non-surgical treatment for adolescent Z-type fractures and to ascertain if differences exist in patient-reported outcomes between the two interventions.

METHODS: A retrospective chart review was conducted of 78 patients at Beaumont Royal Oak Hospital from 01/01/2019 to 12/31/2022. Inclusion criteria included patients between ages 12 and 16, diagnosis of a Z-type comminuted fracture, in-patient admission with surgical treatment, and out-patient cases treated nonsurgically. Data collected included demographics, treatment modality, union achievement, follow-up period, return to activity, range of motion, and patient-reported pain. A preliminary chi-squared test was performed to compare outcomes between treatment groups.

RESULTS: Based on preliminary statistical analysis, 21 patients underwent surgery while the remaining 57 did not. A total of 54 patients either did not follow-up or their follow-up was not present in any charts. 3 patients experienced non-union: 2 non-surgical, 1 surgical ($p = .798514$). Every patient who continued to follow-up was able to return to normal activity, regained normal ROM, and reported minimal to no lingering pain with an average follow-up time of 7.5 months.

CONCLUSIONS: The study found no significant difference in adverse outcomes between surgical and non-surgical treatments for adolescent Z-type comminuted fractures. Non-union rates did not significantly vary between groups, suggesting no superior treatment option. Further research tracking patients longitudinally is needed for comprehensive understanding.

Excision of Talocalcaneal Coalition Resection with Three-Dimensional Navigation

Paper 069

Jacob J. Schaefer, M.D. / Rochester, MN

Co-Authors:

Jacob J. Schaefer, M.D. / Rochester, MN

Anthony A. Stans, M.D. / Rochester, MN

A. Noelle Larson, M.D. / Rochester, MN

Todd A. Milbrandt / Rochester, MN

Emmanouil Grigoriou, M.D. / Rochester, MN

INTRODUCTION: Talocalcaneal (TC) coalition can cause pain, limited subtalar motion, and recurrent ankle injuries, resulting in a rigid, painful flatfoot. Recently, resection of TC coalitions using a combination of intraoperative computed tomography (CT) with a navigated probe and burr has been described. We sought to compare the results following TC coalition resection by the novel 3D-navigated technique with those who underwent resection by the traditional open technique.

METHODS: Patients who underwent navigated TC coalition resection and the traditional open approach at a single tertiary referral center were retrospectively reviewed. There were 12 patients (14 feet) in the navigated TC coalition resection cohort and 4 patients (5 feet) in the open technique cohort. Operative time estimated blood loss (EBL), length of hospital stay (LOS), anesthesia time, complications, duration in boot or cast postoperatively, and overall average effective dose of radiation were reviewed .

RESULTS: Operative time (0.70), EBL ($p=0.10$), LOS ($p=.13$), and anesthesia time ($p=0.84$) did not differ between the two groups. The mean duration of postoperative immobilization (cast or boot) was 2 weeks shorter for the navigated group but was not statistically significant ($p=0.82$). One obese patient (34) in the navigated cohort had delayed wound healing, and 1 patient had a superficial skin infection. The overall average effective dose of radiation for all patients ($n=12$) in the navigated group was 0.0081 mSv. The average dose for patients undergoing only one spin ($n=9$) was 0.0052 mSv.

CONCLUSION: In this study, operative time, EBL, LOS, and anesthesia time did not differ in the navigated TC coalition resection cohort as compared to traditional open approach patients. Overall, navigated TC excision is an effective alternative to the open approach that allows for easy identification of the coalition, ensuring adequate and complete resection at the time of the index procedure without increasing surgical or anesthetic time.

Optimizing Rotator Cuff Repairs: The Impact of Combined Surgical Techniques on Muscle Force

Paper 070

Nirav K. Mungalpara, M.D., MRCS / Chicago, IL

Co-Authors:

Nirav K. Mungalpara, M.D., MRCS /
Sunjung Kim, Ph.D. / New York, NY
Hayden Baker, M.D. / Chicago, IL
Cody Lee, M.D. / Chicago, IL
Ashish Shakya, M.S. / Chicago, IL

Kevin Chen, B.A. / Chicago, IL
Nicolas Maassen, M.D. / Chicago, IL
Aravind Athiviraham, M.D. / Chicago, IL
Jason Koh, M.D. / Chicago, IL
Bassem Elhassan, M.D. / Boston, MA

INTRODUCTION: Supraspinatus (SS) and infraspinatus (IS) tears cause compensatory activation of the teres minor (TM) and subscapularis (SubS) to maintain humeral head alignment in the glenoid cavity, crucial for shoulder stability. This study measures force changes in TM and SubS muscles under six different conditions using a dynamic novel shoulder testing setup. We hypothesize that combining SCR and LTT will better correct rotator cuff forces than either technique alone.

METHODS: Eight fresh-frozen human shoulder specimens from donors aged 55 to 75 (mean = 63.75 yrs) were used, balanced for gender, averaging 219.5 lbs. The cadaveric hemithorax was mounted on polycarbonate glass for biomechanical loading. Rotator cuff and deltoid tendons were connected to force sensors via a pulley system. A novel testing system allowed unrestricted humeral abduction from 0 to 90 degrees, preloading all rotator cuff muscles for smooth abduction.

Experimental Conditions: Data was collected across six conditions: 1) intact rotator cuff (control), 2) incised supraspinatus and superior capsule, 3) incised infraspinatus and underlying capsule, 4) lower trapezius tendon transfer (LTT) with Achilles allograft, 5) superior capsular reconstruction (SCR) with human dermal allograft, and 6) SCR with incised LTT.

RESULTS: Teres Minor (TM): In the intact condition, TM exhibited an average force of 7.43 N during abduction from 0 to 90 degrees. Upon tearing the SS, TM force decreased to 5.46 N, and further to 3.94 N in the absence of SS and IS. LTT increased TM force to 5.85 N, SCR to 4.68 N, and the combined LTT+SCR to 6.43 N, showing a significant improvement from MRCT.

Subscapularis (SubS): In the intact condition, SubS demonstrated a force of -0.73 N. Post-SS tear, force increased to -0.46 N, and to -0.96 N in MRCT. LTT after MRCT resulted in a force of -0.32 N, SCR to -0.28 N, and combined LTT+SCR to -0.66 N, showing significant decreases from MRCT. Friedman's ANOVA revealed significant differences in TM and SubS forces across conditions. For TM, the overall P-value was 1.083×10^{-6} , and for SubS, it was 4.77×10^{-4} , indicating statistical significance.

CONCLUSION: Our cadaveric model shows significant TM force reductions after rotator cuff tears and improvements with LTT and SCR, especially when combined. SubS showed negative force during normal abduction, compensated during MRCT, and returned to normal after LTT and SCR.

Incidence and Risk Factors Associated with Anterior Shoulder Pain Following Reverse Total Shoulder Arthroplasty

Paper 071

Andrew Nahr, M.D. / Memphis, TN

Co-Authors:

Andrew Nahr, M.D. / Memphis, TN

Tori Coble D.O. / Memphis, TN

Mary C. Hunter B.A. / Memphis, TN

Thomas W. Throckmorton, M.D. / Memphis, TN

Tyler Brolin M.D. / Memphis, TN

OBJECTIVE: Reverse total shoulder arthroplasty (rTSA) has become one of the most common performed procedures by shoulder surgeons. It is not without its own unique complications. Prosthetic dislocation, acromial and scapular stress fractures, as well as scapular notching are well known and described following rTSA. Another distinct, yet less recognized complication following rTSA is the development of anterior shoulder pain. This phenomenon is poorly understood with a paucity of literature describing its existence, risk factors, and causes. The purpose of this work is to describe the incidence and associations of anterior shoulder pain following rTSA.

METHODS: A retrospective chart review of a prospectively maintained database was performed for all patients undergoing rTSA by two senior authors. All patients were evaluated for the development of anterior shoulder pain following surgery. The phrase “anterior shoulder pain” was explicitly stated in most notes, and included pain over the anterior head of the deltoid, acromioclavicular joint, biceps, conjoint tendon, and acromion. Patient height and weight, surgical indications, bicep management, version of the humeral component, inlay vs onlay humeral design, subscapularis management, glenosphere size, total glenoid lateralization, use of glenoid augment, and use of a humeral metallic spacer were evaluated for association.

RESULTS: 1401 patients undergoing rTSA from 2010-2023 were analyzed. Of the 1401 patients, 174 (12.4%) had documented anterior shoulder pain at some time point during postoperative follow-up. Variables that were found to be associated with anterior shoulder pain: torn rotator cuff ($p=0.0075$), lower weight 185.6 vs 192.8; $p=0.041$, surgeon A (15.2%) vs B (11.1%); ($p=0.036$), version of the humeral component 20o (16.0%) vs 30o (11.2%); $p=0.0084$, inlay (15.8%) vs onlay (11.0%) humeral component; $p=0.014$, and greater total glenoid lateralization 2.5 vs 1.84mm; 0.0075.

CONCLUSIONS: To our knowledge this is the first work describing the incidence as well as analyzing variables associated with the development of anterior shoulder pain following rTSA. Our data suggests that inlay prosthesis in 20 degrees of retroversion trend toward having higher rates of anterior shoulder pain postoperatively. Additionally, patients without an intact rotator cuff and increasing glenoid sided lateralization trended towards having higher rates of anterior pain. Bicep management, subscapularis repair, and glenosphere size did not appear to correlate. Challenges in this study include the subjective nature of the variable of interest. Further work is needed in this area to continue to improve patient outcomes following total shoulder arthroplasty.

Outcomes and Survivorship of Reverse Total Shoulder Arthroplasty in Patients Under 60

Paper 072

Louis W. Barry, B.S. / Columbus, OH

Co-Authors:

Louis W. Barry, B.S. / Columbus, OH

Erryk S. Katayama, B.A. / Columbus, OH

John S. Barnett, B.S. / Columbus, OH

Akshar V. Patel, B.S. / Columbus, OH

Ryan C. Rauck, M.D. / Columbus, OH

Julie Y. Bishop, M.D. / Columbus, OH

Gregory Cvetanovich, M.D. / Columbus, OH

OBJECTIVE: The incidence of reverse total shoulder arthroplasty (RSA) is rising annually. Although RSA has shown consistent positive outcomes in older patients, its application in those under 60 poses unique challenges. Comparing outcomes between younger and older cohorts is essential to assess early intervention vs. potential complications.

METHODS: A retrospective analysis of 220 patients who underwent primary RSA with at least 2 years of follow-up was conducted. Seven surgeons performed these procedures at a single institution. Patients were divided into two groups: under 60 and over 60. Demographics and both preoperative and postoperative outcomes of ROM and strength were collected via chart review, and patient-reported outcomes (PROs) were obtained via phone calls.

RESULTS: The under 60 group included 50 patients with a mean age of 56.9 ± 4.6 years and a mean follow-up of 4.9 ± 2.7 years. The over 60 group had 170 patients with an average age of 71.2 ± 6.0 years and an average follow-up of 4.5 ± 2.1 years. Both groups showed significant improvement in all functional markers, including active ROM and strength in forward elevation (FE), external rotation (ER), and internal rotation (IR). Compared to the over 60 group, the under 60 group had a statistically higher postoperative FE ROM ($44^\circ \pm 25^\circ$ vs. $39^\circ \pm 12^\circ$, $p=0.048$) and IR ROM (sacrum vs. L5, $p=0.035$). Other values showed no statistical difference. In the under 60 group, 6 patients (12.0%) experienced complications, all leading to revision surgery, with an average of 1.7 years after initial RSA. In the over 60 group, 6 patients (3.5%) had complications, all requiring revision surgery. The under 60 group had a significantly lower implant survival rate: 94.0% at 2-years, 85.9% at 5-years, and 85.8% at 10-years, compared to 97.6% at 2-years, 96.7% at 5-years, and 94.9% at 10-years in the over 60 group ($p=0.021$).

CONCLUSIONS: Our study finds RSA to be both safe and effective in patients at or under 60 years of age. Yet, the complication rate in patients under 60 is over 3 times higher than the over 60 cohort. An early intervention yields important considerations: younger individuals often have heightened postoperative expectations due to increased demand for arm usage. As the trend towards increasing utilization of RSA continues, we emphasize the importance of careful patient selection to ensure optimal outcomes.

Long Head of the Biceps Subpectoral Tenodesis Anatomic vs. Traditional Tensioning Technique During Arthroscopic Rotator Cuff Repair: A Randomized Prospective Trial

Paper 073

Thomas G. Stanila, B.S. / Maywood, IL

Co-Authors:

Amir M. Boubekri, M.D. / Maywood, IL

Krishin Shivdasani, M.D., M.P.H. / Maywood, IL

Thomas Stanila, B.S. / Maywood, IL

Andrew Chen, M.D. / Maywood, IL

Nickolas Garbis, M.D. / Maywood, IL

Dane Salazar, M.D., M.B.A. / Maywood, IL

OBJECTIVE: This study aimed to compare the outcomes of two methods for tensioning the LHB tendon during surgery: one based on surgeon discretion and another utilizing a standardized anatomical approach. We sought to assess changes in the American Shoulder and Elbow Surgeon (ASES) scores post-surgery.

METHODS: 167 patients were randomized to two treatment arms and underwent biceps tenodesis surgery via step-by-step protocol of anatomic tensioning (treatment group = 80) and via surgeon discretion on appropriate tensioning of the tendon (control group = 87). The anatomic tensioning technique has been previously published and is publicly available. A power analysis was performed a priori and determined that each group must have 80 in each arm to detect a statistically significant clinically meaningful difference in change in ASES from before surgery to after surgery between the two groups ($\alpha = 0.05$, power = 0.80). Surgeries were performed from January 2020 to December 2021. Demographic data, visual analog scale pain, active external rotation, active forward flexion, and ASES scores were evaluated preoperatively, and postoperatively at 6 weeks, 3 months, 6 months, 12 months, and at most recent follow-up.

RESULTS: 167 patients underwent biceps tenodesis surgery, and were randomly assigned into treatment (N = 80) and control groups (N = 87). The cohort was 44.3% female, 63.5% White, with a mean age of 55 (23-79), and mean body mass index (BMI) of 30.9 kg/m² (SD 6.14). Follow-up averaged 18.8 months, with no significant difference in demographic characteristics between groups. Linear mixed models showed no significant differences in active forward flexion, active external rotation, or pain scores at any time point postoperatively. Of note, ASES scores were significantly higher in the treatment arm at 6 weeks postoperatively, although no significant differences were discovered at most recent follow-up at roughly 18 months.

CONCLUSIONS: This randomized prospective study revealed no significant difference in active forward flexion, active external rotation, or pain scores between patients treated with anatomic tensioning of the LHB tendon (treatment) and patients treated with standard biceps tenodesis technique (control). However, ASES scores were significantly higher in the treatment arm at 6 weeks postoperatively, although no significant differences were discovered at most recent follow-up at roughly 18 months. These findings suggest that while treatment may yield short-term benefits in functional outcomes, long-term results may vary. Further research could explore the underlying mechanisms driving these differences over time

Outpatient vs. Inpatient Shoulder Arthroplasty Outcomes Using an Updated Patient-Selection Algorithm - Minimum Two-Year Follow-Up

Paper 074

Brenton R. Jennewine, M.D. / Memphis, TN

Co-Authors:

Brenton R. Jennewine, M.D. / Memphis, TN

Anthony J. Marois, M.D. / Memphis, TN

Eric J. West, M.D. / Memphis, TN

Thomas W. Throckmorton, M.D. / Memphis, TN

David L. Bernholt, M.D. / Memphis, TN

Frederick M. Azar, M.D. / Memphis, TN

Tyler J. Brolin, M.D. / Memphis, TN

BACKGROUND: Previous studies have demonstrated the safety and cost-effectiveness of outpatient total shoulder arthroplasty (TSA), with the majority of studies focusing on 90-day outcomes and complications. Patient selection algorithms have helped appropriately choose patients for an outpatient TSA setting. This study's primary aim was to determine the outcomes of TSA between outpatient and inpatient cohorts with at least a 2-year follow-up, utilizing a recently updated patient selections algorithm.

METHODS: A retrospective review identified patients older than 18 years who underwent a TSA with a minimum of 2-year follow-up in either an inpatient or outpatient setting. Using a previously published outpatient TSA patient-selection algorithm, patients were allocated into three groups: outpatient, inpatient due to insurance requirements, and inpatient due to algorithm criteria. Outcomes evaluated included visual analog scale (VAS) pain, American Shoulder and Elbow Surgeons (ASES) score, Single Assessment Numeric Evaluation (SANE) score, range of motion (ROM), strength, complications, re-admissions, and re-operations. Analysis was performed between the outpatient and inpatient groups to demonstrate the safety and efficacy of outpatient TSA with midterm follow-up. Additionally, outcomes of all patients who met outpatient TSA algorithm criteria were compared to those who did not meet algorithm criteria to evaluate the efficacy of the algorithm selection.

RESULTS: A total of 779 TSA were included in this study, allocated into the outpatient (N = 108), inpatient due to insurance (N = 349), and inpatient due to algorithm (N = 322). The average age between these groups was significantly different (59.4 ± 7.4 , 66.5 ± 7.5 , and 72.5 ± 8.7 , respectively; $P < 0.0001$). All patient groups demonstrated significant improvements in preoperative to final patient-outcomes scores, ROM, and strength. Analysis between cohorts showed similar final follow-up outcome scores, ROM, and strength, regardless of surgical location, insurance status, or meeting patient-selection algorithm. Complications, reoperations, and readmissions between all three groups were not significantly different.

CONCLUSION: This study reaffirms prior short-term follow-up literature. Transitioning appropriate patients to outpatient TSA results in similar outcomes and complications compared to inpatient cohorts with mid-term follow-up.

Using Machine and Deep Learning Techniques to Predict Shoulder Injury Severity in High School Football Players

Paper 075

Samantha L. Watson, B.S. / Chicago, IL

Co-Authors:

Rohan M. Shah / Chicago, IL

Rushmin Khazanchi / Chicago, IL

Ravi Ameet Patel / Chicago, IL

Connor Workman / Chicago, IL

Vehniah Tjong / Chicago, IL

Samantha L. Watson, B.S. / Chicago, IL

PURPOSE: Severe injuries in high school sports can present substantial risks, including physical and emotional consequences, as well as the disruption of young athletic careers. In the context of high school football, injuries are common and can occasionally cause long-term damage. Identifying sport-specific factors that predispose severe injuries can inform regulatory changes to reduce adverse events, identify players at elevated risk, and inform post-injury expectations. The present study aims to apply machine and deep learning techniques to predict shoulder injury severity in a national, high school sports injury database.

METHODS: The High School Reporting Information Online (RIO) was queried for all shoulder injuries sustained by athletes playing boys football. High School RIO is a national, deidentified database that has captured athletic exposures and injuries since the 2005 - 2006 academic year. Injury severity was dichotomized by time needed to return to sport (RTS), with prolonged RTS being ≥ 22 days, including medical disqualification for the season. A total of 14 predictors encompassing demographic information, injury setting, and sports-specific factors were included. Several ML algorithms (balanced random forest [RF], elastic-net regression [LR], and gradient boosted tree [GBM]) and one neural net (NN) were created. Model performance was measured using the Area Under the Receiver Operating Curve (AUC) statistic. Additionally, a feature importance analysis using SHAP scores was conducted for the top performing model.

RESULTS: A total of 2,405 patients were included in this study, with an average age of 16.1 years (SD: 1.2), height of 70.0 inches (SD: 3.9), and weight of 182.2 pounds (SD: 54.4). A total of 355 athletes (14.8%) experienced a prolonged return to sport. The GBM had the best performance (AUC: 0.61 ± 0.01), followed by the ENet (AUC: 0.60 ± 0.01), RF (AUC: 0.60 ± 0.02), and NN (AUC: 0.57 ± 0.02). On feature importance analysis, level of play (varsity, junior varsity, sophomore, or freshman), weight, and recurrent injury status were distinctively the top three predictors. Age and height were also ranked in the top five predictors.

CONCLUSIONS: Machine learning was successfully used to predict RTS in high school boys football shoulder injuries. Additionally, a feature importance analysis identified level of play, athlete weight, and recurrent injury status as the top predictors of prolonged RTS.

Biocompatibility of the Subacromial Balloon Spacer: An In Vivo Murine Pouch Model Cytokine Analysis

Paper 076

Noah Elagamy, M.D. / Detroit, MI

Co-Authors:

Rishi Chatterji, M.D. / Southfield, MI

David C. Markel, M.D. / Novi, MI

Therese Bou-Akl, M.D., Ph.D. / Southfield, MI

Adam J. Miller, M.D. / Southfield, MI

Michael T. Fry, M.D. / Southfield, MI

Paula D. Pawlitz / Southfield, MI

Jason O. Holcomb, M.D. / Southfield, MI

OBJECTIVE: Subacromial balloon spacers have emerged as one solution to treating massive rotator cuff tears in patients with severe glenohumeral arthritis. However, previous studies have identified a lasting film in the subacromial space well after the balloon should have dissolved. This study sought to characterize the inflammatory response to the balloons histologically and via cytokine production using an established in-vivo animal model.

METHODS: Forty-two BALB/c mice were randomized into two groups: control (no balloon device, n=4/time point) and experimental (balloon device implanted, n=10/time point). Sacrifice time points were 1, 4, and 12 weeks creating 3 subgroups that contained 4 controls and 10 experimental mice. One balloon subacromial spacer was sectioned into equally sized 3mm diameter sections. Subcutaneous mouse air pouches were created and samples were implanted into each mouse pouch. No implants were placed in controls. Bead array assay was used to measure cytokines TGF-B1, IL-13, IL-1B, IL-4, IL-6, IL-10, and TNF- α . Histologic analysis was also performed for hematoxylin and eosin (H&E) stained sections.

RESULTS: Cytokine analysis: At 1 week and 4 weeks, all cytokines besides TGF-B1 remained within the standard curve and were therefore undetectable. At 12 weeks all cytokines were undetectable.

Histologic analysis: No differences were seen between the control and experimental groups histologically. When characterizing the pouch histology: At 1 week, pouch membranes were infiltrated with inflammatory neutrophils and few macrophages. At 4 weeks the membranes were less densely populated with cells, consisting of mostly fibroblasts, few neutrophils, and no macrophages or lymphocytes. At 12 weeks, the pouch membranes had few cell layers showing mostly fibroblasts.

CONCLUSIONS: Inflammatory cytokines were below the detectable limit, and the inflammatory profile of the subacromial balloon based on histologic analysis was quite benign in an in-vivo animal model. While a thin film may remain after resorption of balloons clinically, the inflammatory response appeared similar to controls.

The Impact of Infrapinatus Integrity on Outcomes Following Reverse Shoulder Arthroplasty for Massive Rotator Cuff Tears

Paper 077

Derek T. Dixon / Germantown, TN

Co-Authors:

Tyler J. Brolin, M.D. / Germantown, TN

Robert A. Achilike, M.D. / Germantown, TN

Derek D. Dixon / Germantown, TN

Margaret Knack / Germantown, TN

Thomas W. Throckmorton, M.D. / Germantown, TN

BACKGROUND: As confidence with reverse shoulder arthroplasty (RTSA) has increased so have the indications. Currently the presence of a massive rotator cuff tear is one of the main indications for RTSA. However, it is unknown whether the type of massive rotator cuff tear or tendons involved affects outcomes or reoperation rates. We aim to compare clinical outcomes and reoperation rates of patients who have undergone primary RTSA for massive rotator cuff tears including anterosuperior, posterosuperior and all three tendons.

METHODS: We retrospectively reviewed patients from a prospectively maintained patient database between March 2011 to February 2023, who underwent a primary RTSA for a massive rotator cuff tear with an intact teres minor. Preoperative and postoperative outcomes at 1 year were recorded. These outcomes included range of motion, Single Assessment Numeric Evaluation, Visual Analog Score, American Shoulder and Elbow Surgeons scores (ASES), complication rates, and reoperation rates. Patients were stratified based on the MRI findings of an anterosuperior, posterosuperior or 3 tendon rotator cuff tear, which was confirmed by the operative findings. Exclusion criteria included: deficient teres minor, prior proximal humerus open reduction internal fixation, prior shoulder arthroplasty, advanced cuff tear arthropathy, concomitant tendon transfer with the reverse shoulder arthroplasty or clinical follow-up less than 1 year.

RESULTS: 224 shoulders met the inclusion criteria of this study. Improvements were seen in clinical outcome scores among the different rotator cuff tear types, but no statistically significant differences were detected for SANE, VAS, ASES, reoperations, or complication rates at 1 year follow-up. Regarding range of motion, the anterosuperior rotator cuff tear group demonstrated statistically significant higher external rotation (average=52.8o, $P < 0.01$) and internal rotation (average=58.3o, $P = 0.03$) at 1 year postop compared to the other 2 groups. Furthermore, the anterosuperior group had a statistically significant increased change from baseline external rotation measurement (average improvement=21.3o, $P = 0.04$), compared to the other groups (average improvement=7.8o).

CONCLUSION: Our data shows no differences in regard to patient reported outcome scores, reoperation rates, or complication rates at 1-year following RTSA for different massive rotator cuff tear types. However, patients with a diagnosis of a massive anterosuperior rotator cuff tear with an intact infrapinatus tendon can expect greater improvement in and higher overall external rotation. This data suggests the vital role of the infrapinatus in achieving external rotation following RTSA.

Evaluation of Three Arthroscopic Techniques to Evaluate for Posterolateral Rotatory Instability of the Elbow

Paper 078

Riikka Koso, M.D. / Pittsburgh, PA

Co-Authors:

Riikka Koso, M.D. / Pittsburgh, PA

Anthony Logli, M.D. / Pittsburgh, PA

Asher Mirvish, B.A. / Pittsburgh, PA

Mark Baratz, M.D. / Pittsburgh, PA

OBJECTIVE: The purpose of this study was to evaluate the sensitivity of three arthroscopic techniques for intraoperative assessment of posterolateral rotatory instability (PLRI).

METHODS: Sequential sectioning was performed on the lateral collateral ligament (LCL) complex of six cadaveric upper limbs. Sectioning involved the anterior half of the LCL complex, followed by the posterior half of the LCL complex, and ultimately a release of the extensor mass origin. The three arthroscopic tests used to test for PLRI were a modification of the Savoie “ulnohumeral drive through” test(1-3), the Arrigoni “annular drive through” test(4), and the Kniesel instrumentation of the proximal radioulnar joint(5). Each of the three arthroscopic tests for PLRI were performed at baseline and after each stage of sequential sectioning in two elbow positions: 90-degrees of flexion and neutral forearm rotation, and in 45-degrees of flexion with full forearm supination. Nonparametric statistical analyses of intra-test and inter-test sensitivity for progressive instability were performed.

RESULTS: Each test reliably detected increased levels of instability, as demonstrated by a statistically significant increase in the measured gap from baseline to complete release of the LCL complex and from baseline to release of the extensor origin. The modified ulnohumeral drive through test and annular ligament drive through test were most sensitive for subtle PLRI, defined as loss of the anterior 50% of the LCL complex ($p = 0.03$). Each test. There were no inter- or intra-test differences in detecting sequential instability with either position of the elbow.

CONCLUSIONS: Subtle PLRI, defined as partial loss of the LCL complex, was most reliably detected by the modified ulnohumeral drive through test and annular drive through tests Each test however demonstrated high sensitivity in detecting both the loss of the posterior half of the LCL complex as well as the loss of the extensor origin. In addition, elbow position during testing is per surgeon preference and does not alter test results.

The Efficacy of Conservative Management for Glenohumeral Osteoarthritis

Paper 079

Kira L. Smith, M.D. / Cleveland, OH

Co-Authors:

Molly M. Piper, B.S. / Cleveland, OH

Kira L. Smith, M.D. / Cleveland, OH

Margaret A Sinkler, M.D. / Cleveland, OH

Ethan R Harlow, M.D. / Cleveland, OH

Raymond E Chen, M.D. / Cleveland, OH

Robert J Gillespie, M.D. / Cleveland, OH

INTRODUCTION: Glenohumeral osteoarthritis (GHOA) is a common cause of shoulder pain and function limitation in patients. When conservative management of GHOA fails, surgical options can include both shoulder arthroscopy and arthroplasty. The purpose of this study is to evaluate the efficacy of conservative management in patients with GHOA.

METHODS: Patients with a diagnosis of GHOA pursuing conservative treatment were prospectively enrolled. Patient-reported outcome measures (PROMs) were recorded at the initial visit and 6- month follow-up visit. PROMs included American Shoulder and Elbow Surgeons (ASES) score, Single Assessment Numeric Score (SANE), and Visual Analog Scale (VAS). Patients were asked to fill out a survey at their initial visit regarding their expectations of the conservative treatment of their shoulder GHOA. Patients participated in home or formal physical therapy exercises. At the 6-month follow-up visit, patients completed PROMs and an outcomes survey evaluating whether their expectations of the treatment of their shoulder GHOA from the initial visit have been met. Functional outcomes were also collected.

RESULTS: There were 39 patients with a minimum of 6 months follow-up with a mean age of 70.5 ± 6.3 years, and 62% of these patients were female (n= 24). 69% of patients had never participated in supervised or home physical therapy for their symptomatic shoulder (n= 27). There were no significant differences in ASES, SANE, or VAS scores when comparing baseline to minimum 6-months follow up. There were also no significant differences in forward flexion or external rotation between baseline and minimum 6-months follow-up measurements. Between the patients who strongly predicted symptom relief and those who were less likely to expect relief at baseline, there was no significant difference in reported relief from GHOA symptoms at a minimum of 6-months follow-up (p= 0.33). There was also no significant difference in patient expectations in terms of sleeping more comfortably or doing more yard or household activities from baseline to a minimum of 6-months follow up (p= 0.72 and p= 0.46, respectively).

CONCLUSION: Conservative management of primary GHOA with formal or home physical therapy exercises does not significantly improve patient outcomes in a period of at least 6 months.

Outcomes and Recurrence Rates Following Shoulder Stabilization in Patients with Elevated BMI

Paper 080

Brent Henderson / Columbus, OH

Co-Authors:

Brent Henderson, B.A. / Columbus, OH
Louis W. Barry, B.S. / Columbus, OH
Benjamin Brej, B.S. / Columbus, OH
Collin Todd, B.S. / Columbus, OH
George Matta, B.S. / Columbus, OH

Erryk Katayama, B.A. / Columbus, OH
Ryan Rauck, M.D. / Columbus, OH
Julie Y. Bishop, M.D. / Columbus, OH
Grant Jones, M.D. / Columbus, OH
Gregory Cvetanovich, M.D. / Columbus, OH

INTRODUCTION: Recurrent instability of the shoulder is often difficult to correct as patients present with unique pathology. Body mass index (BMI) has been commonly studied in relation to hip and knee procedures, but the effect on shoulder instability procedures is less understood. This study aims to analyze BMI's effect on clinical outcomes and recurrence rates in relation to shoulder instability surgery.

METHODS: This is a single institution, retrospective study of patients who underwent operative treatment for shoulder instability and had 6 months of follow up between 2009-2023. Primary procedures included Bankart repair, Latarjet, distal tibial allograft, Hill-Sachs bone grafting, and remplissage. Patients were stratified into 3 cohorts by BMI: underweight or normal weight (U/NW, BMI ≤ 25 kg/m²), overweight (OW, BMI > 25 to ≤ 30 kg/m²), and obese (BMI > 30 kg/m²). Data collected from electronic medical records included patient demographics, clinical outcomes, and functional markers.

RESULTS: A total of 429 patients (323 male, 106 female) underwent surgery for recurrent shoulder instability. 167 patients were U/NW (22.4 ± 1.8 kg/m²), 158 patients were OW (27.2 ± 1.4 kg/m²), and 104 patients were obese (35.6 ± 5.2 kg/m²). Age was directly related to BMI at time of surgery (U/NW vs. OW vs. obese, 25.6 ± 7.9 years vs. 29.3 ± 10.1 years vs. 30.1 ± 11.7 years; $P < 0.001$). Obese individuals had a greater depression rate of 40%, compared to 23% and 22% for U/NW and OW, respectively ($P = 0.002$). Obese patients had significantly lower postoperative external rotation (56 ± 16) and internal rotation (T12) compared to the other cohorts ($p = 0.045$, $p < 0.001$). Obese patients had a significantly lower recurrence-free rate at both 2-years (64%) and 5-years (48%) compared to U/NW and OW patients ($p = 0.002$), but no difference in reoperation rates was seen. There was no significant difference in lifetime recurrence rates between the 3 cohorts (U/NW = 18%, OW = 15%, obese = 25%, $p = 0.131$).

CONCLUSION: Body mass index is an important factor to recognize in patients with shoulder instability. While the goal is shoulder stabilization, we find acceptable differences in functional outcomes with similar recurrence rates, emphasizing that surgery for recurrent instability is an effective treatment regardless of BMI.

Outcomes and Durability of Revision Shoulder Arthroplasty for Instability

Paper 081

Erryk S. Katayama, BA / Columbus, OH

Co-Authors:

Louis W. Barry, B.S. / Columbus, OH

Erryk S. Katayama, B.A. / Columbus, OH

John S. Barnett, B.S. / Columbus, OH

Collin Todd, B.S. / Columbus, OH

Akshar V. Patel, B.S. / Columbus, OH

Gregory L. Cvetanovich, M.D. / Columbus, OH

Ryan C. Rauck, M.D. / Columbus, OH

Julie Y. Bishop, M.D. / Columbus, OH

OBJECTIVE: Instability is a prevalent and challenging reason for revision after primary shoulder arthroplasty (SA). In this study, we assess mid-term outcomes and re-revision rates following revision SA for instability. We hypothesize that while revision SA for instability will yield outcomes comparable to other indications, it will also have higher re-revision rates.

METHODS: This retrospective study, conducted at a single institution, examines aseptic revision SA following primary anatomic total SA (TSA), hemiarthroplasty (HA), or reverse total SA (RSA). The revision procedures were performed between 2009 and 2020, with a minimum clinical follow-up of 2 years. Data collected from electronic medical records included patient demographics, implant survival, and functional measurements. Patient-reported outcomes (PROs) were obtained via phone interviews.

RESULTS: Among 99 aseptic revision SA procedures, 29 were indicated for instability, including 20 dislocations and 9 chronic subluxations. The mean age at revision was 66.5 ± 12.1 years, with a follow-up period of 8.0 ± 6.0 years. Primary SA types included RSA in 13 patients, TSA in 14 patients, and HA in 2 patients. Notably, 14 of the 16 patients with primary TSA or HA exhibited subscapularis insufficiency. Revision procedures involved RSA in 25 patients and HA in 4 patients. The most used implant was a diaphyseal fit/long stem with an inlay system for RSA ($n=17$). Onlay-to-onlay humerus revision was performed in 12 patients. The glenosphere was lateralized by +3mm in 4 cases; polyethylene liners were lateralized by +3mm in 4 cases and +6mm in 7 cases. Subscapularis pathology was present in 21 patients and was repaired in 10 cases. Patients undergoing revision for instability had significantly higher preoperative external rotation ($p=0.004$) and internal rotation ($p=0.003$) strength compared to other patients. Other functional markers, including ROM and strength, did not differ significantly between groups. PROs including ASES, SANE, VAS, and SST showed no significant differences. Re-revision occurred in 6 patients (21%), all due to recurrent instability. Implant survival rates for instability cases were 81% at 2-, 5-, and 10-years, compared to 91%, 80%, and 58% for controls, respectively ($p=0.633$).

CONCLUSIONS: Our findings underscore the importance of patient selection, precise surgical technique, and thorough postoperative counseling to reduce the risk of re-revision due to instability. Most re-revisions for recurrent instability occurred within the first year. Despite these challenges, functional outcomes, PROs, and implant survival rates for instability were comparable to those for other revision indications.

The Impact of Gender on Recovery Following Total Shoulder Arthroplasty

Paper 082

Thomas G. Stanila, B.S. / Maywood, IL

Co-Authors:

Thomas G. Stanila, B.S. / Maywood, IL

Jason Howard, B.S. / Maywood, IL

Krishin Shivdasani, M.D. MPH / Maywood, IL

Nickolas Garbis, M.D. / Maywood, IL

Dane Salazar, M.D. / Maywood, IL

INTRODUCTION: Total shoulder arthroplasty through either anatomic (aTSA) or reverse (rTSA) techniques represents an indispensable therapeutic approach. However, studies have suggested worse postoperative outcomes for women vs. men. This study examines the impact that gender has on rehabilitation after shoulder arthroplasty.

METHODS: A retrospective chart review identified patients who underwent shoulder replacement from 2007 to 2023 for all causes except fracture. Records were reviewed for demographics, body mass index (BMI), Charlson Comorbidity Index (CCI), and follow-up length. Outcomes included active forward flexion (aFF), active external rotation (aER), visual analog scale pain scores, American Shoulder and Elbow Surgeons (ASES) scores, and readmission and revision rates. Information was collected at preoperative, 2 month, 6 month, 1 year, 2 year, and most recent follow-up (MRF) times. An outcome's percent change by MRF compared to preoperatively was also included. Separated by aTSA and rTSA, linear mixed effects models were fit to estimate mean difference in outcomes between male and female patients while controlling for age, BMI, race, and CCI.

RESULTS: 1143 arthroplasties were studied with a mean follow-up of 4.22 years. For the 482 aTSAs, males had greater aFF preoperatively (7.8° , $p = 0.0109$), though no differences existed postoperatively. Females had a greater percent change in aFF by MRF (31.6%, $p = 0.0073$). Females also had more pain at 3 months (0.775, $p = 0.046$) and 6 months (0.626, $p = 0.033$), though no differences existed at other time points. There were no gender differences in aER, ASES scores, readmission, and revision rates as well. For the 661 rTSAs, males also had greater aFF preoperatively (8.3° , $p = 0.015$) and at 2 months (7.7° , $p = 0.0143$), with females still having a greater percent change by MRF (70.9%, $p = 0.0116$). Additionally, while females had more preoperative pain (1.13, $p < 0.0001$), males had a greater change in pain by MRF (21.2%, $p = 0.0334$). No other time points showed significant gender differences in pain or other outcomes.

CONCLUSION: For both aTSA and rTSA, while males began with greater preoperative aFF, females saw greater improvement by MRF. In contrast, where females began with greater preoperative pain, males would see greater pain relief only following rTSA. Though these trends do not appear at specific postoperative time points or for other outcomes, they confirm the impact of gender on patients both before and after shoulder replacement.

Infection and Immune Reaction After Achilles Repair: A Systematic Review

Paper 083

Michael Braman, BBmE / Kansas City, KS

Co-Authors:

Michael Braman, BBmE / Kansas City, KS

Jacob Adams, B.S. / Kansas City, KS

Ian Harmon, M.D. / Kansas City, KS

Bryan Vopat, M.D. / Kansas City, KS

OBJECTIVE: Achilles tendon rupture is a common tendinous injury in athletes. Surgeries in and around the ankle have been reported to have a higher incidence of infection than other orthopedic surgical sites, and the Achilles tendon has been reported to be infected with unique microorganisms differing from other orthopedic surgical sites. The purpose of this study is to systematically review the literature regarding infections following Achilles tendon reconstruction and identify common pathogens, risk factors, and methods associated with this outcome.

METHODS: An electronic review was conducted via PubMed and Cochrane search. Primary factors assessed include causative microorganism, time to infection, treatment, foreign body identified, and risk factors. Because of the small size of studies and the lack of reporting on treatment information and causative agents, case reports were included to give detailed information on the clinical course and infectious agents.

RESULTS: 33 articles were included. Staphylococcus aureus, coagulase negative Staphylococci, and Pseudomonas aeruginosa were the most common infectious agents making up 33.3%, 20%, and 13.3% of cases, respectively. The greatest risk factors were open wounds prior to surgery ($P<0.001$), obesity ($P<0.0001$), and age ($P=0.03$). The time to infection ranged: 10 days-6 months, with most infections occurring within the first 8 weeks.

CONCLUSION: Achilles tendon rupture is one of the most common tendinous injuries and causes significant functional disability typically requiring surgical repair to return to preoperative athletic status. Due to the thinness of the skin and the relative avascularity surrounding the Achilles tendon, healing and immune function can be impaired creating a microenvironment that allows infectious pathogens to thrive in the setting of a postoperative infection. Staphylococcus and streptococcus were the most common causative agents of infection followed by E. coli and pseudomonas which mirrors the common pathogens identified in most surgical infections. Infections generally began within the first 8 weeks postoperatively, but the range of reported timelines spanned 10 days up to 6 months highlighting the need for continued vigilance and sterile wound care postoperatively. Several statistically significant risk factors for postoperative Achilles infection identified include obesity, comorbid medical conditions, smoking, tourniquet time, blood loss, and patient age.

Comparing Perioperative Outcomes After Transmetatarsal Amputation (TMA) in Patients with or without Peripheral Vascular Disease

Paper 084

Michael Peabody, M.D. / Chicago, IL

Co-Authors:

Mark A. Plantz, M.D. / Chicago, IL
Rachel Bergman, M.D. / Chicago, IL
Erik B. Gerlach, M.D. / Chicago, IL
Tyler Compton, M.D. / Chicago, IL

Michael Peabody, M.D. / Chicago, IL
Muhammad Mutawakkil, M.D. / Chicago, IL
Milap Patel, D.O. / Chicago, IL
Anish R. Kadakia, M.D. / Chicago, IL

OBJECTIVE: Transmetatarsal amputation (TMA) is a commonly performed procedure for gangrene in the setting of diabetes or peripheral vascular disease. There is limited research comparing perioperative outcomes and risk factors for complications between these two unique patient populations. The purpose of this study is to investigate the incidence of and risk factors for reoperation and perioperative complications after TMA in patients with or without peripheral vascular disease, specifically.

METHODS: Patients undergoing TMA between January 1, 2015 and December 31, 2020 were identified using the ACS NSQIP database. The indication for surgery was reported using the International Classification of Disease 9/10 codes. Patients were categorized into the three groups: infection/diabetic wounds, peripheral vascular disease, and tumor/other. The incidence of 30-day mortality, readmission, reoperation, non-home discharge, and various medical and surgical complications was reported. Outcome measures were compared between the infection/diabetic wounds vs. peripheral vascular disease groups. Logistic regression was used to identify independent risk factors for each outcome measure of interest.

RESULTS: 3,392 patients were included in the final cohort – 2,812 patients with infection/diabetic wounds, 553 patients with peripheral vascular disease, and 27 patients with tumor/other. A significant percentage of patients had sepsis present preoperatively (7.0%) and even septic shock present preoperatively (0.9%). There was an overall 30-day mortality rate of 2.9%, reoperation rate of 13.8%, readmission rate of 16.8%, surgical complication rate of 22.2%, and medical complication rate of 15.8%. Patients undergoing surgery for a vascular indication had a higher rate of mortality, reoperation, hospital readmission, non-home discharge, and various medical complications. Patients undergoing surgery for infection/diabetic wounds had a higher rate of deep surgical site infection and systemic sepsis. A vascular surgical indication was independently associated with reoperation and overall medical complications on multivariate analysis. Various factors, including age, BMI, medical comorbidities, and the presence of sepsis preoperatively were also associated with poor outcomes.

CONCLUSION: Significant rates of mortality, reoperation, and hospital readmission were reported after TMA. The presence of peripheral vascular disease was independently associated with reoperation and medical complications. Patients undergoing TMA, particularly for peripheral vascular disease, should be counseled about perioperative risks and indicated for surgery carefully.

Midfoot Beam-Plate Constructs for Charcot Neuroarthropathy: A Cohort Study with Midterm Follow-Up

Paper 085

Clayton C. Bettin, M.D. / Memphis, TN

Co-Authors:

Ryan G. Rogero, M.D. / Memphis, TN

Patrick C. McGregor, M.D. / Memphis, TN

William C. Skinner, M.D. / Memphis, TN

Carson M. Rider, M.D. / Memphis, TN

Benjamin J. Grear, M.D. / Memphis, TN

David R. Richardson, M.D. / Memphis, TN

Garnett A. Murphy, M.D. / Memphis, TN

Clayton C. Bettin, M.D. / Memphis, TN

OBJECTIVE: The goal of surgical treatment for Charcot neuroarthropathy (CN) is achieving and maintaining a plantigrade ulcer-free foot. The technique of intramedullary beaming of the metatarsals with a supplemental medial locking plate (referred to here as a midfoot beam-plate construct [MBPC]) utilizes large diameter intramedullary cannulated screws with a medial locked plate for midfoot stabilization. The purpose of this study was to evaluate clinical and radiographic outcomes of MBPC in CN patients.

METHODS: Forty patients (41 limbs) with midfoot CN treated at our institution by five fellowship-trained foot and ankle surgeons between January 2014 and October 2023 met inclusion criteria. A retrospective chart review was performed to obtain patient demographic data, radiographic (Brody) classification, number of re-operations, and clinical outcomes after operative management with MBPC. Lateral Meary's angle was measured for MBPC patients preoperatively, at first postoperative radiographs, and final radiographs to use as a proxy for surgical correction of midfoot Charcot deformity. Furthermore, post-intervention outcomes (rates of ulceration, infection, and amputation) were compared to our previously reported institutional baseline data of 58 CN patients treated from 2005-2014 with limited and reconstructive techniques other than MBPC.

RESULTS: The mean age of the MBPC cohort was 57.6 (range, 37-73) years, mean BMI was 38.0, 82.5% (33/40) of patients had diabetes, and 43.9% (18/41) had an ulcer present at time of surgery. Mean clinical follow-up was 29.1 (range, 4-80) months. 94.4% (17/18) of ulcers present at the time of surgery healed after a MBPC construct was utilized. Seven (17.1%) patients in our cohort underwent a major amputation, lower than the rates for our historical limited (21.9%) and reconstructive technique (23.1%) cohorts. The amputation rate after adopting the MBPC approach decreased by 26% compared to our institutional baseline data. Excluding the 7 amputees, 82.4% (28/34) of our patients were plantigrade, ulcer-free, and able to fit into commercially available footwear at final follow-up. Preoperative lateral Meary's angle in our cohort averaged -31.0 degrees, immediate postoperative measured -5.3 degrees ($p < 0.001$), and final postoperative was -14.4 degrees ($p < 0.001$).

CONCLUSIONS: Patients undergoing MBPCs had a relatively low rate of major amputation, and a large portion achieved a plantigrade, shoeable, ulcer-free foot at final follow-up. We have also shown that active ulceration is not a contraindication to open reconstructive surgery. Furthermore, surgical correction of midfoot deformity, as measured by lateral Meary's angle, was improved and sustained at final radiographic follow-up, demonstrating the durability of MBPCs for deformity correction.

Age and Insurance Status are Predictors of Achilles Tendon Tear Treatment: A Social Determinants Analysis

Paper 086

Michael A. Gaudiani, M.D. / Detroit, MI

Co-Authors:

Michael A. Gaudiani, M.D. / Detroit, MI

Allison Boland, B.S. / Detroit, MI

Christian Freitag, B.S. / Detroit, MI

Susan G. Wager, M.D. / Detroit, MI

Christopher Rittle, B.S. / Detroit, MI

Joshua P. Castle / Detroit, MI

Brandon King, M.D. / Detroit, MI

Vasilios Moutzouros, M.D. / Detroit, MI

INTRODUCTION: There is a growing recognition of the importance of social determinants of health (SDOH) on orthopedic surgery and their influence on surgical outcomes. Multiple studies have reported positive outcomes for both nonoperative and operative treatment for Achilles tendon ruptures as well as with open and minimally invasive techniques (MIS). The purpose of this study was to investigate the impact of SDOH on treatment choice as well as clinical and patient-reported reported outcomes of acute Achilles tendon tears.

METHODS: This study retrospectively reviewed patients treated for Achilles tendon tears at a single hospital system. Patients were excluded if they were <18 years of age, had previous Achilles tendon surgery, and/or concurrent fractures. Demographic data, treatment data complications and re-ruptures were collected from the electronic medical record (EMR). Area deprivation index (ADI) and median household income (MHI) were collected using patient home addresses. Patient-Reported Outcome Measurement Information System (PROMIS) scores for Physical Function (PROMIS-PF) and Pain Interference (PROMIS-PI) were collected preoperatively and at multiple postoperative time points. Percent achieving minimum clinically important difference (MCID) was calculated and compared between cohorts.

RESULTS: A total of 428 patients were included, with 149 nonoperative and 279 operatively treated patients. The nonoperative cohort had a significantly higher mean age than the operative group (50.40 ± 15.47 vs. 43.50 ± 13.45 years; $P < 0.001$). Operative patients were more likely to have private insurance (73% vs 58%, $P = 0.001$) and less likely to have Medicaid (9% vs. 13%; $P = 0.001$) or Medicare (11% vs. 24%; $P = 0.001$). No significant differences were found in ADI and MHI. There was a higher proportion of patients treated with MIS Achilles repair in ADI quartile 3 and 4 compared to quartiles 1 and 2 (28.8% and 28.2% vs 3.8% and 12.2%; $P = 0.025$). Postoperative complication, re-rupture, crossover to surgery, and reoperation rate were similar between ADI quartiles. Medicaid (0.430 [0.205-0.906]; $P = 0.026$) and age (0.973 [0.954-0.993]; $P = 0.008$) were negative predictors of operative treatment in logistic regression. Operative patients showed significantly greater improvement in PROMIS-PI at 6 weeks (-8.24 ± 9.62 vs. -3.61 ± 10.72 , $P = 0.006$. and greater improvement in PROMIS PF at 1 year (21.77 ± 10.39 vs. 5.60 ± 10.74 ; $P = 0.010$).

CONCLUSION: This study found that operatively treated patients were younger and had private insurance. Increasing age and Medicaid insurance were negative predictors for operative treatment of Achilles tendon tears. ADI was not significantly associated with treatment choices and outcomes including reoperation and re-rupture rates.

Short Term Outcomes Utilizing Custom Total Talus Replacement with Subtalar Arthrodesis for Revision and Complex Total Ankle Arthroplasty

Paper 087

Kevin Joseph Horner, M.D. / Columbia, MO

Co-Authors:

Kevin Joseph Horner, M.D. / Columbia, MO

Kyle Schweser, M.D. / Columbia, MO

OBJECTIVE: Total ankle arthroplasty (TAA) in the setting of talar avascular necrosis (AVN) is a challenging problem and is often a contraindication for TAA. Custom 3D talar replacements offer a potential solution and have been shown to re-establish normal foot alignment, preserve motion, and allow almost normal ambulation. We performed this study to assess the short-term outcomes of 3D printed total talus replacements (TTRs) for revision TAA in the setting of talus AVN or collapse of the talar implant, or primary TAA in the setting of pre-existing talar AVN. Our hypothesis is that custom 3D printed talar body replacements lead to good outcome scores and patient satisfaction scores.

METHODS: We performed a retrospective chart review on 10 patients (11 TTRs) who underwent a TTR at our institution. TTR for acute trauma were excluded (n=7). All TTRs (11/11; 100%) had a subtalar ingrowth stem and were performed in conjunction with a primary TAA (7/11) or implanted in the setting of a previous TAA (4/11). One TTR had a talonavicular ingrowth surface. Patients included in this study had at least 12-week follow-up. Patient reported outcome measures (PROMs) included AAOS Foot and Ankle Questionnaire and visual analog scale (VAS) pain scores. Range of motion and 10-meter walking speed were evaluated.

RESULTS: Mean length of follow-up was 1.2 years. All patients achieved subtalar arthrodesis. Mean VAS score was 2.4 (range: 0 - 4) postoperatively. Average Foot and Ankle Core Standardized Mean was 66.1 (range: 35.4 - 93.6). Mean Shoe Comfort Standardized Mean was 56.4 (range: -60 – 88). Mean time to walk 10 meters postoperatively was 8.8 seconds (range: 6.2 – 10.7). Mean ankle dorsiflexion was 2° and plantarflexion was 23°. Four (4/11; 36%) TTRs had an unplanned return to the operating room. The single TTR with the talonavicular ingrowth stem went onto symptomatic nonunion of the TN joint requiring revision talonavicular fusion. Two TTRs had surgical wound dehiscence, one of which necessitated a radial forearm free fasciocutaneous flap. One had synovial fluid cultures grow staphylococcus aureus.

CONCLUSIONS: TTR for primary or revision TAA offers good outcomes and should be considered for patients presenting with a failed TAA or talar AVN with tibiotalar arthritis. Patient selection and education is important. This study adds to the limited data on 3D custom talar implants for revision and complex TAA and is the only one to the authors knowledge presenting data concerning concurrent subtalar arthrodesis utilizing on growth surfaces.

Complications Following Arthrodesis vs. Total Ankle Arthroplasty for Primary Ankle Osteoarthritis: A Propensity Matched Analysis of 3,852 Patients

Paper 088

Andrew J. Moyal, M.D. / Cleveland, OH

Co-Authors:

Andrew J. Moyal, M.D. / Cleveland, OH

Jeremy M. Adelstein, M.D. / Cleveland, OH

Robert J. Burkhart, M.D. / Cleveland, OH

Alexander S. Rascoe, M.D. / Cleveland, OH

David C. Kaelber, M.D. / Cleveland, OH

Raymond W Liu, M.D. / Cleveland, OH

Randall E. Marcus, M.D. / Cleveland, OH

BACKGROUND: End stage primary ankle-arthritis often requires surgical management via ankle arthrodesis (AA) or total ankle arthroplasty (TAA). Despite improvements in TAA, AA remains the gold standard due to its ability to correct deformity and historically lower rate of complications. Recent literature notes improvements in outcomes for TAA, but these have not been validated with large patient populations.

METHODS: A cohort analysis was performed using TriNetX, an aggregated, de-identified electronic health record platform. The database was queried for patients who underwent AA or TAA for primary arthritis within the United States between 2012 – 2022. Primary analysis assessed 3-month surgical site complications, 3-month systemic complications and 2-year surgical site complications. Secondary analysis assessed the impact of post-traumatic arthritis (PTA) on 2-year complications. Tertiary analysis assessed the impact of postoperative nonunion on 2-year complications.

RESULTS: AA when compared to TAA had lower rates of intraoperative fracture ($p < .01$) and wound dehiscence ($p = .02$) within 3 months, but higher rates of infection ($p = .01$). Within 3 months, AA had slightly higher rates of emergency department visits ($p < .01$), hospitalizations ($p < .01$) and postoperative anemia ($p < .01$). AA and TAA did not differ across myocardial infarction, venous thromboembolism, pulmonary complications and critical care requirements. Through 2 years post-op, AA had higher rates of pain ($p < .01$) and mechanical complications ($p < .01$), but a lower rate of reoperation ($p < .01$). Secondary analysis which included PTA and tertiary analysis which excluded nonunion did not change 2-year outcomes.

CONCLUSION: AA and TAA performed over the last decade may have small differences in the types of short-term and long-term complications, but overall rates of complications did not significantly differ. AA and TAA are both appropriate procedures for the treatment of ankle arthritis with similarly low complication rates.

Anatomical Structures at Risk and Joint Preparation Effectiveness in Percutaneous First Metatarsophalangeal Fusion with the Shannon Burr: A Cadaveric Study

Paper 089

Garrett Jebeles / Birmingham, AL

Co-Authors:

Marc Bernstein, M.S / Birmingham, AL

Tyler Kelly, M.D / Birmingham, AL

Garrett Jebeles / Birmingham AL

Matthew McCrosson, M.D / Birmingham, AL

Ashish Shah, M.D. / Birmingham, AL

OBJECTIVE: This cadaveric study aims to evaluate the anatomical structures at risk and the amount of joint preparation achieved during percutaneous first metatarsophalangeal joint (1-MTPJ) preparation with a Shannon burr using a direct medial and dorsal-lateral approach.

METHODS: Eleven fresh-frozen cadaver foot and ankle specimens underwent 1-MTPJ preparation with a Shannon burr under fluoroscopy. Following joint preparation, dissection was carried out to locate and evaluate critical soft tissue structures in the vicinity of the 1-MTPJ, including the extensor hallucis longus (EHL) tendon, medial dorsal cutaneous nerve (MDCN), and lateral dorsal digital artery (LDA). Measurements from the surgical site to these critical structures were recorded. Image analysis using ImageJ software was conducted to measure the joint surface area prepared on both the distal metatarsal and proximal phalanx articular surfaces.

RESULTS: Contact with the LDA and EHL occurred three times each out of the 11 procedures (27%) through the dorsal-lateral approach without macroscopic laceration. The MDCN was contacted three times (27%) via the medial approach without macroscopic laceration and transected once (9%). The average percentage of joint preparation for the distal first metatarsal was 71.8% (+/- 24.0%), and for the proximal first phalanx was 78.2% (+/- 19.8%). There was no statistically significant difference in joint preparation percentage between both surfaces ($p = 0.507$). The raw joint surface area prepared on the metatarsal and phalangeal surfaces was 215.24 mm³ and 187.98 mm³, respectively.

CONCLUSIONS: This study emphasizes the importance of understanding local anatomy and maintaining surgical precision during percutaneous 1-MTPJ fusion using a Shannon burr. Additionally, this technique offers comparable joint surface preparation to other minimally invasive techniques, however, inferior joint preparation compared to open techniques. Future studies with larger in vivo sample sizes are warranted to further refine the percutaneous approach and enhance patient outcomes.

Medial Malleolar Stress Fracture Treatment and Return to Activity: A Systematic Review and Meta-Analysis

Paper 090

Daniel C. Touhey, M.D. / St. Louis, MO

Co-Authors:

Daniel C. Touhey, M.D. / St. Louis, MO

Nikko D. Beady / Johnson City, TN

D. Sina Tartibi / Houston, TX

Robert H. Brophy, M.D. / St. Louis, MO

Matthew J. Matava, M.D. / St. Louis, MO

Matthew V. Smith, M.D. / St. Louis, MO

Derrick M. Knapik, M.D. / St. Louis, MO

OBJECTIVE: Medial malleolar stress fractures (MMSF) are reported to occur primarily in athletes participating in sports requiring prolonged running and repetitive jumping. Nonoperative and operative modalities have been described, yielding a range of outcomes and return to activity (RTA) rates. The purpose of this study was to systematically review the current literature to identify patients sustaining MMSF to better understand current treatments, outcomes, and RTA rates.

METHODS: Studies published in PubMed, EMBASE, and the Cochrane Library reporting on patients sustaining isolated MMSF from inception to June 2024 were identified. Studies published in English reporting treatment (operative vs. non operative), outcomes, RTA rates, and incidence of any complications, were included.

RESULTS: Sixteen studies were identified, consisting of 68 patients, with 74% (n = 50/68) of patients being male. The weighted mean patient age was 26.1 years (range, 9 – 73 years). Overuse injury mechanisms during sporting activities accounted for 93% (n = 63/68) of injuries, while traumatic mechanisms comprised 12% (n = 8/68). Soccer was the most commonly reported athletic activity (n = 18), followed by running (n = 11), and track and field (n = 9). Operative management was performed in 53% of patients (n = 36/68) as initial management at a weighted mean of 19.4 weeks (n = 30) from symptom onset, with another 8 patients undergoing operative treatment following a course of nonoperative management. Complications following treatment were reported in 11% (n = 4/36) of patients treated with surgical management and 6% (n = 2/32) of patients treated nonoperatively. Successful return to pre-injury activity level was reported in 98% (n = 56/57) of patients. When reported, successful fracture healing was confirmed by radiography (n = 41) as well as pain-free return to activity (n = 66).

CONCLUSIONS: Medial malleolar stress fractures are reported to occur primarily in younger, adult patients, commonly resulting secondary to overuse, especially in patients participating in soccer and running. Operative management was reported in 65% of cases at a mean of 19.7 weeks following symptom onset. With appropriate management, successful RTA is high, while further studies evaluating long-term outcomes and complications are warranted.

Arthroscopic Release and Hindfoot Fusion for the Spastic Equinovarus Foot: An All-inside Technique

Paper 091

Elise Grzeskiewicz, M.D. / Columbus, OH

Co-Authors:

Elise M. Grzeskiewicz, M.D. / Columbus, OH

LTC Kevin D. Martin D.O., FAAOS, FAANA / Columbus, OH

OBJECTIVE: To identify functional outcomes using arthroscopic assisted, minimally invasive contracture tenotomies paired with a tibio-talo-calcaneal (TTC) arthrodesis in the reconstruction of SEF.

METHODS: Surgeons log retrospective study on patients who underwent arthroscopic assisted, minimally invasive contracture tenotomies paired with tibio-talo-calcaneal (TTC) arthrodesis in reconstruction of SEF deformities. All cases were performed completely arthroscopically, utilizing posterior approach with TTC fusion done in a prone position by a single surgeon at our institution. Patient demographics, SEF pattern, perioperative complications, and radiographs were collected. Paired t-test was applied for FADI and VAS scores to determine improvement. Multivariate logistic regression was used to determine influence that variables have on failure rates. Any correlation between type of procedure, radiographic findings scores and VAS or FADI scores were examined using Pearson's correlation coefficient at 3 months. Test statistics with p-value less than 0.05 considered significantly different. Analysis was performed with Microsoft Excel.

RESULTS: 10 patient cases included. Average age 37 years old. 6 patients male (60%), 4 female (40%). Mean BMI 30.4. 2 patients were tobacco users (20%). No patients used illicit drugs. Preop, 2 patients used AFO or walker (20%), 1 crutches (10%), 7 were non-ambulatory for 2 years or more (70%). Average time from injury 6.1 years. Mechanisms of injury: drug induced ABI (20%), fall (20%), MVA (30%), CVA (10%), crush injury (10%), ABI (10%). Average tourniquet time 120.2 minutes. 10 patients underwent tenotomies and TTC nail. No tendon transfers. All patients had restoration of alignment. 100% fusion rates (via radiographic evaluation) at 3 months post op. 0 patients required bracing post op. 5 patients minor complications (50%): 4 skin tears, 1 superficial infection treated with oral antibiotics. No patients had major complications. FAS Scores - 7 patients had improvement in FAS scores at 1 year postoperatively (70%), 2 patients had no change (20%), 1 patient had incomplete data (10%). Change in pre and post op FAS scores found to be statistically significant (p-value 0.001). VAS Scores - 3 patients had improvement of VAS at 1 year postoperatively (30%), 3 had no change (30%), 3 had incomplete data (30%) and 1 had worsening in their VAS scores (10%). VAS changes were not statistically significant.

CONCLUSIONS: Patients who undergo arthroscopic assisted minimally invasive surgical treatment for SEF have improved functionality based on FAS scores and postoperative activity levels.

The Impact of Hypothyroidism on Trimalleolar Fracture Outcomes

Paper 092

Lindsey N. Peng, B.S / San Antonio, TX

Co-Authors:

Aaron Singh, B.A. / San Antonio, TX

Travis Kotzur, B.S. / San Antonio, TX

Lindsey Peng, B.S. / San Antonio, TX

Stephanie Jones, M.D. / San Antonio, TX

Travis Bullock, M.D. / San Antonio, TX

Case Martin, M.D. / San Antonio, TX

OBJECTIVE: Hypothyroidism is an increasingly common medical condition affecting around 10% of the United States population. Despite the prevalence and the believed increase in fracture risk of patients with hypothyroidism, there is limited analysis of the impact of hypothyroidism on surgical outcomes. The aim of this study was to assess the impact of diagnosed hypothyroidism on postoperative outcomes in patients undergoing surgical management of a trimalleolar fracture.

METHODS: This retrospective cohort study utilized the National Readmissions Database from 2016 to 2020 to examine patients undergoing trimalleolar fracture repair with and without diagnosed hypothyroidism, identified via ICD-10 codes. Patient demographics and comorbidities, measured via Elixhauser comorbidity index, were controlled for in our analysis. Multivariate regression was performed to assess postoperative outcomes between groups.

RESULTS: A total of 78,189 trimalleolar fracture patients, 12,820 (16.40%) with diagnosed hypothyroidism, were included for analysis. Patients with hypothyroidism were more likely to have both medical (Odds Ratio (OR) 1.21; $p < 0.001$) and surgical (OR 1.29; $p < 0.001$) complications, especially malunion (OR 1.51; $p = 0.04$), mechanical complications (OR 1.63; $p = 0.027$), and osteomyelitis (OR 1.47; $p < 0.001$). They also had increased odds of 30-day readmission (OR 1.39; $p < 0.001$) and reoperation (OR 1.35; $p < 0.001$).

CONCLUSIONS: This study highlights the impact of hypothyroidism on trimalleolar fracture outcomes. Patients with hypothyroidism had higher odds of medical and surgical complications. Notably, orthopedic specific events such as malunion, mechanical complications, and osteomyelitis, were significantly increased compared to patients without hypothyroidism. These results suggest a potential area for patient outcome improvement for patients undergoing surgery for trimalleolar fracture.

Early Weight-Bearing After Ankle Fractures: Correlation of PROMIS Scores with Functionality

Paper 093

Tyler Kelly, M.D / Birmingham, AL

Co-Authors:

Marc Bernstein, M.S / Birmingham, AL

Tyler Kelly, M.D / Birmingham, AL

Garrett Jebeles / Birmingham, AL

Dan Zhang / Birmingham, AL

Ashish Shah, M.D / Birmingham, AL

OBJECTIVE: Ankle fractures, most frequently fractures of the lateral malleolus, are one of the most common injuries treated by orthopedic surgeons. Current guidelines are ambiguous regarding non-weight bearing postoperatively. The primary aim of this study was to identify trends in PROMIS scores in early weight bearing patients undergoing isolated lateral malleolus open reduction internal fixation (ORIF).

METHODS: Retrospective analysis of patients who underwent ORIF with or without syndesmotic fixation from 2021-2023 at a single institution. Patients under the age of 18, that presented with concomitant lower extremity injuries, or had less than 1 year follow up were excluded from analysis. Patient demographics were collected. Patient reported outcome measures assessed included the Foot Function Index (FFI), Pain Interference (PI), Physical Function (PF), and Depression (D), utilizing the Patient-Reported Outcomes Measurement Information System (PROMIS).

RESULTS: Overall, 57% of patients had a preoperative BMI greater than 30. At 2 weeks post-op patients had the highest FFI, PI scores, pain at rest, and lowest physical function. At 6 weeks, there was improvement in FFI, PF, lowest pain at rest and PI. At 3 months, there was an increase in PI and pain at rest but improved FFI and PF. At 6 months, FFI, PI, PF, and pain at rest improved. At 1 year, FFI was the lowest, PF was the highest, with improved PI and pain at rest.

CONCLUSIONS: Early weight bearing after lateral malleolus ORIF with or without syndesmotic fixation may show good outcomes after 2 weeks in terms of decreased pain and increased physical function. The present study is limited by a lack of comparison with a delayed weight bearing group and limitations to patient follow up. Nevertheless, this is one of few papers currently demonstrating interval data for PROMIS score changes in a population.

Posterolateral Distal Fibula Plating Leads to Decreased Implant Related Complications and Removal

Paper 094

Carlos I. Garcia, M.D. / Springfield, IL

Co-Authors:

Elliot Johns, M.D. / Springfield, IL

Brian Kurcz, M.D. / Cincinnati, OH

Carlos Garcia, M.D. / Springfield, IL

BACKGROUND: Rotational ankle fractures are a frequent injury occurring in 187 out of 100,000 people in the US annually. Most unstable ankle fractures are treated with open reduction and internal fixation (ORIF) with either a 1/3 tubular plate or a locked compression plate (LCP). There exists a variety of positions for plate placement including direct lateral, posterior, and posterolateral. There are well known advantages and disadvantages to each plate type and plate location. Historically lateral plating was associated with more acute wound dehiscence, hardware related pain and infection; posterior plating with peroneal tendon irritation and its associated hardware removal. Implant removal after open reduction internal fixation of the lateral malleolus in the literature has been previously documented to range from 7.6 to 50%. Our study investigates the rate of implant removal and reasons for removal associated with each plate type and position. We believe there is a lower rate of removal utilizing the posterolateral 1/3 tubular plating technique compared to previous literature, and other methods of fixation.

METHODS: Retrospective review was performed from a single surgeon from 2014 to 2020, 480 patients received distal fibular plating.

RESULTS: Posterolateral plating demonstrated a 5% removal rate; Lateral non-locking plating showed a 11.1% removal rate; Lateral locking demonstrated a 22.2% removal rate, while the lateral 1/4 tubular hook plate had a 17.3% removal rate.

CONCLUSION: Overall, posterolateral 1/3 tubular plating demonstrated a lower rate of implant removal compared to other plate types and positions in this study as well as in the current literature.

LEVEL OF EVIDENCE: Therapeutic, Level III, Retrospective.

Postoperative Wound Complications After Foot and Ankle Surgery with and without Intraoperative Vancomycin Powder: A Retrospective Cohort Study

Paper 095

Makenna Isley / Chicago, IL

Co-Authors:

Jamal Ahmad, M.D. / Chicago, IL

Ryan Lee / Chicago, IL

Makenna Isley / Chicago, IL

Yanal Kawaleet / Peoria, IL

Nirav Mungalpara, M.D. MRCS / Chicago, IL

Brett Drake / Chicago, IL

Apurva Swapnill Choubey, M.D. / Chicago, IL

INTRODUCTION: Wound complications can be challenging to manage after orthopedic foot and ankle surgery. Intraoperative application of vancomycin powder within surgical wounds has shown promise in reducing surgical site infections (SSI). The purpose of this study is to retrospectively evaluate and compare postoperative wound complications following foot and ankle surgery with and without intraoperative application of vancomycin powder within the surgical wound(s).

METHODS: 367 patients receiving foot and ankle surgery were retrospectively included in this study. 93 and 274 patients did and did not receive intraoperative vancomycin powder within their wound(s) respectively. All surgeries were performed by a single fellowship-trained orthopedic foot/ankle surgeon from February 2019 - October 2023. Exclusion criteria were patients <18 years old, those with wounds too small for usage of vancomycin powder, or those receiving surgery for an infectious condition. Retrospective chart review was performed to identify patient demographics, comorbidities, and postoperative outcomes including the incidence and nature of superficial and deep wound complications. Chi-squared and independent samples t-tests were performed to determine statistically significant differences in patient characteristics and postoperative wound complications between these two groups.

RESULTS: 13 of 93 (14%) patients who received vancomycin powder within their wound(s) during surgery developed post-surgical superficial wound complications compared to 27 of 274 (10%) of patients who did not receive topical vancomycin during surgery ($p=0.270$). 5 of 93 (5%) and 8 of 274 (3%) patients that did and did not receive topical vancomycin at their wound during surgery, developed post-surgical deep wound complications with surgical site infection respectively ($p=0.268$). With regard to patient factors, those with a body mass index (BMI) over 30 and/or a Charlson Comorbidity Index (CCI) at or over 5 were at significantly higher risk for wound complications. Usage of vancomycin powder was not found to be significantly protective against wound complications.

CONCLUSION: This study demonstrates that the intraoperative use of vancomycin powder at surgical wounds does not significantly decrease the incidence of wound complications in foot and ankle surgery. Despite its reported value in preventing wound complications and/or surgical site infection in prior literature, this study showed no such benefit in the patient populations examined. Studies that are prospective with a larger patient population may be needed to further confirm this reported lack of difference when using topical vancomycin intraoperatively to minimize post-surgical wound complications.

UKA to UKA Revisions are 5x More Likely to Fail than UKA to TKA Conversions

Paper 096

Diego J. Restrepo, M.D. / Rochester, MN

Co-Authors:

Diego J. Restrepo, M.D. / Rochester, MN

Sergio F. Guarin Perez, M.D. / Rochester, MN

Andrew D. Pumford BA / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

BACKGROUND: Previous studies report high failure rates when a unicompartmental arthroplasty (UKA) is revised to another UKA. There are, however, certain indications, such as liner failure or periprosthetic joint infection (PJI), where UKA to UKA revision may be considered. The purpose of this study was to compare survivorship and failure rates in patients undergoing UKA to UKA revisions and UKA to TKA conversions for various indications.

METHODS: We reviewed 230 UKA patients (241 knees) revised to UKA (n=24) or converted to TKA (n=217) from 1995 – 2022. Mean time to revision from the index UKA was 6 years. Mean age was 65 years, 47% were female, and mean BMI was 31 kg/m². Indications for conversion to TKA included aseptic loosening (37%), progression of osteoarthritis in adjacent compartments (34%), and unexplained pain (21%). The indications for UKA-to-UKA revision included PJI (71%), instability (12%), and aseptic loosening (12%). Kaplan-Meier survivorship analyses were performed for revisions and reoperations and compared between groups.

RESULTS: The 2-year survivorship free of any revision for patients converted to TKA was 96% compared to 78% in UKA-to-UKA revisions (p=0.0023). The 2-year survivorship free of any reoperation for UKA to TKA conversions was 92% compared to 63% in UKA-to-UKA revisions (p=0.0002). Of the UKA-to-UKA revisions for instability, 67% required re-revision. Similarly, of the UKA-to-UKA revisions for aseptic loosening and prosthetic joint infection (PJI), 33% and 18% required re-revision, respectively. Of the patients who underwent re-revision in the UKA-to-UKA subgroup, 80% were converted into TKA.

CONCLUSION: The 2-year failure rate was 5.5 times higher for UKAs revised to UKA compared to UKA converted to TKA. Surgeons should be aware of the high failure rate when counseling patients when presenting with complications where UKA retention seems to be an option.

Low-Dose Aspirin is the Safest Prophylaxis for Prevention of Venous Thromboembolism After Total Knee Arthroplasty Across All Patient Risk Profiles

Paper 097

Joshua R. Porto, M.S. / Cleveland, OH

Co-Authors:

Monish S. Lavu, MHM / Cleveland, OH

Joshua R. Porto, M.S. / Cleveland, OH

Christian J. Hecht II, B.S. / Cleveland, OH

Alexander J. Acuna, M.D. / Chicago, IL

David C. Kaelber, M.D., Ph.D., MPH / Cleveland, OH

Javad Parvizi, M.D. FRCS / Philadelphia, PA

Atul F. Kamath, M.D., MBA / Cleveland, OH

OBJECTIVE: The International Consensus Meeting for venous thromboembolism (ICM-VTE) in 2022 proclaimed low-dose aspirin to be the most effective agent in patients across all risk profiles undergoing joint arthroplasty. However, data on large patient populations assessing trends in chemoprophylactic choices and related outcomes following total knee arthroplasty (TKA) remains scant. This study was designed to characterize the clinical use of various chemoprophylactic agents in patients undergoing TKA and determine the efficacy of aspirin compared to other agents in patient groups stratified by VTE risk profiles.

METHODS: This study utilized a national database to determine the proportion of patients undergoing TKA receiving low-dose aspirin versus other chemoprophylaxis from 2012 to 2022. VTE risk profile was determined based on comorbidities established in the ICM-VTE. The odds ratios (OR) and 95% confidence intervals (CI) for the use of various classes of thromboprophylaxis between patients with high- and low-risk of VTE were calculated. Odds of deep venous thrombosis (DVT), pulmonary embolus (PE), bleeding events, infections, mortality, and hospitalizations were also assessed in the 90-day postoperative period for propensity matched cohorts receiving low-dose (81 mg) aspirin-only versus other prophylaxis, segregating by VTE risk profile.

RESULTS: A total of 126,692 patients undergoing TKA across 60 health care organizations were included. The proportion of patients receiving low-dose aspirin increased from 7.75% to 55.39% between 2012 and 2022, while the proportion of patients receiving other chemoprophylaxis decreased from 96.35% to 43.08%. Low-dose aspirin-only use increased approximately to 50% in both high- and low-risk populations but was more likely in low-risk populations (OR: 1.17, 95% CI: 1.15-1.20) compared to other medications. Both low- and high-risk patients in the low-dose aspirin-only cohorts had decreased odds of DVT, PE, bleeding, infections, and hospitalizations compared to other prophylaxis regimens.

CONCLUSIONS: The findings of this study on a very large patient population undergoing TKA, endorses the recent ICM-VTE statement in that low-dose aspirin is a safe and effective method of prophylaxis in patients across various risk profiles.

Elevated Area of Deprivation Index Scores Associated with Increased 90-Day Emergency Department and Hospital Readmissions Following Primary Total Knee Arthroplasty

Paper 098

Rana Ahmad, B.S. / Salt lake city, UT

Co-Authors:

Rana Ahmad, B.S. / Chicago, IL

Benjamin Johnson, B.S. / Chicago, IL

Allison Soto, B.S. / Chicago, IL

Brett Drake / Chicago, IL

Apurva Choubey, M.D. / Chicago, IL

Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

OBJECTIVE: It is well documented that patients undergoing total knee arthroplasty (TKA) are negatively affected by a multitude of socioeconomic factors, including lower income, being Medicaid beneficiaries, and living in lower-income neighborhoods. This study aims to understand the impact of socioeconomic status (SES) on TKA patients utilizing national Area Deprivation Index (ADI) scores.

METHODS: ADI was created by the University of Wisconsin-Madison and ranks neighborhoods by socioeconomic disadvantage, utilizing theoretical domains of income, education, employment, and housing quality. Higher levels of ADI are associated with lower socioeconomic status. Patients > 1 year post-operation from primary TKA between December 2020 and May 2023 were retrospectively recruited from an urban, academic tertiary medical center. Prisoners, individuals < 18 years of age, traumatic injuries, infection, and revision surgeries were excluded from this study. The cohort was divided into three groups: ADI 1-25 (high SES), ADI 26-75 (middle SES), and ADI 76-100 (low SES). These groups were compared to analyze for differences in demographics and operative outcomes using Fisher's Exact Test for Count Data and Kruskal-Willis rank sum test.

RESULTS: 308 patients were included in the final analysis. There were differences present in demographics, comorbidities, and postoperative outcomes across the three different groups of national ADI. Patients in the middle ADI and high ADI groups were more likely to be female ($p = 0.032$) as well as Black/African American and Hispanic/Latinx ($p = 0.004$). There was a significantly higher rate of history of anxiety or depression in the higher ADI groups when compared to the lowest ADI group ($p = 0.002$). Additionally, there were significant differences in postoperative outcomes between the three groups. Patients in the higher ADI groups were more associated with higher rates of emergency department visits within 90 days ($p = 0.032$) and higher hospital readmission rates within 90 days ($p = 0.039$). Lastly, patients in the lowest ADI group were more likely to be discharged to a skilled nursing facility, and patients in the two higher ADI groups were more likely to be discharged home ($p = 0.011$).

CONCLUSIONS: Patients with higher ADI scores (indicating lower SES) are more likely to present to the emergency department and be readmitted within 90 days following TKA. Future studies should investigate the association between ADI scores and patient reported outcomes following TKA.

Epidemiology of Periprosthetic Fracture in 44,527 Primary TKAs Over 50 Years

Paper 099

Nicolas A. Selemon, M.D. / Rochester, MN

Co-Authors:

Nicolas A. Selemon, M.D. / Rochester, MN

Ahmadreza Nezameslami, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Henry D. Clarke, M.D. / Phoenix, AZ

Bryan D. Springer, M.D. / Jacksonville, FL

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

INTRODUCTION: Long-term data surrounding the incidence and epidemiology of periprosthetic fracture in primary total knee arthroplasty (TKA) are lacking. The purpose of this study was to describe the cumulative incidence, nature, chronology, and risk factors of periprosthetic fractures in primary TKAs.

METHODS: Utilizing our institutional total joint registry, we reviewed all 44,527 primary TKAs performed at our institution between 1970 – 2020 and identified all intraoperative and postoperative periprosthetic fractures. Fracture location, timing, and type were recorded along with risk factors for fracture.

RESULTS: Overall, there were 1,313 periprosthetic fractures, including 192 (15%) intraoperative fractures. Of the 192 intraoperative fractures, 135 (70%) were femur fractures, 48 (25%) were tibia fractures, and 8 (4%) were patella fractures. Intraoperative fractures were more common in females (HR 2.6, $p < 0.01$). Every 10-year incremental increase in age was associated with an increased risk of intraoperative fracture (HR 1.2, $p = 0.03$). The 10-year survivorship free of any revision and any reoperation after intraoperative fracture were 87% and 81%, respectively.

The 20-year probability of suffering a postoperative periprosthetic fracture after primary TKA was 6%. There were 1,121 postoperative periprosthetic fractures, of which 541 (48%) were femur fractures, 375 (33%) were patella fractures, and 201 (18%) were tibia fractures. Female sex (HR 1.2, $p < 0.01$) was an independent risk factor for postoperative fracture. The 10-year survivorship free of any revision and any reoperation after postoperative fracture were 59% and 41%, respectively. The 5-year mortality after a periprosthetic fracture after primary TKA was 29%.

CONCLUSION: Periprosthetic fracture after primary TKA is a rare, but devastating injury. Female sex is correlated with an increased risk of intraoperative and postoperative periprosthetic fracture. Postoperative periprosthetic fractures after primary TKA are associated with a poor 10-year revision-free survivorship of 59%.

Efficacy of 60-day Percutaneous Peripheral Nerve Stimulation in Reducing Persistent (over one year) Postoperative Pain and Improving Function in Patients Post-Total Knee Arthroplasty: A Randomized Controlled Trial

Paper 100

Maxim Eckmann, M.D. / Chapel Hill, NC

Co-Authors:

David M. Dickerson, M.D. / Chicago, IL

Johnathan H. Goree, M.D. / Little Rock, AR

Stuart A. Grant, M.D. / Chapel Hill, NC

Yashar Eshraghi, M.D. / New Orleans, LA

Ravi K. Bashyal, M.D. / Chicago, IL

Jeffrey B. Stambough, M.D. / Little Rock, AR

Maxim S. Eckmann, M.D. / San Antonio, TX

John E. Gilbert, Ph.D. / Chapel Hill, NC

Amorn Wongsarnpigoon, Ph.D. / Chapel Hill, NC

Joseph W. Boggs, Ph.D. / Chapel Hill, NC

INTRODUCTION: Total knee arthroplasty (TKA) is successful for most patients, but persistent postoperative pain and poor function affect approximately 20% of patients. This study evaluated percutaneous peripheral nerve stimulation (PNS) to treat postoperative pain and improve function following TKA.

METHODS: This prospective, randomized, double-blind, placebo-controlled trial included individuals with persistent postoperative pain following TKA. Key exclusion criteria included high opioid use (≥ 90 mg/day MED) and those requiring revision surgery. Subjects received an FDA-cleared PNS device and were randomized to receive either active PNS or placebo (sham) stimulation for 8 weeks. The primary outcome was the percentage of subjects achieving $\geq 50\%$ pain relief relative to baseline during weeks 5-8 on a 0-10 numerical rating scale (NRS). Secondary outcomes included the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC; 0-10 NRS) and six-minute walk test (6MWT). All improvements are reported relative to baseline. The present post-hoc analysis focused on subjects that enrolled at least one year after primary TKA surgery.

RESULTS: Fifty-two subjects were randomized and received treatment, and 35 of these 52 subjects were at least one-year post-TKA at the time of enrollment and reported data during the primary endpoint (weeks 5-8 of treatment). Among these subjects, baseline pain scores were approximately the same in both groups (7.2 out of 10 and 7.3 out of 10 in the PNS group and placebo group, respectively), and a significantly higher proportion of subjects in the PNS group (61%; 11/18) achieved $\geq 50\%$ pain relief relative to baseline during the primary endpoint compared to the placebo group (24%; 4/17) ($p=0.04$).

Subjects were considered responders for WOMAC if they had $\geq 50\%$ improvement in their score relative to baseline. At end of treatment, subjects in the PNS group had an average improvement in their WOMAC scores of 3.9 points (61%) compared to a 2.0-point improvement (29%) in the placebo group ($p=0.03$). In the PNS group, 78% (14/18) of subjects were classified as responders for WOMAC scores compared to 25% (4/16) of the placebo group ($p=0.005$). At the 12-month follow-up, 54% (7/13) of the PNS group continued to be responders demonstrating enduring improvements following treatment.

CONCLUSIONS: 60-day PNS treatment significantly reduced pain, resulting in improved function in TKA patients with persistent postoperative pain, including those with pain at least one year after their TKA, supporting the efficacy of PNS as a non-opioid treatment for persistent postoperative pain.

Comparative Analysis of Tibial Periprosthetic Fracture Risk in Unicondylar Knee Arthroplasty: Robotic-Assisted vs. Conventional Techniques

Paper 101

Ye Lin, M.D. / Chicago, IL

Co-Authors:

Michael Redondo, M.D. / Chicago, IL

Nirav K. Mungalpara, M.D., MRCS / Chicago, IL

Ye Lin, M.D. / Chicago, IL

Avinash Inabathula, M.D. / Chicago, IL

Hristo Piponov, M.D. / Chicago, IL

Farid Amirouche, Ph.D. / Chicago, IL

INTRODUCTION: Recent evidence suggests that robotic-assisted surgery may facilitate more accurate implant positioning, soft tissue balancing, or limb alignment. However, the risk of periprosthetic tibia fractures, a severe complication of Unicondylar knee arthroplasty (UKA), has not been extensively compared between robotic-assisted and conventional techniques. The purpose of this study is to examine the difference between robotic-assisted burring techniques and conventional UKA methods regarding periprosthetic tibia fracture risk.

METHODOLOGY: The study included twelve fresh-frozen full lower extremity cadaveric specimens divided into two groups. Group 1 was the conventional cemented UKA group, while the other was treated using a robot-assisted burring technique (CORI, Smith & Nephew). The tibias were isolated following surgery, and each specimen was loaded axially in a servo-hydraulic material testing machine (MTS, Eden Prairie, MN, USA) to measure the force needed to cause macroscopic periprosthetic fractures.

RESULTS: The male-to-female ratio was 1:1 in both groups. The average age in the conventional group was 82.5 years (81-92) in the robotic group, compared to 76.83 years (64-87) in the conventional group. The average BMI was 27.9 (range: 24.03-35.15) in the conventional group, 22.03-35.15 in the conventional group, and 23.36 (19.02-36.27) in the robotic group.

The load to failure (N) was evaluated for both groups, with the measurements normalized to percentage body weight (%BW) to minimize variations due to age and weight. The conventional group mean load to failure was 3559.33 N (SD = 1861.81) and 4394.83 N (SD = 1198.20) in the robotic group. In this study, the robotic group required a 23.37% greater force to induce a periprosthetic fracture in the tibia. ($p = 0.3760$).

In fracture patterns analysis, each specimen showed crack propagation from the end of the sagittal cut of the tibial plate towards the meta-diaphyseal junction, terminating in the proximal diaphysis of the tibia in the conventional group. One specimen in the conventional group presented an intercondylar eminence fracture. Conversely, in the robotic group, all fractures were confined to the metaphyseal region with depression of the reconstructed articular surface.

CONCLUSION: Robotic-assisted UKA showed a 23.37% higher force requirement for tibial fractures than conventional methods, indicating potential benefits in precision and reduced fracture risk. Future studies are needed to see if the improved precision of robotic UKA translates into clinically significant reductions in tibial fracture risk.

RCT of Extended-Release Bupivacaine/Meloxicam vs. Standard Periarticular Injection During Primary TKA

Paper 102

Harold I. Salmons, M.D. / Rochester, MN

Co-Authors:

Harold I. Salmons, M.D. / Rochester, MN
Adam W. Amundson, M.D. / Rochester, MN
Christopher M. Duncan, M.D. / Rochester, MN
Dirk R. Larson, M.S. / Rochester, MN
Benjamin D. Mallinger, B.S. / Rochester, MN
Cory G. Couch, M.D. / Rochester, MN
Mark W. Pagnano, M.D. / Rochester, MN
Robert T. Trousdale, M.D. / Rochester, MN
Matthew P. Abdel, M.D. / Rochester, MN

OBJECTIVE: The FDA recently approved extended-release bupivacaine and meloxicam for periarticular injections during total knee arthroplasty (TKA). Evidence to date is limited. This study investigated the efficacy of this new injection compared to our traditional periarticular injection in a randomized clinical trial (RCT) of TKAs.

METHODS: We prospectively enrolled 101 patients who underwent primary, unilateral TKA for osteoarthritis by fellowship-trained arthroplasty surgeons at a high-volume academic center. All received a standardized multimodal analgesic pathway. Patients were randomized and blinded preoperatively 1:1 to experimental and control groups. The experimental group received intra-articular extended-release bupivacaine and meloxicam (Zynrelef®). Controls received traditional intra-articular block (diluted ropivacaine, epinephrine, and ketorolac). Numeric rating scale (NRS) for pain and opioid consumption were collected using pain diaries. The primary outcome was NRS pain area under the curve (AUC) at 72 hours with a minimal clinically important difference (MCID) considered 30%. This study was registered with clinicaltrials.gov.

RESULTS: Unadjusted AUC NRS pain scores were not statistically different at 72 or 48 hours. When adjusted for fluctuations in opioid consumption, the 72-hour AUC NRS pain score was no different between groups ($p=0.087$). The 48-hour adjusted AUC NRS pain score was significantly lower (13%) in the experimental group vs. controls ($p<0.05$). Distance walked with therapy was similar ($p=0.45$). There were three complications, one in the experimental group and 2 in the control group ($p=0.6$), but none were injection related.

CONCLUSION: This RCT determined that extended-release bupivacaine and meloxicam performed like our traditional ropivacaine-based periarticular injection when evaluating pain at 72 hours. There was a statistically, but not clinically, significant decrease in pain at 48 hours when accounting for opioid consumption in the extended-release bupivacaine and meloxicam group.

Patient Predictors for Achieving the Centers for Medicare and Medicaid Services (CMS) Defined "Substantial Clinical Benefit" Following Total Knee Arthroplasty (TKA) and Total Hip Arthroplasty (THA)

Paper 103

Alexander Driessche, M.S.E. / Detroit, MI

Co-Authors:

Phillip C. McKegg, M.S. / Detroit, MI

Hamza Raja, B.S. / Detroit, MI

Alexander Driessche, M.S.E / Detroit, MI

Trevor North, M.D. / Detroit, MI

Michael Charters, M.D. / Detroit, MI

INTRODUCTION: The Centers for Medicare and Medicaid Services (CMS) begins a mandatory requirement to report patient-reported outcome measures (PROM) for inpatient hip and knee arthroplasty procedures on 7/1/2024, comprising of a 0-90 day preoperative score and a 300-425 day postoperative score. The CMS-defined threshold of "substantial clinical benefit" (SCB) is a 22-point increase in HOOS-JR, a PROM for THA, and a 20-point increase in KOOS-JR, a PROM for TKA. The objective of this study is to identify predictors to patients achieving SCB.

MATERIALS: Demographic and clinical data was collected for patients who underwent primary TKA or THA over a two-year period (2021-2022). PROM data, including KOOS-JR and HOOS-JR scores, were extracted from the electronic medical record system. Patients were included if they had PROM data per the CMS criteria of 0-90 days preoperatively and 300-425 days postoperatively. Substantial clinical benefit (SCB) was defined as a 22-point increase in HOOS-JR, and a 20-point increase in KOOS-JR. Logistic regression analyses were used with statistical significance maintained at $p < 0.05$.

RESULTS: A total of 837 TKA and 486 THA met inclusion criteria. Of those who underwent TKA, 520 (62.1%) achieved the CMS-defined SCB, while 317 (37.9%) did not. Of those who underwent THA, 343 (70.6%) achieved the CMS-defined SCB, while 143 (29.4%) did not. On univariate analysis, participation in an interactive preoperative surgery class prior to TKA ($p=0.001$) and a lower pre-op KOOS-JR score (42 points vs 47 points, $p<0.001$) was predictive of achieving SCB. Predictors of not achieving SCB after TKA include: a diagnosis of diabetes ($p=0.016$) and preoperative opioid use ($p=0.044$). On univariate analysis, patient factors predictive of achieving SCB after THA include: younger age (66 years vs. 68 years, $p=0.029$) and lower preoperative HOOS score (43 points vs 50 points, $p<0.001$). On multivariate analysis, a lower pre-op PROM was associated with achieving the SCB for THA and TKA, respectively (THA: OR 0.96; $p<0.001$; TKA: OR 0.95; $p<0.001$).

CONCLUSION: In this study, predictors of achieving the expected SCB included participation in an interactive preop surgery class for TKA and a younger age for THA. A lower preoperative PROM is predictive of achieving SCB in both procedures. These results allow orthopedic surgeons to gain insight into potential outcome scores for patients undergoing TJA.

Cemented Robotic-Assisted vs. Manual Total Knee Arthroplasty Outcomes: A Single Center MARCQI-Based Study

Paper 104

Alexander Ziedas / Dearborn, MI

Co-Authors:

Alexander Ziedas, M.D. / Southfield, MI

Michael Laker, M.D. / Southfield, MI

William Kesto, M.D. / Southfield, MI

Jefferey Michaelson, M.D. / Southfield, MI

David Knesek, M.D. / Southfield, MI

Todd Frush, M.D. / Southfield, MI

David Markel, M.D. / Southfield, MI

PURPOSE: Cemented total knee arthroplasty can be performed with or without robot-assistance (RA). The purpose of this study was to determine whether a difference exists between cemented manual and RA-TKA with regards to 90-day outcomes and revision rates. We hypothesized that there would be no differences between implantation technique.

METHODS: A single centers data within the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI), was queried for all primary cemented TKAs implanted January 2012 to July 2023. Cemented RA-TKA and manual cohorts were compared for revisions and 90-day complications including emergency department (ED) visits, readmissions, and returns to the OR. Chi-square and Fisher's exact tests were used for categorical data and t-tests for continuous data.

RESULTS: Of 7417 cemented TKAs (mean age 67.9 ± 9.6 years, 70% female), 273 were RA-TKA and 7144 manual. There were no significant differences in age, BMI, gender, race, or overall revision rate. Cemented RA-TKA had significantly more periprosthetic joint infection (PJI) revisions, more 90-day ED visits and readmissions for wound complications. Logistical regression modeling showed patients who were ≥ 65 years, BMI ≥ 35 , African American, diabetic, had a smoking history, VTE history, length of stay (LOS) ≥ 24 hours, and ASA $\geq III$ were at increased odds of a 90-day event. RA-TKA had longer mean surgical time (111.88 ± 30.4 vs 95.36 ± 28.2 minutes, $p=0.0001$) and shorter LOS (40.6 ± 26.8 vs 45.5 ± 29.5 hours, $p=0.0069$). 283 revision surgeries were performed (9 RA-TKA 3.2%, 274 manual 3.8%, ($p=0.8714$)). Mean time to revision was shorter for RA-TKA (1.4 ± 1.1 vs 2.8 ± 2.5 years, $p=0.0001$). There was no difference in Cumulative percent revision (CPR) at five years (3.9% RA-TKA, 3.5% Manual ($p=0.5220$)).

CONCLUSION: Cemented RA-TKA had more PJI related revisions, 90-day ED visits, wound related readmissions, with longer OR time and shorter time to revision than manual TKA. RA-TKA may need to be selectively applied.

Effect of Cannabis and Tobacco Use on Postoperative Outcomes in Total Knee Arthroplasty Patients

Paper 105

Mudassir Khan / Rockford, IL

Co-Authors:

Mudassir Khan / Rockford, IL

Apurva S. Choubey, M.D. / Chicago, IL

Brett Drake / Chicago, IL

Nirav K. Mungalpara, M.D. / Chicago, IL

Yasser Farid, M.D. / Chicago, IL

Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

OBJECTIVE: Prior studies have shown the deleterious effects of tobacco use, however, there is not enough research surrounding cannabis use in orthopedic patients. The purpose of this study was to examine the differing postoperative effects of tobacco and cannabis use in total knee arthroplasty (TKA) patients.

METHODS: This is a retrospective study using the PearlDiver Mariner 165 database. The dataset included 123,028 patients that underwent primary TKA from 2010-2022. We compared the cohorts of total knee arthroplasty (TKA) patients who used tobacco and cannabis with those who did not use these substances. Patients were matched and controlled for age, gender, Elixhauser Comorbidity Index, obesity, diabetes, and hypertension. The PearlDiver database was then used to extract postoperative complications (e.g. wound, infection, pulmonary embolism (PE), revisions, 90 day readmissions, periprosthetic fractures) following TKA to calculate the odd ratio. Pearson's Chi-square test was used to compare the proportion of patients for each measure type by use of tobacco or cannabis products.

RESULTS: The study revealed strong statistical correlations between both tobacco and cannabis use and postoperative complications, with cannabis displaying a more pronounced impact than tobacco use. For 90 day emergency department (ED) visits, tobacco users exhibited a 1.5 times greater incidence and cannabis users 2.2 times greater incidence than non-smokers, while comorbid users displayed a 2.75 greater incidence than non-smokers ($p < 0.001$). For prosthetic joint infections, tobacco and cannabis users had a 1.6-1.7 times higher incidence, and comorbid users over twice the incidence compared to nonsmokers ($p < 0.001$). For wound disruption, tobacco use led to a 1.4 times higher incidence, cannabis 1.5 times higher, and comorbid users over twice the incidence compared to nonsmokers ($p < 0.001$). Tobacco use appeared protective of acute kidney injury (AKI) complications (OR: 0.9, CI: 0.88 - 0.94, $p < 0.01$), and although isolated cannabis use led to a mild increase (OR: 1.15, $p < 0.01$), the comorbid use accentuated the incidence up to nearly 1.5 times greater ($p < 0.001$).

CONCLUSIONS: Cannabis use is directly tied to more postoperative complications than tobacco use. Comorbid use of both substances can double or triple the odds of certain complications.

Manipulation Under Anesthesia with or without Lysis of Adhesions After Primary Total Knee Arthroplasty

Paper 106

Justin M. Walsh, M.D. / Houston, TX

Co-Authors:

Justin M. Walsh, M.D. / Houston, TX
Thomas C. Sullivan, B.S. / Houston, TX
Blesson Varghese, B.S. / Houston, TX
Karen L. Hernandez, B.S. / Houston, TX

Stephen J. Incavo, M.D. / Houston, TX
Timothy S. Brown, M.D. / Houston, TX
Kwan J. Park M.D. / Houston, TX

BACKGROUND: Stiffness after total knee arthroplasty (TKA) remains a frustrating complication for both patients and clinicians, affecting approximately 1.3-5.8% of patients undergoing TKA. The purpose of this study was to evaluate the outcomes of manipulation under anesthesia (MUA) with or without arthroscopic lysis of adhesions (LOA) following primary TKA and investigate the effect of patient demographic and perioperative variables on its outcomes.

METHODS: A single-institution retrospective cohort study on patients who underwent an MUA with or without LOA after primary TKA between August 2016 and March 2024. 17,000 primary TKAs by 34 surgeons across 8 clinical sites at our institution were available for review. Any patients in the database who underwent MUA or LOA after primary TKA were included in the study. Indication for MUA/LOA was individualized to each patient and per surgeon clinical judgement. Exclusion criteria included revision TKA, previous incision and drainage, and neuromuscular disorders. Patient clinical history and demographics, perioperative variables, and postoperative outcomes were collected. Failure of MUA/LOA was defined as repeat MUA or LOA, revision TKA for arthrofibrosis, or failure to gain $\geq 50\%$ of flexion achieved intraoperatively. Chi-squared and unpaired t-tests were used for categorical and continuous variables, respectively.

RESULTS: 654 patients (678 knees, 726 MUA/LOAs) including 54 repeat interventions with an average follow-up of 263.8 ± 375.9 days met inclusion criteria (64% female, 63.1 ± 9.3 years of age, 31.9 ± 6.1 BMI). 605 patients underwent primary MUA and 67 primary LOA+MUA. Compared with LOA+MUA, MUA patients demonstrated quicker time to intervention after index TKA (68.2 ± 36.3 days vs 165.2 ± 79.9 days, $P < 0.001$) and higher rates of diabetes (22.5% vs 11.9%, $P = 0.046$). MUA patients also demonstrated lower absolute values of knee flexion pre-TKA (111.2° vs 119.7° , $P < 0.001$), preoperatively (84.8° vs 100.4° , $P < 0.001$), intraoperatively (123.0° vs 129.4° , $P < 0.001$) and postoperatively (106.1° vs 112.7° , $P < 0.001$) but showed significantly greater gains in knee flexion at final follow-up (21.5° vs 13.0° , $P < 0.001$) than LOA+MUA. For both MUA and LOA+MUA, nearly all gains in flexion were realized by the second postoperative visit at an average of 105.5 days. No differences in failures, including all-cause revision, failure to gain $\geq 50\%$ of flexion achieved intraoperatively, repeat MUA or LOA, or revision TKA for arthrofibrosis were observed.

CONCLUSIONS: MUA and LOA+MUA are reliable interventions for treating stiffness after primary TKA. Patients undergoing MUA can be expected to have lower absolute knee flexion preoperatively and postoperatively but achieve greater gains in knee flexion than LOA+MUA with comparable complication profiles.

Evaluating Post-Surgical Outcomes of Total Knee Arthroplasty with GLP-1 Therapy

Paper 107

Nasiruddin Shaik, B.S. / Chicago, IL

Co-Authors:

Nasiruddin Shaik, B.S. / Chicago, IL

Apurva S. Choubey, M.D. / Chicago, IL

Nezar Abunnur, B.S. / Chicago, IL

Mudassir Khan, B.S. / Chicago, IL

Brett Drake, B.S. / Chicago, IL

Jibreel Hussain, MBA / Chicago, IL

Yasser R. Farid, M.D., Ph.D. / Chicago, IL

OBJECTIVE: Glucagon-like Peptide-1 Receptor Agonists (GLP-1 RA) have shown significant benefits in diabetes and obesity management, including reduced adiposity, improved blood glucose control, and anti-inflammatory effects. These benefits could reduce postoperative complications in orthopedic patients. This study investigates the impact of GLP-1 RAs on outcomes following Total Knee Arthroplasty (TKA).

METHODS: Using the Pearl Diver Mariner 165 claims database (2010-2022), patients who underwent primary TKA were identified with CPT code 27403. TKA patients on GLP-1 RA therapy (variable) were matched 10:1 with those not on the therapy (control), controlling for age, gender, Elixhauser Comorbidity Index, diabetes, obesity, and hypertension. Paired T-tests and Pearson's Chi-square tests compared the groups.

RESULTS: The study included 255,959 TKA patients, with 23,301 in the variable group and 232,658 in the control group. Control group patients had higher odds of: Periprosthetic osteolysis (1.63 times), Broken prosthesis (1.62 times), Revision surgery (1.59 times), Prosthesis dislocation (1.45 times), Joint instability (1.35 times), Periprosthetic fracture (1.30 times) No significant difference was found in prosthetic joint infection (OR 1.01, $p=0.83$).

However, the control group had increased odds of surgical site infection, wound dehiscence, postoperative transfusion (OR 1.70, $p<0.001$), cardiac arrest, hematoma, pulmonary embolism, deep vein thrombosis, urinary tract infection, and 90-day ED visits. Overall, the control group was 1.39 times more likely to experience complications post-TKA ($p<0.001$).

CONCLUSION: This study highlights the significant reduction in postoperative complications associated with GLP-1 RA therapy in TKA patients, including lower risks of osteolysis, fractures, prosthesis dislocation, revision surgeries, and hematoma. These findings suggest potential benefits of GLP-1 RA therapy in TKA patients, though further research is needed to confirm these benefits in broader patient populations.

BMI Cutoffs Before Total Knee Arthroplasty

Paper 108

Michael W. Seward, M.D. / Rochester, MN

Co-Authors:

Michael W. Seward, M.D. / Rochester, MN

Jessica A. Grimm, M.S. / Rochester, MN

Charles P. Hannon, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

OBJECTIVE: Many institutions use BMI cutoffs when offering total knee arthroplasty (TKA). However, little is known about whether achieving BMI cutoffs tangibly improves outcomes. This study determined how many patients lost weight before TKA and if achieving weight loss cutoffs improves outcomes.

METHODS: Among 35,417 primary TKAs performed between 2000 and 2021, we identified 6704 patients with preoperative BMI ≥ 30 kg/m² measured 1-24 months before and at surgery. The mean age was 67 years, 58% were female, and mean BMI was 37 kg/m². Outcomes included complications, revisions, and reoperations. Multivariable regressions evaluated patients with BMI ≥ 40 kg/m² preoperatively and BMI < 40 kg/m² at surgery ("Weight Loss"), BMI ≥ 40 kg/m² preoperatively and at surgery ("BMI ≥ 40 "), and BMI 30 to 40 kg/m² preoperatively and at surgery ("BMI < 40 "). Multivariable analyses adjusted for BMI category, Charlson Comorbidity Index (CCI), age, gender, and preoperative weight loss medications. Mean follow-up was 7 years.

RESULTS: The overall cohort included BMI < 40 (75%), Weight Loss (5%), and BMI ≥ 40 (20%) groups. Among the Weight Loss group, the mean BMI preoperatively and at surgery was 43 and 37 kg/m², respectively. Achieving the BMI 40 kg/m² cutoff took a mean 1.3 years (range 0.1-2.0), 16% took weight loss medications, and 7% had bariatric surgery. Weight Loss was not significantly associated with complications, revisions, or reoperations compared to BMI < 40 in multivariable analysis. However, BMI ≥ 40 was associated with increased risks of complications (HR 1.6; 95% CI 1.2-2.0, $p < 0.01$) and revisions (HR 1.5; 95% CI 1.1-1.9, $p < 0.01$).

CONCLUSIONS: Surgeons must balance many patient factors in preoperative risk assessments, and BMI cutoffs may be one way to help guide decisions. While maintaining BMI ≥ 40 kg/m² before TKA had increased postoperative risks, losing weight preoperatively to achieve the BMI 40 kg/m² cutoff by surgery was associated with patient risk profiles similar to those of patients consistently with BMI < 40 kg/m² preoperatively.

Outcomes of Direct Anterior Total Hip Arthroplasty in Patients with Preoperative Gluteal Tendinopathy and Tears: A Propensity-Matched Analysis

Paper 109

Samuel S. Rudisill, M.D. / Rochester, MN

Co-Authors:

Samuel S. Rudisill, M.D. / Rochester, MN
Sean C. Clark, M.S. / Rochester, MN
Christopher V. Nagelli, Ph.D. / Rochester, MN
Luke S. Spencer-Gardner, M.D. / Jacksonville, FL

Cory G. Couch, M.D. / Rochester, MN
Naveen S. Murthy, M.D. / Rochester, MN
Michael J. Taunton, M.D. / Rochester, MN
Mario Hevesi, M.D., Ph.D. / Rochester, MN

OBJECTIVE: The gluteus medius and minimus muscles play a critical role in hip biomechanics, however there is a paucity of literature examining the impact of preoperative gluteal pathology on outcomes following total hip arthroplasty (THA). This study compared pain, satisfaction, and functional outcomes among THA patients with and without preoperative gluteal tendon pathology.

METHODS: Using an institutional total joint registry, patients undergoing direct anterior (DA) THA for osteoarthritis between 2010-2022 were retrospectively reviewed. Those with MRI evidence of gluteal tear or tendinopathy within 1 year prior to surgery were propensity-matched on a 1:4 basis by age, sex, BMI, laterality, year of surgery, and surgeon to patients with no clinical evidence of abductor pathology. Postoperative outcomes were assessed using Visual Analog Scale (VAS) at rest, VAS with use, Hip Disability and Osteoarthritis Outcome Score (HOOS) Pain, Forgotten Joint Score-12 (FJS-12), and modified Harris Hip Score (mHHS). Subsequent injections and reoperations were recorded.

RESULTS: Twenty-two patients with gluteal tears (8/22 male, mean age 63.5±8.1 years) and 29 with gluteal tendinopathy (9/29 male, mean age 60.1±10.4 years) were respectively matched to 88 and 116 controls and followed for 4.0±2.3 (range 1.1–12.7) years following DA THA. While all achieved excellent postoperative outcomes, patients with gluteal tears experienced less improvement in pain and function compared to controls, trending towards lower final mHHS score ($p=0.052$). Patients with gluteal tendinopathy reported greater pain, decreased satisfaction, and inferior function than controls according to measures of VAS at rest ($p=0.014$), VAS with use ($p=0.003$), HOOS pain ($p=0.005$), FJS-12 ($p=0.003$), and mHHS ($p=0.007$). Nevertheless, none of these differences were sufficient to meet minimum clinically important difference thresholds. Postoperative trochanteric or gluteal injections and subsequent hip surgeries were infrequent despite no intraoperative tendon treatment. Seventeen (81.0%) patients with gluteal tear and 24 (80.0%) patients with gluteal tendinopathy responded to a follow-up survey and reported high satisfaction, with 100% of patients with gluteal tear and 83.3% of patients with gluteal tendinopathy stating they would be “likely” or “very likely” to undergo the procedure again.

CONCLUSIONS: Patients with gluteal tendon pathology do well following DA THA, however gluteal tear and tendinopathy are associated with relatively greater pain, decreased satisfaction, and inferior functional outcomes. Preoperative surrounding soft tissue integrity, particularly of the gluteus medius and minimus, should therefore be considered when prognosticating recovery and evaluating potential causes of persistent pain and functional limitation following THA.

Does Head-to-Cup Size Ratio Matter in Preventing Dislocation After Total Hip Arthroplasty?

Paper 110

Jacqueline K. Kobayashi, M.D. / Ann Arbor, MI

Co-Authors:

Jacqueline K. Kobayashi, M.D. / Ann Arbor, MI

Zhaorui Wang, M.D. / Ann Arbor, MI

Elizabeth A. Klag, M.D. / Ann Arbor, MI

Michael M. Kheir, M.D. / Ann Arbor, MI

OBJECTIVE: Dislocation is a known complication after total hip arthroplasty (THA). Utilizing a large femoral head to increase jump distance may reduce the risk of dislocation. However, large head sizes may not be available for smaller cups depending on the manufacturer. The head-to-cup ratio may be a measure of determining appropriate head size to prevent dislocation. This study aims to determine if the head-to-cup ratio predicts dislocations within 90 days after primary THA.

METHODS: This was a retrospective study of prospectively collected data of 5,350 patients who underwent a primary THA at a single academic institution between 2012-2023, identified through the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI). Logistic regression analyses were performed to account for age, approach, body mass index, manufacturer, sex, and surgery date. ROC curves were generated to determine the optimal head-to-cup ratio to prevent dislocation.

RESULTS: Of the entire cohort, seventy-nine patients (1.5%) sustained a dislocation within the first 90 days postoperatively. We observed a temporal trend of increasing head size over this period. The optimal head-to-cup ratio to prevent dislocation was identified as >0.69 (AUC 0.604; sensitivity 78.5%, specificity 41.0%). Sixty-two of 79 dislocations occurred in patients with head-cup ratio <0.69 . Our logistic regression analysis demonstrated a strong influence of higher head-cup ratio on decreased rate of dislocation. ($p=0.01$, OR 0.001, 95% CI: 0.000-0.224).

CONCLUSIONS: Having a higher head-to-cup ratio is associated with a significantly lower rate of prosthetic hip dislocations in the first 90 days postoperatively, even when controlling for several confounders. With highly cross-linked polyethylene, surgeons should weigh the benefits and risks of using a larger femoral head for patients in order to reduce this complication.

Disparities in Preoperative Weight Loss and Obesity Treatment Before Total Joint Arthroplasty

Paper 111

Charles P. Hannon, M.D., MBA / Rochester, MN

Co-Authors:

Michael W. Seward, M.D. / Rochester, MN

Jessica A. Grimm, M.S. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Charles P. Hannon, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

OBJECTIVE: Many institutions use body mass index (BMI) cutoffs for offering total hip (THA) and knee (TKA) arthroplasty. However, there are sex and socioeconomic disparities in access and response to obesity treatment which could limit patients' abilities to meet BMI cutoffs. The goals of this study were to determine preoperative obesity treatment utilization and if there are disparities in weight loss and access to obesity treatment before THA and TKA.

METHODS: Among 21,038 primary THAs and 23,726 primary TKAs performed between 2002 and 2019, we identified 6128 patients with preoperative BMIs $>30 \text{ kg/m}^2$ measured 1-24 months before surgery and a weight measured at surgery. The mean age was 67 years with 55% female. The mean BMI was 36 kg/m^2 . The Area Deprivation Index (ADI) was used to analyze socioeconomic status. Univariable logistic regression evaluated use of nutrition services or bariatric weight loss surgery and the likelihood of weight loss.

RESULTS: Few patients with obesity received weight loss medications (0.2%), nutrition services (1.6%), and/or bariatric surgery (2.6%) before arthroplasty. Females had higher odds of losing ≥ 5 pounds ($\text{OR}=1.14; p=0.014$). However, losing ≥ 10 pounds ($\text{OR}=1.1; p=0.082$) or ≥ 20 pounds ($\text{OR}=1.01; p=0.94$) was not significantly different by sex. ADI was not associated with losing ≥ 5 pounds, ≥ 10 pounds, or ≥ 20 pounds. While not statistically significant, females were more likely to receive nutritional services ($\text{OR}=1.2, p=0.38$). Males were more likely to receive preoperative bariatric surgery ($\text{OR}=2.3; p<0.0001$). ADI was not significantly associated with receiving preoperative bariatric surgery.

CONCLUSIONS: Few patients (4.4%) received preoperative obesity treatment before primary TKA or THA via medications, nutrition services, or bariatric surgery. While sex and socioeconomic status were not significantly associated with meaningful preoperative weight loss, an interdisciplinary approach to preoperative weight management may increase the poor utilization of obesity treatments before primary THA and TKA.

Broach Only THA Using a Short, Uncemented, Fit-and-Fill Stem: Average Five-Year Follow-Up

Paper 112

Lindsey K. Meding, M.S. / Noblesville, IN

Co-Authors:

John B. Meding, M.D. / Indianapolis, IN

Lindsey K. Meding, M.S. / Indianapolis, IN

Evan R. Deckard, B.S.E / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Short femoral stems in THA have increased recently due the potential advantages of preserving bone, diminishing distal thigh pain, surgical efficiency with broach-only techniques and ease of insertion through minimally-invasive and anterior-based approaches. The purpose of this study was to evaluate the minimum 2-year radiographic and clinical results of a short, uncemented, fit-and-fill stem implanted using a broach only technique.

METHODS: The clinical and radiographic results of 505 consecutive cementless THAs were reviewed 2 to 9 years postoperatively. A posterior approach and dual-mobility articulation were used in all hips. The average age was 62 years (18-88). 54% of patients were male. Dorr class was 31% A, 64% B, and 5% C. All patients were followed for a minimum of 2 years. Harris Hip Scores and radiographs were obtained at 6 months, 1 year, and every 2-3 years thereafter. The average follow-up was 5.6 years (2-9 years).

RESULTS: At final follow-up, the average Harris hip and pain scores were 90 (57-100) and 42 (30-44), respectively. 82% of hips were rated as pain free. One patient reported activity-related thigh pain. There were no cases of femoral aseptic loosening. However, at operation, 14% of stems were placed in more than 5 degrees of measured varus with an intraoperative femur fracture occurring in 13 hips (2.5%). Two stems were revised (1 infection and 1 late femur fracture).

CONCLUSION: Biomechanical data have demonstrated that the shorter version of this stem increases proximal femoral loading closer to the native femur compared to its standard-length design. Nevertheless, the theoretical advantages of using a fit-and-fill stem may be offset by the tendency for varus placement and proximal femur fracture when using a broach-only technique.

Economic Analysis of Hip Arthroplasty Reimbursements: Inflation-Adjusted Case Complexity Analysis from 2006-2022

Paper 113

Jibreel Hussain, MBA / Chicago, IL

Co-Authors:

Apurva Choubey, M.D. / Chicago, IL

Brett A. Drake, B.S. / Chicago, IL

Jibreel Hussain, MBA / Chicago, IL

Nasiruddin Shaik, B.S. / Chicago, IL

Nezar Abunnur, B.S. / Chicago, IL

Nirav K. Mungalpara, M.D. / Chicago, IL

Luke Zabawa, M.D. / Chicago, IL

Yasser Farid, M.D. / Chicago, IL

Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

INTRODUCTION: Total hip arthroplasty (THA) has seen significant advancements aimed at improving patient outcomes. However, compensation for orthopedic surgeons has declined, raising concerns about the sustainability of current reimbursement models. This study examines Medicare reimbursement trends for THA and revision THA (rTHA) from 2006 to 2022, considering the high inflation rates post-COVID-19, which peaked at 9.2% in June 2022. The goal is to analyze these trends with inflation-adjusted dollars to understand changes over this period.

METHODS: Medicare reimbursement data for THA and rTHA from 2006 to 2022 were analyzed, adjusted for inflation. Data from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) and the Medicare Physician Payment Schedule were used to calculate Relative Value Units (RVUs) and procedural reimbursements. Current Procedural Terminology (CPT) codes identified THA and rTHA surgeries, classifying case complexity. To compare payments across years, nominal values were converted to 2022 dollars using the U.S. Consumer Price Index from the Bureau of Labor Statistics.

The study calculated average RVUs for the listed CPT codes through NSQIP, determining average reimbursement per case in nominal and inflation-adjusted terms. The Total Percentage Change and Compound Annual Growth Rate (CAGR) from 2006-2022 were calculated for each CPT code, allowing for future reimbursement rate projections assuming similar trends continue. Forecasts for 2030 reimbursement rates were then derived.

RESULTS: Reimbursements for THA procedures, when adjusted for inflation, showed a significant decline. Primary THA reimbursements decreased by 39.69% since 2006, with a negative 3.11% CAGR, while rTHA reimbursements declined by 34.28% with a negative 2.58% CAGR. Projected reimbursement rates for 2030 suggest further decreases if current trends persist. The forecasted physician reimbursement for a primary THA in 2030 is \$526.79 (in 2022 dollars), a 53.17% decrease from 2006. The forecasted reimbursement for rTHA in 2030 is \$849.59 (in 2022 dollars), a 46.72% decrease from 2006.

CONCLUSION: The study reveals a significant disparity between surgeon compensation and procedural complexity, particularly for revision surgeries. Medicare reimbursements inadequately reflect case time and complexity, potentially disincentivizing surgeons from performing essential procedures. As arthroplasty demand grows, fair compensation aligned with procedural complexity and inflation is crucial for sustaining quality care. Post-pandemic economic challenges and high inflation necessitate revisiting Medicare reimbursement policies for arthroplasty to ensure sustainable healthcare delivery.

A Subhemispheric Acetabular Component is Associated with Increased Dislocation Risk: A Single-Center Retrospective Study

Paper 114

Noah Hodson, M.D. / Detroit, MI

Co-Authors:

Brian T. Darrith, M.D. / Detroit, MI

Noah Hodson, M.D. / Detroit, MI

Tahsin M. Rahman, M.D. / Detroit, MI

Robb M. Weir, M.D. / Detroit, MI

OBJECTIVE: Instability after primary total hip arthroplasty (THA) remains a leading cause for revision. Various patient-related, surgical, and implant factors contribute to dislocation risk. The purpose of the current study is to identify patient and component related risk factors for dislocation, with particular interest in the type of acetabular component utilized.

METHODS: A consecutive series of 1,724 primary THAs performed over a six-year period at a single community teaching hospital by three fellowship-trained arthroplasty surgeons was retrospectively analyzed. Acetabular components from three different manufacturers were utilized. Univariate and multivariate logistic regression were used to identify risk factors for dislocation.

RESULTS: Postoperative dislocation occurred in 2.5% (n=43) of the THAs. Half of these (n=21) dislocations occurred with a subhemispheric acetabular component (Zimmer Continuum, Warsaw, IN), which demonstrated a 7.6% dislocation rate compared to 1.5% for all other components ($p<0.001$). THAs utilizing a subhemispheric cup exhibited a fivefold increase in dislocation in both univariate and multivariate analyses (odds ratio 5.2, $p<0.001$). Additionally, prior lumbar fusion was associated with higher dislocation rate (odds ratio 2.7, $p=0.02$). Among the 21 dislocations occurring with a subhemispheric cup, 20 involved a standard polyethylene liner while only one involved an elevated-rim liner.

CONCLUSIONS: The current study suggests that prior lumbar fusion and use of a subhemispheric acetabular component are both associated with increased dislocation rate. The subhemispheric design of the standard liner causes the center of rotation of the femoral head to lie outside the plane of the cup's opening which decreases the jump distance necessary for dislocation. Surgeons should consider the impact of subhemispheric acetabular component design on jump distance and dislocation risk. For patients with increased odds of dislocation, such as those with prior lumbar fusion, surgeons should optimize modifiable factors such as the jump distance offered by the acetabular component.

Slight Varus of Triple-Tapered Femoral Components in Primary THA Leads to Excellent Outcomes

Paper 115

Brian E. Kelley / Rochester, MN

Co-Authors:

Brian E. Kelley / Rochester, MN

Baochao Ji / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Michael J. Taunton, M.D. / Rochester, MN

Mark W. Pagnano, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

INTRODUCTION: Component positioning in primary total hip arthroplasty (THA) is important for hip stability and implant survivorship. Recently, triple-tapered femoral components have been adopted widely and the accompanying surgical techniques often encourage broaching in slight varus. The purpose of this study was to determine the impact of alignment of triple-tapered femoral components on implant survivorship, periprosthetic fracture incidence, clinical outcomes, and radiographic results.

METHODS: Utilizing our institutional total joint registry, we identified 1272 primary THAs performed with one of two uncemented, triple-tapered femoral components. Coronal alignment was measured at 3 months postoperatively. There were 1013 (80%) neutrally aligned (defined as $0 \pm 3^\circ$) femoral components and 259 femoral components outside that range with 98% of these in varus. Outcomes analyzed include implant survivorship, Harris hip scores (HHS), and radiographic outcomes. Mean follow-up was 2 years.

RESULTS: The 5-year survivorship free of aseptic femoral component loosening was 99.9% and 100% in the neutral and varus groups, respectively ($p=0.6$). The 5-year survivorship free of any femoral component revision was 99.5% and 100% in the neutral and varus groups, respectively ($p=0.25$). The 5-year survivorships free of any revision ($p=0.45$) and free of any reoperation ($p=0.59$) were similar between groups. The mean HHS was nearly identical in both groups ($p=0.8$). There were no differences in the rates of heterotopic ossification ($p=0.84$), nor the presence of radiolucent lines ($p=0.62$) between groups. There were 14 periprosthetic fractures (1.4%) in neutral femoral components and 1 in varus femoral components (0.4%; $p=0.19$). There was no difference in the dislocation rate between groups (0.5% v. 0.8%; $p=0.59$).

CONCLUSIONS: Nearly 20% of all triple-tapered femoral components placed at our institution were in varus alignment. Uncemented triple-tapered femoral components with and without a collar were durable and reliable when inserted in slight varus.

Hybrid Primary Total Hip Arthroplasty Through the Direct Anterior Approach is Not Associated with Increased Complications When Compared to the Posterior Approach: A Matched Cohort Study

Paper 116

Matthew L. Hadley, M.D. / Rochester, MN

Co-Authors:

Matthew L. Hadley, M.D. / Rochester, MN

Brandon P. McMaster, M.D. / Rochester, MN

Matthew B. Shirley, M.D. / Charlotte, NC

Dirk R. Larson, M.S. / Rochester, MN

Elizabeth Gausden, M.D., MPH / New York, NY

Michael J. Taunton, M.D. / Rochester, MN

OBJECTIVE: The use of cemented femoral stems in the elderly has been shown to reduce the risk of early revision, and recent evidence has suggested that cemented stems can be safely and effectively implanted through a direct anterior approach (DAA). However, there remains a paucity of data comparing outcomes of hybrid primary total hip arthroplasty (THA) between the DAA and the posterior approach (PA). Our aim is to compare implant survivorships, complication rates, and clinical outcomes of hybrid primary THA performed through either a DAA or PA at short-term follow up.

METHODS: Between 2015 and 2020, 69 DAA primary THAs utilizing a cemented Exeter stem were identified using our institutional total joint registry and matched 1:3 to 207 PA primary THAs utilizing the same stem based on age, sex, BMI, and indication. Mean age for the entire cohort was 76 years, 75% were female, and mean BMI was 28 kg/m². Kaplan Meier survivorship analyses were performed and compared. Mean follow up was 2.7 years.

RESULTS: At 3 years, there was no significant difference in survivorship free of periprosthetic fracture (100% vs 98%, $p=0.61$), nonoperative complication (97% vs 96%, $p=0.70$), reoperation (99% vs 93%, $p=0.18$), or revision (100% vs 94%, $p=0.18$) in the DAA and PA cohorts respectively. Three periprosthetic fractures occurred (1%). All 3 cases underwent a PA and none occurred intraoperatively. There was no significant difference in mean Harris Hip Scores at 2 years between the two cohorts (87.6 vs 86.4, $p=0.61$).

CONCLUSIONS: Compared to the PA, hybrid primary THA performed through a DAA is not associated with an increased risk of periprosthetic fracture, nonoperative complication, reoperation, or revision. Hybrid primary THA performed through either a DAA or PA is associated with reliable and durable outcomes at short-term follow up.

Five-Year Incidence of Progression to Osteoarthritis and Total Joint Arthroplasty in Patients Prescribed Glucagon-Like Peptide 1 (GLP-1) Receptor Agonists

Paper 117

Monish S. Lavu, MHM / Cleveland, OH

Co-Authors:

Monish S. Lavu, MHM / Cleveland, OH

Joshua R. Porto, M.S. / Cleveland, OH

Christian J. Hecht II, B.S. / Cleveland, OH

David C. Kaelber, M.D., Ph.D., MPH / Cleveland, OH

Peter J. Sculco / Cleveland, OH

Nathanael D. Heckmann, M.D. / Los Angeles, CA

Atul F. Kamath, M.D., MBA / Cleveland, OH

OBJECTIVE: Research has suggested that glucagon-like peptide-1 receptor agonists (GLP-1-RAs) may have therapeutic effects on osteoarthritis of the hip and knee, in addition to managing diabetes and obesity. However, there is a lack of understanding regarding the association between GLP-1-RA use and diagnosis of osteoarthritis (OA) of the hip and knee.

METHODS: TriNetX was queried for obese diabetic (n=1,094,198), obese non-diabetic (n=916,235), and non-obese diabetic patients (n=157,305) with an index visit between 2015-2017. Patients with pre-existing hip and/or knee OA were excluded. One-to-one propensity score matching (PSM) was used to balance GLP-1-RA use in stratified cohorts for age, sex, race, body mass index (BMI), and hemoglobin A1c (HbA1c). The primary outcomes were rates of progression to hip OA, knee OA, major joint injections, total hip arthroplasty (THA), and total knee arthroplasty (TKA). Cox proportional hazards models determined hazard ratios (HR) between cohorts prescribed and not prescribed GLP-1-RAs.

RESULTS: All patients had five-year follow-up. Rates of progression to hip and knee OA were higher among the GLP-1-RA users in both obese diabetic (Hip HR: 1.63, 95% confidence interval [CI]: 1.46-1.82; Knee HR: 1.52, CI: 1.41-1.64) and non-obese diabetic (Hip HR: 1.78, CI: 1.50-2.10; Knee HR: 1.58, CI: 1.39-1.80) cohorts. These diabetic cohorts received higher rates of major joint injections, though there was no difference in rates of THA or TKA. No differences in five-year outcomes were seen when comparing obese, non-diabetic patients who were prescribed GLP-1-RAs with obese, non-diabetics not exposed to GLP-1-RAs.

CONCLUSIONS: Contrary to the perceived protective mechanisms of GLP-1-RAs in mitigating arthritis progression, this study with five-year follow-up found a greater risk of progression to hip and knee OA among obese and non-obese diabetic GLP-1-RA users. Further studies should explore the efficacy of GLP-1-RAs with respect to intersecting endpoints of glucose management, weight loss, and lower extremity arthritis development.

Complications After Direct Anterior vs. Posterior Total Hip Arthroplasty: Lower Rates of Instability But No Difference in Reoperation and Resolution: A Multicenter Study

Paper 118

Abraham Babalola / Rochester, MN

Co-Authors:

Diego J. Restrepo, M.D. / Rochester, MN
Sergio F. Guarin Perez, M.D. / Rochester, MN
Heather J. Roberts, M.D. / Rochester, MN
Robert T. Trousdale, M.D. / Rochester, MN
Abraham Babalola / Rochester, MN
Michael J Tauton, M.D. / Rochester, MN
Rafael J. Sierra, M.D. / Rochester, MN
Cameron K. Ledford, M.D. / Jacksonville, FL
Joshua S. Bingham, M.D. / Scottsdale, AZ

INTRODUCTION: Complication rates differ between direct anterior (DA) and posterior approaches for total hip arthroplasty (THA). Previous studies have reported higher rates of periprosthetic fracture, infection, and femoral component revision with the DA approach and higher rates of instability with the posterior approach. However, it is unknown whether the ultimate impact and outcome at latest follow-up after the complication differs between approaches. The aim of this study was to report surgical complications after THA performed through the DA or posterior approach, with an emphasis on the impact and outcome of these complications.

METHODS: We identified 9730 THAs performed for a diagnosis of primary osteoarthritis via the DA or posterior approach between 2010 and 2021 from 3 different sites. We evaluated the top five surgical complications: aseptic loosening, infection, periprosthetic femur fracture, and instability, each within one year, and neurologic deficit within 3 months of index surgery. Of the 4236 (44%) DA THA, 260 (2.7%) had complications; of the 4476 (56%) posterior THA, 303 (6.8%) had complications. Multivariate Cox models were used to compare complication rates between approaches, adjusting for BMI and ASA classification. Impact was quantified by number of reoperations required, and outcome by resolution or persistence of the complication.

RESULTS: Overall rate of complication was lower in the DA group compared to the posterior group (HR 0.6, $p=0.002$). Rate of instability was lower in the DA group compared to the posterior group (HR 0.18, 95% CI 0.08, 0.41, $p<0.001$). There were no differences in neurologic deficit, femoral loosening, infection, or periprosthetic fracture between approaches. Among patients with a complication, mean number of reoperations (0.35 vs 0.44, $p=0.14$) and rate of resolution (88% vs 86%, $p=0.75$) did not differ between DA and posterior groups, respectively.

CONCLUSION: Compared to the posterior approach, the complication rate is lower in direct anterior THA, driven largely by decreased risk of instability. However, among patients who developed a complication, number of reoperations required and rate of resolution did not differ between approaches.

Robotic-Assistance is Associated with Better Outcomes Compared to Conventional Techniques in Total Hip Arthroplasty: A Propensity-Matched Large Database Study of 7,896 Patients

Paper 119

Aakash K. Shah / Cleveland, OH

Co-Authors:

Aakash K. Shah / Cleveland, OH

Monish S. Lavu, MHM / Cleveland, OH

Robert J. Burkhart, M.D. / Cleveland, OH

Christian J. Hecht II / Cleveland, OH

Collin Blackburn, M.D., MBA / Cleveland, OH

Nicholas Romeo, DO / Cleveland, OH

INTRODUCTION: The outcomes of total hip arthroplasty (THA) are highly dependent upon the restoration of native hip biomechanics and optimal component positioning. Robotic technologies for THA have rapidly improved the accuracy of component positioning and maintaining the planned center of rotation. While robotic-assisted THA (RA-THA) has primarily been employed in surgically intricate cases, its potential benefits in scenarios of diminished surgical complexity remain less explored. Therefore, the purpose of this study was to assess the odds of developing systemic and joint complications following RA-THA in cases of reduced surgical complexity.

METHODS: A retrospective cohort study was conducted using a national database to identify patients who underwent primary THA (Current Procedural Terminology code 27130) from 2005 to 2022. Patients undergoing RA-THA were identified by ICD-10-PCS code 8E0Y0CZ and Healthcare Common Procedure Coding System code S2900. One-to-one propensity score matching was conducted to generate 2 cohorts: 1) RA-THA and 2) conventional THA (C-THA). Systemic and joint complications were assessed at the 30-day, 90-day, 1-year, and 5-year postoperative periods.

RESULTS: Patients undergoing RA-THA had a lower risk of needing a revision THA at the 90-day, 1-year, and 5-year time points. RA-THA was associated with a lower risk of prosthetic dislocation at 90 days and 1 year and prosthetic pain at 1 year and 5 years. Dislocation of the hip or fracture of the femur was significantly lower in the RA-THA cohort at all four-time points.

CONCLUSION: These findings suggest that RA-THA has comparable systemic and joint complication risks at 30-day to 5-year timepoints between RA-THA and C-THA. Future studies with large sample sizes and long-term follow-up are needed to understand the patient-reported outcomes and functional outcomes of RA-THA for cases with reduced surgical complexity.

Surgical Management of Consecutive Prosthetic Hip Joint Infections: Single-Stage vs. Two-Stage Revision Hip Arthroplasty

Paper 120

Austin M. DeBoer, B.S. / Minneapolis, MN

Co-Authors:

Austin M. DeBoer, B.S. / Minneapolis, MN

Nickolas Van Roekel, M.D. / Minneapolis, MN

Travis Parkulo, M.D. / Minneapolis, MN

Gaonhia Moua, B.S. / Minneapolis, MN

Sandy Vang, B.S. / Minneapolis, MN

Scott Marston, M.D. / Minneapolis, MN

OBJECTIVE: Single-stage hip revision continues to gain popularity for the treatment of prosthetic joint infections (PJI) compared to the gold standard two-stage hip revision. In this single-provider, single-protocol study we aimed to compare the outcomes between these two revision methods.

METHODS: A retrospective study was performed including 63 patients who underwent a single-stage or two-stage hip revision for chronic PJI between 2009-2020. Exclusion criteria for single-stage revisions were limited to being 18 years or older and not meeting requirements for PJI, otherwise all cases of PJI revision were undertaken as a single-stage procedure after (1/2015). Infections were classified using the Delphi-based consensus criteria. We evaluated the rate of reinfection between the two revision methods and compared rates of adverse postoperative events.

RESULTS: There were 43 single-stage (68.3%) and 20 two-stage (31.8%) revisions. The mean age was 59.5 ± 13 years, 35 were females (55.56%), and the mean BMI was 35.8 ± 9.1 kg/m². At the mean follow-up rate of 6.9 years (2.1-10.8), the success rate for the resolution of the infection was 81.4% in the single-stage revision compared to 80.0% in the two-stage revision ($p = 1.000$). 20.9% of the patients in the single-stage revision required a reoperation procedure for a non-infectious reason compared to 15.0% in the two-stage revision ($p = 0.7367$). Further, there were no statistical differences when comparing rates of adverse postoperative events between the single-stage and two-stage revision.

CONCLUSIONS: Single-stage revision is as effective as two-stage revision for the resolution of hip PJI in patients with limited exclusion criteria.

Does a Previously Failed Debridement, Antibiotics, And Implant Retention or Two-Stage Revision Impact the Success Rate of Subsequent One-Stage or Two-Stage Revision?

Paper 121

Austin M. DeBoer, B.S. / Minneapolis, MN

Co-Authors:

Austin M. DeBoer, B.S. / Minneapolis, MN

Nickolas Van Roekel, M.D. / Minneapolis, MN

Travis Parkulo, M.D. / Minneapolis, MN

Gaonhia Moua, B.S. / Minneapolis, MN

Sandy Vang, B.S. / Minneapolis, MN

Scott Marston, M.D. / Minneapolis, MN

OBJECTIVE: Previous literature has found that the success rates of two-stage revision for prosthetic joint infection (PJI) may be compromised by a prior failed procedure such as debridement, antibiotics, and implant retention (DAIR). The aim of this study was to clarify whether a previously failed procedure (DAIR or two-stage revision) impacts the success rate of subsequent one-stage or two-stage revisions.

METHODS: This was a retrospective review of 112 patients who underwent a one-stage or two-stage revision for PJI with a minimum of a 2-year follow-up. 69 patients (62%) had a prior failed procedure, and 43 patients (38%) had no prior procedures. Of the prior failed procedure group, 24 patients (35%) had a prior two-stage revision and 45 patients (65%) had a prior DAIR. The primary outcome was the failure of the one-stage or two-stage revision, which was defined as subsequent surgery due to infection.

RESULTS: Treatment success of chronic PJI for the prior procedure cohort was 78% compared to 79% in the no prior procedure cohort ($p = 1.000$). Success rates of no prior procedure, prior two-stage revision, and prior DAIR success rates were 79%, 75%, and 80%, respectively ($p = 0.9133$). Patients with prior surgery were more likely to have received antibiotics prior to staged revision (50 vs 20 patients, $p = 0.009$) and require plastic surgery for recurrent infection (18 vs 1 patients, $p = 0.001$). There were no differences in the time from one-stage or two-stage revision to readmission for recurrence of infection between the no prior procedure, prior two-stage revision, and prior DAIR groups.

CONCLUSIONS: These findings suggest that a prior failed two-stage revision or DAIR does not have a significant impact on the success rates of subsequent one-stage or two-stage revisions for the treatment of chronic PJI, but it is more likely to require plastic surgery intervention for soft tissue coverage.

Does the Addition of a Traction Pad Reduce the Rate of Postoperative Pudendal Neuralgia in Hip Arthroscopy: Interim Analysis of a Randomized Controlled Trial

Paper 122

Joseph Tanenbaum, M.D. / Chicago, IL

Co-Authors:

Joseph Tanenbaum, M.D., Ph.D / Chicago, IL

Richard Nicolay, M.D. / Chicago, IL

Hunter Angileri, BA / Chicago, IL

Michael Terry, M.D. / Chicago, IL

Vehniah Tjong, M.D. / Chicago, IL

BACKGROUND: Transient pudendal neuralgia is the most frequently described complication following hip arthroscopy. Traction pads are theorized to reduce postoperative pudendal neuralgia when using a perineal post. The present study is the first randomized controlled trial assessing pudendal neuralgia with and without the use of a traction pad among patients undergoing hip arthroscopy with a perineal post.

METHODS: Adult patients undergoing hip arthroscopy at a single institution were prospectively enrolled in this pre-registered trial. Block randomization was performed to either perineal post alone or perineal post plus a traction pad. All patients completed ordinal questionnaires (not at all, mild, moderate, severe) regarding saddle numbness, difficulty with urination or bowel movements, skin changes, and sexual dysfunction at baseline, two hours, seventy-two hours, one week, three weeks, and six weeks postoperatively. Outcomes were compared at each time point using ordinal logistic regression models. A predetermined alpha of 0.05 was used to assess statistical significance. An interim analysis of the first fifty-three patients was performed due to anecdotal concerns that failure to use a traction pad led to undue patient harm.

RESULTS: Among the first fifty-three patients enrolled in this trial, 26 and 27 patients were randomized to the traction pad and control groups, respectively. Average age and gender distribution were similar across the two groups (40.2 years in the traction pad group vs 37.1 years in the control group ($p=0.31$) and 24% male vs. 34.6% male, $p=0.60$). We did not find a statistically significant association between use of a traction pad and any of our outcomes at any time point. The overall rate of experiencing any adverse outcome at any time point was 94.4%.

CONCLUSION: This study is the first randomized controlled trial of neurologic outcomes following hip arthroscopy with concomitant use of a perineal post and a traction pad. In conjunction with the high overall rate of any adverse outcome at any time point, these interim results suggest that use of a traction pad does not mitigate the adverse effects of a perineal post during hip arthroscopy. Our findings highlight the benefits of moving away from use of a perineal post toward post-less surgery.

Introducing the Reflection Index: A Novel Radiographic Assessment of Cam Morphology in Femoroacetabular Impingement and Predictor of Outcomes Following Hip Arthroscopy with Minimum Two-Year Follow-Up

Paper 123

Andrew Paliobeis / University Heights, OH

Co-Authors:

Andrew Paliobeis, M.D. / Cleveland, OH

John Strony, M.D. / Cleveland, OH

Jason Ina, M.D. / Cleveland, OH

Mingda Chen / Cleveland, OH

Sunita Mengers, M.D. / Cleveland, OH

Molly Piper / Cleveland, OH

James Voos, M.D. / Cleveland, OH

Michael Salata, M.D. / Cleveland, OH

OBJECTIVE: Femoroacetabular impingement (FAI) is commonly treated with hip arthroscopy and cam under-resection is a common reason for failure. Cam resection is assessed intraoperatively using radiographic parameters. However, currently used parameters have had equivocal results predicting patient reported outcomes (PROs). The purpose of this study was to define a novel radiographic parameter, reflection index, which can be used to assess cam resection. We hypothesized that the postoperative reflection index correlated with outcomes following hip arthroscopy.

METHODS: Patients with symptomatic FAI undergoing primary hip arthroscopy between 2019 and 2021 were identified. Preoperative and postoperative alpha angle, head-neck offset ratio (HNOR), and reflection index were measured. Reflection index was defined as a curvilinear area superior to the femoral neck divided by a curvilinear area inferior to the femoral neck on 45° Dunn lateral radiograph. A reflection index of 1 was defined as a perfect cam resection. PROs were obtained preoperatively and 2 years postoperatively including modified Harris Hip Score (mHHS), PROMIS Global Physical Health (GPH), PROMIS Global Mental Health (GMH) and visual analog scale pain (VAS) scores. Multivariate and logistic regression models were utilized to evaluate the predictive value of each radiographic measure on outcomes.

RESULTS: Sixty-three hips met eligibility criteria with mean age of 29.13 years and 44 (69.84%) females. Multivariate regression revealed reflection index further from 1 to be an independent predictor of lower postoperative mHHS, GPH, and higher VAS with regression coefficients of -137.099 ($p < 0.001$), -49.747 ($p = 0.004$), 9.548 ($p = 0.038$), respectively, for the transformed variable $\text{Abs}(\log \text{ reflection index})$. Reflection index closer to 1 was an independent predictor of achieving PASS and SCB for mHHS at 2 years. Alpha angle and HNOR had no association with postoperative mHHS, GPH, GMH or VAS scores.

CONCLUSION: Reflection index can be used to assess cam resection in hip arthroscopy. Postoperative reflection index closer to 1 was an independent predictor of superior postoperative outcomes. Alpha angle and HNOR failed to predict outcomes. Reflection index may be a useful radiographic assessment in hip arthroscopy to guide cam resection intraoperatively and provide prognostic value postoperatively.

Long-Term Outcomes of Advanced Arthroscopic Techniques for Patients with Acetabular Retroversion Without Anteverting Periacetabular Osteotomy

Paper 124

Megan E. Flynn, M.D. / Chicago, IL

Co-Authors:

Megan E. Flynn, M.D. / Des Plaines, IL

Yasemin E. Kingham, BA / Des Plaines, IL

Jessica C. Keane, B.S. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Anterolateral acetabular over coverage, also known as acetabular retroversion, can cause femoroacetabular impingement syndrome (FAIS). Various surgical options have been suggested for treatment, ranging from anteverting periacetabular osteotomy to hip arthroscopy.

PURPOSE: (1) To report and analyze long-term patient-reported outcome scores (PROs) in patients with FAIS and labral tears in the setting of acetabular retroversion following hip arthroscopy and (2) compare these PROs with those of a propensity-matched benchmark control group without acetabular retroversion.

METHODS: Prospectively collected data were retrospectively reviewed for patients who underwent hip arthroscopy for FAIS and labral tear treatment between June 2008 and December 2013. On a well-positioned anteroposterior pelvic radiograph, retroversion was determined based on the presence of an ischial spine sign, >20% crossover sign, and presence of posterior wall sign. Inclusion criteria included acetabular retroversion. Outcomes measured included pre- and postoperative PROs, rates of achieving clinically relevant thresholds, survivorship, and rate of revision hip arthroscopy. Propensity score matching was utilized to match to a control group 1:1 on age, sex, body mass index (BMI), acetabular and femoral head Outerbridge grade, preoperative lateral center-edge angle, and labral treatment.

RESULTS: A total of 106 hips with acetabular retroversion were matched to a control group. The groups showed no difference between demographic variables. The retroversion group was composed of 71 female and 35 male hips, with a mean SD age of 24.7 ± 7.9 years and follow-up time of 112.5 ± 29.9 months. Significant improvements were seen in all PROs collected in both groups, and the RA group showed significantly better iHOT-12, postoperative VAS, and change in VAS compared to the control group ($P < 0.05$). Intraoperative diagnostic data and procedures performed revealed a higher prevalence of cam and pincer morphology in the control group in addition to a higher incidence of femoroplasty while the RA group showed a higher rate of both acetabular chondroplasty and ACEA.

CONCLUSION: Patients with acetabular retroversion who present with FAIS and labral tears can be safely treated using advanced hip arthroscopic techniques without reverse (anteverting) periacetabular osteotomy in a high-volume surgeon's hands. Patients with acetabular retroversion demonstrated favorable PROs and low rate of revision arthroscopy and conversion to THA at long-term follow-up, which is consistent with a propensity-matched control group without acetabular retroversion.

Mid-Term Outcomes in Patients Undergoing Primary Hip Arthroscopy Demonstrates Favorable Survivorship Following Central Acetabular Decompression Irrespective of Perifoveal Femoral Head Cartilage Damage

Paper 125

Benjamin D. Kuhns, M.D., M.S. / Des Plaines, IL

Co-Authors:

Benjamin D. Kuhns, M.D., M.S. / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Tyler R. McCarroll, M.D. / Des Plaines, IL

Yasemin E. Kingham, BA / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

INTRODUCTION: Central acetabular stenosis (CAS), as defined by an osteophyte within the acetabular fossa, is associated with higher rates of femoral head chondral damage and inferior short-term outcomes following hip arthroscopy. Central acetabular decompression (CAD) is an arthroscopic technique to resect the central acetabular osteophyte with the goal of increasing the volume of the acetabular fossa and decreasing the stress on the perifoveal region of the femoral head. The purpose of this study was to evaluate mid-term outcomes following central acetabular decompression in patients with CAS undergoing primary hip arthroscopy for femoroacetabular impingement.

METHODS: A prospectively collected IRB-approved surgical database of a high-volume hip surgeon was reviewed for patients who received CAD for CAS identified during hip arthroscopy. Primary outcomes for the study was conversion to arthroplasty with secondary outcomes including revision arthroscopy and patient reported outcome scores with associated clinically relevant thresholds. A multivariate regression analysis was performed to evaluate risk factors for progression to arthroplasty.

RESULTS: Minimum five year follow up was obtained on 155 out of 189 eligible patients (82%). The average age was 45.9 ± 10.8 years with 90 females (58%). 33 patients (21.3%) had progressive osteoarthritis requiring arthroplasty while 9 patients (6%) had revision arthroscopy. Significant improvement for all outcome scores was observed throughout the 5 year time point with high rates of postoperative satisfaction and achievement of clinically relevant outcomes. Significant risk factors for conversion to arthroplasty included older age, higher BMI, acetabular chondral defects with Outerbridge greater than 2, and the presence of a Sabertooth osteophyte. Using a multivariate analysis, only acetabular chondral defects were predictive of conversion to arthroplasty.

CONCLUSION: Patients receiving central acetabular decompression for central acetabular stenosis had durable improvement and modest rates of conversion to arthroplasty with minimum five year follow up in a population with higher rates of intraoperative chondral injury. Severe acetabular chondral defects, but not femoral head chondral defects, predicted interim conversion to arthroplasty in this cohort.

Comparative Short-Term Outcomes: Periacetabular Osteotomy with Concomitant Hip Arthroscopy vs. Isolated Hip Arthroscopy with Capsular Plication in Borderline Dysplastic Hips: A Propensity-Matched Study

Paper 126

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Co-Authors:

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Andrew R. Schab, B.S. / Des Plaines, IL

Jessica C. Keane, B.S. / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Traditionally, patients with symptomatic borderline hip dysplasia (BHD) have been managed using periacetabular osteotomy (PAO) with or without concomitant hip arthroscopy. Isolated hip arthroscopy with capsular plication has emerged as a less invasive procedure for restoring hip stability. The purpose of this study is to compare minimum 2-year outcomes of PAO concomitant with hip arthroscopy vs. isolated hip arthroscopy with capsular plication, in patients with BHD.

METHODS: Data was prospectively collected between 2008 and 2021 and retrospectively reviewed for all patients who underwent surgical intervention for hip pain in the setting of borderline hip dysplasia. Patients were included if they had preoperative and minimum 2-year postoperative patient reported outcomes (PROs) or reached an endpoint during the study period. Patients were excluded from this study if they had previous ipsilateral hip pathology, LCEA $< 18^\circ$ or $> 25^\circ$, or preoperative Tonnis osteoarthritis grade > 1 . Patients were divided into groups based on whether they underwent concomitant PAO. Patients were propensity matched in a 1:1 ratio based on age, sex, BMI, and Tonnis Grade. Patient characteristics, radiographic measurements, and PROs were reported and compared between the groups.

RESULTS: A total of 74 hips were included in the study. The groups had similar preoperative and minimum two-year postoperative values, and comparable magnitudes of improvement across all PROs. Furthermore, the groups met clinically relevant thresholds at similar rates ($p > 0.05$). Two patients in the HA group required PAO. The two groups had similar rates of revision surgery ($p > 0.05$). Complication rates were similar between the groups ($p > 0.05$).

CONCLUSION: PAO with concomitant hip arthroscopy and isolated hip arthroscopy with capsular plication in the setting of BHD yielded favorable functional outcomes. A high percentage of patients reached clinically relevant hip preservation thresholds, with similar rates of revision surgery and conversion to arthroplasty at a minimum 2-year follow-up.

Minimum Five-Year Outcomes of Hip Arthroscopy for the Treatment of FAI And Labral Tears in Competitive Soccer Players: A Comprehensive Evaluation with Return-To-Sport Analysis

Paper 127

Andrew R. Schab, B.S. / Des Plaines, IL

Co-Authors:

Andrew R. Schab, B.S. / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Matthew J. Strok, BA / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

INTRODUCTION: Previous reports have suggested a high prevalence of femoroacetabular impingement (FAI) syndrome among soccer players. The study aims to evaluate the outcomes and return-to-sport rates of hip arthroscopy as a treatment for FAI and labral tears in competitive soccer players at midterm follow up with a secondary sub-analysis of return to sport based on sex and competitive level.

METHODS: Retrospectively analyzed data for all patients who underwent hip arthroscopy as treatment for FAI between February 2008 and January 2019. Included patients reported competitive soccer participation and had completed preoperative and minimum of 5-year postoperative questionnaires for at least one of the following patients reported outcomes (PROs): the modified Harris Hip Score (mHHS), Non-Arthritic Hip Score (NAHS), Hip Outcome Score-Sports Specific Subscale (HOS-SSS), International Hip Outcome Tool (iHOT-12), Visual Analogue Scale (VAS) for pain and patient satisfaction, or documented an endpoint during the study timeframe. Clinically important thresholds were included in the analysis. An overall return-to-sport analysis was conducted, with a sub-analysis considering preoperative competitive level and sex.

RESULTS: A total of 65 patients (74 hips) were included. All patients experienced significant improvement of mHHS, NAHS, HOS-SSS, iHOT-12, VAS, and had high patient satisfaction. Furthermore, a high percentage of patients reached the MCID and PASS for the evaluated PROs. Of the 65 patients, 7 (10.8%) chose to stop playing soccer due to lifestyle transitions. Among the remaining 58 patients, 47 (81%) returned to soccer. Only 4 patients (6.1%) did not return due to persisted hip symptoms. Moreover, of those who returned to sport, 32 (68.1%) continued to play soccer at a minimum of 5 years follow-up. No differences were observed when comparing sex or previous competitive level in return-to-soccer rates. Eight hips (10.8%) required revision hip arthroscopy, and two (2.7%) underwent conversion to THA.

CONCLUSIONS: Hip arthroscopy for FAI and labral treatment in soccer players resulted in significant improvements in functional outcomes, with a high percentage of patients achieving important clinical thresholds. There was a high rate of return to soccer, enabling a substantial number of patients to continue playing at a minimum 5-year follow-up.

LEVEL OF EVIDENCE: Level III Retrospective cohort study.

Minimum Two-Year Outcomes of Iliopsoas Tunnel Deepening with Primary Hip Arthroscopy: A Propensity Matched Comparison with Iliopsoas Fractional Lengthening

Paper 128

Andrew R. Schab, B.S. / Des Plaines, IL

Co-Authors:

Andrew R. Schab, B.S. / Des Plaines, IL
Benjamin D. Kuhns, M.D. / Des Plaines, IL
Elizabeth G. Walsh, B.S. / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL
Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL
Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Iliopsoas impingement is a cause of hip pain in the spectrum of pre-arthritis hip disorders, often associated with internal snapping of hip. Traditionally, iliopsoas impingement has been managed with iliopsoas tenotomy or fractional lengthening (IFL), while iliopsoas tunnel deepening (ITD) has recently emerged as a novel treatment option.

PURPOSE: To report minimum two-year outcomes of ITD during hip arthroscopy and compare their results to a propensity-matched cohort undergoing IFL.

STUDY DESIGN: Cohort study; Level of evidence, 3.

METHODS: Data was collected between December 2017 and January 2022 and retrospectively reviewed for all patients who underwent primary hip arthroscopy to treat FAI, labral tears, and iliopsoas impingement. Hips included had preoperative and minimum two-year minimum postoperative patient reported outcomes (PRO). Subjects receiving ITD were propensity matched to IFLs in a 1:1 ratio based on age, sex, BMI, intraoperative cartilage status, labral treatment, and capsular management. Patient demographics, radiographic measurements, intraoperative findings, surgical procedures, and PROs were compared. Clinically relevant outcomes including the minimum clinically important difference (MCID) and patient acceptable symptomatic state (PASS) were compared between groups.

RESULTS: A total of 66 hips were included in the study. Both groups demonstrated significant improvement in all PROs with comparable postoperative improvement ($p > 0.05$). Both groups had high rates of resolution of painful internal snapping, including 26 (78.79%) ITD and 27 (81.82%) IFL hips ($p > 0.05$). MCID, PASS and MOI were met at similar rates between the two groups ($p > 0.05$). ITDs and IFLs underwent revision arthroscopy at comparable rates (9.1% vs. 9.1%; $p > 0.05$). No conversions to arthroplasty were reported in either group.

CONCLUSION: Both ITD and IFL improved mechanical symptoms and painful internal snapping when treating iliopsoas impingement during hip arthroscopy. ITDs had comparable improvements in PROs and clinical outcomes when compared to IFLs. Both ITD and IFL appear to be efficacious procedures when managing iliopsoas impingement.

Mid-Term Outcomes of Patients with Concomitant Painful External Snapping Hip And Femoroacetabular Impingement Syndromes: A Minimum Five-Year Follow-Up Study

Paper 129

Drashti Sikligar, MEng / Des Plaines, IL

Co-Authors:

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Drashti Sikligar, MEng / Des Plaines, IL

Andrew R. Schab, B.S. / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Hip arthroscopy treating external snapping hip (ESH) and femoroacetabular impingement (FAI) concomitantly has shown favorable short-term outcomes. This study aimed to report mid-term outcomes of hip arthroscopy that concomitantly treats FAI and ESH, with a secondary comparison of these results to a benchmark control group hips with FAI without ESH.

METHODS: Data was retrospectively analyzed for hips who underwent hip arthroscopy as treatment for FAI and iliotibial band (ITB) and gluteus maximus tendon release as treatment for painful ESH between 2008 and 2019. Included patients had complete pre- and postoperative patient reported outcomes (PROs) or a documented endpoint at minimum five-year follow-up. Rates of revision surgery and conversion to total hip arthroplasty (THA) were included in the analysis. Patients were propensity matched to a benchmark control group of FAI patients without ESH in a 1:4 ratio by sex, age at surgery, body mass index (BMI), Acetabular Outerbridge Grade, labral treatment, and capsular treatment.

RESULTS: 215 hips (211 patients) were included in the study. The study group showed significant improvements in all assessed PROs, with 98% of patients reporting resolution of painful external snapping at latest follow up, and no patient requiring revision hip arthroscopy secondary to a persisted external snapping. When compared to the benchmark control group, patients with ESH had similar preoperative scores for mHHS, NAHS, HOS-SSS and VAS and had equivalent magnitudes of improvement. Additionally, similar postoperative scores across all PROs and patient satisfaction were met. MCID and PASS for all evaluated PROs were met at similar rates.

CONCLUSIONS: Primary hip arthroscopy addressing FAI and painful ESH with ITB and gluteus maximus tendon release demonstrated significant improvement in all evaluated PROs, with 98% of patients reporting resolution of external snapping, and no revision surgery due external snapping recurrence at minimum five-year follow-up. Functional outcomes and rates of clinically relevant thresholds achievement were comparable to a propensity-matched benchmark control group of FAI without ESH.

A Multi-Center Analysis of Three Decades of Hip Arthroscopy: Evolving Techniques and Growing Patient Volumes from 1988 - 2022

Paper 130

Ryan T. Conyer, M.D. / Rochester, MN

Co-Authors:

Ryan T. Conyer, M.D. / Rochester, MN

Emmett J. Cleary, M.D. / Rochester, MN

Allen S. Wang, M.S. / Rochester, MN

Alex M. Boos, B.S. / Rochester, MN

Matthew M. Crowe, M.D. / Jacksonville, FL

Kostas J. Economopoulos, M.D. / Phoenix, AZ

Aaron J. Krych, M.D. / Rochester, MN

Bruce A. Levy, M.D. / Rochester, MN

Mario Hevesi, M.D., Ph.D. / Rochester, MN

OBJECTIVE: The number of hip arthroscopies performed in the United States has grown significantly over the past several decades, with evolving indications and emerging techniques. The purpose of this study was to examine the evolution of hip arthroscopy at three tertiary referral centers from 1988 to 2022 and to quantify trends in patient demographics and procedures performed.

METHODS: A retrospective analysis was performed of all patients undergoing hip arthroscopy at three academic centers between 1988 and 2022. Demographic data were collected using standardized forms and operative notes, and intraoperative images were manually reviewed for each patient to determine the specific procedures performed at the time of the hip arthroscopy. Surgical procedures were plotted over time to evaluate trends. Patients were divided into three time periods for comparison: Early hip arthroscopy from 1988 – 2008, 2009 (the time of the first labral repair in our cohort) – 2015, and 2016 – 2022.

RESULTS: A total of 3000 patients (age: 35.7 ± 13.8 years, range: 10 – 89; 2109 female (70.3%); BMI: 27.4 ± 6.3 kg/m²) underwent arthroscopic hip procedures between 1988 and 2022. The mean number of cases increased from an average of 3.2 per year in 1988 – 2008 to 285.9 per year in 2015 - 2022 ($p < 0.001$). Labral treatment at the time of primary hip arthroscopy evolved from 100% debridement and 0% repair from 1988 - 2008 to 5.0% debridement, 94.0% repair, and 1.0% labral reconstruction in 2016 – 2022 ($p < 0.001$). Cam resection increased from 4.1% in 1988 – 2008 to 86.9% in 2016 – 2022 ($p < 0.001$). By 2022, 45 out of 325 cases (13.8%) were revisions. The rate of capsular repair at the time of primary hip arthroscopy increased from 0.0% in 1988 – 2008 up to 81.0% in 2016 – 2022.

CONCLUSIONS: There has been a significant growth of hip arthroscopy volumes as well as a significant transition from use as a tool for diagnosis and labral debridement to procedures restoring native anatomy including labral repair, cam resection, capsular repair, periacetabular osteotomy, and gluteus repair.

Surgical Management of Ischiofemoral Impingement Leads to Satisfactory Results: A Case Series of 12 Hips with a Mean 8-Year Follow-Up

Paper 131

Brandon P. McMaster, M.D. / Rochester, MN

Co-Authors:

Brandon P. McMaster, MD / Rochester, MN

Sean C. Clark, M.S. / Rochester, MN

Xuankang Pan, B.S. / Rochester, MN

Louis S. Kang, B.S. / Rochester, MN

Sanathan Iyer, B.S. / Rochester, MN

Gavin H. Ward, B.S. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

Aaron J. Krych, M.D. / Rochester, MN

Mario Hevesi, M.D. / Rochester, MN

OBJECTIVE: Ischiofemoral impingement is an uncommon but increasingly recognized condition characterized by abnormal contact or narrowing of the space between the ischium and lesser trochanter. The purpose of this study was to evaluate the clinical outcomes and reoperation rates of patients with ischiofemoral impingement who underwent surgical intervention.

METHODS: All patients who underwent surgical treatment for ischiofemoral impingement were retrospectively reviewed. Surgical treatment involved either lesser trochanter osteotomy or partial resection of the ischial tuberosity. Patients were excluded if they did not have complete postoperative outcome scores or underwent subsequent surgery around the hip. A total of 10 patients (12 hips) were included in the study. Three patients were excluded, two of which underwent subsequent surgeries while the other had incomplete postoperative outcome scores and was lost to follow-up. At final follow-up, postoperative outcomes including Visual Analog Scale (VAS) pain at rest, VAS pain with use, patient satisfaction on a scale from 0 to 10 with 10 being the most satisfied, whether the patient feels better or worse after surgery in comparison to before surgery using a five-question Likert scale, Tegner Activity Scale, International Hip Outcome Tool (iHOT-12), Hip Outcome Score – Activities of Daily Living (HOS-ADL), Forgotten Joint Score-12 (FJS-12), and modified Harris Hip Score (mHHS) were obtained. Additionally, subsequent injections around the hip were also recorded.

RESULTS: The average age at surgery was 41.1 ± 18.6 years (range 17.2 – 75.0 years) with most patients being female (70.0%, 7/10). The average follow-up for the cohort was 7.8 ± 2.1 years (range 4.1 – 12.0 years). Nine hips (75.0%) underwent partial or complete resection of the lesser trochanter while 3 (25.0%) underwent partial ischial tuberosity resection. Only one hip underwent subsequent surgery for hardware removal from the greater trochanter at 1.2 years postoperatively. The average patient satisfaction was 8.0 ± 2.9 , while the average VAS at rest and with use was 2.0 ± 2.4 and 3.0 ± 2.7 , respectively. The mean Tegner Activity Scale, iHOT-12, HOS-ADL, and mHHS were 4.2 ± 2.7 , 68.9 ± 28.3 , 81.1 ± 22.7 , and 81.5 ± 24.2 , respectively. A Likert scale questionnaire based on how the patients subjectively felt after surgery demonstrated that 91.7% of hips (11/12) felt much better or slightly better than before surgery.

CONCLUSIONS: Surgical management resulted in satisfactory clinical outcomes and low reoperation rates and should be considered in patients with ischiofemoral impingement refractory to comprehensive conservative management.

Labral Revision Reconstruction in the Hip: Minimum Two-Year Outcomes with a Nested Propensity-Matched Control

Paper 132

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Co-Authors:

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Yasemin E. Kingham, BA / Des Plaines, IL

Jessica C. Keane, B.S. / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Onur Hapa, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Although existing literature suggests poorer outcomes for patients undergoing revision hip arthroscopy compared to those undergoing a primary procedure, there is a lack of evidence demonstrating exactly how revision reconstructions compare to primary reconstructions.

PURPOSE/HYPOTHESIS: To present minimum 2-year patient reported outcomes (PROs) of revision arthroscopic labral reconstruction in the setting of a failed primary hip arthroscopy in comparison to a matched primary reconstruction group. We anticipate that revision labral reconstruction will show significant improvement in PROs, albeit potentially inferior when compared to the control group.

METHODS: Data from April 2010 to November 2021 were retrospectively reviewed. Patients were included if they underwent a revision hip arthroscopy for labral reconstruction in the setting of irreparable labral tear and femoroacetabular impingement, with minimum 2-year follow-up for modified Harris Hip Score (mHHS), Nonarthritic Hip Score (NAHS), Hip Outcome Score–Sports Specific Subscale (HOS-SSS), International Hip Outcome Tool (iHOT), patient satisfaction, and visual analog scale for pain. Exclusion criteria were Tonnis osteoarthritis grade >1, hip conditions prior to the primary surgery, or workers' compensation claims. Cases were matched with a benchmark control group of primary labral reconstruction. Patient-reported outcomes and rates of achieving clinically relevant thresholds were compared between the two groups.

RESULTS: 92 hips who underwent revision labral reconstruction were 1:1 matched to 92 hips who underwent primary labral reconstruction. At minimum 2-year follow-up both groups showed significant improvement in all PRO ($p < 0.001$) with comparable rates of improvement in mHHS, NAHS and VAS ($p > 0.05$). Revision reconstruction exhibit inferior 2-year outcomes in all PROs when compared to the control group ($p < 0.001$).

Recovery from Hip Arthroscopy for Femoroacetabular Impingement : A Qualitative Study of Patients' Experiences

Paper 133

W. Kelton Vasileff, M.D. / Columbus, OH

Co-Authors:

Marcia Edwards PsyD / Columbus OH

Tyler Barker Ph.D. / Columbus OH

William Vasileff, M.D. / Columbus OH

BACKGROUND: The incidence of hip arthroscopy for femoroacetabular impingement (FAI) has substantially increased in recent years. Hip arthroscopy for FAI generally results in good symptomatic relief and improved functioning, although prior studies have demonstrated variability in patient outcomes. Currently, no studies have used qualitative methods to understand the experiences of individuals recovering from hip arthroscopy for FAI, including the perceived impact of surgery and facilitators and barriers to the rehabilitation and recovery process. Understanding the experiences of individuals recovering from hip arthroscopy for FAI is critical for developing effective interventions and strategies to promote optimal function and recovery after surgery.

METHODS: We conducted qualitative interviews with 12 individuals (9 females and 3 males) aged 19-78 years old following hip arthroscopy for FAI. All interviews were conducted by phone approximately six weeks following surgery. Interviews were recorded and transcribed. Data were analyzed using thematic analysis.

RESULTS: We identified eight themes: (1) role of social support, (2) physical, social, and emotional needs throughout recovery, (3) emotional response to the rehabilitation process, (4) influence of mental health on recovery, (5) impact of surgery on quality of life and wellbeing, (6) barriers and facilitators to rehabilitation and recovery, (7) interventions to promote mental health throughout the rehabilitation and recovery process, and (8) advice for future hip arthroscopy patients.

CONCLUSIONS: Hip arthroscopy can positively influence quality of life and wellbeing in individuals with FAI, although patients often experience challenges during the initial postoperative period. Meeting patients' fundamental care and emotional needs are essential for positive patient experiences and optimal recovery. Individuals' social support systems must also be considered throughout the rehabilitation and recovery process. Our findings suggest that individuals recovering from hip arthroscopy for FAI may benefit from interventions and resources that promote mental well-being and enhance social support throughout the rehabilitation and recovery process. As such, interventions and resources to enhance mental well-being and social support need to be developed for and tested in individuals recovering from hip arthroscopy for FAI.

Iliopsoas Fractional Lengthening After Total Hip Arthroplasty: A Multicenter Study

Paper 134

Kevin Jurgensmeier, M.D. / Rochester, MN

Co-Authors:

Kevin Jurgensmeier, M.D. / Rochester, MN
Karissa N. Simon, B.S. / Rochester, MN
Michael Vogel B.S. / Chicago, IL
Michael J. Taunton, M.D. / Rochester, MN

Bruce A. Levy, M.D. / Rochester, MN
Shane J. Nho, M.D. MS / Chicago, IL
Mario Hevesi M.D., Ph.D. / Rochester, MN

OBJECTIVES: Iliopsoas tendon impingement has been reported to exist in up to 8.3% of patients following total hip arthroplasty, and most often manifests as persistent anterior groin pain. There are anatomic, technical, and prosthetic causes of this phenomenon, and malpositioned or oversized acetabular cups are a common culprit due to the mechanical irritation the hardware applies to the tendon. There is a relative dearth of information with regards to outcomes of iliopsoas release, especially in considering postoperative strength and function. The purpose of this study was to evaluate patient reported outcomes (PROs) after arthroscopic iliopsoas fractional lengthening (AIL), to assess correlation of anterior acetabular cup overhang with postoperative PROs and assess the rate of progression to revision arthroplasty.

METHODS: Patients with iliopsoas tendinitis in the setting of prior THA who underwent AIL from 1988 to 2023 at 2 academic institutions were reviewed. Patients were included if they had 12 months of follow-up and underwent evaluation of preoperative anterior acetabular component overhang, surgery satisfaction, postoperative subjective hip flexion strength and anterior groin pain improvement, modified Harris Hip Score, Single Assessment Numeric Evaluation score, Tegner activity scale score, visual analog scale (VAS) score, and revision hip arthroplasty.

RESULTS: Sixty hips (21 male and 39 female) were followed for a mean of 39.3 months (range, 12.0-105.9 months) postoperatively. Of the patients, 77% reported feeling “much better” or “slightly better,” 75% reported improved anterior groin pain, and 60% reported improved subjective hip flexion strength. The surgery satisfaction rating was 7.2 ± 3.3 (scale of 0 to 10). The mean postoperative modified Harris Hip Score, VAS score for pain at rest, VAS score for pain with use, and Single Assessment Numeric Evaluation score were 73.9 ± 19.4 , 1.3 ± 2.4 , 3.8 ± 2.9 , and 71.9 ± 21.9 , respectively. Preoperative anterior acetabular component overhang was 3.3 ± 6.5 mm and did not significantly correlate with postoperative PROs ($P \geq .45$). The Tegner score improved from 2.5 ± 1.7 preoperatively to 2.9 ± 1.4 postoperatively ($P = .0253$). Three patients underwent revision arthroplasty at a mean of 25.3 months (range, 11.6-40.4 months) postoperatively, yielding an acetabular component revision rate of 3.3%.

CONCLUSIONS: Satisfactory outcomes including improvement in hip flexion strength and low revision arthroplasty rates were observed in patients undergoing AIL after THA. There was no statistically significant relation between anterior acetabular component overhang and final PROs.

Impact of Antibiotic Stewardship on Flexor Tenosynovitis Length of Stay

Paper 135

Joel W. Mayo, M.S. / Chicago, IL

Co-Authors:

Joel W Mayo, M.S. / Chicago, IL

Apurva S Choubey, M.D. / Chicago, IL

Brett Drake, B.S. / Chicago, IL

Bhavik Patel, M.D. / Chicago, IL

Gautam Malhotra, M.D. / Chicago, IL

INTRODUCTION: Pyogenic flexor tenosynovitis (PFT) is an aggressive closed-space infection of the flexor tendon sheaths. Complications of PFT include bone and tendon deformity, tendon necrosis, and eventual need for amputation. Evaluating and implementing perioperative protocols that allow for decreased time between surgery and discharge has the potential to reduce healthcare costs and improve outcomes. Length of Stay (LOS) has been a key metric for evaluating management protocols and developing strategies to increase high value care. This study aims to identify procedural and patient-specific factors that contribute to extended LOS in patients undergoing surgical intervention for PFT.

METHODS: A retrospective analysis was performed on patients who received surgical treatment for PFT at an urban, academic tertiary care center between 2018 and 2023. A patient pool was generated using the diagnosis of flexor tenosynovitis in the upper extremity, which yielded 63 subjects. After exclusions, a final sample of 33 patients was yielded. Data on patient demographics, comorbidities, total length of stay, operative details, wound culture results, and antibiotics used, were collected. Statistical analysis was performed to determine associations with extended length of stay. Extended length of stay was considered as stays averaging >120 hours. Statistical analysis was conducted to determine significant differences between the groups.

RESULTS: There were a total of 33 patients in the final analysis. 18 patients fit the criteria for extended length of stay (stay >120 hours). Patient demographics showed no significant differences between age and body mass index (BMI). There was a significant difference in total Charlson Comorbidity Index (CCI) scores between the two groups, with the extended stay group having significantly greater CCI scores ($p=0.024$). Kanavel signs between the two groups trended towards significance ($p=0.083$). However, other markers of infection severity including PFT scale, intraoperative purulence, re-operations, change in antibiotics, and presence of positive bacterial cultures did not differ significantly between the two groups.

DISCUSSION: We see that length of stay is significantly affected by the patient's pre-injury health status, as captured by the CCI. Additional areas of interest, such as indicators of infection severity like Kanavel signs and PFT scale were not significant, yet the number of Kanavel signs does trend toward significance. Certain limitations exist in this iteration of study, namely the limited sample size.

The Use of the Procedure Room for High-Risk Patients Undergoing WALANT Hand Surgery

Paper 136

Jordan C. Serotte, M.D. / Chicago, IL

Co-Authors:

Jordan C. Serotte, M.D. / Chicago, IL

Kevin Chen, B.S. / Chicago, IL

Jennifer Wolf, M.D. Ph.D. / Chicago, IL

Megan Conti Mica, M.D. / Chicago, IL

OBJECTIVE: Patients who would be deemed high-risk individuals by traditional classifications of American Society of Anesthesiologists (ASA) or the updated guidelines of ASA Practice Advisory can safely undergo surgery under WALANT in procedure room setting without any increased risks of complications. We hypothesize no increased complication rates in high-risk patients, and prompt time to surgery by using our standardized procedure room protocol.

METHODS: 436 surgeries performed in our procedure room over a 4-year period were analyzed. Preoperative medical or anesthesia evaluation was not required for patients, regardless of comorbidities. No medical comorbidities precluded a patient from surgery within the procedure room. Chart review of the electronic medical record was conducted. All patients were risk-stratified based on two classifications systems: American Society of Anesthesiology (ASA) Classification System and ASA Practice Advisory for Preanesthetic Evaluation (ASAPA). We recorded the incidence of complications.

RESULTS: Our total complication rate was 2.74% with an incidence of SSI of 6/437 (1.4%). Patient characteristics for the complications group were not significantly different on the basis of age, BMI, smoking status, presence of diabetes, or risk stratification. All the patients with complications were either ASA I, II, or III, and were equally distributed between the different categories for ASAPA score (6 requiring no clearance, and 6 requiring either PCP or cardiac clearance). Finally, we found no significant medical complications or admissions in any patients.

CONCLUSION: Like many other previously published other studies, our study also demonstrated there is no increased risk to patients who have surgery with WALANT in the procedure room, compared to operating rooms. Our overall complication rate of 2.74% is similar to previous which found complication rates of 3% for WALANT published in literature.

Our study uniquely shows that there is no increase in complications for high-risk patients who had surgeries performed in the procedure room. In our cohort, almost 30% of the patients would need some sort of additional clearance prior to having surgery at an ASC, most likely to assure the safety of the patient receiving anesthesia. Instead, our patients received prompt care within the confines of the procedure room. This study outlines a safe method for a procedure room and demonstrates that the procedure room is an effective way to treat patients of various medical complexities.

Cubital Tunnel Syndrome and Bariatric Surgery: Impact On Surgical Outcomes and Care Strategies

Paper 137

Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

Co-Authors:

Brett Drake, B.S. / Chicago, IL

Apurva Choubey, M.D. / Chicago, IL

Vennela Challagondla, B.S., MPH / Chicago, IL

Nirav Mungalpara, M.D. / Chicago, IL

Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

OBJECTIVE: Currently, there is limited research examining the impact of prior bariatric surgery on outcomes following cubital tunnel surgery. Our study evaluates and compares patient factors influencing the development of cubital tunnel syndrome and postoperative outcomes following cubital tunnel surgery in patients with and without a history of bariatric surgery.

METHODS: The study utilized the PearlDiver Mariner 165 database, covering records from 165 million patients between 2010 and 2022. Patients with cubital tunnel syndrome and those undergoing related surgery were identified using ICD and CPT codes. They were divided into cohorts based on bariatric surgery history, matched 1:10 with controls by age, sex, and Charlson Comorbidity Index. Analyses compared demographics, comorbidities, and outcomes like nerve injury, complex regional pain syndrome (CRPS), additional tunnel surgeries, and emergency department (ED) visits using Chi-square tests. A Kaplan-Meier curve assessed time from initial cubital tunnel surgery to subsequent procedures.

RESULTS: The study included 6,044 patients with prior bariatric surgery and 60,418 without, all diagnosed with cubital tunnel syndrome. Patients with bariatric surgery had significantly higher rates of comorbidities compared to those without, including anemia (36.04% vs. 19.98%, $p<0.001$), depression (70.87% vs. 61.67%, $p<0.001$), and diabetes (66.14% vs. 47.14%, $p<0.001$). Bariatric surgery patients had significantly higher rates of emergency department visits (85.44% vs. 81.65%, $p<0.001$) and subsequent carpal tunnel surgeries (61.79% vs. 56.29%, $p<0.001$). Among those who underwent cubital tunnel surgery (1,332 with prior bariatric surgery and 13,291 without), similar trends were observed, with higher comorbidity rates and a trend towards more subsequent cubital tunnel surgeries within 2 years among bariatric surgery patients ($p=0.062$). Patients with a history of bariatric surgery were more likely to have an additional cubital tunnel surgery within 2 years of the initial operation compared to those without bariatric surgery.

CONCLUSIONS: Post-bariatric surgery, patients with cubital tunnel syndrome exhibit more comorbidities and undergo increased carpal and cubital tunnel surgeries, indicating worsened neuropathy symptoms. Elevated rates of cervical radiculopathy and peripheral neuropathy suggest a potential double crush syndrome. Further studies are needed to investigate nutritional interventions post-bariatric surgery and their effect on cubital tunnel syndrome progression.

Double Crush Hypothesis: Exploring the Impact of Pre-Existing Cervical Radiculopathy on the Development of Carpal Tunnel Syndrome After Distal Radius Fractures

Paper 138

Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

Co-Authors:

Nirav K. Mungalpara, M.D., MRCs / Chicago, IL
Logan P. Van Poucke / Chicago, IL
Victoria Marino / Chicago, IL
Abhishek Deshpande, M.D. / Chicago, IL
Brett K. Drake, B.S. / Chicago, IL

Apurva S. Choubey, M.D. / Chicago, IL
Alfonso Mejia, M.D., MPH / Chicago, IL
Daniel P. Mass, M.D. / Chicago, IL
Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

OBJECTIVE: Carpal tunnel syndrome (CTS) is the most common peripheral neuropathy, constituting nearly 90% of all neuropathies. CTS arises from increased pressure and narrowing of the carpal tunnel at the wrist. Distal radius fractures (DRF) can cause symptoms of median nerve irritation in previously asymptomatic individuals. Previous research has explored various causes and relationships between CTS after DRF but on a small scale. The large-scale impact of pre-existing cervical radiculopathy (CR) remains unknown. This study investigates the influence of pre-existing CR on CTS development following different types of DRF.

METHODS: Using the PearlDiver database, data from 165 million patients were analyzed. Patients were categorized based on DRF type: closed, open, or complicated (resulting in non-union or malunion). Those with prior CR were divided into three sub-cohorts based on the AND function. We compared the likelihood of CTS development between patients with and without pre-existing CR. A five-year Kaplan-Meier curve analyzed CTS occurrence post-DRF. Additionally, we examined the likelihood of CR occurrence in patients who developed CTS following DRF compared to those who did not.

RESULTS: Cohorts were matched by age, ECI, gender, hypertension, diabetes, and obesity for fracture type. Patients with pre-existing CR who developed CTS after a closed DRF had an odds ratio (OR) of 2.06 (CI = 2.02–2.10), after an open DRF had an OR of 2.1 (CI = 1.77–2.49), and after a complicated DRF had an OR of 2.16 (CI = 1.96–2.37). The Kaplan-Meier curves indicate a significant association between CR and CTS development post-DRF.

CONCLUSIONS: Patients with pre-existing CR are at a significantly increased risk of developing CTS following all DRF types. Similarly, the presence of CTS after DRF increases the likelihood of a CR diagnosis. Clinicians should consider evaluating patients with DRF for CR to anticipate and manage potential peripheral nerve complications effectively.

Comparison of Z-Lengthening to Fractional Lengthening of Forearm Flexor Tendons: A Biomechanical Cadaveric Analysis

Paper 139

Angel A. Valencia, M.D. / Dallas, TX

Co-Authors:

Angel A. Valencia, M.D. / Dallas, TX

Dang-Huy Do, M.D. / Dallas, TX

Junho Ahn, M.D. / Dallas, TX

Nathan Heineman, M.D. / Dallas, TX

Douglas Sammer, M.D. / Dallas, TX

Daniel Koehler, M.D. / Dallas, TX

INTRODUCTION: Z-lengthening performed at the tendon level and fractional lengthening (FL) performed at the musculotendinous junction are two common procedural interventions to address flexion contractures. The purpose of this study was to compare the biomechanical properties of flexor tendons undergoing Z-lengthening vs. fractional lengthening.

METHODS: Seventy-two flexor tendons were harvested from twelve paired upper extremities, including flexor carpi radialis (FCR), flexor carpi ulnaris (FCU), flexor pollicis longus (FPL), and flexor digitorum superficialis (FDS2-4) tendons. Tendons for each set of paired upper extremities were either fractional lengthened or Z-lengthened. Z-lengthened tendons were lengthened 20 mm and repaired with a pair of 3-0 sutures using figure-of-8 technique. For fractionally lengthened tendons, a transverse tenotomy was made at the musculotendinous junction at the level corresponding to 75% of its maximal width, followed by a second tenotomy 1 cm distal to the first. Mann-Whitney U tests were performed to compare the maximum load at failure and excursion at failure for each tendon type. Cohen's d effect size (d) for each tendon type were calculated and statistical significance was set at p-value <0.05.

RESULTS: Four fractionally lengthened tendons in the FL group were excluded due to disrupted musculotendinous junctions, leaving 68 tendons for testing. There was significantly greater load to failure for FCR (p=0.004, d=2.3), FDS3 (p=0.017, d=2.0), FDS4 (p=0.010, d=2.1), and flexor tendons overall (p=0.001) with Z-lengthening, compared to fractional lengthening. Maximum tendon excursion at failure was also significantly greater for Z-lengthening compared to fractional lengthening for FCR (p=0.002, d=2.4), FDS3 (p=0.009, d=0.8), and flexor tendons overall (p<0.001). Among Z-lengthened tendons, 89% (32/36) failed due to suture pull out, which occurred at the distal 27.7% (10/36) or proximal suture 36.1% (13/36), or at both sutures 25% (9/36).

CONCLUSION: Z-lengthened forearm flexor tendons had greater overall tensile strength and excursion at failure compared to fractionally lengthened tendons. Specifically, when Z-lengthened, the FCR, FDS3, and FDS4 tendons had a greater load to failure and FCR and FDS3 had greater excursion at failure compared to fractional lengthening. Surgeons should consider performing Z-lengthening as an alternative method for tendons that are susceptible to failure with fractional lengthening.

Outcomes of Suture Tape Augmentation for Digital MCP RCL Repair Compared to Repair Alone

Paper 140

Sarah Ridenour, M.D. / Rochester, MN

Co-Authors:

Sarah Ridenour, M.D. / Rochester, MN

Jacob Schaefer, M.D. / Rochester, MN

Sanjeev Kakar, M.D. / Rochester, MN

OBJECTIVE: Options for repair of a torn finger metacarpophalangeal (MCP) radial collateral ligament (RCL) include repair or reconstruction. Repair can be augmented with suture tape (ST), which spans the repair and demonstrates increased load to failure in biomechanical studies. Our objective was to evaluate clinical outcomes for digital MCP RCL repair with ST compared to repair alone.

METHODS: After institutional review board approval, evaluated all patients at a single institution who underwent repair alone (RA) vs. repair and ST augmentation (ST) of acute and chronic MCP RCL injuries of the index, middle, ring and small fingers. We collected patient demographics, surgical technique, functional outcomes and complications. Results were analyzed using students t-test for continuous variables and Chi square test for categorical variables. A P-value of <0.05 was used to indicate statistical significance.

RESULTS: Fifty-two patients underwent acute treatment within 90 days of injury. Forty-eight patients were in the RA group and four were in the ST group. Mean duration of postoperative immobilization was significantly shorter in the ST group at 35 days compared to the RA group at 43.8 days ($p=.02$). There was a 12.5% rate of reoperation in the RA group compared to 0% in the ST group ($p=.45$) and a significantly lower number of reoperations in the ST group ($p=.03$). The groups were otherwise similar regarding pain ($p=0.07$), MCP joint stability ($p=.70$) and range of motion ($p=.62$) postoperatively. Mean age was 46.7 years and mean followup was 6.3 months.

Sixty-four patients underwent chronic treatment 90 days after their injury. Sixty patients were in the RA group and four were in the ST group. Mean duration of postoperative immobilization was significantly shorter in the ST group at 22 days compared to 43 days in the RA group ($p=.02$) with better range of motion ($p=0.045$). There was an 8% rate of reoperation in the RA group compared to 0% in the ST group ($p=.55$) and a significantly lower number of reoperations in the ST group ($p=.03$). The groups were otherwise similar regarding pain ($p=.64$) and MCP joint stability ($p=.62$). Mean age was 51.3 years and mean followup was 4.9 months.

CONCLUSIONS: This study demonstrates that compared to repair alone, ST augmentation for digit MCP RCL repair has shorter duration of immobilization, better range of motion and lower number of reoperations.

Surgical Management of Fixed VISI Deformities

Paper 141

Courtney R. Carlson Strother, M.D. / Rochester, MN

Co-Authors:

Abigail J. Bardwell, D.O. / Rochester, MN

Courtney R. Carlson Strother, M.D. / Rochester, MN

Alexander Shin, M.D. / Rochester, MN

HYPOTHESIS: The reported outcomes of surgical treatment of patients with fixed volar intercalated segment instability (VISI) deformities is sparse and only exists in the forms of case reports or small series. We hypothesized that soft tissue reconstructions (tenodesis with ligament reconstruction) would result in inferior correction of VISI deformities and have poorer outcomes than bony reconstruction (motion sparing procedures: scaphoidectomy + 4 corner fusion, radiolunate fusion, lunotriquetral fusion, proximal row carpectomy [PRC], or total wrist fusions) for patients with symptomatic VISI carpal deformities.

METHODS: A retrospective review of all patients who were evaluated for symptomatic fixed VISI deformities between 2000-2021 was performed. Patients with fixed and painful VISI deformity who underwent operative management were included. Medical records, surgical technique, and radiographs were reviewed. Primary outcome was reported pain at final follow up. Secondary outcomes included surgical complications and postoperative correction of radiolunate angle (RL angle) on radiographs.

RESULTS: Twenty-eight patients were identified with fixed painful VISI deformities that underwent surgery, of which 16 (57%) were male. Average age and average follow up was 43.5 and 1.9 years, respectively. The etiology of fixed VISI deformity was prior trauma (n=23, 76.7%), inflammatory conditions (n=3, 10.7%), and miscellaneous causes (n=4, 14.3%). Surgical management included soft tissue reconstruction, limited carpal or radiocarpal fusions, PRC, and total wrist fusion.

SUMMARY: In summary, surgical management of VISI deformity remains a challenging problem, with nearly 1/3 of patients reporting continued pain postoperatively regardless of the surgical procedure. Total wrist arthrodesis was the most reliable method of relieving pain, but comes at the sacrifice of wrist motion. Further studies to elucidate the best treatment option for painful VISI deformity are warranted to balance optimal pain relief with sparing wrist motion if possible.

Evaluating the Efficacy of Corticosteroid Dosing on Hand Surgery

Paper 142

Rishab H. Bhatt , B.S. / Chicago, IL

Co-Authors:

Manish Pathuri, B.S. / Chicago, IL

Rishab H. Bhatt , B.S. / Chicago, IL

Jeffrey G. Stepan, M.D. / Chicago, IL

Jennifer Moriatis Wolf, M.D. / Chicago, IL

Jason A. Strelzow, M.D. / Chicago, IL

INTRODUCTION: This retrospective study evaluated the efficacy of high vs low steroid injection doses to guide steroid dosing for injections used in hand soft tissue pathologies. We hypothesized that there would be no difference in efficacy between high-dose corticosteroid injections (40mg) and low-dose (5-10mg) used for common soft tissue hand pathologies. The current study compared the rate of disease resolution, need for secondary injection, and conversion to surgery between low-dose and high-dose corticosteroid injections used for trigger finger, carpal tunnel, and DeQuervain tenosynovitis.

METHODS: The study is a retrospective chart review of patients from January 1st, 2020 to February 28, 2023. Patients who received a corticosteroid injection for primarily trigger finger, carpal tunnel, De Quervian's Tenosynovitis, and other tendon-related issues were divided into a high-dose injection group (40mg) and a low-dose injection group (5mg and 10mg). The primary outcomes evaluated were the rate of need for follow-up, estimated time of relief from the injection, rate of second injection, and transition to surgery.

RESULTS: A total of 466 patients (649 injections) met inclusion criteria for this study over the study period. In total, 62% of injections were for trigger finger, 17% for carpal tunnel, and 21% for De Quervian's Tenosynovitis. When controlling for established risk factors for injection failure, high-dose injection had a lower rate of repeat injection (18% vs 35% $p<0.05$), lower rate of conversion to surgery (12% vs 21% $p<0.05$), lower rate of need for follow-up (26% vs 46% $p<0.05$), higher estimated time to repeat injection (11.97 months vs 5.64 months $p<0.05$), and higher estimated time to surgery (11.08 months vs 7.73 months $p<0.05$) when compared to the low-dose group. The complication profile for both groups was similar.

DISCUSSION: Our findings indicate that high-dose corticosteroid injections may be more effective than low-dose injections in managing common soft tissue hand pathologies. Hand surgeons should consider the advantages of high-dose corticosteroid injections when determining treatment strategies for patients with soft tissue hand pathologies. Future research, particularly randomized controlled trials, will be essential to validate the findings of this retrospective study further and to establish more definitive treatment guidelines.

Fracture Patterns in Transitional Fractures of the Distal Radius

Paper 143

Alexandra M. Arguello, M.D. / Rochester, MN

Co-Authors:

Mikaela H. Sullivan, M.D. / Rochester, MN

Francis Baffour, M.D. / Rochester, MN

Nicholas Pulos, M.D. / Rochester, MN

Alexandra M. Arguello, M.D. / Rochester, MN

OBJECTIVE: The study hypothesis was that pediatric transitional fractures of the distal radius will occur in the adolescent population and follow a consistent fracture pattern, similar to Tillaux fractures of the distal tibia. The purpose of this study is to evaluate Salter Harris III and IV fractures of the distal radius in the pediatric transitional population for consistent fracture patterns.

METHODS: A retrospective chart review of pediatric patients with transitional fractures of the distal radius at a single institution was performed. Salter Harris III and IV fractures of the distal radius with CT imaging were included. Two independent reviewers determined the metaphyseal fracture plane and the major intra-articular epiphyseal fracture fragments based on the Medoff fragment classification system. Descriptive statistical analysis was performed.

RESULTS: Thirty patients with transitional fractures of the distal radius were identified. Five were Salter Harris III fractures, and 25 were Salter Harris IV fractures. Average age at the time of injury was 15 ± 1.5 years. The metaphyseal fracture demonstrated a coronal fracture plane in all cases, and 20% of these had an additional sagittal plane component. The major epiphyseal fracture fragments were identified as ulnar corner in 70%, radial column in 43%, volar rim in 30%, and dorsal wall in 17%.

CONCLUSIONS: Transitional fractures of the distal radius occurred on average at age 15 years. The injuries demonstrated a consistent pattern with a coronal fracture plane in the metaphysis and an ulnar corner fragment in most epiphyses. Future studies should aim to increase sample size and evaluate treatment based on fracture patterns.

Comparing Surgical Complications and Healthcare Utilization After Forearm Nonunion/Malunion Repair with or without the Use of Autograft

Paper 144

Tyler Compton, M.D. / Chicago, IL

Co-Authors:

Mark A. Plantz, M.D. / Chicago, IL
Michael Kavanagh, M.D. / Chicago, IL
Neha Gupta, BA / Chicago, IL
Manasa Pagadala, B.S. / Chicago, IL
John Carney, M.D. / Chicago, IL

Tyler Compton, M.D. / Chicago, IL
Erik B. Gerlach, M.D. / Chicago, IL
Peter J. Ostergaard, M.D. / Chicago, IL
Chirag Shah, M.D. / Chicago, IL

OBJECTIVE: There is a lack of large sample data comparing short-term complications and healthcare utilization after forearm nonunion or malunion reconstruction with or without the use autograft. The purpose of this study is to compare short-term complications and healthcare utilization after forearm nonunion or malunion repair with or without the use of autograft.

METHODS: All cases of radius and/or ulna nonunion/malunion repair performed between January 1, 2015 and December 31, 2020 were identified using the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database. Current Procedural Terminology (CPT) codes of interest included 25400, 25405, 25415, and 25420, respectively. Patient demographics and surgical variables were reported, including sex, age, body mass index (BMI), medical comorbidities, American Society of Anesthesiologists (ASA) classification, and operative time. Outcomes of interest included unplanned hospital readmission, reoperation, non-home discharge, mortality, inpatient hospitalization, and various surgical and medical complications within 30 days of the index procedure. The surgical complications of interest included surgical site infection, wound dehiscence, and bleeding requiring transfusion. Categorical variables were compared using Chi squared tests, or Fisher's exact test, when appropriate. Continuous variables were compared using unpaired t-tests. Binary logistic regression was used to identify variables that were independently associated with the outcomes of interest.

RESULTS: 1,327 cases were included in the final cohort (617 with autograft use; 710 with no autograft. The autograft group had more male patients, less patients aged 70 years and older, a higher rate of class III obesity, and a lower rate of underweight patients ($p < 0.05$). Otherwise, patient demographics, medical comorbidities, and ASA class were similar between groups ($p > 0.05$). The autograft group had longer operative times ($p < 0.05$). The autograft group had a higher rate of inpatient hospitalization and surgical complications, largely driven by more wound complications ($p < 0.05$). Use of autograft was independently associated with inpatient hospitalization (R.R. 4.306, 95% C.I.: [2.105 – 8.806]) and overall surgical complications (R.R. 2.475, 95% C.I.: [1.111 – 5.511]) ($p < 0.05$). Otherwise, various patient demographic variables, medical comorbidities, and increased operative time were associated with various complications.

CONCLUSION: Forearm nonunion/malunion repair with autograft resulted in higher rates of wound complications and inpatient hospitalization compared to the non-grafting control group. Autograft use was independently associated with wound complications and inpatient hospitalization on multivariate regression analysis. Medical comorbidities, advanced age, and increased operative time were associated with various perioperative complications.

Cervical Radiculopathy as a Risk Factor for CRPS Following Distal Radius Fractures

Paper 145

Nirav K. Mungalpara, M.D., MRCS / Chicago, IL

Co-Authors:

Logan Van Poucke, B.S. / Chicago, IL

Brett A Drake, B.S. / Chicago, IL

Apurva Choubey, M.D. / Chicago, IL

Gautam Malhotra, M.D. / Chicago, IL

Daniel Mass, M.D. / Chicago, IL

Alfonso Mejia, M.D. / Chicago, IL

Mark H. Gonzalez, M.D., Ph.D. / Chicago, IL

OBJECTIVE: Complex Regional Pain Syndrome (CRPS) is a chronic condition that usually affects a limb following injury or trauma. It results from a combination of nerve damage and an abnormal immune response. Distal radius fractures (DRF) can lead to peripheral nerve irritation symptoms in previously asymptomatic individuals. While prior research has examined various causes and the relationship between CRPS and cervical radiculopathy (CR) on a small scale, the large-scale impact of DRF remains unclear. This study investigates how pre-existing CR influences CRPS development following different types of DRF.

METHODS: Using the PearlDiver database, data from 165 million patients were analyzed. Patients were categorized by DRF type: closed, open, or complicated (resulting in non-union or malunion). Those with prior CR were divided into three sub-cohorts using the AND function. We compared the likelihood of CRPS development between patients with and without pre-existing CR. A five-year Kaplan-Meier curve analyzed CRPS occurrence post-DRF. Additionally, we examined the likelihood of CR occurrence in patients who developed CRPS following DRF compared to those who did not.

RESULTS: Cohorts were matched by age, ECI, gender, hypertension, diabetes, and obesity for fracture type. Patients with pre-existing CR who developed CRPS after a closed distal radius fracture (DRF) had an odds ratio (OR) of 3.01 (CI = 2.74–3.30). After an open DRF, the OR was 2.29 (CI = 1.1–4.80), and after a complicated DRF, the OR was 2.03 (CI = 1.41–2.92). The Kaplan-Meier curves indicate a significant association between CR and CRPS development post-DRF.

Compares patients with DRF who developed CRPS to those who did not. The odds of having CR were 2.59 (CI = 2.422–2.779) following closed DRF, 2.10 (CI = 1.328–3.306) following open DRF, and 2.20 (CI = 1.612–3.008) following complicated DRF. Cohorts were matched by age, ECI, gender, hypertension, diabetes, and obesity for fracture type.

CONCLUSIONS: Patients with pre-existing CR significantly increase the likelihood of developing CRPS following CRF. Similarly, the presence of CRPS after DRF increases the likelihood of a CR diagnosis. These results highlight the importance of considering pre-existing cervical conditions in patients with distal radius fractures to better anticipate and manage the risk of CRPS development.

Antibiotic Prescription Practices in Revision Finger Amputations

Paper 146

Olivia J. Thomas, M.D. / Boca Raton, FL

Co-Authors:

Olivia J. Thomas, M.D. / Omaha, NE

Thomas D. Clare, B.S. / Omaha, NE

Joseph A. Morgan, M.D. / Omaha, NE

OBJECTIVE: Revision finger amputations are often performed at bedside in the Emergency Department (ED) when replantation or formal irrigation and debridement in the operating room is not indicated. Unlike open fracture guidelines, there is not a standardized protocol for antibiotic administration while in the ED and after discharge following revision finger amputation. The objective of this study was to evaluate antibiotic prescription practices, including type and duration of therapy, in revision finger amputations in order to optimize protocol standardization.

METHODS: A retrospective chart review of patients who underwent primary revision amputation of at least one digit at a single tertiary Level 1 Trauma Center ED from October 2020-May 2024 by an on-call orthopedic surgery resident was conducted. Patient demographics, injury mechanism and procedure details, ED antibiotic and tetanus administration, discharge antibiotic type and duration, and post-procedural course were recorded as available. Patients younger than 19 years of age, incarcerated, or immunosuppressed at the time of revision amputation were excluded.

RESULTS: Ninety-three patients were identified as meeting study criteria. Eighty-four patients (90.3%) received antibiotics and 65 (69.9%) received tetanus immunization in the ED. Of the 84 patients who received ED antibiotics, 70 (83.3%) received cefazolin, 9 (10.7%) received ceftriaxone, and 5 (0.06%) received ampicillin/sulbactam. Eighty-three patients (98.8%) received post-procedural antibiotics, including 62 (74.6%) discharged on trimethoprim/sulfamethoxazole and 17 (20.5%) on cefalexin with a mean initial duration of 9.7 days (range 7-14 days).

CONCLUSIONS: Revision finger amputations are commonly performed at bedside in the emergency setting; antibiotic prescribing practices are often left to the discretion of treating providers. The majority of patients in this study received cefazolin in the ED and 10 days of trimethoprim/sulfamethoxazole upon discharge, although variation in antibiotic type and duration was noted in the data. Further expansion of the study period and detailed analysis of clinical outcomes will allow for development of a standardized antibiotic protocol and improved patient care.

Revision A1 Pulley Release: An Assessment of Risk Factors Using a National Database

Paper 147

Douglas J. Weaver, M.D. / Chicago, IL

Co-Authors:

Douglas J. Weaver, M.D. / Chicago, IL

Jennifer Lewis / Chicago, IL

Walaa Abdelfadeel, M.D. / Chicago, IL

Jason Strelzow, M.D. / Chicago, IL

Jennifer Wolf, M.D. Ph.D. / Chicago, IL

OBJECTIVE: Trigger finger release (TFR) is a commonly performed procedure in hand surgery. While the success rate of TFR is high, disease recurrence is possible. Data on revision trigger finger release (rTFR) are sparse and little is known regarding those factors associated with revision surgery. Our purpose was to analyze risk factors associated with rTFR procedures.

METHODS: Using a national database (PearlDiver Research Program), patients who underwent a TFR between 2015 to 2022 were identified using CPT and ICD-10 codes. Patients were included if they received an ICD-10 diagnosis of trigger finger on the same day as their release or within two weeks of their procedure. Patients who underwent rTFR were determined through identification of a secondary procedure completed in the same digit on the ipsilateral hand performed after the index procedure. Revision rates at 1, 3, and 5 years were recorded. Demographics and comorbidities were categorically examined via univariate and multivariable logistic regression analysis.

RESULTS: A total of 46,613 patients meeting inclusion criteria were identified after TFR with 1,793 (3.85%) undergoing revision release. Multivariable analysis demonstrated that diabetes, ischemic heart disease, and male sex were associated with statistically significantly increased odds of revision procedures at 1, 3, and 5 years from the initial operation. Age >65 and hypertension were associated with an increased odds of revision surgery at three and five years, and carpal tunnel syndrome as a risk factor at one and three years only. Hypothyroidism was associated with a decreased revision rate at all time points and tobacco use at five years only.

CONCLUSIONS: These data demonstrate that male sex, diabetes, and heart disease are risk factors for requiring revision trigger finger release in the short and medium term. This information should be part of preoperative discussions with patients undergoing surgical treatment of trigger digits.

Trends and Complications of Total Elbow Arthroplasty and Open Reduction and Internal Fixation for the Treatment of Distal Humerus Fracture: A National Database Study

Paper 148

David H. Jung, B.A. / Chicago, IL

Co-Authors:

David H. Jung, B.A. / Chicago, IL

Douglas Zhang, B.A. / Chicago, IL

Augustin G. L. Vannier, B.A. / Chicago, IL

Jason A. Strelzow, M.D. / Chicago, IL

OBJECTIVE: This study investigates trends in usage, outcomes, and associated risk factors of total elbow arthroplasty (TEA) and open reduction and internal fixation (ORIF) for treating distal humerus fractures (DHF) in patients aged 55 and above over the last 10 years.

METHODS: A national insurance database was used to identify patients aged 55 or older treated for DHF with either TEA or ORIF from 2010 to 2021. Risk factors (e.g. age, gender, diabetes, smoking, obesity, chronic kidney disease), rates of 90-day complications (e.g. postoperative bleeding, wound disruption, thromboembolic events, and infection), and 12-month revision rates for each treatment modality were assessed on a yearly basis to visualize trends and changes in utilization patterns. Secondly, we assessed outcome differences between TEA and ORIF through an exact matched cohort using a 1:4 ratio methodology. Chi-square analysis and multivariable logistic regression were used, focusing on the covariates of gender, age, diabetes, obesity, smoking, and chronic kidney disease and any variables found to be significant through univariable regression.

RESULTS: Overall, 16,572 patients were identified. A year-over-year decrease in the ratio of TEA to ORIF usage was seen over the 10 years. Over time, mean age and rates of all studied comorbidities increased for both treatment groups, while complication rates decreased. The revision rate decreased among ORIF patients but remained stable for TEA. Postoperative complications, including bleeding and infection, were significantly higher in the TEA group compared to ORIF in chi-square analysis. Upon multivariable analysis, TEA was found to be associated with increased risk of infection (odds ratio: 1.88, $p < 0.0001$). Infection was further associated with smoking (odds ratio: 1.60, $p = 0.002$), chronic kidney disease (odds ratio: 1.74, $p = 0.0004$), and obesity (odds ratio: 1.62, $p = 0.002$), while revision was associated with obesity (odds ratio: 1.48, $p = 0.003$).

CONCLUSIONS: This study reveals a declining usage of TEA for DHF management in the current study population. Although the main reasons for this decline cannot be established by this study and despite earlier literature suggesting broader applications for TEA, its association with higher immediate complications compared to ORIF may be the reason for the more cautious approach in its application. There is a need for ongoing assessment of treatment trends and their impact on clinical decisions.

Timing of Direct Oral Anticoagulant Usage Does Not Negatively Impact Outcomes Following Hip Arthroplasty for Femoral Neck Fractures

Paper 149

Xiao Tony Chen, M.D. / Rochester, MN

Co-Authors:

Xiao Tony Chen, M.D. / Rochester, MN
Bryan D. Springer M.D. / Jacksonville, FL
Shalmali Borkar, MPH / Jacksonville, FL
Aaron Spaulding, Ph.D / Jacksonville, FL
Linjun Yang, Ph.D. / Rochester, MN

Cody C. Wyles, M.D. / Rochester, MN
Steven B. Porter, M.D. / Jacksonville, FL
Joshua S. Bingham, M.D. / Phoenix, AZ
Benjamin K. Wilke M.D. / Jacksonville, FL

OBJECTIVE: Orthopedic surgeons routinely delay surgical management of femoral neck fractures for 36-48 hours in patients taking direct acting oral anticoagulants (DOACs). This study assessed if there was a higher risk for complications in patients who underwent early surgery (within 24 hours after DOAC administration) compared to patients with delayed surgery or no preceding DOAC usage.

METHODS: A multi-center, retrospective cohort study was conducted on 2,833 patients who underwent primary total hip arthroplasty (THA) or hemiarthroplasty (HA) for femoral neck fracture between 12/31/2017-1/29/2024. Exclusion criteria included internal fixation, a diagnosis of periprosthetic fracture (revision arthroplasty), and patient age < 18 years. Mortality, readmission, blood transfusion, discharge disposition, hospital length of stay (LOS), and medical complications were compared between groups. Subgroup analysis was performed to stratify outcomes by number of days a DOAC was held prior to surgery. Chi-square and Student's T-test were performed for statistical analysis.

RESULTS: A total of 207 patients (7%) took a DOAC prior to surgery. The DOAC group was older and more likely to be male (84 years; 53% women) compared to the control group (81 years; 65% women) ($p=0.002$). DOAC patients were more likely to receive a postoperative blood transfusion compared to controls (16% vs. 9%, $p=0.005$) despite having similar preoperative hemoglobin levels (12.3 g/dL vs. 12.6 g/dL; $p=0.079$) and clinically comparable absolute drop in postoperative hemoglobin (-2.0 g/dL vs. -2.1 g/dL, $p=0.05$). Operative time was faster in the DOAC patients (101 minutes vs. 108 minutes, $p=0.028$). Subgroup analysis demonstrated early surgery (within 24 hours of DOAC) had a comparable hospital LOS to control patients (6.0 days vs. 5.8 days), which was shorter than the delayed DOAC groups (7.0 days and 7.7 days) ($p=0.005$). There was no difference in mortality, reoperation, medical complications, or discharge disposition between early and late DOAC groups and control patients (all $p>0.05$).

CONCLUSIONS: Delayed surgical management for DOAC medications may be unnecessary in patients undergoing arthroplasty due to femoral neck fractures. Consideration should be given to adjusting transfusion triggers to reduce the blood transfusion risk in DOAC patients.

Predictors of Five-year Mortality in Femoral Neck Fractures

Paper 150

Sarah N. Powell, M.D. / Omaha, NE

Co-Authors:

Sarah N. Powell, M.D. / Omaha, NE

Aidan P Gaertner, B.S. / Omaha, NE

Granlee V Nguyen, B.S. / Omaha, NE

Elizabeth Lyden, M.S. / Omaha, NE

Annemarie K. Leonard, M.D. / Omaha, NE

Christopher F. Deans, M.D. / Omaha, NE

OBJECTIVE: Determining the optimal surgical management of displaced low-energy femoral neck fractures in the elderly remains a debated topic. Studies have shown that Total Hip Arthroplasty (THA) for FNF is not clinically superior to Hemiarthroplasty (HA) for the first 12-24 months postoperatively and THA is a more costly surgery with potentially increased risks. Efforts have been made at determining objective measures for surgical decision-making, including preoperative albumin, preoperative activity, use of ambulatory aids, comorbidities, and more. This study attempted to determine factors associated with 1- and 5-year mortality after FNF treated with HA or THA.

METHODS: A retrospective chart review from 2012 to 2023 at a single tertiary academic medical center of all patients over 65 years old who underwent THA or HA for low-energy FNF was undertaken. These charts were reviewed for preoperative (age, sex, preoperative ambulatory status, albumin, hemoglobin, ASA score, BMI, and comorbidities), intraoperative, and postoperative (postoperative ambulatory status, mortality) factors. Fischer's exact test was used to look at the association of these factors with mortality at 1 and 5 years postoperatively. Variables were considered for final model if bivariate association of $p < 0.1$. Multivariable logistic regression with backward selection was performed with retention criteria of $p < 0.05$ to build the final model.

RESULTS: Of 496 total patients, 427 patients met inclusion criteria, with an average age of 80 years. 295 patients underwent HA while 132 underwent THA. 193 patients were deceased at 5 years, including 27 THA patients (20.5%) and 166 HA (56.6%) patients. Preoperative ambulatory status, age, preoperative hemoglobin, and preoperative albumin were all significantly associated with mortality at 1 year. Preoperative ambulatory status, age, ASA score, preoperative albumin, and preoperative BMI were all significantly associated with mortality at 5 years. Specifically, patients who were not community ambulators before surgery had 4.3-fold increased odds of death < 5 years compared to community ambulators ($p < 0.001$). Preoperative albumin was associated with 58% increased odds of death at 5 years per each 1gm/dL decrease.

CONCLUSIONS: We found that multiple preoperative risk factors are significantly associated with 1- and 5-year mortality after surgical intervention for FNF. Given the subjective nature of indicating THA vs. HA for patients with FNF, we hope to use these data to create an index that may be used to guide surgical decision-making for THA vs. HA with the goal of improving patient outcomes, limiting postoperative complications, and being cost conscious.

Impact of Intraoperative Periprosthetic Fractures During Cemented Hemiarthroplasty for Femoral Neck Fractures

Paper 151

Austen L. Thompson, M.D., Ph.D. / Rochester, MN

Co-Authors:

Ankur Khanna, B.S. / Rochester, MN

Austen L. Thompson, M.D., Ph.D. / Rochester, MN

Megan L. Anderson, B.S. / Rochester, MN

William W. Cross III, M.D. / Rochester, MN

Jennifer Tangtiphaiboon, M.D. / Rochester, MN

Krystin A. Hidden, M.D. / Rochester, MN

Brandon J. Yuan, M.D. / Rochester, MN

INTRODUCTION: There has been significant study on intraoperative femoral fractures (IFFs) during primary total hip arthroplasty, but it is not well understood how this complication affects the patient population undergoing cemented hemiarthroplasty. This study aimed to analyze the impact of IFFs sustained during cemented hemiarthroplasty for treatment of femoral neck fractures.

METHODS: A retrospective review was conducted of all patients who were treated for AO/OTA 31B fractures with cemented hemiarthroplasty between January 1, 2001, and December 31, 2021, at a single academic Level 1 trauma center. An initial cohort was constructed of all patients who sustained an IFF during their surgery, yielding 31 patients after excluding those who sustained a pathologic fracture or had incomplete data. These patients were matched 2:1 on age, sex, and BMI to patients in a control cohort. The primary outcome measure was implant failure. Secondary outcome measures included complications, all-cause mortality, and radiographic outcomes (subsidence, femoral component loosening, acetabular wear, and heterotopic ossification) postoperatively.

RESULTS: Subsequent implant revision was required in 3.2% (n=1) of patients who sustained an IFF and 1.6% (n=1) of patients who did not. After adjusting for comorbidities, there was no observed excess risk of implant failure in the fracture cohort when compared to the control cohort (HR=0.30, P=0.740). There was no observed excess risk of morbidity (HR=0.69, P=0.621) or all-cause mortality (HR=0.23, P=0.330). There was no femoral component loosening in either cohort. Radiolucent lines were present in 42% of the fracture cohort and 29% of the control cohort, but this did not differ significantly (p=0.201). Additional radiographic outcomes also did not significantly differ between the two cohorts (P>0.05).

CONCLUSIONS: Intraoperative fractures during cemented hemiarthroplasty do not contribute to increased risk of secondary surgery, morbidity, or mortality after surgery. They also do not adversely affect radiographic outcomes postoperatively.

Complications and Outcomes in Press-Fit vs. Cemented Hip Hemiarthroplasty in Geriatric Patients

Paper 152

Noah Hodson, M.D. / Detroit, MI

Co-Authors:

Noah Hodson, M.D. / Detroit, MI

Hamza M. Raja, B.S. / Detroit, MI

Phillip C. McKegg, DO, M.S. / Detroit, MI

Nicholas Livingston, B.S. / Detroit, MI

Nicholas E. Daher, B.S. / Detroit, MI

Colton L. Clymer, B.S. / Detroit, MI

Joseph F. Hanania, B.S. / Detroit, MI

Elizabeth P. Theirl, BA, B.S. / Detroit, MI

Robb M. Weir, M.D. / Detroit, MI

OBJECTIVE: Hemiarthroplasty, a standard procedure for displaced femoral neck fractures in the geriatric population, continues to be debated regarding the use of press-fit vs. cemented implants. This study aims to compare the clinical outcomes of patients receiving either press-fit or cemented implants for hemiarthroplasty.

METHODS: This retrospective cohort study, conducted over a 10-year period at two trauma centers (level 1 and 3), evaluated outcomes in patients undergoing hemiarthroplasty for femoral neck fractures. Patients were identified through billing codes, and data on demographics, American Society of Anesthesiologists (ASA) status, injury characteristics, and postoperative outcomes were collected via chart review. The primary outcome was the need for revision surgery, while secondary outcomes included deep vein thrombosis (DVT), pulmonary embolism (PE), mortality rates, and 90-day readmission. Descriptive statistics summarized patient characteristics, with the Mann-Whitney U test used for non-normally distributed data. Outcome differences between the two cohorts were analyzed using chi-square tests, with significance set at $p < 0.05$.

RESULTS: 752 patients were analyzed, of which 451 received press-fit implants and 301 received cemented implants. The median age was 82 years (range: 42-105, IQR: 63) for press-fit patients and 81 years (range: 19-102, IQR: 83) for cemented patients. There was no difference in rate of revision for press-fit vs. cemented groups (5.5% vs 7.0%, $p = 0.44$). DVT occurred in 19 cemented (6.3%) and 14 press-fit patients (3.1%) ($p = 0.034$). Press-fit patients demonstrated a trend towards higher ASA 3 status (71.4% vs 64.1%, $p = 0.049$). No significant differences were found between cohorts for 90-day readmission, PE development, and death ($p > 0.05$).

CONCLUSIONS: For the geriatric cohort, press-fit and cementless hemiarthroplasty for femoral neck fractures offer similar rates of revision, allowing surgeons to use their preferred implant without increased risk. Preoperative consideration of ASA status is crucial when selecting implants. Additionally, patients at higher risk for DVT may benefit more from press-fit implants compared to cemented ones.

Cemented vs. Uncemented Total Hip Arthroplasty for Femoral Neck Fracture in Non-Geriatric Patients: A Comparison of 90-Day Adverse Events and 5-Year Implant Survival

Paper 153

Harold G. Moore, M.D. / Dallas, TX

Co-Authors:

Harold G. Moore, M.D. / Dallas, TX

Adeeb Alomar, B.S. / Dallas, TX

Benjamin Conover, B.S. / Dallas, TX

Mikaela Bankston, B.S. / Dallas, TX

Garen A. Collett, M.D. / Dallas, TX

Michael H. Huo, M.D. / Dallas, TX

INTRODUCTION: Controversies remain with regard to cement vs uncemented fixation in total hip arthroplasty in the patients with FNFs. There is increasing evidence supporting cement fixation as safe and durable in FNFx in the geriatric patient population. There is less evidence with regard to which type fixation is more durable in THAs done for FNFs in the younger patients. The purpose of this study is to analyze the medical and the surgical complications in the younger patients (age <65 years) for THAs performed with or without cement for FNFs.

METHODS: All patients who underwent THAs for displaced FNFs from 2016-2021 in a United States administrative insurance claims database with least 90 days of postoperative follow up were identified. Two groups were selected: those cemented THAs were compared to those patients with uncemented THAs for femoral neck fractures. Data were extracted using ICD-10 diagnosis codes for demographic and comorbidities as well as the ninety-day incidence of medical, infectious, and implant-related complications. The five-year implant survival was assessed and compared based on need for revision of one or both components including liner exchange. Demographic factors and complications were compared using multivariate logistic regression. Kaplan-Meier analysis was used to compare 5-year implant survival. Significance was set at $p < 0.05$ for all analyses.

RESULTS: In total, 10,799 patients aged 18-64 with femoral neck fractures receiving uncemented THAs, and 4,185 patients undergoing cemented THAs for FNF. Based on the multivariate regression controlling for significant differences in comorbidities, patients with uncemented fixation had significantly lower odds of medical postoperative complications compared to the cemented cohort including urinary tract infection (Odds Ratio [OR]=0.80, 95% Confidence Interval [CI]: 1.70-0.92, $p=0.002$), pneumonia (OR=0.68, CI: 0.58-0.79, $p<0.001$), thromboembolic events (OR=0.61, CI: 0.47-0.79, $p<0.001$), cardiac complications (OR=0.68, CI: 0.53-0.88 $p=0.003$), acute kidney injury (OR=0.73, CI 0.63-0.89, and infection (both PJI and surgical site infection) (OR=0.78, CI: 0.68-0.89, $p<0.001$) within 90 days of surgery. However, the uncemented cohort had significantly higher odds of periprosthetic fracture (OR 1.96, CI: 1.59-2.43, $p<0.001$) and dislocation (OR=1.29, CI: 1.09-1.53, $P=0.003$). At five years, 86.8% of the uncemented cohort and 81.5% of the cemented cohort remained unrevised using the Kaplan Meier analysis (log rank, $p<0.001$).

CONCLUSION: Our findings suggest that the mechanical complications including periprosthetic fracture and dislocation are perioperative complications in younger patients undergoing uncemented THAs. However, uncemented fixation had significantly greater implant survival compared to cemented fixation at the 5-year interval.

Nutrition Supplementation Can Reduce the Risk of Complications and Loss of Muscle Mass After Trauma, But What Subgroups Benefit the Most?

Paper 154

John Davison, M.D. / Iowa City, IA

Co-Authors:

John Davison, M.D. / Iowa City, IA

Gretchen, Jones, B.S. / Iowa City, IA

Nathan Hendrickson, M.D. / Minneapolis, MN

Emiko Hasegawa, B.S. / Des Moines, IA

Natalie Glass, Ph.D. / Iowa City, IA

J. Lawrence Marsh, M.D. / Iowa City, IA

Michael Willey, M.D. / Iowa City, IA

OBJECTIVE: The objective of this study was to assess the influence of conditionally essential amino acid (CEAA) supplementation on body composition and complications after orthopedic trauma, based on injury type using data to perform a secondary analysis of a randomized controlled clinical trial.

METHODS: The previously published RCT used for this secondary analysis evaluated body composition changes and complication rates among patients receiving CEAA supplementation (Intervention) vs. Standard Diet (Control). Eligible subjects were adults indicated for operative fixation of acute long bone and pelvis fractures. Randomization was stratified by injury type (open fracture/polytrauma (OF/PT), fragility fracture (FFx), and isolated fractures (IFx)). Body composition (fat-free mass [FFM]) was measured at baseline, 2, 6, and 12 weeks postoperatively. Complications were prospectively collected up to 1 year. Body composition was determined using A-mode ultrasound. CEAA supplement was taken twice daily for 14 days postoperatively.

RESULTS: Enrollment took place from March 2018 - November 2019. 394/400 enrolled subjects were included in the final analysis (OF/PT n=161, FFx n=80, IFx n= 153). There were no differences in baseline demographics (age, sex, BMI, baseline FFM) between CEAA and Control patients within each stratification group.

Assessing FFM changes, regardless of randomization, demonstrated significant decreases at 6 weeks among OF/PT patients ($-1.08 \pm 0.39\text{kg}$, $p=0.006$), and at 12 weeks in the FFx patients ($-1.68 \pm 0.68\text{kg}$, $p=0.015$). FFM increased in IFx subjects at 12 weeks ($1.21 \pm 0.40\text{kg}$, $p=0.003$). Changes at all other time points for each group were non-significant ($p>0.05$). Comparatively, the OF/PT subjects lost significantly more FFM at 6 weeks compared to IFx subjects (diff= $1.11 \pm 0.55\text{kg}$, $p=0.04$). The 12-week FFM increase in the IFx group was also significant compared to both OF/PT (diff= 1.73 ± 0.56 , $p=0.002$) and FFx (diff= $2.89 \pm 0.80\text{kg}$, $p<0.001$).

Among only control subjects, FFM decreased in OF/PT subjects at 6 weeks ($-1.82 \pm 0.6\text{kg}$, $p=0.003$) and increased in IFx subjects at 12 weeks ($1.37 \pm 0.58\text{kg}$, $p=0.18$). The FFM decrease in the OF/PT group at 6 weeks was significant compared to the IFx group (diff= $1.89 \pm 0.83\text{kg}$, $p=0.023$). The 12-week FFM increase in IFx subjects was significant compared to changes in both the OF/PT (diff= $2.21 \pm 0.81\text{kg}$, $p=0.007$) and FFx (diff= $3.07 \pm 1.16\text{kg}$, $p=0.009$) groups.

Assessing body comp changes within each stratification group (CEAA vs. Control), in the OF/PT group, FFM decreased at 6 weeks among controls ($-1.81 \pm 0.66\text{kg}$, $p=0.007$) but not among CEAA subjects ($-0.52 \pm 0.58\text{kg}$, $p=0.37$). In the FFx Group, FFM decreased at 12 weeks among controls ($-1.69 \pm 0.81\text{kg}$, $p=0.040$) and CEAA subjects ($-1.6 \pm 0.78\text{kg}$, $p=0.043$). In the IFx group, FFM increased at 12 weeks among

both control (1.29 ± 0.53 kg, $p=0.02$) and CEAA (1.04 ± 0.51 kg, $p=0.042$) subjects. FFM changes between study arms were not significantly different at any timepoint during follow-up (all $p>0.05$).

Overall complication risks between groups, regardless of randomization, were compared using IFx subjects as the reference group. OF/PT subjects had significantly higher risk of surgical site infections (SSI) (RR=2.91 (95% CI: 1.49-5.67), $p=0.002$), unplanned re-operation (RR=3.02 (1.45-6.32) $p=0.003$), and total complications (RR=1.67 (1.19-2.33) $p=0.003$). FFx subjects had higher risk of medical complications (RR=2.35 (1.47-3.74) $p<0.001$), mortality (RR=4.88 (1.03-23.17) $p=0.046$), and total complications (RR=1.78 (1.24-2.55) $p=0.002$).

Among only control subjects, OF/PT subjects had greater risk of SSI (RR=2.21 (1.04-4.70) $p=0.039$) and re-operation (RR=3.30 (1.31-8.31) $p=0.011$) compared to the IFx group. FFx subjects had significantly higher risk of mortality (RR=9.32 (1.20-72.14) $p=0.033$).

Within stratification analysis, demonstrated lower risk of non-union among CEAA subjects vs. Controls in the OF/PT group (RR=0.42 (0.18-0.98) $p=0.044$). GFx CEAA subjects had lower risk of mortality (RR=0.86 (0.77-0.97) $p=0.027$). IFx CEAA subjects had lower risk of total complications (RR=0.45 (0.24-0.83) $p=0.010$).

DISCUSSION AND CONCLUSIONS: This secondary analysis found significant loss of muscle mass in young adults that sustained high-energy trauma (OF/PT) and in older adults with fragility fractures (FFx). This early loss of muscle mass was not seen in young adults with isolated injuries. Stratification analysis demonstrated a protective effect of supplementation against FFM loss among patients that sustained high-energy trauma (OF/PT) and older adults with fragility fracture (FFx). Subjects randomized to CEAA supplementation had lower rates of complications compared to controls across injury stratification groups. Overall, younger patients with high-energy trauma and older adults with fragility fractures may benefit most from supplementation.

Intraoperative Lactate: A Marker for Predicting Post-Surgical Complications in Orthopedic Trauma?

Paper 155

Sai Reddy, B.S. / Chicago, IL

Co-Authors:

INTRODUCTION: Serum lactate is widely used as a marker for tissue perfusion perioperatively. Elevated preoperative and postoperative serum lactates have been associated with poorer surgical outcomes. Prior non-orthopedic literature suggests that early-onset hyperlactatemia develops intraoperatively and may also have a relationship with postoperative complications; however, this has yet to be investigated thoroughly, especially in orthopedic care. Our study assesses the relationship between intraoperative lactate and postoperative complications.

METHODS: This prospective cohort study was performed at a single Level 1 trauma center. All adult orthopedic trauma patients presenting for surgical fracture management between 2023-2024 were approached for participation. Patients with pre-existing conditions that may influence baseline lactic acid levels were excluded. Based on the incidence of perioperative elevated lactate, 112 subjects were needed to detect a clinically meaningful difference with 90% power and $\alpha=0.05$. Patient demographics, injury information, Injury Severity Score (ISS), and surgical details were collected. Post-op complication rates (elevation of care, surgical site infection, revision surgeries, etc.) were also collected. Data was analyzed through Wilcoxon Rank-Sum tests and multivariate logistic regressions.

RESULTS: In total, 123 patients had data for review. Patients were primarily male (80.49%) and African American (46.34%) with femoral fractures (36.59%) due to motor vehicle accidents (37.40). ISS ranged from 4–57, with the median ISS 23. For patients with elevated intraoperative lactate ($n=52$), the median ISS [32, 18–57], fraction of femur injuries, and GSW-mediated trauma were elevated compared to patients with normal intraoperative lactate ($n=71$). The median intraoperative lactate was 2.2 mmol/L [0.6–10.1 mmol/L], which was significantly higher than the median preoperative levels [1.8 mmol/L, 0.6–5.9 mmol/L]. Complications were reported in 38.7% of patients, 27.7% during their hospital stay and 33.4% within 90 days following discharge. Patients with elevated preoperative lactate and ISS were 1.25x more likely to experience a complication. No correlation was found between intraoperative lactate and hospital-admission or 90-day post-op complications.

CONCLUSIONS: In this study, we confirmed that preoperative lactate and ISS scores are established predictors of all-cause complications following trauma. However, intraoperative lactate did not provide any predictive ability to elucidate complication risk. Additionally, the median intraoperative lactate, albeit elevated, did not exceed risk thresholds (>4 mmol/L) established in the literature that suggest systemic hypoperfusion. This likely reflects modern surgical precautions and control of serum lactate preoperatively to monitor patient resuscitation. Further controlled trials may help confirm this conclusion.

Effects of Gut Microbiome Diversity on Postoperative Complications in Polytrauma Patients

Paper 156

Brett D. Crist, M.D. / Columbia, MO

Co-Authors:

Mubinah I. Khaleel, D.O. / Columbia, MO

Aaron Conrad Ericsson, Ph.D.. / Columbia, MO

James P Stannard, M.D. / Columbia, MO

Mauricio Kfuri, M.D. / Columbia, MO

Gregory John Della Rocca, M.D., Ph.D.. / Columbia, MO

Brett D. Crist, M.D. / Columbia, MO

Kyle Schweser, M.D. / Columbia, MO

OBJECTIVE: Postoperative complications in trauma patients occur with relative frequency. It is not always clear why a patient develops complications. Risk factors, like smoking, are known to increase the risk of complications, however, not everyone who smokes develops a complication. Likewise, patients without any known risk factors also develop complications. An explanation may lie with the gut biome, which has been shown in other medical specialties to effect both mental/physical health and complications. While recent literature has demonstrated detrimental and beneficial links between the gut biome and certain orthopedic conditions, no literature examines its link to postoperative complications in trauma patients. This prospective observational study examines differences in the gut microbiome in orthopedic trauma patients who develop postoperative complications, compared to those who do not.

METHODS: Patients over 18 who presented as a trauma activation with orthopedic injuries were enrolled preoperatively. At the time of initial orthopedic surgical intervention, a fecal swab was collected, with a second sample obtained prior to discharge. A total of 25 patients were enrolled, 17 of which provided paired samples. Patients were monitored for complications including deep infection, wound healing delays, reoperations, and nonunions. Primary outcome was microbiome diversity based on 16S rRNA sequencing and presence of postoperative complications. Data were analyzed using PERMANOVA with Jaccard distances and serial t-tests. Statistical significance was set at $p < 0.05$.

RESULTS: 11/17 patients with paired samples developed complications postoperatively. Two-way PERMANOVA detected a significant difference in overall composition (beta-diversity) between individuals who developed complications vs. those that did not ($p=0.0004$). Several bacterial taxa were enriched in patients with or without complications including members of Lachnospiraceae and Peptostreptococcaceae, respectively, among others.

CONCLUSION: Trauma patients with a less diverse gut biome, and higher concentrations of certain bacterial taxa, are at higher risks of developing postoperative complications.

Evaluating Acute Complication Risk After Lower Extremity Fracture Fixation Using Stratified Lactate Levels

Paper 157

Robert J. Burkhart, M.D. / Cleveland, OH

Co-Authors:

Robert J. Burkhart, M.D. / Cleveland, OH

Andrew Moyal, MD / Cleveland, OH

Jeremy M. Adelstein, M.D. / Cleveland, OH

Ryan J. Furdock, M.D. / Cleveland, OH

Raymond W. Liu, M.D. / Cleveland, OH

Joshua K. Napora, M.D. / Cleveland, OH

INTRODUCTION: Early appropriate care (EAC) defined lactate <4.0 mmol/L as one indicator of adequate resuscitation prior to definitive fracture fixation, however this was determined by a study using a small population at a single institution. The purpose of this study was to 1) determine if the current lactate threshold holds true in a large database study, 2) determine if risk of acute post-surgical complications decrease further even as lactate levels are already below 4.0 mmol/L, and 3) provide more granular thresholds by evaluating risk based on stratified lactate levels.

METHODS: TriNetX, a global federated research network, was retrospectively queried to identify adult patients with lower extremity fractures presenting to the emergency department (ED). Polytrauma patients with other significant injuries were excluded. One-to-one propensity score matching for age, sex, race, and comorbidities was conducted to generate cohorts based on lactate levels of: <2 , 2-4, 4-6, and >6 mmol/L within 24 hours of surgery. Frequency and risk of acute post-surgical complications such as sepsis, systemic inflammatory response syndrome (SIRS), venous thromboembolism (VTE), cardiac complications, pulmonary complications, acute kidney failure, stroke, critical care and death. Cardiac complications include myocardial infarction, acute heart failure, arrhythmia and cardiac arrest. Pulmonary complications include atelectasis, pneumonia, acute respiratory failure and acute respiratory distress syndrome.

RESULTS: Across the cohorts, rates of all complications increased with an increased lactate level. Patients with a lactate <2 mmol/L had lower rates of sepsis, cardiac complications, pulmonary complications, acute kidney failure and critical care requirement when compared to a lactate value of 2-4 mmol/L (all $p < .05$). When compared to higher lactate levels of 4-6 mmol/L and >6 mmol/L, the <2 mmol/L group also had lower rates of VTE ($p = .02$) and death ($p < .01$). When comparing the Lactate 2-4 mmol/L cohort to the 4-6 and >6 groups, the results were similar. No significant difference was seen between the lactate 4-6 mmol/L and >6 mmol/L cohorts.

CONCLUSION: This study validates the 4mmol/L cutoff currently used in practice, and further supports stratified lactate levels as a potentially useful parameter to guide care with acute lower extremity fractures. Especially in patients that meet the 4 mmol/L cutoff but cannot immediately go to surgery, there may be some benefit for continued resuscitation.

Essential Amino Acid, Conditionally Essential Amino Acid, and Branched Chain Amino Acid Supplementation in Orthopedic Surgery: A Systematic Review of Randomized Clinical Trials

Paper 158

Samantha Mohler, M.D. / Little Rock, AR

Co-Authors:

Elizabeth Brown, M.D. / Little Rock, AR

Samantha Mohler, M.D. / Little Rock, AR

Shiloah Kviatkovsky, Ph.D., CISSN / Little Rock, AR

J. Ryan Hill, M.D. / Little Rock, AR

Jeffrey Stambough, M.D. / Little Rock, AR

Paul Inclan, M.D. / Little Rock, AR

OBJECTIVE: Essential amino acid (EAA) – including branched-chain amino acid (BCAA), and conditionally essential amino acid (CEAA) – supplementation has been suggested as a mechanism to optimize patient outcomes by counteracting atrophy associated with orthopedic procedures. This systematic review and meta-analysis aims to evaluate the impact of EAA supplementation on patients undergoing orthopedic surgery.

METHODS: Utilizing Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic review of previously published literature was conducted. Studies of interest were prospective, randomized controlled clinical trials evaluating the impact of EAA supplementation on patients undergoing orthopedic and spine surgical interventions.

RESULTS: Ten randomized, controlled clinical trials evaluating EAA supplementation in trauma, adult reconstruction, and spine surgery were identified – half of which focused on adult reconstruction. EAA supplementation dose (3.4 g to 20 g), frequency (one to three times per day), and duration (14 to 49 days) varied widely across studies. Three studies evaluated BCAA, one study evaluated CEAA, and 6 studies evaluated EAA. Seven studies reported parameters related to muscle size and/or composition. Of these, three reported statistically significant increase in size/composition of muscle in patients receiving perioperative EAA supplementation. Meta-analysis of studies evaluating the impact of EAA on muscle volume following total knee arthroplasty showed a significant benefit for EAA supplementation (Mean difference = 10.05, 95% CI = 3.33 – 16.79. Three studies reported significant improvements in standardized mobility tests in the EAA groups including timed up and go (TUG) test, 4–6-minute walk distance, and stair climb test. Meta-analysis of these study results was prohibited by variations across measurement variables.

CONCLUSIONS: Pooled Level 1 evidence supports the utilization of EAA supplementation to enhance patient outcomes across several orthopedic subspecialties. However, significant heterogeneity exists regarding the quantity, duration, and content of EAAs administered. Further prospective studies are needed to determine optimal/standardized parameters to control for these factors.

The Role of a Multidisciplinary Approach to Opioid Reduction for Patients with Operatively Treated Upper Extremity Fractures

Paper 159

Jack H. Drake / Madison, WI

Co-Authors:

Jack H. Drake / Madison, WI

Nathan Poli / Madison, WI

Grant Keith / Madison, WI

Gabrielle Kuhn, M.D. / Madison, WI

Samuel Mosiman / Madison, WI

Kristoffer T. Sladky, MPH / Madison, WI

INTRODUCTION: The opioid epidemic in our country is well documented, and orthopedic surgeons are among the highest prescribers of opioids. Guidelines recommend practice-based approaches to pain management, but significant variation in postoperative pain treatment protocols remain. The aim of this study was to determine whether a multidisciplinary program for opioid reduction in upper extremity fracture patients decreased inpatient opioid consumption during postoperative days (POD) 1-4 as well as outpatient opioid prescription volume.

METHODS: A retrospective comparative study was performed on patients with isolated upper extremity fractures admitted to the inpatient orthopedic unit at an academic level-1 trauma center in 2018 and 2020 (pre- and post-program implementation). We calculated total inpatient opioid consumption during POD 1-4 and within 90-days post-discharge (measured in morphine milligram equivalents [MMEs]). Patients that had multiple concurrent fractures, pre-existing neuropathic pain syndrome diagnoses requiring opioids, or less than 90-day follow-up were excluded. Descriptive statistics in the form of frequencies (%) as well as means (SD) were gathered. Linear mixed modeling with repeated measures was completed, and a p-value less than 0.05 was considered statistically significant.

RESULTS: 128 patients (76 in 2018, 52 in 2020) with an operative upper extremity fracture were identified. No differences in patient demographics existed between groups. Peripheral nerve block use was similar between groups ($p=0.570$). Gabapentin was used significantly more in 2020 (34%) vs. 2018 (18.3%, $p=0.050$). Inpatient opioid consumption significantly decreased from 2018 to 2020 ($p=0.003$), most notably on POD 1 and 2, with age and ASA class being significant predictors of opioid use ($p=0.0012$ and $p=0.0315$, respectively). Mean MMEs on POD 1 in 2018 were 68.21 vs. 50.32 in 2020, whereas mean MMEs on POD 2 in 2018 were 46.76 vs. 12.15 in 2020. 46.05% of patients in 2018 were taking opioids on POD 2 vs. 26.92% in 2020 ($p=0.029$). There were no significant differences in pain scores on POD 1-4 ($p\geq 0.4875$). 90-day post-discharge opioid prescriptions decreased in 2020, but this decline was not significant. Primary diagnosis and concomitant gabapentin use were significant predictors of outpatient opioid use ($p=0.001$ and $p=0.013$, respectively).

CONCLUSION: A multidisciplinary approach is an effective strategy in reducing inpatient opioid consumption in operative upper extremity fracture patients, especially on POD 1 and 2. Gabapentin was prescribed

Femoral Head Fractures: Can We Change Outcomes?

Paper 160

Brett D. Crist, M.D. / Columbia, MO

Co-Authors:

Samuel C. Marshall / OK City, OK

Caleb Bischoff / Columbia, MO

Emily Leary / Columbia, MO

Brett D. Crist, M.D., FACS / Columbia, MO

North American Femoral Head Fracture Consortium /

OBJECTIVE: Femoral head fractures are rare, and usually complex. High complication rates and poor outcomes make it difficult for surgeons to agree on the best course of treatment. The goal of this study is to compare treatment methods on the rates of complications and outcomes.

METHODS: A multi-center retrospective cohort study was performed that included 30 ACS Level 1 Academic Trauma Centers utilizing patient data from 2005 to 2023. This timeframe was chosen to include the increased use of surgical hip dislocation in the management of femoral head fractures. Patients were excluded if follow-up was less than 6 months. Data points evaluated include age, BMI, race, sex, mechanism of injury, history of dislocation, direction of dislocation, side of injury, Pipkin classification type, associated injuries and related procedures, medical comorbidities, treatment method, surgical approach (if surgery was done), complications, final follow-up time, and patient reported outcomes.

RESULTS: 1691 patients were included. Average age was 38.8 years old and average BMI was 27.88. 29 institutions included information on gender--1071 (63.34%) male, 479 (28.67%) female, and 9 patients other. Mechanism of injury included--motor vehicle crash 1287 (76.1%), 9 (.50%) falls, 18 (1.06%) work-related accidents, and 297 (17.56%) were due to other causes. Most fractures were Pipkin IV (1101, 66.3%), Pipkin I (217, 13.1%) and Pipkin II (256, 15.4%). Major complications occurred in 364 (21.5%) and included osteoarthritis 171 (10.11%), HO 100 (5.91%), and AVN 93 (5.50%). This data was only recently available, and one more center is still working on getting data submitted. We are currently working on the association of outcomes with treatment type, and surgical approach. Statistical analysis of this data is currently being done and will be completed by the OTA deadline.

CONCLUSIONS: This is the largest study to date evaluating the treatment of femoral head fractures. Analysis is ongoing and will elucidate the factors that affect outcome, including comparing surgical hip dislocation vs. anterior-based surgical approaches in the management of these fractures. Previous meta-analyses show complication rates around 35%. Our preliminary results show lower complication rates 21.5%.

Postoperative Periprosthetic Humerus Fractures After Shoulder Arthroplasty: What Are the Outcomes After Nonoperative Treatment?

Paper 161

Kristin E. Yu, M.D. / Rochester, MN

Co-Authors:

Kristin E. Yu, M.D. / Rochester, MN

Christopher M. Hart, M.D. / Rochester, MN

Ankur Khanna, B.S. / Rochester, MN

Tristan B. Weir, M.D. / Rochester, MN

Jonathan D. Barlow, M.D. / Rochester, MN

Mark E. Morrey, M.D. / Rochester, MN

John W. Sperling, M.D. / Rochester, MN

Joaquin Sanchez-Sotelo, M.D. / Rochester, MN

Jennifer Tangtiphaiboon, M.D. / Rochester, MN

INTRODUCTION: Postoperative periprosthetic humerus fractures are a challenging complication. Traditional treatment algorithms are based on implant stability and fracture classification; however, little is known about outcomes or factors influencing the risk of nonunion following nonoperative treatment. The aim of this study was to report outcomes of nonoperative management of postoperative periprosthetic humerus fractures complicating hemiarthroplasty, anatomic (TSA), or reverse shoulder arthroplasty (rTSA) and to determine whether there are factors predictive of nonunion.

METHODS: A retrospective review was conducted of patients treated nonoperatively for periprosthetic humerus fracture between January 2013 and December 2021. There were thirty-four patients with an average age of 70 ± 10 years, an average BMI of 30 ± 7 kg/m², and female predominance (77%, n=26). Fractures complicated hemiarthroplasty in four (12%), anatomic TSA in 9 (27%), and rTSA in 12 patients (35%). The remaining 9 patients (27%) fractured after revision rTSA. Fractures were classified as IIA in 12, IIB in 9, IIC in 8, and C in 5 shoulders. Univariate and multivariate analysis were used to determine risk factors for nonunion considering demographics, comorbidities, type of arthroplasty, and fracture type.

RESULTS: Nonoperative treatment led to union in 22 shoulders. The remaining twelve fractures (35%) developed a nonunion; internal fixation with or without component revision resulted in union in all 12 nonunions, although 3 fractures required surgery twice before union was achieved. In the group of 12 nonunions 3 required unplanned additional surgery for dislocation (n=1), humeral loosening (n=1), and periprosthetic infection (n=1). One patient developed a radial nerve palsy prior to open reduction and internal fixation. No patients in the union cohort developed a nerve palsy or required reoperation for any reason. In this cohort, no associations could be established between nonunion and age (p=0.58), sex (p=1.00), BMI (p=0.97), osteoporosis (p=0.72), diabetes (p=0.69), tobacco use (p=1.00), arthroplasty type (p=0.46), or fracture type (p=0.96). Multivariable analysis with stepwise regression similarly did not find any significant associations.

CONCLUSIONS: Nonoperative management of postoperative periprosthetic humerus fractures resulted in a 35% nonunion rate. In patients requiring surgery to achieve union after failed nonoperative management, 50% underwent additional surgery for persistent nonunion or other reasons. With the numbers available, we failed to identify predictive risk factors for nonunion.

Analysis of Albumin Levels as a Continuous Variable on Postoperative Outcomes Following Total Joint Arthroplasty

Paper 162

Harmanjeet Singh B.A / Canton, MI

Co-Authors:

Siddhartha Dandamudi B.B.A. / Chicago, IL

Enrico Forlenza M.D. / Chicago, IL

Harmanjeet Singh B.S. / Chicago, IL

Jonathan H Shaw M.D. / Chicago, IL

Brett R Levine, M.D., M.S. / Chicago, IL

BACKGROUND: Suboptimal nutritional status has been linked to poor outcomes within orthopedics. Low serum albumin levels have been associated with complications following total joint arthroplasty (TJA) procedures. This study aims to determine a cut-off value to predict postoperative complications following primary total hip (THA) and knee (TKA) arthroplasty.

METHODS: Patients undergoing primary TJAs by multiple surgeons between 2016-2023 at a single, academic medical center were reviewed. All revision surgeries or TJA for malignancy or fracture were excluded. Area Under the Curve analysis and multivariate regression modeling was performed to determine the sensitivity and specificity of various albumin levels at predicting any complication, revision surgery and readmission.

RESULTS: 1,908 patients were included, of which 1,087 (56.9%) underwent TKA and 821 (43.1%) THA. The mean overall preoperative albumin level was 4.03 ± 0.38 g/dL. The overall complication, readmission and revision rate was 6.7%, 3.1% and 2.3%, respectively. Albumin level < 3.8 g/dL was associated with an increased risk of complications following TJA (OR 1.56 [1.08-2.25]; $p=0.018$). Albumin level < 3.5 g/dL was found to be 91.9% specific for any complication following THA, whereas an albumin level < 3.6 g/dL was found to be 85.7% and 85.8% specific for readmission and revision surgery following TKA.

CONCLUSION: Albumin levels < 3.8 g/dL acts as a cutoff for overall complications in TJA, with lower albumin of < 3.5 g/dL and < 3.6 g/dL being highly specific for complications in THA and readmission and revision surgery following TKA respectively. Greater numbers may elucidate values that require further optimization prior to TJA.

Do Patients with Pre-Existing Psychiatric Diagnoses Experience Increased Rates of Postoperative Complications Following Pelvic Fracture Surgery?

Paper 163

David May, M.S.E. / Knoxville, TN

Co-Authors:

Amber Park, B.S. / Knoxville, TN

Phillip C. McKegg, M.S. / Baltimore MD

David May, M.S.E. / New Orleans, LA

William Brigode, M.D. / Chicago, IL

Joel Williams, M.D. / Chicago, IL

OBJECTIVE: Patients with pre-existing psychiatric diagnoses have been reported to have suboptimal postoperative outcomes in various surgical fields, however, few such studies exist in the orthopedic surgery literature. The goal of this study was to examine the affect a preoperative psychiatric diagnosis had on short-term postoperative outcomes in patients undergoing surgical fixation of a pelvic fracture.

METHODS: The American College of Surgeons – Trauma Quality Improvement Program (TQIP) was queried using ICD10 procedure codes to identify patients undergoing operative fixation of a pelvic fracture from 2017-2021. The patient cohort was stratified into two groups, those with a pre-existing psychiatric diagnosis versus those without a pre-existing psychiatric diagnosis. Psychiatric diagnoses included in the TQIP variable were schizophrenia, bipolar disorder, major depressive disorder, social anxiety disorder, posttraumatic stress disorder, and antisocial personality disorder. Our primary outcome measure was pooled infection rate. Secondary outcome measures included infections that comprised the pooled infection variable, as well as other postoperative sequela captured in the TQIP database. Outcome measures between the two cohorts were compared using chi-square and Fisher's exact test.

RESULTS: A total of 107,748 patients undergoing pelvic fixation were identified, as well as 11,306 with a mental health/personality disorder at time of admission. Patients with pre-existing psychiatric diagnoses were more likely to also have comorbid conditions than those without a pre-existing psychiatric diagnosis. Furthermore, these patients were more likely to have a positive drug screen on admission compared to those without a pre-existing psychiatric diagnosis. In terms of overall infection, individuals with a pre-existing psychiatric diagnosis were more likely to experience infection overall, as well as dSSI, sSSI, organ space infection and osteomyelitis, compared to those without a psychiatric history ($p < 0.05$).

CONCLUSIONS: Patients with pre-existing psychiatric diagnoses represent a unique and significant portion of patients undergoing pelvic fracture surgery. These patients are more likely to suffer from substance misuse and comorbid conditions at time of admission, thus requiring increased attention and optimization both before and following surgery to help mitigate risk of postoperative complications.

Dexamethasone Decreases Opioid Consumption Up to Three Months After Rotator Cuff Repair

Paper 164

Johnny Kasto, M.D. / Detroit, MI

Co-Authors:

Johnny Kasto, M.D. / Detroit, MI

Trevor Wolterink, B.S. / Detroit, MI

Joshua P. Castle, M.D. / Detroit, MI

Michael A. Gaudiani, M.D. / Detroit, MI

Alexander Jurayj, B.A. / Detroit, MI

Christian Freitag, B.S. / Detroit, MI

Nathan Li, B.S. / Detroit, MI

Julio Nerys-Figueroa, B.S. / Detroit, MI

Jared Mahylis, M.D. / Detroit, MI

Stephanie J. Muh, M.D. / Detroit, MI

INTRODUCTION: This study aims to evaluate the analgesic impact of perioperative administration of dexamethasone on postoperative pain and opioid consumption in patients who underwent arthroscopic rotator cuff repair (RCR). Our hypothesis is that perioperative administration of dexamethasone will lead to better pain control and reduced opioid consumption post-rotator cuff repair.

METHODS: A retrospective review was conducted of patients undergoing primary arthroscopic RCR with MRI or ultrasound confirmed supraspinatus or infraspinatus tears from 2013-2023. Exclusion criteria included the following: ≤ 18 years old, subscapularis or unclassified RCR, history of ipsilateral shoulder surgery, kidney or liver failure, history of alcohol/drug abuse, and < 3 months of postoperative follow-up. The primary outcomes of interest were visual analog scale (VAS) pain scores, and the secondary outcome was opioid consumption as measured by morphine milligram equivalents (MME) up to 3 months postoperatively. Statistical analysis was performed to compare outcomes of patients who received 10 mg of perioperative dexamethasone (dexamethasone group) to those who did not (control group). Outcomes were stratified by tear size: partial, small/medium, and large/massive tears.

RESULTS: A total of 633 patients were included, with 311 patients in the dexamethasone group and 322 in the control group. Average age (61.2 ± 8.5 vs. 63.0 ± 9.6 ; $P=0.005$) and rate of diabetes mellitus (18.3% vs. 29.8% ; $P<0.001$) were significantly lower in the dexamethasone group. There were no significant differences in VAS scores between groups for any tear size out to 3 months. In general, opioid consumption was significantly lower in the dexamethasone group at 1 week (523.3 ± 372.5 , 584.1 ± 331.4 , $p<0.001$) and 3 months (224.9 ± 843.7 , 262.3 ± 659.8 , $p=0.006$) postoperatively. When stratified by tear size, patients in the dexamethasone group experienced significantly lower opioid consumption at 1 week (491 ± 532 vs. 535 ± 285 ; $P<0.001$) for partial tears; at 1 week (523 ± 372 vs. 584 ± 331 ; $P<0.001$), 6 weeks (274 ± 536 vs. 490 ± 848 ; $P<0.001$), and 3 months (120 ± 369 vs. 294 ± 774 ; $P<0.001$) for small/medium tears; and at 1 week (521 ± 360 vs. 623 ± 318 ; $P<0.001$) and 3 months (174 ± 838 vs. 270 ± 608 ; $P=0.021$) for large/massive tears. Retear rates were equivalent between the dexamethasone and control groups, respectively (12 , 3.9% vs. 5 , 1.6% , $p=0.438$). There were no other significant differences in complications between groups for any tear size.

CONCLUSION: Perioperative IV dexamethasone use in patients undergoing primary arthroscopic RCR is associated with decreased opioid consumption with equivalent pain control up to 3 months postoperatively.

Factors Impacting Hospital Charges of Rotator Cuff Repair

Paper 165

Aaron Singh / San Antonio, TX

Co-Authors:

Aaron Singh / San Antonio, TX

Travis Kotzur / San Antonio, TX

Blaire Peterson / San Antonio, TX

Jordan Carter, M.D. / San Antonio, TX

Ralph Zachary Garza, M.D. / San Antonio, TX

Christina Brady, M.D. / San Antonio, TX

INTRODUCTION: Before the Health Care PRICE Transparency Act was passed in 2021, hospital charges were mostly inaccessible, making it difficult to identify characteristics outside of the actual cost of care that impacted pricing. Due to pricing previously not being readily available, there is a lack of literature on the topic. This study aims to identify specific hospital characteristics that impact charges to individual and commercial payers for rotator cuff repair.

METHODS: This retrospective study analyzes the cost of rotator cuff repair, queried by Current Procedural Terminology (CPT) code from Turquoise Health, a database of hospital pricing and cost information. We assessed a number of factors, including hospital size, teaching or non-teaching, ownership, quality and performance metrics, and geographic setting, via fixed- and mixed-effect gamma regression analysis to determine the impact on list prices, cash prices, and charges to commercial payers. Charges were normalized to the geographic wage index to account for base regional cost variation.

RESULTS: The list price for rotator cuff repair ranged from \$2,447.45 at the 10th percentile to \$41,177.27 at the 90th percentile. For individual payers, the cash price ranged from \$1,495.04 at the 10th percentile to \$21,105.00 at the 90th percentile. For commercial payers, the range of hospital charges was from \$2,090.87 at the 10th percentile to \$19,530.41 at the 90th percentile. In comparison to the Northeast, hospitals in the Midwest charged commercial payers more for rotator cuff repair (Percent increase (PI) 1.41, $p < 0.001$), as did those in the South (PI 1.44, $p < 0.001$). Hospitals in urban areas charged more than those in rural areas; those with 3-5 hospitals in a 25 mile range charged 19% more ($p = 0.036$) than those with no other hospitals in a 25 mile range, while those with 6+ hospitals in a 25 mile range charged 22% more ($p = 0.011$). List price of rotator cuff repair by hospitals with a mortality above the national average (PI 0.76; $p = 0.005$) was lower than those with a mortality at the national average; however, charges to commercial payers were not significantly different.

CONCLUSION: This study identified multiple factors beyond the actual cost of care that significantly impact hospital charges for rotator cuff repair. These results imply the need for further investigation with future studies into why these discrepancies exist. This is one of the first studies to identify specific hospital characteristics that impact list prices, cash prices, and charges to commercial payers for rotator cuff repair.

Evaluating the Impact of Virtual Reality Training on Orthopedic Surgery Skills: A Focus on Femoral Neck Fracture Fixation

Paper 166

Joel W. Mayo, M.S. / Chicago, IL

Co-Authors:

Brett Segobiano, B.S. / Chicago, IL

Julia Nascimben, B.S. / Chicago, IL

Joel W. Mayo, M.S. / Chicago, IL

Brett Drake, B.S. / Chicago, IL

Apurva Choubey, M.D. / Chicago, IL

Nirav K. Mungalpara, M.D. / Chicago, IL

Joseph Karam, M.D. / Chicago, IL

Mark H. Gonzalez, M.D., Ph.D. / Chicago, ILinois

INTRODUCTION: Orthopaedic surgery residency demands ongoing learning and skill development. Traditionally, residents enhance their skills through technique guides, videos, and supervised practice. However, these methods often lack detailed instruction. New technologies like virtual reality (VR) aim to bridge these gaps, yet many residents still feel unprepared. This study examines how VR training can improve trainees' performance and retention in femoral neck fracture fixation.

METHODS: First- and second-year medical students with no prior experience in femoral neck fracture fixation were randomly assigned to either a technique guide group (n=18) or a VR group (n=17). The technique guide group used a commercially available guide for three one-hour sessions. The VR group used a commercially available VR headset with a procedural simulation for 3-4 one-hour sessions spaced 2-3 days apart. Post-training, all participants attempted the procedure on a SawBones model. Completion was determined by correctly performing all procedural steps. A blinded orthopedic surgeon assessed their performance using the Objective Structured Assessments of Technical Skills (OSATS). Student t-tests compared mean OSATS scores, incorrect steps, and procedural time between the groups.

RESULTS: A total of 14 participants in the VR group and 6 in the technique guide group were included in the final analysis. Participants in the technique guide group had significantly higher mean Time and Motion ($p<0.001$) and Total OSATS scores ($p=0.033$) compared to those in the VR group. No significant differences were found among the other OSATS subcategories. Similarly, no significant differences were observed between the two groups in the percentage of correct steps performed, the number of normalized incorrect steps or hints, or procedural completion time. However, participants in the VR group had a higher percentage of correct steps and a lower number of normalized incorrect steps compared to those in the technique guide group.

CONCLUSION: Technique guide training resulted in significantly better OSATS scores than VR training for femoral neck fracture fixation. Nevertheless, VR training reduced procedural errors compared to the technique guide. These preliminary findings suggest that VR can provide comparable outcomes to traditional methods and may enhance procedural retention and familiarity. Further research with larger sample sizes and different orthopedic procedures is necessary to validate VR training's effectiveness and its utility at various educational levels in residency training.

Preparing for a Subspecialty Sub-Internship: A Lecture Series Preparing Medical Students for Rotations in Orthopedic Subspecialties

Paper 167

Jose Markland-Sanchez, B.S. / Chicago, IL

Co-Authors:

Tanios Dagher, B.S.E / Chicago, IL

Jose Markland-Sanchez, B.S. / Chicago, IL

Tessa Balach, M.D. / Chicago, IL

OBJECTIVE: Orthopaedic surgery applicants complete multiple high-stakes sub-internship rotations to be competitive applicants for the Orthopaedic Match. These rotations often involve a steep learning curve as students navigate multiple resources—many of which are financially inaccessible—without guidance. Our aims were to 1) develop a free lecture series designed to act as a starting point for students preparing for orthopedic subspecialty rotations and 2) evaluate the ability of the resource to increase student-reported confidence in preparing for a subspecialty rotation.

METHODS: The Preparing for Subspecialty Sub-Internship lecture series consists of nine, 20–45-minute free lectures (one for each subspecialty) covering relevant anatomy, common conditions, physical exam maneuvers, and resources for further education. Anonymous pre- and post-lecture surveys collected participant demographics and solicited student confidence in preparing for subspecialty sub-internships before and after the lecture (1=very unconfident to 5=very confident), usefulness of the content (1=very unuseful, 5=very useful), and likelihood of recommending to other medical students (1=very unlikely to 5=very likely). Free-text response questions solicited the most valuable components of the lecture and areas for improvement. Comparative analysis was conducted using Wilcoxon signed-rank testing. Free-text responses were reviewed to identify emerging themes.

RESULTS: As of June 3, 2024, 331 students registered to access the lecture series. 41% (n=136/331) were MS4s and 11% (n=35/331) were research fellows. Participant demographics demonstrated a more diverse cohort than that of the orthopedic applicant pool. The trauma lecture was the most accessed, with 72 student participants. Combining the data from all lectures, there were 57 completed pre- and post-lecture surveys. There was a significant increase in student-rated confidence in preparing for a subspecialty sub-internship across the lectures, increasing from an average of 3.3/5 (SD=1.1) before to 4.0/5 (SD=0.9) after the lecture ($p < 0.001$). 81% of participants found the lecture useful, and 84% would recommend it to other medical students. Students most often cited discussion of the subspecialty's most common conditions (n=10) and practice questions (n=10) as the most useful components of the lectures. Areas for improvement included expanding the amount of information covered (n=14) and providing more practice questions (n=4).

CONCLUSIONS: The Preparing for a Subspecialty Sub-Internship resource has increased student-reported confidence in preparing for subspecialty rotations. Given expenses associated with current resources, this series has the potential to increase access to high-quality preparation for all students pursuing orthopedics.

Association Between Medical School Ranking and 2020-2022 Orthopedic Surgery Residency Match Outcomes

Paper 168

Justin Perry / Jacksonville, FL

Co-Authors:

Justin Perry / Providence, RI

Virginia Y. Xie / Los Angeles, CA

Richard Glebocki / Providence, RI

Ron A. Navarro, M.D., FAAOS / Los Angeles, CA

Lisa K. Cannada, M.D. / Jacksonville, FL

BACKGROUND: This study aimed to analyze match outcomes based on medical school rank, medical school characteristics (HBCU, orphan, public, private, allopathic, or osteopathic), resident biological sex, medical school and residency program location for 2020-22.

METHODS: Residents who matched from 2020-2022 into ACGME-accredited programs were identified via rosters on program websites. Medical school US News and World Report (USNWR) rankings and Doximity residency rankings were obtained and divided into tiers. Resident sex, match year, program and school locations, and HBCU, public, private, allopathic, and osteopathic medical school status were found on websites and social media associated with residency programs and individual residents. Frequency data analysis, chi square testing, and multivariate ordinal logistic regression were performed.

RESULTS: 2,529 residents in 191 programs met the inclusion criteria. The percentage of residents accepted from higher-ranked medical schools increased from Tier 4 through Tier 1 programs, and that of residents from lower-tier medical schools increased from Tier 1 through Tier 4 programs. 90% of residents in Tier 1, Tier 2, and Tier 3 programs earned an MD. 62.7% of residents in Tier 4 programs earned a DO. Less than 20% of residents in Tier 1, Tier 2, and Tier 3 programs attended orphan medical schools, but over 60% of residents in Tier 4 programs attended an orphan medical school.

Female sex (AOR = 1.59, 95% CI: 1.32-1.92, $p < 0.001$), private medical school status (AOR=1.37, 95% CI: 1.15, 1.62, $p < 0.001$), and MD school status (AOR=26.6, 95% CI: 18.4-38.7, $p < 0.001$) had greater odds of matching into a higher-tier program. Residents who attended medical school in the same city as the program at which they matched also had higher higher-tier match odds compared to residents who attended medical school in a different region (AOR=1.46, 95% CI: 1.07-1.99, $p = 0.017$).

CONCLUSIONS: Female sex, medical school rank, attending an MD or private medical school, and attending a medical school in the same city as a particular residency program play a significant role in matching into a higher-ranked orthopedic surgery residency program. This information will serve to advise premedical and medical school students as they gauge their competitiveness prior to the match and aid residency programs as they develop strategies for recruitment. However, other key factors, including USMLE scores, medical school grades, and letters of evaluation were not considered and may be useful to analyze in future investigations.

Impact of Transitioning to a Level I Trauma Center on Orthopedic Surgical Volume and Resident Education: A Retrospective Analysis

Paper 169

Darlington C. Nwaudu, M.D. / Chicago, IL

Co-Authors:

Darlington C. Nwaudu, M.D. / Chicago, IL

Solomon Egbe, B.A. / Chicago, IL

Audrey Litvak, B.A. / Chicago, IL

Jason A. Strelzow, M.D. / Chicago, IL

INTRODUCTION: Orthopaedic residents must complete a minimum of 1000 surgical cases during their 5-year residency, encompassing specific procedural categories as mandated by the Accreditation Council for Graduate Medical Education (ACGME). In 2018, our institution transitioned from an adult Level III to a Level I trauma center (L1TC). This study examines the impact of transitioning a major academic medical center to an L1TC on orthopedic surgical volume, complexity, and residents' educational experience.

METHODS: We retrospectively reviewed resident reported ACGME case logs and electronic medical records (EMR) for orthopedic surgeries performed at a single urban institution from July 1, 2013, to June 30, 2023. Data were divided into pre-L1TC (2013-2018) and post-L1TC (2018-2023) periods. We evaluated this experience using two metrics: ACGME Trauma logs (reported by residents) and Trauma cases as reported by the institutional EMR. Trauma logs were identified based on ACGME criteria involving CPT codes within the “fracture and/or dislocation” and “manipulation” categories. Trauma cases were identified based on strict surgical criteria including; procedures performed by fellowship-trained trauma surgeons, occurring on weekends or holidays, or being designated as emergent, urgent, or semi-urgent. All other surgical cases were considered elective. Statistical analyses were conducted using parametric linear regressions to evaluate trends in case volumes.

RESULTS: The total number of ACGME cases logged yearly fluctuated from 6172 in 2015 to 10,541 in 2018, with no significant trend over the study period ($p=0.17$). Post-L1TC ACGME trauma logs increased significantly ($p=4.25 \times 10^{-4}$), averaging 2586 (31.1% of all logs) compared to 1467 (21.6% of all logs) pre-L1TC. Trauma case volume (EMR data) experienced an 11.6-fold increase post-L1TC ($p=1.375 \times 10^{-5}$). Elective surgical cases remained largely stable across the 10-year study period ($p=0.48$). Notably, when exclusively examining the trend in pre-pandemic academic years (2014-2019), we observed a significant increase in elective case volume ($p=0.0035$). Utilizing this regression to predict expected elective cases in “normal” academic years, we observed an average of 30% decline in elective cases in post-pandemic academic years (2020-2022).

DISCUSSION AND CONCLUSION: Transitioning to an L1TC significantly increased resident reported ACGME trauma logs and institutional orthopedic trauma cases. Total ACGME cases logged did not significantly change, likely due to shifts in logging behavior and the predominance of trauma cases meeting procedural requirements. The COVID-19 pandemic impacted elective surgical volumes but not trauma cases, underscoring the critical role of L1TC access in maintaining surgical education and experience during disruptions. Future research should explore how L1TC training influences early career competence, knowledge and skill development, and proficiency in orthopedic surgeons. Our findings highlight the importance of trauma center access in shaping resident training and the need for ongoing investigations to optimize surgical education.

Knot-Tying Proficiency Among Surgical Trainees Improved with Utilization of Video Education and Fundamentals of Arthroscopic Surgical Training (FAST) Workstation

Paper 170

Andrew Gaetano, B.S. / Maywood, IL

Co-Authors:

Hassan Farooq, M.D. / Maywood, IL

Krishin Shivdasani, M.D., M.P.H. / Maywood, IL

Joshua Anderson, B.S. / Maywood, IL

Andrew Gaetano, B.S. / Maywood, IL

Andrew Chen, M.D. / Maywood, IL

Dane Salazar, M.D., M.B.A. / Maywood, IL

Nickolas Garbis, M.D. / Maywood, IL

OBJECTIVE: Proficiency in knot-tying is pivotal for surgical success, yet its assessment has traditionally relied on subjective evaluation. Innovative training tools like the Fundamentals of Arthroscopic Surgical Training (FAST) workstation now enable objective measurement of knot-tying proficiency. We leveraged the FAST workstation to evaluate surgical residents' knot-tying abilities and assessed the impact of guided education on their knot strength.

METHODS: Participants in this study were surgical residents of various post-graduate years (PGY). In a surgical simulation laboratory, surgical residents were instructed to perform knot-tying alone in the pre-education phase. Next, participants watched a short instructional video in which a fellowship-trained orthopedic surgeon demonstrated proper knot-tying technique. After watching the video, the residents were instructed to perform knot-tying in the post-educational phase. The FAST workstation quantified the mechanical resilience of each knot, measured as suture loop elongation. Data analysis employed chi-squared tests, and Fisher's exact test was utilized when expected frequencies were below 5 in more than 20% of cells.

RESULTS: Forty-one surgical residents participated in this study from various PGYs. There was a significant increase in knot-tying success after the instructional video for PGY-1, PGY-2, and PGY-3 residents, but no significant difference for PGY-4 and PGY-5 residents. Among participants using the one-handed technique, there was a significant improvement in knot-tying success post-video, but no significant change for those using the two-handed technique. Furthermore, 20.83% of participants tied knots with 3 throws or less and 79.17% used 4 throws or more; both groups showed a significant improvement in knot-tying success after video instruction.

CONCLUSIONS: Early instructional intervention on proper knot-tying technique significantly enhances the mechanical resilience of surgical knots among residents. Integrating objective knot-tying measurement systems such as the FAST workstation alongside direct instructional intervention should be considered by surgical residency training programs to improve trainees' knot-tying proficiency.

Can Flexed Elbow Valgus External Rotation (FEVER) View MRI Eliminate the Need for an MR Arthrogram or Dynamic Stress Ultrasound in Athletes with Ulnar Collateral Ligament Injuries of the Elbow? A Prospective Study of Professional and Varsity Athletes

Paper 171

H. Parker Stride, M.D. / Chicago, IL

Co-Authors:

H. Parker Stride, M.D. / Chicago, IL

Vehniah Tjong, M.D. / Chicago, IL

Mark Plantz, M.D. / Chicago, IL

Stephen M. Gryzlo, M.D. / Chicago, IL

OBJECTIVE: The purpose of this study was to evaluate UCL injured patients using both dynamic valgus stress ultrasound and the FEVER MRI to assess its reliability in confirming the diagnosis of an incompetent UCL requiring surgery.

METHODS: Professional and varsity athletes who met inclusion criteria of the following were included in the study: >16 years of age, acute presentation with signs of UCL injury, participation in an overhead throwing sport. Exclusion criteria included prior ipsilateral UCL surgery, other concomitant elbow injuries, and patients who could not undergo MRI. Both a valgus stress US performed by one blinded MSK radiologist and a FEVER MRI were conducted on all patients according to protocol. A positive stress ultrasound was defined as >2mm widening of the ulnohumeral joint with valgus stress of the elbow compared to neutral, while a positive FEVER MRI was defined as >1mm widening on stress sequence compared to the neutral sequence. Using positive stress ultrasound as a marker for true injury, sensitivity and specificity were calculated based on the results from the MRI to determine the ability of the FEVER MRI to detect a UCL tear.

RESULTS: Of the 18 patients who met inclusion criteria, 16 were male (89%), the average age at presentation was 20.7 years (range 16-28), and 13 were right-handed (72%). Of the 18 patients, seven had a UCL injury as defined by a dynamic stress ultrasound with greater than 2mm of ulnohumeral gapping. All seven patients with a positive ultrasound also had greater than 1mm ulnohumeral gapping on FEVER MRI. Furthermore, all 11 patients who had a negative stress ultrasound also had a negative FEVER MRI (Sn 1.0, Sp 1.0). Four patients with a positive test underwent surgery, while the other three patients all had surgery recommended to them but elected not to undergo the procedure.

CONCLUSION: A correct diagnosis of an ulnar collateral ligament injury is critically important when deciding to perform a ligament reconstruction in high level athletes. All patients in this study with a positive UCL stress ultrasound (>2mm ulnohumeral gapping) also had a positive FEVER MRI (>1mm ulnohumeral gapping). Additionally, there were no patients with a positive FEVER MRI and a negative UCL stress ultrasound. Therefore, the FEVER MRI may be both sensitive and specific for detecting UCL injuries and guiding surgical decision making while obviating the need for joint contrast fluid.

Complete Elbow Ankylosis Secondary to Heterotopic Ossification: Operative Management Leads to Fair to Excellent Long-Term Outcomes

Paper 172

Andrew Gaetano, B.S. / Maywood, IL

Co-Authors:

Krishin Shivdasani, M.D., M.P.H. / Maywood, IL

Michael Scheidt, M.D. / Maywood, IL

Stanley Liu, M.A. / Maywood, IL

Amir Boubekri, M.D. / Maywood, IL

Andrew Chen, M.D. / Maywood, IL

Nickolas Garbis, M.D. / Maywood, IL

Dane Salazar, M.D., M.B.A. / Maywood, IL

OBJECTIVE: Heterotopic ossification (HO) in the elbow, often caused by trauma or neurogenic factors, can lead to limited range of motion and physical impairment, while severe cases may result in debilitating loss of function. Complete bony ankylosis of the elbow, though rare, presents challenges in treatment due to complex anatomy and high recurrence rates, with limited literature on management and outcomes. This study retrospectively investigates cases of elbow ankylosis secondary to HO, assessing long-term functional outcomes following operative intervention and standardized rehabilitation.

METHODS: A retrospective case series was performed on patients who underwent surgical excision of heterotopic ossification of the elbow at our institution. Outcomes of interest were intraoperative flexion-extension arc, flexion-extension arc at final long-term postoperative follow-up, visual analog scale pain scores at long-term follow-up, and Mayo Elbow Performance Scores at long-term follow-up. Wilcoxon signed-rank test was performed to identify a statistically significant difference between arc of motion achieved intraoperatively and the arc of motion maintained at final long-term postoperative follow-up.

RESULTS: Between September 1999 and July 2021, 107 patients underwent operative resection for heterotopic ossification around the elbow, with 13 patients (16 elbows) exhibiting complete ankylosis at time of surgery. Patients were followed for a minimum of two years. Long-term outcomes demonstrated a mean VAS pain score of 1.4 +/- 1.7, and a mean MEPS of 85.9 +/-12.8, with 75% of cases maintaining at least 100 degrees of flexion-extension arc at final long-term postoperative follow-up. On average, the flexion-extension arc of motion at final follow-up was preserved at 95% of intraoperative levels. Patients did have a mean residual flexion contracture of 18 +/- 9 degrees at final follow-up.

CONCLUSIONS: Surgical excision for complete elbow ankylosis secondary to heterotopic ossification presents challenges due to potential complications. Our study shows favorable long-term outcomes in pain scores, range of motion, and Mayo Elbow Performance Scores (MEPS). Despite reported complications in the literature, our series exhibited no adverse events, supporting operative excision as a standard treatment with overall fair to excellent outcomes. Further research, particularly involving multicenter, randomized, prospective studies, is warranted to refine protocols and understand predictors for improved outcomes in this patient population.

Do Patients Really Understand the Orthopedic Resident Role at a Teaching Hospital?

Paper 173

Abdulai T. Bangura, M.D. / Columbia, MO

Co-Authors:

Abdulai T Bangura, M.D. / Columbia, MO

Lasun O. Oladeji, M.D., Ph.D. / Columbia MO

Jeffton Pierre, B.S. / Columbia, MO

Steven F. DeFroda, M.D., MEng / Columbia, MO

INTRODUCTION: Academic hospitals and resident physicians play a fundamental role in ensuring that patients have 24-hour healthcare access. However, numerous studies suggest that patients have a poor understanding of the role of resident physicians. Informed consent is one of the tenants of the American healthcare system, but is difficult to establish without an accurate understanding of the care team. Therefore, this study was to evaluate patient's understanding of the orthopedic resident role at an academic teaching hospital.

METHODS: Patients at an academic hospital between April 2023 and May 2024 participated in a survey study assessing their understanding of the orthopedic resident physician. The questionnaire had sections dedicated to demographic information, patient preferences with respect to resident physicians, and an evaluation of their knowledge on the resident's role. The knowledge section was composed of nine questions that were graded with one point assigned for each correct answer. Linear regression was used to identify factors associated with higher performance on the knowledge section score.

RESULTS: A total of 132 patients completed the survey, 79 females and 53 males with an average age of 43.8 ± 16.9 . There was a relatively equal distribution among three of our four patient education levels: graduate degree (20.1%), college degree (35.1%), and high school graduate (40.3%). The majority of respondents reported an annual income of \$50,000 or less (64.9%). The average score on the knowledge section was 7.7 ± 1.4 . Of note, 75.6% of respondents reported that a resident is a doctor while 83.2% of respondents believed that residents had completed medical school. However, 93.9% of respondents believed that a resident physician is under supervision while providing patient care. Approximately 78% of respondents somewhat agree that they understood the role of the resident physician in their care. Finally, 43% of respondents agreed that they would like to know more about the education level of those involved in their medical care.

CONCLUSIONS: The findings of this study highlight that while many patients have a good understanding of the hierarchy at an academic medical center, there remain some areas of confusion. Nearly 50% of survey respondents would like to know more about the education level of those involved in their medical care. To ensure that health care is delivered with full informed consent, future efforts should focus on providing patients with additional information about the role and educational level of each member of their healthcare team.

Two Years into Preference Signaling: Evolving Trends in the Orthopedic Surgery Match

Paper 174

S. Trent Guthrie, M.D. / Chicago, IL

Co-Authors:

Tanios Dagher, B.S.E / Chicago, IL

S. Trent Guthrie, M.D. / Detroit, MI

Jodi Essey-Stapleton, M.S., M.E.d. / Des Plaines, IL

Tessa Balach, M.D. / Des Plaines, IL

OBJECTIVE: During the first year of preference signaling in the Orthopaedic Surgery Match, we administered a nation survey to applicants and program leaders (program directors, assistant program directors, and program coordinators). Results demonstrated that the signaling program was well-received among both parties and associated with a decrease in application numbers. However, questions remained surrounding whether application volume would continue to decrease and whether signals would act as a de facto application cap. The purpose of our study was to examine the evolving effects of preference signaling on student and residency program leader behaviors, attitudes, and outcomes in the Orthopaedic Surgery Match.

METHODS: We distributed surveys to American Orthopaedic Association/Council of Orthopaedic Residency Directors (AOA/CORD) member program leaders and applicants registered for the AOA/CORD Electronic Standardized Letter of Recommendation following Universal Interview Offer Day (Fall Survey) in 2023 and Match Day (Spring Survey) in 2024. Comparison testing was run using Wilcoxon rank-sum and chi-square testing.

RESULTS: For the 2023-2024 Match, 95 program leaders and 311 applicants completed the Fall Survey, and 119 program leaders and 365 applicants completed the Spring Survey. Applicants submitted an average of 61 applications, significantly lower than 84 in 2022 ($p < .001$). 48% of applicants received at least one interview invitation from a non-sigaled program ($n=140/312$), compared to 68% last year ($n=197/291$). On average, program leaders distributed interviews as follows: 12% home students, 37% away rotators, 47% non-rotators who sigaled, 5% non-rotators who did not signal. 43% of programs noted that they used preference signaling in making Rank Order List decisions ($n=51/119$), up from 12% last year ($n=17/123$). 85% of applicant respondents reported matching ($n=278/329$). Of this group, 96% matched at a sigaled program ($n=266/278$). Overall, 87% of applicants and 88% of program leaders support the continued use of signaling, significantly higher than 78% and 70% respectively last year ($p=0.003$, $p=0.01$ respectively). When asked whether residency programs should be encouraged or mandated to provide applicants with information regarding their use of signals, 61% of applicants said programs should be mandated ($n=197/325$) and 36% ($n=117$) said they should be encouraged.

CONCLUSIONS: The number of applications continued to decrease in the second year of preference signaling implementation in the Orthopaedic Match. Signals are being increasingly used in filtering out applicants, and applicants are requesting further data on how individual institutions consider signals.

Can Twitter Be the Ultimate Equalizer? A Four-Year Analysis of #OrthoTwitter Use During Match Week

Paper 175

Brook Willett, B.S. / Philadelphia, PA

Co-Authors:

Desiree Ojo, MPH, MPA, D.O. / Philadelphia, PA

Geoffrey Deckard, MBA / San Antonio, TX

Brandon Rust, B.S. / Fort Lauderdale, FL

Omar Guerrero, B.S. / Mesa, AZ

Jalen Warren, B.S. / Columbus, OH

Michael Megafu, MPH, D.O. / Hartford, CT

Brook Willett, B.S. / San Antonio, TX

Davis Hedbany, MPH / San Luis Obispo, CA

Morgan Turnow, D.O. / Columbus, OH

INTRODUCTION: The landscape of the orthopedic surgery match has changed vastly in the past couple of years. Since the COVID-19 pandemic orthopedic surgery candidates and residency programs have used #Orthotwitter as a way to promote, advocate and educate their followers. In order to characterize and improve how the orthopedic surgery community uses #Orthotwitter during Match Week, we analyzed #Orthotwitter engagement in response to the orthopedic surgery match during the years of 2021, 2022, 2023 and 2024.

METHODS: Top tweets containing the hashtags #Orthotwitter and/or #OrthoMatch during the 2021, 2022, 2023 and 2024 Match Week were reviewed and collected. Tweet analytics, the year the author joined twitter, author type, content type, activity before and after the match, institution association and number of followers were preliminarily analyzed using descriptive analysis. Tweet engagement after adjusting for the number of account followers was analyzed via sensitivity analysis. Differences in engagement between author type and content was analyzed using the Kruskal-Wallis H test.

RESULTS: There were 375 tweets in total with 25.6% (n=97) from 2024, 24.5% (n=93) from 2023, 25% (n=95) in 2022 and 23.7% (n=90) in 2021. Over the course of 4 years, medical students (47.7%, n=179) tweeted the most during #OrthoTwitter Match week, followed by attendings (26.6%, n=100), and third-party organizations (9.6%, n=36). Tweets focusing on the announcement of a positive match result ($P < 0.001$), negative match results ($P < 0.001$) received the most engagement compared to other categories.

DISCUSSION AND CONCLUSION: The evolution of #Orthotwitter over the course of the past 4 years has shifted from a focus on the thoughts of attendings and third-party organizations to medical students. This validates the steady increase in robust content curation and increased content engagement within the #Orthotwitter community. Students are more likely to share with the #Orthotwitter community a negative match result and third-party organizations and attendings are more likely to tweet and share information about resources for unmatched orthopedic surgery candidates. As the #Orthomatch continues to evolve, we anticipate that Twitter can become the ultimate equalizer for students who are left unmatched on Match Day.

Instagram Engagement Helps Increase Residency Applicant Interest in Orthopedic Surgery

Paper 176

Meredith J. Benson, B.S./BA / Maywood, IL

Co-Authors:

Vidhatri Raturi, M.S. / New Orleans, LA

Meredith J. Benson / Maywood, IL

Elizabeth Cho, M.D. / Maywood, IL

Chista R. Irani, B.S. / New Orleans, LA

Mia V. Rumps, M.S. / Maywood, IL

Mary K. Mulcahey, M.D. / Maywood, IL

OBJECTIVE: The purpose of this study was to evaluate whether Instagram engagement data impacts residency application volumes for orthopedic surgery residency programs and rank the top 50 Instagram accounts associated with programs based on engagement.

METHODS: In August of 2023, Instagram metrics via Popster's social media analytic tool for business accounts and manually for non-business accounts, as well as applicant numbers via AAMC Residency Explorer Tool from 1/1/20-6/30/23 were collected for programs. Top 50 rankings were created from 2020-2022 based off engagement score (number of likes + 3*number of comments), number of applicants, and growth in number of applicants. Correlational analysis was done for programs with active Instagram accounts and full AAMC data from 2020-2022. To reflect the current social media landscape, a list of the top 50 most influential programs' Instagram accounts was compiled from 1/1/20-6/30/23 based off engagement scores including follower count ($0.33 \times \text{number of followers} + \text{number of likes} + 3 \times \text{number of comments}$).

RESULTS: Out of 210 programs, 163 (78%) had a total of 184 Instagram accounts. The average number of likes and comments per post for each account increased from 60 to 98 and 1.4 to 2.3 from 2020 to June 2023 ($r = 0.95$; 0.9). For the 153 programs with active accounts and corresponding AAMC applicant data from 2020-2022, there was an increase in average engagement score (2,938 to 3,483) and number of applicants (636 to 824) with a weak positive correlation (2020: $r=0.15$, $p=0.06$; 2021: $r=0.18$, $p=0.02$; 2022: $r=0.20$, $p=0.01$).

CONCLUSIONS: Social media has become a useful tool that orthopedic surgery residency programs are leveraging to highlight aspects of their programs to prospective applicants. The findings of this study demonstrate a positive correlation between social media engagement and applicant numbers from 2020 to 2022, with the strength of correlation increasing each subsequent year. Several influential orthopedic surgery residency programs, based off high engagement scores, received the most applications in the previous three cycles, reinforcing the value of social media, particularly Instagram, in promoting residency programs.

A Non-Opioid Multimodal Pain Protocol Achieves Equivalent Pain Control After Total Shoulder Arthroplasty: A Randomized-Controlled Trial

Paper 177

Joshua Castle, M.D. / West Bloomfield, MI

Co-Authors:

Joshua Castle, M.D. /

Johnny Kasto, M.D. / Detroit, MI

Hardy Evans, M.D. / Detroit, MI

Despina Tsitlakidou, B.S. / Detroit, MI

Ryan Sanii, M.D. / Detroit, MI

Eric Jiang, M.D. / Detroit, MI

Stephanie Muh, M.D. / Detroit, MI

BACKGROUND: Orthopaedic surgeons are among the highest prescribers of opioid medications after surgery. Significant effort has been made to curtail the number of opioids prescribed through improved awareness of opioid stewardship and the development of multimodal pain management protocols. However, there remains a paucity of prospective data demonstrating the efficacy of a non-opioid protocol after total shoulder arthroplasty. The aim of this study was to evaluate the efficacy of a postoperative non-opioid multimodal pain protocol compared to an opioid protocol in terms of patient opioid utilization, postoperative pain control, and adverse effects of medications for patients who underwent shoulder arthroplasty.

METHODS: We performed a prospective, randomized controlled trial including patients undergoing anatomic or reverse total shoulder arthroplasty. Patients were excluded if they underwent revision surgery, fracture, or received opioids within 3 months of surgery. All patients received standardized preoperative analgesic medications, general anesthesia, and an intraoperative periarticular injection without an interscalene nerve block. Patients were randomly assigned to a postoperative non-opioid multimodal pain protocol or an opioid protocol containing 28 tablets of 5mg oxycodone in addition to the same multimodal regimen. Patients completed visual analog scale (VAS) pain and Patient-Reported Outcomes Measurement Information System (PROMIS) Pain Interference (PI) surveys, and were queried for opioid usage and recorded adverse effects of medications for 10-days postoperatively. An intention-to-treat analysis was performed.

RESULTS: A total of 74 patients were enrolled and included in the analysis with 37 in each cohort. There were no significant differences in VAS pain (2.1 ± 1.9 multimodal vs. 2.5 ± 1.8 opioid; $p > .05$) or PROMIS-PI scores (60.4 ± 7.7 multimodal vs. 60.4 opioid ± 6.7 ; $p > .05$) between treatment groups at 10-days postoperatively. The morphine milligram equivalents (MME) consumed between discharge and 10 days postoperatively for the opioid group was 32.9 ± 49.1 compared to 2.4 ± 6.9 for the non-opioid group ($p < .001$). The most common medication side effects for both groups were constipation (52.9% [18/34] multimodal vs. 72.2% [26/36] opioid) and drowsiness although there were no significant differences in the duration of side effects or the number of days without any side effects ($p > .05$) between treatment groups. Age, sex, race, and body mass index were all similar between both treatment groups.

CONCLUSION: A non-opioid multimodal pain protocol achieved similar pain control with significantly reduced MMEs consumed after shoulder arthroplasty.

Evaluating If ChatGPT Can Answer Common Patient Questions Regarding Rotator Cuff Tears

Paper 178

Emil Espinal, M.D. / Detroit, MI

Co-Authors:

Alexander Jurayj, B.A. / Detroit, MI

Julio Nerys-Figueroa, B.S. / Detroit, MI

Emil Espinal, M.D. / Detroit, MI

Michael Gaudiani, M.D. / Detroit, MI

Travis Baes, M.D. / Detroit, MI

Jared Mahylis, M.D. / Detroit, MI

Stephanie Muh, M.D. / Detroit, MI

INTRODUCTION: This study evaluates if ChatGPT can deliver patient-facing information on rotator cuff injuries at a 6th grade reading level, as recommended by the NIH and AMA. We compare ChatGPT's responses with those from the American Academy of Orthopaedic Surgeons (AAOS) patient information page to assess medical accuracy and appropriateness.

METHODS: We selected the 8 frequently asked questions from the OrthoInfo rotator cuff tear web page. These were entered twice into ChatGPT, once with prompting to provide answers at a 6th grade reading level and once without additional prompting. Each response was analyzed for accuracy and appropriateness on a Likert scale by five fellowship trained orthopedic surgeons. Reading level of each response was performed using the Flesch-Kincaid Grade Level. Responses were compared using a paired student t-test.

RESULTS: Standard ChatGPT responses were rated significantly more accurate (4.7 ± 0.47 vs 3.6 ± 0.76 ; $p < 0.001$) and significantly more appropriate (4.5 ± 0.57 vs 3.7 ± 0.98 ; $p < 0.001$) compared to the ChatGPT 6th grade group. OrthoInfo responses were rated significantly more accurate (5 ± 0.0 vs 4.7 ± 0.47 ; $p = 0.004$) and appropriate (5 ± 0.0 vs 4.5 ± 0.57 ; $p = 0.016$) compared to standard ChatGPT responses. OrthoInfo responses were rated significantly more accurate (5 ± 0.0 vs 3.6 ± 0.76 ; $p < 0.001$) and appropriate (5 ± 0.0 vs 3.7 ± 0.98 ; $p < 0.001$) compared to 6th grade ChatGPT responses. The standard ChatGPT response was written at a higher reading level compared to both OrthoInfo responses and 6th grade ChatGPT level responses (Standard FK mean=14.3, AAOS FK mean=10.33, $p = 0.002$; 6th Grade FK mean=7.71; $p < 0.001$).

DISCUSSION AND CONCLUSION: We found ChatGPT standard responses less accurate, less appropriate, and had a worse readability score compared to OrthoInfo responses. After including a 6th grade level prompt, ChatGPT responses were less accurate and less appropriate, but provided responses at an easier reading level compared to the standard ChatGPT responses and OrthoInfo. At this time, we cannot recommend ChatGPT as a reliable standalone source for patient information on the treatment of rotator cuff tears, however patients may be able to utilize ChatGPT in addition to information provided by their orthopedic surgeon.

Arthroscopic Bankart vs. Open Latarjet Procedure: Recurrence Rates and Functional Outcomes in Shoulder Instability Management

Paper 179

George Matta, B.S. / Columbus, OH

Co-Authors:

Collin P. Todd, B.S. / Columbus, OH
George Matta, B.S. / Columbus, OH
Erryk Katayama, BA / Columbus, OH
Louis W. Barry, B.S. / Columbus, OH
Benjamin Brej, B.S. / Columbus, OH

Brent Henderson, BA / Columbus, OH
Ryan C. Rauck, M.D. / Columbus, OH
Gregory Cvetanovich, M.D. / Columbus, OH
Grant Jones, M.D. / Columbus, OH
Julie Y. Bishop, M.D. / Columbus, OH

OBJECTIVE: The optimal procedure to treat anterior shoulder instability remains debated; while arthroscopic Bankart restores normal shoulder anatomy, providing a greater range of motion, open Latarjet decreases instability recurrence, allowing for a quicker return-to-play. Therefore, this study aims to compare the functional outcomes, survivability, and recurrence rates between arthroscopic Bankart and open Latarjet in a large patient cohort.

METHODS: Between 2009-2023, a retrospective analysis was conducted on 429 patients who underwent shoulder stabilization for recurrent shoulder instability and had a minimum of six months of follow-up. Procedures were performed by 9 surgeons at a single institution. Recurrent instability was defined as multiple instances of dislocation and subluxation.

RESULTS: Of the original cohort, 204 patients received Bankart repairs, while 136 received a Latarjet procedure. Both cohorts had similar ages, with the mean age for the Bankart and Latarjet being 28.0 ± 10.2 and 26.3 ± 7.5 years ($p=0.113$), respectively. As expected, bone loss was higher for the Latarjet group, $19.1 \pm 7.4\%$, compared to those who received Bankart, $6.5 \pm 7.5\%$ ($p<0.001$). Of note, the smoking rate for the Latarjet cohort (26%) was significantly higher than the Bankart cohort (13%; $p=0.003$). The mean follow-up for Latarjet (1.5 ± 1.6 years) and Bankart (2.0 ± 2.9) was not statistically significant ($p=0.060$). Postoperatively, external rotation was $55^\circ \pm 15^\circ$ and $63^\circ \pm 19^\circ$ for Latarjet and Bankart cohorts ($p<0.001$); similarly, postoperatively Bankart displayed more internal rotation at T11 compared to Latarjet's T10 ($p<0.001$). The postoperative recurrence rate for Latarjet ($n=20/136$) and Bankart ($n=49/204$) procedures was found to be 15% and 24%, respectively ($p=0.036$). The 5-year reoperation Kaplan Meyer survival probability for arthroscopic Bankart was 70% while open Latarjet was 69% ($p=0.735$), while the 5-year recurrent instability estimate was 53% for Bankart and 55% for Latarjet ($p=0.358$).

CONCLUSIONS: Despite greater preoperative bone loss in the open Latarjet group, the significantly lower postoperative instability recurrence rate demonstrates that open Latarjet could be a preferred option for those who have a high postoperative demand on their shoulder. Yet, the cost of increased stabilization is a loss of range-of-motion when compared to arthroscopic Bankart. Therefore, patient circumstance and postoperative activity should dictate procedure choice.

Primary Total Knee Arthroplasty Using a Cementless Highly Porous Titanium Tibial Baseplate: a Minimum 10-Year Follow-up

Paper 180

Erik Van Eperen, M.D. / Louisville, KY

Co-Authors:

Michael Stoltz, M.D. / Louisville, KY

Maunil Mullick, B.S. / Louisville, KY

Erik Van Eperen, M.D. / Louisville, KY

Langan Smith, B.S. / Louisville, KY

Madhusudhan Yakkanti, M.D. / Louisville, KY

Arthur Malkani, M.D. / Louisville, KY

INTRODUCTION: Historically, cemented total knee arthroplasty (TKA) has been the gold standard. Due to higher failure rates of cemented implants in obese, younger, and active males along with increasing life span, cementless TKA has had a resurgence due to the potential of long-term biologic fixation. The purpose of this study was to evaluate the clinical and radiographic results of primary TKA using a cementless highly porous tibial baseplate with a minimum 10-year follow-up.

METHODS: This was a retrospective study with 200 consecutive, primary cementless TKAs using the same highly porous tibial baseplate. 23 patients were deceased, 22 lost to follow-up, and 5 unable to participate leaving 150 cases available for review with a minimum 10-year follow-up. The mean BMI was 34.7 (range: 19.7-63.9), with 73 males and 127 females, with a mean age at surgery of 62.7 years (range: 40-85). Outcome measures included knee range-of-motion (ROM), Knee Society score (KSS), KOOS JR score, Forgotten Joint Score (FJS-12), PROMIS-10 score, patient satisfaction, revision incidence, and radiographic findings. Statistical analysis involved paired t-tests to compare preoperative and postoperative scores.

RESULTS: Mean KSS Function and Knee scores improved from 46.0 and 40.4 preoperatively to 77.4 and 90.2 postoperatively ($p < 0.0001$). The mean postoperative KOOS JR score was 85.7, FJS-12 mean of 82.5, and PROMIS-10 Mental Health mean of 54.1 and Physical Health of 47.1. Range of motion improved from a preoperative mean flexion of 105 degrees and 2.4 degrees of extension to 118.8 degrees of flexion and 0 degrees of extension at 10 years ($p < 0.0001$). 98.6% (141/143) of the patients in the cohort were very satisfied or satisfied. There were 7 revisions: 1 aseptic tibial loosening, 2 instability, 1 extensor mechanism rupture, 1 patella subluxation, 1 infection, and 1 for unexplained pain revised at an outside facility. Survivorship with all-cause failure as the endpoint at 10 years was 95.3% and 99.5% with aseptic loosening as the endpoint. Radiographic evaluation demonstrated no evidence of osteolysis or progressive radiolucent lines.

CONCLUSION: Cementless TKA using a highly porous, tibial baseplate at 10-year follow-up provided effective pain relief, high patient satisfaction, and 95.3% survivorship. Current design cementless TKA appears to be a sound alternative to cemented TKA especially in younger, obese, and more active patients undergoing primary TKA providing durable results at 10 years follow-up.

Impact of Disease-Modifying Anti-Rheumatic Drug Use on Total Knee Arthroplasty Outcomes in Patients with Inflammatory Arthritides

Paper 181

Travis Kotzur, B.S. / San Antonio, TX

Co-Authors:

Travis Kotzur, B.S. / San Antonio, TX

Aaron Singh, BA / San Antonio, TX

Blaire Peterson, B.S. / San Antonio, TX

Casey McDonald, M.D. / San Antonio, TX

Chance Moore, M.D. / San Antonio, TX

Frank Buttacavoli, M.D. / San Antonio, TX

INTRODUCTION: Disease-modifying anti-rheumatic drugs (DMARDs) are commonly prescribed amongst patients with inflammatory arthritides. These drugs, however, have been associated with potentially negative outcomes following orthopedic surgery. This study aims to compare the postoperative outcomes of TKA patients with rheumatic or psoriatic arthritis who use DMARDs with those who do not.

METHODS: This retrospective cohort study utilized data from the TriNetX Research Network, which includes over 80 healthcare organizations and more than 120 million patient records. Patients undergoing TKA with either rheumatic or psoriatic arthritis were identified using Current Procedural Terminology (CPT) codes, while those with a concomitant DMARD prescription within six months of the indexed TKA event were identified through Anatomical Therapeutic Chemical (ATC) codes. Patients were propensity-matched based on age, sex, and comorbidities. The odds of periprosthetic fractures, postoperative joint infections, mechanical complications, and revisions were assessed over a one-year period following the TKA index event.

RESULTS: A total of 27,115 patients undergoing TKA with either rheumatoid or psoriatic arthritis were included, with 21,125 having no use of DMARDs and 5,990 having recorded use of DMARDs. After successful matching, there were 5,799 patients in both the DMARD and non-DMARD groups. Patients using DMARDs had higher odds of postoperative joint infection (Odds Ratio (OR) 1.21; $p=0.042$) and revision surgery within one year (OR 1.4; $p=0.014$). However, there was no difference in odds of periprosthetic fracture (OR 1.36, $p=0.197$) or mechanical complications (OR 1.21; $p=0.087$) between the two cohorts.

CONCLUSIONS: This study highlights that TKA patients with inflammatory arthritides who use DMARDs have an increased risk of postoperative joint infections and revision surgery compared to those who do not use DMARDs. These findings suggest the need for careful consideration of patient risk factors, such as DMARD use, to optimize postoperative outcomes in TKA patients. Further research is warranted to understand the underlying mechanisms that cause worse outcomes with DMARD use in this patient population.

SUMMARY: This study highlights that TKA patients with inflammatory arthritides who use DMARDs have an increased risk of postoperative joint infections and revision surgery compared to those who do not.

Obesity is Associated with Greater Improvement in Patient-Reported Outcomes Following Revision TKA

Paper 182

Austin Darden, B.S. / Fishers, IN

Co-Authors:

Austin Darden, B.S. / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

Kevin A. Sonn, M.D. / Indianapolis, IN

Evan R. Deckard, B.S.E / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Body mass index (BMI) cutoffs are frequently implemented for total knee arthroplasty (TKA) candidates. However, recent data in primary TKA suggest obese patients have greater improvement in patient-reported outcome measures (PROMs) and no difference in postoperative complications when utilizing standardized medical optimization protocols. This study evaluated the influence of BMI on PROMs following revision TKA using these optimization protocols.

METHODS: Between 2010 and 2022, 572 consecutive revision TKAs were retrospectively reviewed. Cases were dichotomized into two BMI groups, $\geq 35 \text{ kg/m}^2$ and $< 35 \text{ kg/m}^2$ (range, 20 to 65 kg/m^2). Activity level, pain, function, and satisfaction were compared between groups, controlling for multiple comorbidities and case characteristics. The BMI $\geq 35 \text{ kg/m}^2$ group was younger; had a higher prevalence of depression/anxiety and pre-revision narcotics; and worse pre-revision PROMs ($P \leq 0.090$). Multivariate statistical analysis was performed with $P < 0.05$ as significant.

RESULTS: Study groups did not differ by the indication for revision or the number of components revised ($P \geq 0.108$). Patients with a BMI ≥ 35 demonstrated greater improvement in KOOS-JR, and pain with level walking and stair climbing ($P \leq 0.071$) at a mean of 2.0 years. More patients in the BMI ≥ 35 group achieved MCIDs for PROMs (46-67% vs. 59-70%). Revision for aseptic loosening compared to instability was significantly associated with PROM improvements. Additionally, the BMI ≥ 35 group showed greater mean satisfaction (72.2 vs. 66.5%, $P = 0.254$), and more patients reported their knee feels 'always' normal (28.4 vs. 19.8%, $P = 0.149$). There was no difference in re-revisions between the two groups with regard to aseptic loosening or infection.

CONCLUSION: Despite being more debilitated preoperatively, revision TKA patients with a BMI ≥ 35 experienced greater improvements in PROMs compared to patients with lower BMIs, independent of revision indication. Given the significant improvements in PROMs with appropriate perioperative optimization, obese patients should not be restricted access to revision TKA when appropriately indicated.

PROMs and Pain in Cemented vs. Cementless Primary TKA: A Matched Cohort Analysis

Paper 183

Julian E. Dilley, M.D. / Indianapolis, IN

Co-Authors:

Julian E. Dilley, M.D. / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

Evan R. Deckard, B.S.E / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Cementless fixation in total knee arthroplasty (TKA) continues to increase. However, limited data are available on the comparison of patient-reported outcome measures (PROMs) on these two fixation methods. This study evaluated PROMs in matched cohorts of cemented and cementless TKA groups.

METHODS: 2,308 primary TKAs using consistent clinical protocols were retrospectively reviewed. 191 cemented and 191 cementless TKAs were tightly matched using the following criteria: age (± 7), BMI (± 7), sex (exact), ASA-PS (exact), and patellar resurfacing (exact). Demographics and covariates were accounted for in the analysis. Modern PROMs collected were UCLA Activity Level, KOOS JR, KSS pain with level walking, and KSS pain with climbing stairs. Associated clinically important differences were evaluated at a mean of 2.1 years (range, 1-10) with a statical significance level of 0.05.

RESULTS: The majority of demographic and covariate variables did not differ between groups ($P \geq 0.220$). However, the cementless group was a mean 3 years younger ($P < 0.001$) reflecting a fixation selection bias; and a greater incidence of depression and narcotic use was documented in the cemented group ($P \leq 0.029$). Both cemented and cementless groups achieved minimal clinically important differences (MCIDs) for all PROMs, on average ($P < 0.001$). No statistically significant differences were observed in preoperative, latest, improvement from baseline, or achievement of clinically important differences in all collected PROMs ($P \geq 0.198$). Satisfaction was not different between cemented and cementless fixation groups ($P = 1.000$); however, the cementless TKA group reported a higher proportion of their knees feel “sometimes or always” normal (90 vs. 83%, $P = 0.070$).

CONCLUSION: Study results demonstrate similar outcomes between matched cohorts of cemented and cementless TKAs at a mean of 2.1 years follow-up. These data support the continued use of cementless fixation in primary TKA and appear to refute the contention that TKA patients with cementless fixation may have more pain clinically.

The Impact of Diabetic Neuropathy on Total Knee Arthroplasty Outcomes

Paper 184

Travis Kotzur, B.S. / San Antonio, TX

Co-Authors:

Blaire Peterson, B.S. / San Antonio, TX

Travis Kotzur, B.S. / San Antonio, TX

Aaron Singh, BA / San Antonio, TX

John Parker, M.D. / San Antonio, TX

Frank Buttacavoli, M.D. / San Antonio, TX

Chance Moore, M.D. / San Antonio, TX

INTRODUCTION: The aim of this study was to investigate the impact of diabetic neuropathy on total knee arthroplasty (TKA) outcomes when compared with both non-diabetic and diabetic patients without neuropathy.

METHODS: This retrospective cohort study utilized the National Readmissions Database from 2016 to 2020. Patients undergoing primary total knee arthroplasty (TKA) were identified using ICD-10 codes, including those with diabetes and diabetic neuropathy. Regression models compared non-diabetic to neuropathic patients and diabetic to neuropathic patients. Multivariate regression was conducted to analyze postoperative outcomes. Gamma regression assessed total charges and length of stay (LOS). Demographics and comorbidities, measured by the Elixhauser comorbidity index, were controlled for in the regression analysis.

RESULTS: This study included 2,210,548 patients; 1,739,188 (78.7%) patients without diabetes, 415,640 (18.8%) patients with diabetes but without diabetic neuropathy, and 55,720 (2.5%) patients with diabetic neuropathy. When compared to patients without diabetes, patients with diabetic neuropathy had increased odds of medical (Odds ratio (OR) 1.86; $p < 0.001$) and surgical (OR 1.5; $p < 0.001$) complications, including joint infection (OR 1.81; $p < 0.001$) and periprosthetic fracture (OR 1.93; $p < 0.001$). When compared to patients with diabetes, but without neuropathy, patients with diabetic neuropathy again had significantly higher odds of joint infection (OR 1.62; $p < 0.001$) and periprosthetic fracture (OR 2.36; $p < 0.001$).

DISCUSSION: This study found that diabetic neuropathy, when compared with both non-diabetic and diabetic patients without neuropathy, resulted in higher odds of medical and surgical complications following TKA. Specifically, diabetic neuropathy was associated with higher odds of joint infection and periprosthetic fracture. Orthopedic surgeons should be aware of the added surgical risk associated with diabetic neuropathy, outside of the impact of diabetes, overall.

Importance of an Integrated Practice Unit for the Reduction of Body Mass Index Prior to Total Joint Arthroplasty

Paper 185

Ayane Rossano, M.D. / Austin, TX

Co-Authors:

Ayane Rossano, M.D. / Austin, TX

Stephanie Price, M.D. / Austin, TX

Chizitam Ibezim, M.D. / Austin, TX

Sina Ramtin, M.D. / Austin, TX

Amanda Hayes, M.D. / Austin, TX

Kevin Bozic, M.D. / Austin, TX

Karl Koenig, M.D. / Austin, TX

OBJECTIVE: Obesity in Total Joint Arthroplasty (TJA) is associated with perioperative complications such as increased risk of deep infection, component malpositioning, and revisions. An Integrated Practice Unit (IPU) model enables efficient and frequent access to in-house nutritionists who possess specialized experience with arthroplasty candidates. The purpose of this study was to determine the impact of working with an IPU nutritionist preoperatively on Body Mass Index (BMI) prior to undergoing pTJA.

METHODS: A retrospective chart review was performed for patients with a presenting BMI $> 40 \text{ kg/m}^2$ who sought hip or knee arthroplasty at an urban Musculoskeletal IPU from November 2017 to September 2022. BMI was tracked from time of referral to 6 months after referral, or from initial visit to 6 months after initial visit for patients not referred. Baseline Generalized Anxiety Disorder (GAD), Patient Health Questionnaire 9 (PHQ-9), and baseline and follow-up preoperative Patient Reported Outcome Measures (PROMs; HOOS, JR and KOOS, JR) were collected. Data was analyzed through multivariate logistic regression and corollary models with significance set at $p < 0.05$.

RESULTS: A total of 356 patients were included for analysis. The average BMI reduction of patients referred to the IPU nutritionist ($n = 197$) was 0.33, compared to an average preoperative BMI increase of 0.59 in those who did not work with an IPU nutritionist ($n = 159$) ($p = 0.02$). Variables associated with a decrease in BMI by 6 months were having at least one appointment with the IPU nutritionist ($p = 0.0029$) and a higher number of in-person nutritionist visits ($p = 0.0289$). The PROMs for patients who visited with the IPU nutritionist improved by 5.1 points on average, while PROMs worsened by an average of 4.9 points for those who did not ($p = 0.0000002$).

CONCLUSIONS: The accessibility of a nutritionist preoperatively is not only associated with a higher BMI reduction rate, but also corresponds with a significant improvement in PROMs. This study demonstrates the impact an IPU can have on optimizing obese patients for surgery and improving preoperative functional outcome measures.

Neutral Mechanical Alignment in TKA Elevates Lateral Collateral Ligament Strain: A Cadaveric Study

Paper 186

Joseph Kitchen, M.D. / Louisville, KY

Co-Authors:

Joseph Kitchen, M.D. / Louisville, KY

Jarod Richards, M.D. / Louisville, KY

John Powers, B.S. / Louisville, KY

Peter Quesada, Ph.D. / Louisville, KY

Arthur Malkani, M.D. / Louisville, KY

INTRODUCTION: Alternative alignment techniques have been introduced for total knee arthroplasty (TKA) with the goal of more closely replicating a patient's native joint line and knee kinematics in an effort to improve patient outcomes and satisfaction. The purpose of this study is to investigate changes in lateral collateral ligament (LCL) strain following deviation from the native distal femoral joint alignment following TKA.

METHODS: Using a novel method with motion capture technology, strain in the LCL was calculated in six cadaver knees at various degrees of flexion with range of motion. Baseline strain measurements were recorded of the native knee, then repeated after TKA using restricted kinematic alignment (rKA) and neutral mechanical alignment (nMA) in the same specimen. nMA (perpendicular joint line to long axis of femur) was incrementally achieved by distalizing the lateral femoral condyle in 2-mm increments up to 6 mm. Peak strain in the LCL was reported and compared using Pairwise Wilcoxon Signed-Rank tests.

RESULTS: Median peak strain in the LCL following TKA increased from baseline to 1.6% using rKA. Strain increased to 1.9% with 2 mm of lateral femoral condyle distalization from the native joint line, 6.0% with 4 mm of distalization, and 8.1% for 6 mm of distalization. Statistically significant differences ($p < 0.05$) existed with lateral femoral condyle distalization from 0 to 4-mm, 0- and 6-mm, and 4- and 6-mm.

CONCLUSION: Using nMA as the target during TKA forces the surgeon to distalize the lateral femoral condylar joint line from its native oblique angle, which increases strain on the LCL. Strain of 5.1% has been associated with structural damage in ligaments. This level of strain can be surpassed when the lateral femoral condyle is distalized by 4 mm or more.

Deviation from native alignment that occurs when using nMA may be a source of lateral knee pain and dissatisfaction for patients.

Implant Costs for Revision Hip and Knee Arthroplasty Account for More than a Quarter of Hospital Reimbursement

Paper 187

Simon Mears, M.D. / Little Rock, AR

Co-Authors:

Alexandria Smith, M.D. / Little Rock, AR

Simon Mears, M.D. / Gainesville, FL

C. Lowry Barnes, M.D. / Little Rock, AR

Jeffrey Stambough, M.D. / Little Rock, AR

Benjamin Stronach, M.D. / Little Rock, AR

INTRODUCTION: While overall reimbursement for revision total hip (THA) and revision knee arthroplasty (TKA) decreases, the revision burden continues to expand. We sought to evaluate the percentage of the Diagnostic-Related Group (DRG) reimbursement spent on implants in revision arthroplasty and calculated the variability of implant costs within each DRG.

METHODS: A consecutive series of 199 revision THAs and 187 revision TKAs performed between June 1, 2019, and June 1, 2021, were reviewed at one academic medical center. Patient characteristics, preoperative diagnosis, implant records and billing data were recorded from the hospital billing records for DRG 466 (revision hip or knee replacement with major complication), 467 (revision with complication or comorbidity) and 468 (revision without comorbidity or complication). Data was stratified by DRG and diagnosis for comparison. Implant and patient comorbidity factors were analyzed for association with increased costs.

RESULTS: Implant costs comprised 24% of reimbursements for DRG 466 (range: 2.4-133%), 36.7% for DRG 467 (3.5-118%), and 35% for DRG 468 (2.5-175%). When stratified by diagnoses, the groups with the largest ranges in implant costs measured as a percentage of the reimbursement were aseptic loosening (range: 6.6-171.6%), infection (3.2-129.3%), and metallosis (2.4-108%). Implants for revision TKA were significantly more costly than revision THA across all DRGs (33.3 vs. 25.7%, $p < .010$). Factors associated with higher implant costs included a greater number of prior arthroplasty surgeries on the same joint ($p < .001$) and an American Society of Anesthesiology (ASA) score ≥ 3 ($p = .006$).

DISCUSSION: On average, 30% of the DRG reimbursement is spent on implants in revision arthroplasty. However, there is a wide range in cost contributions within DRG groups, making it difficult to determine profitability associated with individual diagnoses. Regardless of DRG grouping, revision joint arthroplasty in sicker patients (ASA ≥ 3) or multiply revised joints was associated with higher implant costs.

Outcomes of Regional Block in Revision Total Joint Arthroplasty for Prosthetic Joint Infection

Paper 188

Ashley Treanor, B.S. / Chicago, IL

Co-Authors:

Ashley Treanor, B.S. / Maywood, IL

Michelle Shimizu, B.S. / Maywood, IL

Athena Barrett, B.S. / Maywood, IL

Scott Byram, M.D. / Maywood, IL

Daniel Schmitt, M.D. / Maywood, IL

Nicholas M. Brown, M.D. / Maywood, IL

Harold W. Rees, M.D. / Maywood, IL

INTRODUCTION: Infection is one of the most common reasons for revision following a total joint arthroplasty (TJA) and is associated with significant morbidity and mortality rates. As the demand for TJA increases, a concurrent increase in the prevalence of prosthetic joint infection (PJI) is also expected to rise. While previous studies have explored differences in postoperative outcomes between general and spinal anesthesia, there is limited data on the use of regional blocks in patients undergoing revision joint replacement for PJI. This study aimed to evaluate the postoperative outcomes of patients undergoing revision TJA for PJI using regional blocks.

METHODS: Data from 532 patients was retrospectively collected. Patients included in the study had undergone revision TJA due to PJI from January 2004 – January 2023 at a single institution. Same-date bilateral revisions, above-knee amputations, and aseptic revisions were excluded. Postoperative complications investigated included local complications and the block site, postoperative transfusion, wound complication, readmission, sepsis, systemic infection, spinal infection, death, persistent PJI, periprosthetic fracture, and unplanned reoperation. Chi2 analysis was used to compare postoperative complications between surgeries that used regional blocks and those that used other anesthesia types which include general and spinal.

RESULTS: 38 of 532 patients (7.3%) received a regional block. After surgery, 26.3% (n=10) of regional block patients and 22.1% (n=107) of other anesthesia patients experienced persistent PJI (p=0.686). There was no significant difference in terms of postoperative wound complication rates between regional block (n=6, 15.8%) and other anesthesia (n=32, 6.6%) (p=0.110). Readmission (regional block n=18 (47.4%) versus other anesthesia n=191 (39.4%), p=0.426), unplanned reoperation (regional block n=13 (34.2%) versus other anesthesia n=124 (25.6%), p=0.998), and death (regional block n=2 (5.3%) versus other anesthesia n=13 (4.1%), p=0.679) also did not differ significantly. Sepsis (regional block n=2 (5.3%) versus other anesthesia n=20 (4.1%), p=0.810), systemic infection (regional block n=0 (0%) versus other anesthesia n=5 (1.0%), p=0.699), and spinal infection (regional block n=0 (0%) versus other anesthesia n=4 (0.8%), p=0.757) within one year following revision TJA for PJI surgery rates were comparable between the two groups.

CONCLUSION: The results of our study suggest that the use of regional block is not associated with an increased probability of postoperative persistent PJI, local wound complication, reoperation, spinal/systemic/other infections, death, or reoperation. Surgeons can comfortably choose regional block as a safe option for revision surgeries due to PJI.

Coding Patterns and Implications on Reimbursement in Foot and Ankle Surgery

Paper 189

Ryan G. Rogero, M.D. / Memphis, TN

Co-Authors:

Ryan G. Rogero, M.D. / Memphis, TN

Carson M. Rider, M.D. / Memphis, TN

Benjamin J. Grear, M.D. / Memphis, TN

David R. Richardson, M.D. / Memphis, TN

Garnett A. Murphy, M.D. / Memphis, TN

Clayton C. Bettin, M.D. / Memphis, TN

OBJECTIVE: Coding is an essential part of a foot and ankle surgeon's duties and can both quantify the amount of work done by the surgeon and influence compensation. The purpose of this study was to evaluate the coding patterns among foot and ankle orthopedic surgeons and to quantify the effects of these on reimbursement using real-life patient cases.

METHODS: A survey consisting of 12 commonly encountered real deidentified patient cases was administered to all foot and ankle fellowship-trained orthopedic surgeons of a large, combined academic-private practice orthopedic group. The scenarios included preoperative diagnostic imaging and reports, intraoperative imaging, and postoperative radiographs. Surgeons were asked which Current Procedural Terminology (CPT) codes would be applied and if any Modifiers to these codes would be utilized. If multiple CPT codes were utilized, surgeons were asked to list the codes in the same order as would be theoretically listed on their operative note. Respondents were allowed to use any sources of information they desired to complete the survey. Total work-relative value units (RVUs) and the generated reimbursement values were calculated for each case and respondent using the 2024 Centers for Medicare & Medicaid Services (CMS) conversion factor (\$32.74 per RVU), with the primary procedure reimbursed at 100%, with additional procedures reimbursed at 50%.

RESULTS: Five surgeons completed the survey. Among case scenarios, four of the 12 cases had at least four of the five respondents in agreement on the primary CPT code, whereas only one case had 100% agreement among respondents on the primary CPT code. Similarly, only five of the 12 cases had at least four of the five respondents in agreement regarding modifier usage, with only one case having 100% agreement among respondents on modifier utilization. Modifier 59 was most utilized. The total RVU and reimbursement difference between the respondents with the highest and lowest listed RVUs was 216.06 and \$3,627.92, respectively. The cases with the most variability among both RVUs and modifiers involved a Lisfranc injury, Charcot reconstruction, and midfoot fracture-dislocation.

CONCLUSIONS: Great variability exists between foot and ankle surgeons when coding common foot and ankle procedures. Surgeons should be aware of these differences and the large effect they can have on quantifying reimbursement.

Utility of Radiographs Following Primary Anatomic and Reverse Total Shoulder Arthroplasty

Paper 190

Vincent Buckman, B.S. / Chicago, IL

Co-Authors:

David H. Jung, B.A. / Chicago, IL

Vincent Buckman, B.S. / Chicago, IL

Nicholas A. Carola, B.S. / Hamden, CT

Darlington Nwaudo, M.D. / Chicago, IL

Nicholas H. Maassen, M.D. / Chicago, IL

Lewis L. Shi, M.D. / Chicago, IL

OBJECTIVE: Radiographs are frequently obtained after total shoulder replacement (TSA) to confirm implant placement and follow the status of the bone and prostheses; however, standardization of their use is lacking. There are concerns regarding frequent use of radiographs due to their cost and patient radiation exposure. The aim of this study is to assess the postoperative radiograph frequency and efficacy in primary anatomic and reverse total shoulder replacements. We hypothesize that multiple radiographs taken beyond the initial 2-week postoperative interval are of uncertain benefit for both primary anatomic and reverse total shoulder arthroplasties, regardless of the presence of symptoms.

METHODS: A retrospective chart and imaging review was conducted on all patients who underwent primary TSA between 2014 and 2021, with documentation of at least 2 years of follow-up. All available postoperative radiographs, radiologist interpretations, and clinic notes were followed up for 2 years after the date of surgery, or until another surgery was performed within the 2-year timeframe. Radiographs were assessed for component positioning, fractures, loosening, and dislocation. Clinic notes were also checked for changes in patient management. Patients were grouped by surgery type (anatomic/reverse).

RESULTS: A total of 213 patients (234 surgeries) were identified (55 anatomic TSA, 179 reverse TSA). The mean number of radiographs within the first 2 years of surgery was 3.6 for anatomic TSA and 4.0 for reverse TSA. 166 patients were asymptomatic and had only 3 positive X-rays and zero revision rate in the first 2 years. No changes in management were implemented based on these routine radiographs. 68 surgeries were symptomatic, of which 21 had positive X-rays. Of this subgroup, 19 (90.5%) underwent revision.

CONCLUSIONS: Routine radiographs are overused and typically do not lead to any changes in asymptomatic patients in the first 2 years after TSA. For patients experiencing pain or limited range of motion, ongoing assessment using additional X-rays, CT scans, or other diagnostic tests is recommended for effective monitoring.

Patient Demographics, Marital Status, Smoking Status, and Injury Characteristics are Predictors to No-Show in Orthopedic Trauma Clinic

Paper 191

Michelle Hertzberg, M.D. / Detroit, MI

Co-Authors:

Michelle Hertzberg, M.D. / Detroit, MI

Hamza M Raja, B.S. / Detroit, MI

Christian Freitag, B.S. / Detroit, MI

Alexa Bernard, B.S. / Detroit, MI

Husain Rasheed, B.S. / Detroit, MI

Eric Jiang, M.D. / Detroit, MI

Lindsay Maier, M.D. / Detroit, MI

Joseph Hoegler, M.D. / Detroit, MI

S. Trent Guthrie, M.D. / Detroit, MI

William Hakeos, M.D. / Detroit, MI

OBJECTIVE: Non-adherence with postoperative follow-up visits, “no-shows”, are associated with poorer outcomes and increased costs to patients and providers. Identifying patients at risk for no-show is the first step in minimizing these risks. This study investigates patient factors including demographics, marital status, trauma characteristics, BMI, and smoking status, and their correlation with no-show status to postoperative clinic visits in orthopedic trauma.

METHODS: A retrospective chart review at a level I trauma center evaluated patients that failed to present to follow-up clinic within 1 year of surgery over a 2-year period. Patients who attended all postoperative clinic visits within 1 year of surgery over the same period were identified as controls. Patient demographics and medical data were correlated with no-show to postoperative clinic visits in orthopedic trauma. Multivariable logistic regression analyses were used with statistical significance maintained at $p < 0.05$.

RESULTS: There were 449 no-show patients and 369 controls identified. Race, marital status, presence of polytrauma (>1 fracture), type of trauma, smoking status, and insurance status were significant patient predictors of no-show status. African-American race was as a positive predictor to no-show status, compared to white and other (OR: 2.83 [1.85-4.33]; $p < 0.05$). Unmarried patients, reporting a marital status of single or other, including divorced or widowed were more likely to no-show compared to married patients (Single OR: 1.92 [1.16-3.20]; Other OR: 1.93 [1.05-3.19]; $p < 0.050$). The presence of polytrauma was a statistically significant predictor for no-show status (OR: 5.85 [2.02 – 16.8]; $p < 0.05$). A non-fracture diagnosis (including infection, painful hardware, etc.) was a positive predictor of no-show status, while upper extremity trauma was a negative predictor of no-show status ($p < 0.05$). Current smokers were more likely to no-show than never and former smokers (OR: 2.11 [1.36 – 3.27]; $p < 0.05$). Patients with Medicare or Medicaid coverage were more likely to no-show than private insurance patients (Medicare OR: 2.29 [1.36-3.86]; Medicaid OR: 2.11 [1.29-3.45]; $p < 0.05$). Age, sex, BMI, and language were not predictors of no-show status ($p > 0.05$).

CONCLUSION: Patient predictors like race, marital status, trauma diagnosis, presence of polytrauma, smoking status, and insurance status can be utilized to identify patients at risk for poor postoperative follow-up. Early identification of patients at risk for a “no-show” visit allows orthopedic surgeons to create patient-centered treatment plans to optimize patient outcomes.

Reverse Shoulder Arthroplasty for Proximal Humerus Fractures and Reverse Shoulder Arthroplasty for Elective Indications Should Have Separate Current Procedural Terminology (CPT) Codes

Paper 192

Nickolas Garbis, M.D. / Maywood, IL

Co-Authors:

Amir M. Boubekri, M.D. / Maywood, IL

William Oetojo, B.A. / Maywood, IL

Michael Scheidt, M.D. / Maywood, IL

Krishin Shivdasani, M.D., M.P.H. / Maywood, IL

Andrew Chen, M.D. / Maywood, IL

Nickolas Garbis, M.D. / Maywood, IL

Dane Salazar, M.D., M.B.A. / Maywood, IL

OBJECTIVE: Reverse total shoulder arthroplasty (RSA) for fracture and arthropathy indications share a current procedural terminology (CPT) code and 90-day Centers for Medicare and Medicaid Services (CMS) bundled payment despite requiring a different level of urgency, technical demands on surgeons, and hospital systems resource utilization. We sought to compare 90-day perioperative resource utilization and short-term functional and pain outcomes between RSA for fractures and arthropathy indications.

METHODS: 383 RSAs were retrospectively reviewed from January 2011 to December 2020. Demographics, operative time, financial charge and cost data, length of stay (LOS), discharge disposition, early (within 90 days) and late (after 90 days) all-cause revisions were investigated. Visual analog scale pain and active range of motion (ROM) were evaluated at 2, 6, and 12 months.

RESULTS: 197 total RSA were included with 28 for fracture and 169 for arthropathy indications after exclusions and at least 1 year follow up. Age, and BMI did not significantly differ between groups ($p>0.05$). The average RSA operative time was longer for fracture with 143.2 ± 33.7 vs. 108.2 ± 33.9 ($p<0.01$). The average cost per patient for reverse shoulder arthroplasty for proximal humerus fracture was \$2,489 higher than that of elective reverse shoulder arthroplasty, although this difference was not statistically significant ($p=0.1263$). LOS was longer for RSA for fracture compared to arthropathy with a mean of 4.0 ± 3.6 days vs. 1.8 ± 2.3 days ($p<0.01$). The fracture group was 3.6 times more likely to be discharged to a skilled nursing facility or an inpatient rehab (32% vs. 9%, $p<0.01$). All-cause revision within 2 years was statistically significantly higher for fracture than arthropathy, 32% and 9% respectively ($p=.02$). Differences in postoperative ROM for fracture vs. arthropathy were significant for aFF at 2 months ($95.5\pm36.7^\circ$, $117.0\pm32.3^\circ$) and 6 months ($110.9\pm35.2^\circ$, $129.2\pm28.3^\circ$), aER at 6 months ($20.0\pm20.9^\circ$, $33.1\pm12.3^\circ$), and aER at 12 months ($23.3\pm18.1^\circ$, $34.5\pm13.8^\circ$) ($p<0.05$). No difference in VAS pain score was noted between fracture and arthropathy groups at 2 months (3.1 vs 2.3, $p=0.192$), 6 months (2 vs 1.7, $p=0.600$), or 12 months (1.7 vs 1.7, $p=0.935$), postoperatively.

CONCLUSIONS: RSA for fractures and arthropathy indications share a CPT code, but have different degrees of surgical complexity, hospital resource utilization, cost, and trend toward higher early revision rate within the 90-day period, and 3.6 times higher all-cause revision rate within two years. This may be important to consider when determining future reimbursement models or revised CPT codes.

The Conversion of UKA to TKA with Robotic Assistance: A Novel Surgical Technique and Case Series

Paper 193

Obed Barkus, M.D. / Detroit, MI

Co-Authors:

Hamza Raja, B.S. / Detroit, MI

Noah Hodson, M.D. / Detroit, MI

Michael A. Charters, M.D. / Detroit, MI

Wayne T. North, M.D. / Detroit, MI

Obed Barkus, M.D. / Detroit, MI

OBJECTIVE: Robotic-assisted devices help provide precise component positioning in conversion of unicompartmental knee arthroplasty (UKA) to total knee arthroplasty (TKA). A few studies offer surgical techniques for CT-based robotic-assisted conversion of UKA to TKA, however no studies to date detail this procedure utilizing a non-CT based robotic assisted device. This paper introduces a novel technique employing a non-CT based robotic assisted device (ROSA® Knee System, Zimmer Biomet, Warsaw, IN) for converting UKA to TKA with a focus on its efficacy in gap balancing.

METHODS: We present three patients (ages 46 to 66) who were evaluated for conversion of UKA to TKA for aseptic loosening, stress fracture, and progressive osteoarthritis. Each patient underwent robotic-assisted conversion to TKA. Postoperative assessments at 1 year revealed improved pain, function, and radiographic stability. **Technique:** Preoperative planning included biplanar long leg radiographs to determine the anatomic and mechanical axis of the leg. After arthrotomy with a standard medial parapatellar approach, infrared reflectors were pinned into the femur and tibia, followed by topographical mapping of the knee with the UKA in-situ. The intraoperative software was utilized to evaluate flexion and extension balancing and plan bony resections. Then, the robotic arm guided placement of the femoral and tibial guide pins and the UKA components were removed. After bony resection of the distal femur and proximal tibia, the intraoperative software was used to reassess the extension gap, and plan posterior condylar resection to have the flexion gap match the extension gap.

CONCLUSION: The use of a non-CT based robotic assisted device in conversion of UKA to TKA is a novel technique and a good option for surgeons familiar with robotic-assisted arthroplasty, resulting in excellent outcomes at 1 year.

The Impact of Unilateral Transfemoral Amputation on Lumbar Bone and Muscle Quality

Paper 194

Caden Messer, B.S. / Rochester, MN

Co-Authors:

Hannah A. Levy, M.D. / Rochester, MN
Caden Messer, B.S. / Rochester, MN
Andrew Pumford, BA / Rochester, MN
Brian Kelley, B.S. / Rochester, MN
Ahmad Nassr, M.D. / Rochester, MN

Brett Freedman, M.D. / Rochester, MN
Melvin Helgeson, M.D. / Rochester, MN
Matthew Houdek, M.D. / Rochester, MN
Fantley Smither, M.D. / Rochester, MN
Brian Karamian, M.D. / Salt Lake City, UT

INTRODUCTION: After unilateral transfemoral (TFA) amputation, aberrant mechanical loading patterns, asymmetric force generation, and compensatory increase in proximal joint motion can precipitate lumbar muscular and osseous changes and lead to mechanical back pain. However, the specific perturbances to lumbar static and dynamic structures that may result in back pain or spinal pathologies after TFA remain poorly characterized. This study aimed to examine the long-term perioperative changes in lumbar bone density, muscle size and fatty atrophy, and facet degeneration after TFA.

METHODS: All patients who underwent TFA at an academic center between 2002-2022 were retrospectively identified. Patients were required to have preoperative and postoperative CT at a minimum of one year after TFA and regularly utilize a prosthesis. Preoperative to postoperative changes in psoas, quadratus lumborum, multifidus, and erector spinae cross-sectional area (CSA) and Hounsfield units (HU) were calculated for the amputated and contralateral side at the level of the L3-4 disc space. Perioperative changes in lumbar vertebral HU and facet degeneration (CT Weishapt grade) were determined. Paired univariate analysis was utilized to compare preoperative and postoperative outcomes.

RESULTS: A total of 42 TFA patients (indications: 20 infection, 6 malignancy, 16 ischemia) met the inclusion criteria. The average pre- to postoperative changes in HUs in the L1 and L3 vertebral bodies were -17.69 ($p=0.037$) and -25.35 ($p=0.021$), respectively. There were significant pre- to postoperative increases in L4-5 and L5-S1 facet degeneration grade ($p<0.001$). There were significant pre- to postoperative decreases in amputated side psoas HU (pre: 43.31 vs post: 36.66, $p=0.008$) and CSA (pre: 1074.43 vs post: 880.92, $p<0.001$). There were also significant pre- to postoperative HU decreases in the bilateral multifidus (amputated- pre: 37.16 vs post: 30.49, $p=0.011$, contralateral- pre: 35.96 vs post: 26.79, $p=0.001$) and the bilateral erector spinae (amputated- pre: 27.95 vs post: 22.41, $p=0.044$, contralateral- pre: 27.93 vs post: 17.68, $p<0.001$) muscles, where the changes were more pronounced on the contralateral side (all $p<0.05$).

CONCLUSION: TFA was associated with progression of lumbar facet degeneration, small scale decreases in lumbar bone quality, amputated side psoas atrophy, and bilateral fatty infiltration of the multifidus and erector spinae. Relative to the TFA side, the contralateral side demonstrated greater multifidus and erector spinae fatty changes.

Smoking Cessation Success - Is Total Joint Arthroplasty a Powerful Motivator?

Paper 195

Mary Hennekes, M.D. / Detroit, MI

Co-Authors:

Mary E. Hennekes, M.D. / Detroit, MI

Hamza M. Raja, B.S. / Detroit, MI

Aaron Pang, M.D. / Detroit, MI

Husain Rasheed, B.S. / Ann Arbor, MI

Brian Darrith, M.D. / Richmond, VA

W. Trevor North, M.D. / Detroit, MI

Michael Charters, M.D. / Detroit, MI

INTRODUCTION: Smoking is an established risk factor for perioperative complications after elective total joint arthroplasty (TJA). This study aimed to assess the success rate of smoking cessation in TJA patients through one smoking cessation framework and explore demographic factors associated with smoking cessation.

METHODS: All adult patients undergoing primary TJA for hip or knee osteoarthritis who had received smoking cessation counseling within a two year period (2021-2022) were included in this retrospective cohort study. Nicotine and cotinine blood tests were used to confirm smoking cessation after 6 weeks of self-reported abstinence. The smoking cessation interval was calculated as the duration from initial encounter to the date normal nicotine and cotinine labs. Logistic regression analyses were used to assess the associations between demographic characteristics with smoking cessation success and time to normal labs. Significance level was $p < 0.05$.

RESULTS: 103 patients met inclusion criteria. 32 patients (31.1%) self-reported abstinence after 6 weeks. 19/32 (59.4%) had normal nicotine and cotinine tests. The smoking cessation interval was a median of 84.0 days [IQR: 45.5-178.5]. An additional 8/32 (25.0%) patients had normal labs after a second period of abstinence. Ultimately 29/32 (90.6%) of patients achieved smoking cessation success after multiple periods of self-reported abstinence. Marital status was the only demographic factor associated with smoking cessation. Single patients had a significantly decreased likelihood of successful smoking cessation compared with married patients (OR 0.26; $p = 0.011$). Married patients were also likely to achieve successful cessation on average 218.8 days earlier than single patients.

CONCLUSION: This study highlights that a substantial number of patients (29/103), approximately 20% more than the national average of 8%, were successful at smoking cessation within this framework which includes objective lab measures through nicotine and cotinine testing and the motivation of TJA. This study also highlights the impact of social support within the home for smoking cessation success. Future research should elucidate more clearly the efficacy of different smoking cessation frameworks.

Risk Assessment with OARA Score for Same Day Outpatient Primary TJA: A Multi-Center Study

Paper 196

Evan R. Deckard, BSE / Fishers, IN

Co-Authors:

Evan R. Deckard, B.S.E / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: The Outpatient Arthroplasty Risk Assessment (OARA) Score was developed to risk stratify patients for safe same day discharge outpatient total joint arthroplasty (TJA). It has demonstrated predictive ability for length of stay in primary TJA compared to other medical risk stratification systems. However, there is minimal external validity of the original studies. This multi-center database study evaluated the risk assessment and predictive ability for same day discharge of the OARA score on clinical outcomes following primary TJA.

METHODS: Across 40 locations, 12,809 primary TJAs (4,656 hips, 8,153 knees) performed from 2017 to 2023 were identified. A total of 5,552 and 4,974 cases had length of stay and complication/readmission data, respectively. Statistical models evaluated the predictive ability of the OARA Score on same day discharge, complications, and readmission rates within 90-days. P-values ≤ 0.05 were considered statistically significant.

RESULTS: Overall, 1,864 (34%) patients were discharged on the same day after primary TJA. Patients who had an OARA Score <60 and <80 ; and hips (compared to knees) were ≥ 2.6 and 1.2 times more likely to discharge on the same day of surgery; however, only a lower OARA Score was associated with proportionally less complications and readmissions ($P \leq 0.001$). OARA Scores <60 and <80 were associated with $\leq 8.0\%$ and $\leq 9.4\%$ likelihood of any complication, and $\leq 6.4\%$ and $\leq 7.6\%$ likelihood of readmission, respectively. Complications and readmissions were 2.9 to 3.1 and 3.1 to 3.3 times more likely with OARA Scores ≥ 60 and ≥ 80 , respectively.

CONCLUSION: Study results demonstrate lower OARA Scores were predictive of same day discharge, and less chance for a complication or readmission after primary TJA. These results from multiple centers across the United States further support the original studies and provide evidence for the continued use of the OARA Score to identify appropriate candidates for outpatient primary TJA.

Complication Rates for Bariatric Surgical Patients Undergoing Total Hip Arthroplasty

Paper 197

Mason Poffenbarger, M.D. / Denton, TX

Co-Authors:

Hans Drawbert, M.D. / Denton, TX

Mason Poffenbarger, M.D. / Denton, TX

John T. Riehl, M.D. / Southlake, TX

INTRODUCTION: Prior studies have demonstrated that obesity is a risk factor for complications after total hip arthroplasty (THA). The role of bariatric surgery in these patients and the effect it has on outcomes and complications in THA is unclear. This study aims to determine what effect bariatric surgery has on complications following THA.

METHODS: This is a retrospective review looking at patients with a history of bariatric surgery (BS) prior to THA (treatment group) compared to those receiving THA without a history of BS (control group). Complications such as infection, cardiac events, respiratory compromise, readmissions and length of stay were recorded.

RESULTS: 17,273 patients were included in this study. 308(1.7%) had a history of a BS prior to THA. The patients who had undergone BS had significantly higher rates of DVT (4.2% vs 2.3%, $p < 0.031$), and surgical site infection (6.5% vs 3.2%, $P < 0.001$) during their initial hospital stay. BS patients were more likely to be readmitted to the hospital within 30 ($p < 0.001$) and 90 ($p < 0.001$) days of their THA with an odds ratio of 1.761 for 90 day readmission. Similarly, patients with a BMI of 34.99-40 and > 40 had increased odds of 90 day readmission (OR 1.307, 1.457 respectively, $p < 0.01$). Length of stay for the BS group was 1.293 times greater than the patients who had not had BS ($p < 0.00001$).

CONCLUSION: Our study shows that patients who have a history of BS prior to THA are at increased risk for complications such as infection, DVT, length of stay and readmission. Despite undergoing bariatric surgery to lose weight, these patients have increased risk for complications following surgery and increased odds of 90 day readmission greater than those in obese patients.

Is a Telehealth Preoperative Weight Loss Program an Effective Strategy for Meeting BMI Criteria in Total Joint Arthroplasty Candidates?

Paper 198

Simon Mears, M.D. / Little Rock, AR

Co-Authors:

MacLain R. Edington, B.S. / Little Rock, AR
Benjamin M. Stronach, M.S., M.D. / Little Rock, AR
C. Lowry Barnes, M.D. / Little Rock, AR

Simon C. Mears, M.D., Ph.D. / Gainesville, FL
Eric R. Siegel, M.S. / Little Rock, AR
Jeffrey B. Stambough, M.D. / Little Rock, AR

OBJECTIVE: Nearly three-quarters of adults in the United States are overweight or obese, posing challenges for surgical clearances. This study evaluates the 20Lighter® preoperative patient-optimization program (POPOP), an 8-week medical weight loss program addressing obesity through tailored meal plans, natural supplements, and telehealth. It aims to improve total joint arthroplasty (TJA) surgical eligibility, health indicators, and postoperative outcomes compared to standard-of-care (SOC) patient-derived lifestyle changes. We hypothesized that patients completing the 20Lighter POPOP will be more likely to achieve a BMI below 40 kg/m², show improvements in key preoperative health indicators, and demonstrate notably enhanced Patient-Reported Outcome Measures (PROMs) six weeks post-surgery.

METHODS: This prospective, randomized study enrolled patients seeking TJA with a body mass index (BMI) of 41-48 kg/m² over one year at our tertiary referral orthopedic clinic. Patients were randomized into SOC or POPOP groups, with POPOP including meal plans, nutritional supplementation, and daily engagement via a smartphone app with a 20Lighter health care provider for eight weeks. Data on body composition, health indicators, and PROMs were collected and compared between groups with ANCOVA to adjust for baseline assessments.

RESULTS: Of the 46 patients enrolled, 23 completed the study, 10 in POPOP and 13 in SOC. Conversion rates to TJA eligibility were 70% with POPOP vs. 0% with SOC (P<0.001). After 90 days, POPOP participants had 4.69-kg/m² lower BMI (P<0.001) and 2.56% lower visceral fat (P=0.004). POPOP participants also had 2.17% lower body fat percentage (P=0.330) and 1.17% lower body water percentage (P=0.449) after 90 days, though these changes were not statistically significant. Over the same period, changes in hemoglobin A1c (P=0.242), blood urea nitrogen (P=0.054), albumin (P=0.216), creatinine (P=0.245), C-reactive protein (P=0.470), hematocrit (P=0.394), hemoglobin (P=0.668), alanine aminotransferase (P=0.074), and aspartate aminotransferase (P=0.095) levels were non-significant. Six weeks post-TJA, POPOP participants showed a 31.19-point average improvement in KOOS/HOOS JR (P=0.013) and an 11.33-point average decrease in PROMIS® Pain Interference scores (P=0.043) compared to preoperative scores. Changes in PROMIS® Physical Function scores were not significant (P=0.134).

CONCLUSION: The POPOP group achieved more TJA eligibility and greater reductions in BMI and visceral fat compared to SOC. 70% decreased BMI below 40. POPOP had minimal effects on various preoperative health, nutritional, and inflammatory laboratory values, but improved KOOS/HOOS JR and PROMIS Pain Interference scores six weeks post-TJA for participants. These findings demonstrate that a preoperative weight loss program can be a highly effective method in enhancing eligibility for TJA.

The Impact of Leg Length and Offset Change on Dislocation Risk Following Primary Total Hip Arthroplasty

Paper 199

Austin F. Grove / Rochester, MN

Co-Authors:

Austin F. Grove / Rochester, MN

Elizabeth S. Kaji / Rochester, MN

Lainey G. Bukowiec, M.D. / Rochester, MN

Kellen L. Mulford, P.h.D. / Rochester, MN

Dirk R. Larson, M.S. / Rochester, MN

Joshua Labott, M.D. / Rochester, MN

Ryan Roman / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

Michael J. Taunton, M.D. / Rochester, MN

Cody C. Wyles, M.D. / Rochester, MN

INTRODUCTION: Soft tissue management in total hip arthroplasty (THA) includes appropriate restoration and/or alteration of leg length and offset to re-establish natural hip biomechanics. The purpose of this study was to evaluate the effect of leg length and offset derived variables in a multivariable survival model for dislocation.

METHODS: Clinical, surgical, and radiographic data was retrospectively acquired for 12,582 patients undergoing primary THA at a single institution from 1998 to 2018. Twelve variables derived from preoperative and postoperative radiographs related to leg length and offset were measured using a validated automated algorithm. These measurements, as well as other modifiable and non-modifiable surgical, clinical, and demographic factors were used to determine hazard ratios (HR) for dislocation risk.

RESULTS: None of the leg length or offset variables conferred significant risk or protective benefit for dislocation risk. By contrast, all other variables included in the multivariable model demonstrated a statistically significant effect on dislocation risk with a minimum effect size of 28% (range 0.72 - 1.54) (age, sex, surgical approach, acetabular liner type, femoral head size, neurologic disease, spine disease, prior spine surgery).

CONCLUSION: Contrary to traditional teaching and our hypothesis, operative changes in leg length and offset did not demonstrate any clinically or statistically significant effect in this large and well characterized cohort. This does not imply that these variables are not important in individual cases, but rather suggests the overall impact of leg length and offset changes is relatively minor for dislocation risk compared to other variables that were found to be highly clinically and statistically significant in this population. These results may also suggest that surgeons do a good job of restoring native leg length and offset for patients, which may mitigate their analyzed impact.

DAIR for Acute PJI: Results of 133 Primary Hip Arthroplasties at Extended Follow-Up of 7 Years

Paper 200

E. Bailey Terhune, M.D. / Rochester, MN

Co-Authors:

E. Bailey Terhune, M.D. / Rochester, MN

Khaled A. Elmenawi, M.D. / Rochester, MN

Jessica A. Grimm, M.S. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Elie F. Berbari, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

INTRODUCTION: There is renewed interest in single or double debridement, antibiotics, and implant retention (DAIR) for acute periprosthetic joint infections (PJIs). The purpose of this study was to assess the results of single DAIRs for acute PJI after primary hip arthroplasty.

METHODS: We identified 133 hips (114 total hip arthroplasties, 19 hemiarthroplasties) with acute PJI treated with DAIR followed by chronic antibiotic suppression between 2000-2021 at a single institution. Acute postoperative PJI was defined as infection within four weeks of primary hip arthroplasty, and acute hematogenous PJI was defined as infection occurring more than four weeks after primary hip arthroplasty with symptoms for less than 21 days. The mean age was 67 years, 42% were female, and mean BMI was 34 kg/m². PJI diagnosis was based on the 2011 MSIS criteria. Kaplan-Meier survivorship analyses were performed. Mean follow-up was 7 years.

RESULTS: Survivorship free of reinfection was 80% at 1 year, 79% at 2 years, and 77% at 5 years. There was no difference in survivorship free of reinfection between early postoperative and acute hematogenous PJIs ($p=0.1$). McPherson Host Grade C was predictive of reinfection (HR 5, $p=0.03$). Reinfection was caused by the original organism in 38% of hips. Median time to reinfection was 13 days. Survivorship free of any revision was 85% at 1 year, 83% at 2 years, and 82% at 5 years. Indications for revision included recurrent PJI (92%), dislocation (4%), and aseptic mechanical failures (4%). Mean HHS improved from 63 to 83 at 5 years ($p=0.8$).

CONCLUSIONS: In this large series of acute PJIs after primary hip arthroplasties treated with a single DAIR, infection-free survival was 77% at 5 years. Poor host status predicted reinfection. With a rigorous definition of acute PJI, success was markedly improved at extended follow-up compared to most historical series.

SUMMARY: In 133 primary hip arthroplasties with acute PJI treated with a single DAIR, the 5-year survivorship free of reinfection was much improved at 77%. Poor host status was most predictive of failure.

Trends and Epidemiology in Revision Total Hip Arthroplasty: A Large Database Study

Paper 201

Alexander J. Acuña, M.D. / Chicago, IL

Co-Authors:

Conor M. Jones, M.D. / Chicago, IL

Alexander J. Acuna, M.D. / Chicago, IL

Enrico M. Forlenza, M.D. / Chicago, IL

Kyleen Jan, M.D. / Chicago, IL

Craig J. Della Valle, M.D. / Chicago, IL

INTRODUCTION: With the growing clinical and financial burden of revision total hip arthroplasty (rTHA) procedures, investigation is needed to characterize case volume, reason for failure, and postoperative complications. The purpose of this study was to characterize contemporary indications for and complications following rTHA.

METHODS: Patients undergoing rTHA between 2010 and 2021 were identified within the PearlDiver database. Adjusted rTHA incidence was calculated by dividing the annual rTHA volume by the annual primary THA and multiplying by 100,000. Mann-Kendall trend tests were utilized to trend revision volume, etiology, and 90-day postoperative complications.

RESULTS: 225,958 Revision THAs were identified. The annual volume of rTHA did not change over the study period (18,833 to 16,293; $p=0.064$). However, the adjusted incidence of rTHA significantly decreased (20,169.3 to 13,061.2 per 100,000 THAs; $p<0.001$). The most common causes of revision THA were aseptic implant loosening (21.5%), instability (19.8%), and infection (19.1%). The adjusted incidences of revision due to infection (4,659.9 to 2,596.1 per 100,000 THAs; $p<0.001$) and aseptic implant loosening (4,651.4 to 2,493.2 per 100,00 THAs; $p<0.001$) decreased over time. Unfortunately, the adjusted rate of instability (3,149.8 to 3,245.3 per 100,000 THAs; $p=0.304$) did not change. Rates of post-revision deep vein thrombosis, hematoma, surgical site infection, and transfusion significantly decreased over the study period ($p<0.05$) while rates of emergency department visits and readmission did not change.

DISCUSSION: The incidence of rTHA due to infection and aseptic loosening appears to be decreasing, however the risk of revision for dislocation remains unchanged. It is encouraging to see that the rates of postoperative complications also appear to have decreased over time. Advancements in implant design and surgical techniques as well improvements in perioperative protocols may have contributed to these trends. Continued study is necessary to further decrease the need for revision THA and postoperative complications.

Osteochondral Allograft and Autograft Transplantation for Femoral Head Defects: A Multicenter Study with a Mean Five-Year Follow-Up

Paper 202

Jason G. Ina, MD / Rochester, MN

Co-Authors:

Jason G. Ina, M.D. / Rochester, MN

Christopher V. Nagelli, Ph.D. / Rochester, MN

Sean C. Clark, M.S. / Rochester, MN

Anthony DeNovio, M.D. / Rochester, MN

Jason G. Ina, M.D. / Rochester, MN

Louis S. Kang, B.S. / Rochester, MN

Sanathan Iyer, B.S. / Rochester, MN

Kostas J. Economopoulos, M.D. / Rochester, MN

Mario Hevesi, M.D., Ph.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

OBJECTIVE: Osteochondral allograft and autograft transplantation for femoral head defects have emerged as promising treatments for concomitant cartilage and subchondral bone injuries in young patients. The purpose of this study was to evaluate the clinical and radiological outcomes of patients who underwent osteochondral allograft or autograft transplantation for femoral head defects and assess any risk factors that may lead to conversion to THA.

METHODS: All patients who underwent osteochondral allograft or autograft transplantation for femoral head defects across two academic institutions were analyzed. Clinical outcomes were assessed at final follow-up with the modified Harris Hip Score (mHHS), Hip Outcome Score – Activities of Daily Living (HOS-ADL), Hip Outcome Score – Sport-Specific Subscale (HOS-SSS), and International Hip Outcome Tool (iHOT-12). Complications and reoperations were also recorded. Additionally, patients were assessed radiographically preoperatively and at a final postoperative visit using anteroposterior and lateral radiographs for osteoarthritis using Tönnis grading.

RESULTS: A total of 27 patients were included in this study (19 osteochondral allograft transplantation, 8 osteochondral autograft transplantation). The overall mean follow-up was 4.7 years. The average defect size for patients who underwent allograft and autograft transplantation was 2.8 x 2.1 cm and 1.6 x 1.0 cm, respectively. The average mHHS, HOS-ADL, HOS-SSS, and iHOT-12 for the allograft cohort were 86.7, 92.8, 81.4, and 79.0, respectively, while for the autograft cohort it was 87.6, 92.7, 83.1, and 82.0, respectively. There was no significant difference in outcomes for patients who underwent femoral head allograft vs. non-orthotopic femoral condyle allograft transplantation. For the allograft cohort, there were a total of 5 reoperations (26.3%) consisting of 4 THA at a mean of 1.9 years and 1 trochanteric osteotomy nonunion at 0.7 year. For the remaining allograft patients who did not undergo treatment failure, only one (6.7%) had radiographic osteoarthritis progression. None of the patients in the autograft cohort underwent THA. Overall, conversion to THA was 14.8%.

CONCLUSIONS: Osteochondral allograft and autograft transplantation for femoral head defects demonstrated overall favorable clinical outcomes and conversion to THA at mean 5-year follow-up and should be considered for patients with focal femoral head defects.

Results of Hip Decompression in Steinberg 3 and 4 Hips with Segmental Collapse

Paper 203

John-Rudolph H. Smith, M.D. / Rochester, MN

Co-Authors:

Diego J. Restrepo, M.D. / Rochester, MN

Sergio F. Guarin Perez, M.D. / Rochester, MN

John-Rudolph H. Smith, M.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

BACKGROUND: Hip decompression (HD) has shown promising outcomes for osteonecrosis (ON) of the femoral head, particularly when performed in Steinberg 1 and 2 hips. Early intervention may delay the progression to total hip arthroplasty (THA). This study aims to evaluate the outcomes of HD with elevation of the collapsed segment in patients with more advanced stages of disease, specifically those classified as Steinberg stages 3 and 4.

METHODS: A total of 263 patients underwent HD for ON between 2007 and 2020. 13 hips undergoing HD with elevation of necrotic segment collapse for Steinberg 3 or 4 hips were included. Four hips underwent HD through a surgical hip dislocation, while the rest underwent percutaneous decompression. Postoperatively patients were made toe-touch weightbearing for 3 months on crutches. The mean age at surgery was 31.8 years (range: 12-58), with 77% being male. The average BMI was 24.9 kg/m² (range: 17-33). The modified Kerboul angle was measured in preoperative MRI. Patient characteristics, risk factors associated with ON, operative notes, and clinical and patient-reported outcomes (preoperative pain, postoperative pain, and the University of California Los Angeles (UCLA) activity scale were collected.

RESULTS: Six hips were classified as Steinberg stage 3 and seven as Steinberg stage 4. The average follow-up period after HD was 5.41 years (range: 3.7 months to 9.2 years). An updated follow-up is pending for 4 hips. Five patients had idiopathic ON, six had a history of steroid usage, and two were heavy alcohol consumers. Of the 13 hips, 31% (4 patients) required conversion to THA at an average time of 2.3 years. The modified Kerboul angle was measured on MRI, with six patients in the group having angles less than 200 degrees and seven patients with angles over 200 degrees. No significant association was found between a larger Kerboul angle and the need for THA (HR 1.93; p=0.5765). Patients who did not require conversion to THA reported a decrease in daily life pain at the latest follow-up (mean pain score 2.6/10) compared to preoperative levels (mean 8/10) and achieved UCLA Activity Scale values of 7 or above.

CONCLUSION: HD with segment elevation for ON stages 3/4 shows potential for delaying or avoiding THA in patients with smaller medial lesions. Further follow-up and studies are needed for robust data on these high-risk patients.

Substantial Loss of Skeletal Muscle Mass Occurs Early After Hip Preservation Surgery

Paper 204

Irving Delgado-Arellanes, B.S. / Iowa City, IA

Co-Authors:

Irving Delgado-Arellanes, B.S. / Iowa City, IA
Robert Westermann, M.D. / Iowa City, IA
John Davison, M.D. / Iowa City, IA
Natalie Glass, Ph.D. / Iowa City, IA
Courtney Seffker, PA-C / Iowa City, IA

Gretchen Jones, B.S. / Iowa City, IA
Steele McCulley, B.S. / Iowa City, IA
Jenna Jensen, B.S.N, RN / Iowa City, IA
Ashley Kochuyt, B.S. / Iowa City, IA
Michael C. Willey, M.D. / Iowa City, IA

INTRODUCTION: Skeletal muscle mass is important for physical performance. Orthopaedic surgery can cause loss of skeletal muscle mass that is not easily recovered through postoperative rehabilitation. The quantity of skeletal muscle lost after hip preservation surgery has not been documented. The aim of this study was to document preoperative to postoperative changes in body composition for patients undergoing hip arthroscopy (HA), periacetabular osteotomy (PAO), and femoral osteotomy (FO).

METHODS: We prospectively enrolled patients indicated for hip preservation surgery. Body composition was measured preoperatively and at 3 weeks, 6 weeks, 3 months, and 6 months using a bioelectrical impedance analysis device (Skeletal Muscle Mass (SMM) and Body Fat Mass (BFM)). Additionally, patients completed baseline international Hip Outcome Tool (iHOT) score, a measure of hip pain and disability. Changes in body composition were evaluated using generalized linear mixed models. Correlations between iHOT scores and body composition were described using Pearson correlation coefficients.

RESULTS: 79 participants (mean age 23.9 ± 8.3 years) were enrolled and completed at least one follow up measurement. Participants were predominantly female (85%) and 52% underwent either PAO/FO. Sensitivity analyses determined no difference between arthroscopy vs osteotomy procedures in baseline characteristics and changes in body composition over time. Participants lost a mean of -0.59 (-0.94 - -0.25) kg of skeletal muscle mass by 6 weeks (27.5 (26.1 - 28.9)kg preoperatively to 26.9 (25.9 - 28.6) kg 6 weeks postoperatively, $p=0.003$) with significant recovery by 12 weeks ($p=0.142$). Mean preoperative iHOT score was 31.1 ± 15.9 . There were small, significant correlations between these iHOT scores and preoperative fat mass ($r = -0.25$, $p=0.019$) and skeletal muscle mass ($r=0.25$, $p=0.028$). Fat mass did not significantly change from preoperative (mean: 22.3 (95% CI: 19.8 - 24.7) kg) to 12 weeks postoperative (22.6 (20.3 - 24.9) kg, $p=0.555$).

DISCUSSION: We found early loss of skeletal muscle mass by 6 weeks postoperatively with recovery by 12 weeks in young adults undergoing hip preservation surgery. Interestingly, loss of muscle mass was not greater in young adults undergoing hip osteotomy procedures. Furthermore, there was a positive correlation between preoperative iHOT and skeletal muscle mass with a similar inverse relationship with fat mass, suggesting that higher disability and pain were associated with higher fat mass and lower muscle mass. These findings are significant for establishing trends of muscle mass loss in young adults undergoing hip preservation surgery that would allow surgeons to develop interventions to mitigate muscle loss after surgery.

Rotational Femoral Osteotomy to Treat Abnormal Femoral Version

Paper 205

Steele McCulley, B.S. / Iowa City, IA

Co-Authors:

Steele McCulley, B.S. / Iowa City, IA

Robert Westermann, M.D. / Iowa City, IA

Courtney Seffker, PA-C / Iowa City, IA

Jenna Jensen, RN / Iowa City, IA

Joshua Hockman / Iowa City, IA

Ashley Kochuyt, B.S. / Iowa City, IA

Michael Willey, M.D. / Iowa City, IA

OBJECTIVE: The impact of femoral version (also referred to as femoral torsion) on gait and hip mechanics is the topic of recent investigation. Femoral version is the primary driver of hip range of motion and can cause femoroacetabular impingement (femoral retroversion) and instability (femoral anteversion). Abnormal femoral version is a common cause of persistent hip pain after arthroscopic treatment. The aim of this study was to report clinical outcomes of rotational femoral osteotomy to treat abnormal femoral version.

METHODS: Patients indicated for diaphyseal femoral osteotomy to treat either excessive femoral anteversion or retroversion prospectively completed the International Hip Outcome Tool-11 (iHOT) survey preoperatively and 6 months and 1 year postoperatively to measure hip pain and dysfunction. Femoral osteotomy was performed with an open approach and repaired with a 4.5mm plate. Additionally, patient demographics, femoral version measured with CT scan, laterality, previous hip arthroscopy surgery, concomitant hip preservation surgery, and non-union requiring revision surgery was recorded.

Preoperative to 6-month and 12-month iHOT scores were compared. The incidence of achieving Minimal Clinically Important Differences (MCID) was recorded (Δ iHOT >15). Differences between groups were evaluated using t-tests.

RESULTS: 42 patients underwent rotational diaphyseal femoral osteotomy and completed preoperative, 6 month, and 1-year postoperative iHOT surveys. Average age was 22.7 ± 7.2 years and 90.5% were female, with an average BMI of 26.87 ± 6.24 . Femoral osteotomy was performed for excessive anteversion in 57% retroversion in 43%. Previous hip arthroscopy was performed in 40% of patients (2 had previous periacetabular osteotomy and 1 had undergone previous PAO with hip arthroscopy). 38 patients underwent hip arthroscopy (one labral reconstruction) and 5 underwent PAO during the same surgical procedure as the femoral osteotomy.

One patient experienced non-union that underwent revision fixation with an intramedullary nail. Mean (SD) preoperative iHOT scores was 32.5 ± 17.4 and increased to 60.4 ± 26.7 . At 6-months postoperatively, the mean iHOT score increased 34.0 ± 24.2 points ($p < 0.001$) with 66.6% meeting MCID. Mean 1-year postoperative iHOT scores were 63.2 ± 25.4 , an increase of 34.8 ± 25.4 ($p < 0.001$) with 71.4% meeting MCID.

CONCLUSIONS: Diaphyseal rotational femoral osteotomy repaired with a plate has a high union rate and improved patient-reported hip pain and dysfunction. Nearly half of these surgeries were performed for patients with previous hip preservation surgery, with 40% having undergone previous hip arthroscopy, possibly contributing to the lower rate of meeting MCID compared to other hip preservation surgeries.

Outpatient Periacetabular Osteotomy: Common Clinical Fact or Insurance Fiction?

Paper 206

Brandon C. Cabarcas, M.D. / Rochester, MN

Co-Authors:

Sean C. Clark, M.S. / Rochester, MN

Brandon C. Cabarcas, M.D. / Rochester, MN

Jason G. Ina, M.D. / Rochester, MN

Louis S. Kang, B.S. / Rochester, MN

Gavin H. Ward, B.S. / Rochester, MN

Sanathan Iyer, B.S. / Rochester, MN

Karen Gomez-Ruiz, PA-C / Rochester, MN

Robert T. Trousdale, M.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

Mario Hevesi, M.D. / Rochester, MN

OBJECTIVE: Periacetabular osteotomy (PAO) is a complex procedure historically requiring inpatient stay. There is increased emphasis for these to be performed on an outpatient or outpatient overnight basis by insurance companies. The purpose of this study was to investigate the proportion of various surgical listing classifications (outpatient, outpatient-overnight, inpatient), the incidence of subsequent denial/request for additional documentation for approval of inpatient stay, and to characterize the average length of stay (LOS) following PAO.

METHODS: A retrospective chart review was performed to identify all PAOs, performed by four participating surgeons, at a single academic institution over a two-year period. The initial listing status as an outpatient-overnight or inpatient procedure was identified. Whether a preoperative peer review was required for approval of inpatient listings as well as if additional documentation was necessary to convert outpatient-overnight listings to inpatient stays were also recorded.

RESULTS: A total of 140 PAOs amongst 117 patients were performed with 25 (17.9%) initially listed as an inpatient stay and 115 (82.1%) listed as outpatient-overnight. Of the 25 PAOs listed as inpatient, 2 (8.0%) required a preoperative peer review process to justify or clarify listing status. The average LOS was 1.9 ± 1.4 days with 55.7% (78/140) of PAOs staying two or more nights in the hospital. Only 6 PAOs (4.3%) went home the same day as surgery. Patients who underwent PAO with concomitant hip arthroscopy stayed on average 2.4 ± 1.2 days in comparison to 1.6 ± 1.4 days for those who underwent PAO alone ($p < 0.001$). Of the 115 PAOs listed as an outpatient-overnight, 53 (46.1%) converted to an inpatient stay.

CONCLUSIONS: Over half of PAOs performed required inpatient stay beyond outpatient-overnight status. Preoperative peer-to-peer review for inpatient stay approval was modestly frequent (8% of inpatient listings), and all conversions to inpatient required additional service documentation to support status conversion. Understanding trends in postoperative hospitalizations and LOS might allow for better informed partnerships between surgeons and insurance companies creating more efficient pre-authorizations, billing practices, and expected patterns of patient care and discharge.

Patient Personality Influences Early Satisfaction After Primary Total Joint Hip and Knee Arthroplasty

Paper 207

Leonard T. Buller, M.D. / Indianapolis, IN

Co-Authors:

Mary Ziemba-Davis, B.A. / Indianapolis, IN

Jared A. Zanolta, B.S. / Indianapolis, IN

Kevin A. Sonn, M.D. / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

OBJECTIVE: Up to 20% of patients report dissatisfaction after primary total joint arthroplasty (TJA). Patient characteristics, surgical techniques, and clinical outcomes do not fully explain dissatisfaction. It is known that dispositional personality traits are related to health behaviors and outcomes. We evaluated the relationship between patient personality and early overall satisfaction after TJA.

METHODS: Elective primary TJAs (n=166, 40% hip, 60% knee) performed for osteoarthritis were prospectively enrolled in the study. The sample consisted of 60% women, with average age and body mass index (BMI) of 67 (range: 43-86) years and 34.7 (range: 14.0-64.9) kg/m². A validated personality assessment, the Big Five Inventory-2 Short Form, was administered preoperatively. Satisfaction was measured at a mean of 4.6 ±0.9 months postoperatively as were other covariates including whether expectations for pain and functional improvement were met, joint health scores, activity level, mental and physical health, and health literacy. Patient sex, race, age, BMI, ASA-PS classification, surgeon, procedure type, and complications within 90 days of surgery also were evaluated as covariates. Variables significantly related to being satisfied or very satisfied with TJA were analyzed with binary logistic regression.

RESULTS: Patient reported satisfaction was 83% for improvement in recreational activities, 87% for activities of daily living, 95% for pain, and 95% overall (P<.001). In multivariable analyses, each unit increase in the personality domain open mindedness increased the odds of being satisfied or very satisfied overall by 8.8 times (95% CI 1.5, 50.4, P=.015) as did each unit increase in expectations for TJA being met (odds ratio = 3.5, 95% CI 1.7, 7.4, P=.001) with no interaction between the two predictors.

CONCLUSIONS: In addition to preoperative expectations being met, patient personality may influence early patient-reported satisfaction after TJA warranting careful consideration of using patient-reported satisfaction to assess surgical effectiveness and reimbursement without controlling for personality influences.

Patient Perspective on Robotic Assisted Total Joint Arthroplasty

Paper 208

Siddhartha Dandamudi / Canton, MI

Co-Authors:

Siddhartha Dandamudi, B.B.A / Chicago, IL

Kyleen Jan, M.D. / Chicago, IL

Madelyn Malvitz, B.S. / Chicago, IL

Anne DeBenedetti, M.S.c / Chicago, IL

Omar Behery, M.D., M.P.H / Chicago, IL

Brett R. Levine, M.D., M.S. / Chicago, IL

Aditya Yadav, B.S. / Chicago, IL

INTRODUCTION: Robotic-assisted total joint arthroplasty (TJA) has gained popularity in recent years. Despite, mixed patient and surgeon perceptions and evidence regarding efficacy, utility and cost-effectiveness in comparison to manual TJA, marketing of robotic technology to patients has increased. Patients' perspective and expectations surrounding robotic assisted TJA remain unclear. This study aims to assess patients' expectations on robotic technology in TJA.

METHODS: A 9-question survey assessing patient understanding and expectations of the use of robotics in TJA was distributed to preoperative and postoperative hip and knee patients of multiple surgeons at a large academic center. Responses were descriptively analyzed.

RESULTS: 498 responses were collected. 69.1% of respondents are aware of robotic usage in TJA. 68.5% are interested, but unsure of the benefits and 19.5% feel it is superior to manual surgery. Most patients did not consider robotic TJA as minimally invasive surgery, with 61.7% stating they are not the same. Additionally, 52.3% were not comfortable with extra incisions or longer incisions for robotic procedures. When it comes to choosing a surgeon, 94.9% did not consider if the surgeon is able to perform robotic TJA, 74.4% wanted their surgeon proficient in manual TJA, and 72.4% felt that surgeons who use robotic technology are not more capable than manual surgeons.

CONCLUSION: Awareness and curiosity of robotic assisted TJR exists, however the majority of patients did not appear to acknowledge superiority or benefits over manual surgery. Surgeons should weigh patient goals and expectations along with outcomes and cost considerations when choosing to perform robotic TJA.

Assessing the Impact of a Transitional Care Program Following Inpatient Admission After Lower Extremity Arthroplasty

Paper 209

Mackenzie A. Neumaier, M.D. / Houston, TX

Co-Authors:

Mackenzie A. Neumaier, M.D. / Houston, TX

Thomas C. Sullivan, B.S. / Houston, TX

Katherine E. Schriener, PA-C / Houston, TX

Sade P. Kelly, RN / Houston, TX

Timothy S. Brown, M.D. / Houston, TX

Kwan J. Park, M.D. / Houston, TX

OBJECTIVE: Transitional care programs aim to shift perioperative care to the home environment for high-risk patients, who may have previously been subjected to rehabilitation or skilled nursing facilities (SNF). We investigated the success of the transitional care program utilized by our institution regarding readmission rates and postoperative emergency department (ED) visits in enrolled patients compared to a similar demographic of patients that did not participate. We hypothesized that transitional care will result in a decrease on both readmission rate and ED visits.

METHODS: In this retrospective cohort study, patients that underwent lower extremity arthroplasty (both primary and revision) procedures between 2018-2023 that were admitted or observation status postoperatively and enrolled in the transitional care program were compared to patients who had either declined enrollment or received surgery prior to the program's inception. Exclusion criteria included discharge to SNF or rehab. Both cohorts were then compared regarding 30- and 90-day readmission rate as well as postoperative ED visits and logistic regression was used to adjust for differences between groups.

RESULTS: One hundred and seventy-six subjects were enrolled in the transitional care group and 449 patients in the control group. At both 30- (4.5% Enrolled, 9.6% Non-Enrolled) and 90-day timepoints (9.1% Enrolled, 1.60% Non-Enrolled), transitional care program accounted for a lower readmission rate which remained significant after adjustment for Elixhauser Comorbidity Index ($P < 0.001$ at both 30- and 90- days). ED visits were not significantly different at either time point. In both groups, the most common reason for readmission was infection/wound problem (37.5% and 25% of readmissions at 30d and 90d, respectively for the enrolled cohort, and 24.44% and 28.57% for the non-enrolled at 30d and 90d, respectively). The only significant finding was increased cardiovascular readmissions in the non-enrolled group at 30-days ($P = 0.040$). Regarding ED visits, the most common reason for the enrolled group at both 30d (46.15% of total visits; $P = 0.003$) and 90d (33.33% of total visits; $P = 0.003$) was dressing/orthotic related problem. Whereas, for the non-enrolled group, pain was the most common reason accounting for 28.94% of visits at 30d and 22.03% of visits out to 90d ($P = 0.255$).

CONCLUSIONS: Since implementing a transitional care program, our system has observed decreased readmission rates at 30 and 90 days postoperatively. Our results suggest it is particularly effective in reducing more general medical concerns, however, it may be less effective in reducing orthopedic complaints, such as managing dressings.

Patient Personality Influences Preoperative Expectations Before Primary Total Hip and Knee Arthroplasty

Paper 210

Jared A. Zanolla, B.S. / Indianapolis, IN

Co-Authors:

Jared A. Zanolla, B.S. / Indianapolis, IN

Mary Ziemba-Davis, B.A. / Indianapolis, IN

Kevin A. Sonn, M.D. / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

OBJECTIVE: Satisfaction with primary THA and TKA is correlated with expectations for improved pain and function, but less is known about factors influencing patient expectations. Dispositional personality traits are related to health behaviors and outcomes. We evaluated the relationship between personality and expectations for primary THA and TKA.

METHODS: Elective primary THAs (n=160) and TKAs (n=240) performed for osteoarthritis were prospectively enrolled in the study. The THA sample consisted of 52% women, with average age and body mass index (BMI) of 66 (range: 31-88) years and 32.5 (range: 14.0-59.3) kg/m². For TKAs, these statistics were 67%, 66 (range: 43-86), and 35.6 (range:18.0-67.9). Measures were completed preoperatively. Independent and dependent measures were the Big Five Inventory-2 Short Form (BFI-2-S) and Knee Society expectations for pain and functional improvement, respectively. Covariates included HOOS JR and KOOS JR joint health, health literacy, PROMIS mental and physical health, patient sex, race, age, BMI, and ASA-PS classification.

RESULTS: In multivariable analyses, each unit increase in the personality domain extraversion increased expectation scores .453 (95% CI .089-.816, P=.015) points for THA and .350 (95% CI .004-.696, P=.048) points for TKA. Each unit increase in conscientiousness increased expectation scores .528 (95% CI .219-.837, P=.001) points for THA with no effect for TKA. In bivariate analyses, mean extraversion (P=.004 and .008 respectively) and conscientiousness (P=.003 and .012) were higher in THA and TKA patients with the highest expectation scores (15) and lowest in THA (\leq .027) and TKA (\leq .001) patients with the lowest expectation scores (\leq 10). For both THA (P=.051) and TKA (P=.023), mean negative emotionality was significantly higher in patients with the lowest expectation scores.

CONCLUSIONS: Expectations, and hence possibly satisfaction, are influenced by patient personality. Understanding the influence of personality is crucial with the increasing use of patient-reported outcomes to assess surgical effectiveness and reimbursement.

A Survey of Communication Preferences of Total Joint Arthroplasty Patients

Paper 211

Ajay Potluri / Canton, MI

Co-Authors:

Siddhartha Dandamudi, B.B.A. / Chicago, IL

Kyleen Jan, M.D. / Chicago, IL

Ajay Potluri, B.S. / Chicago, IL

Anne DeBenedetti, M.S.c / Chicago, IL

Omar Behery, M.D., M.P.H. / Chicago, IL

Brett R Levine, M.D., M.S. / Chicago, IL

INTRODUCTION: Patient satisfaction is paramount within orthopedics, and effective communication is essential for fostering a strong physician-patient relationship. With a growing number of patient engagement platforms, understanding communication preferences is crucial to help tailor practice specific patient contact strategies more effectively. This study's goal is to assess communication medium preferences of orthopedic patients.

METHODS: A 10-question survey focused on patient communication preferences with the surgical team was distributed anonymously to patients at clinic visits of multiple surgeons at a large academic center. No identifying information was collected, and all responses were exported to a database.

RESULTS: 537 responses were collected. 96.1% of patients were willing to share their phone number with the surgical team with 48.9% and 39.2% indicating a phone call and text respectively were their preferred communication medium. The patient portal was the least popular communication medium (54.8%). A majority (93.7%) of respondents had positive feelings towards receiving one-way message updates with reminders, videos, and expected milestones peri operatively. Most patients (92.7%) want an open line of communication with the surgical team and almost every respondent (99.2%) believes the surgeon or insurance company are responsible financially for this means of communication or patient engagement platform.

CONCLUSION: It appears direct communication via phone calls and texts is the preferred medium of communication with orthopedic patients. Financially, surgeons should be aware that engagement platforms may add to a practice overhead and should include these favorable communication pathways. Aligning practices with patient preferences may improve perceived patient satisfaction.

The Impact of Hemipelvectomy and Hip Disarticulation on Lumbar Bone and Muscle Quality

Paper 212

Hannah A. Levy, M.D. / Rochester, MN

Co-Authors:

Hannah A. Levy, M.D. / Rochester, MN
Caden Messer, B.S. / Rochester, MN
Sarah Padilla / Rochester, MN
Bradford Currier, M.D. / San Diego, CA
Ahmad Nassr, M.D. / Rochester, MN

Brett Freedman, M.D. / Rochester, MN
Melvin Helgeson, M.D. / Rochester, MN
Matthew Houdek, M.D. / Rochester, MN
Fantley Smither, M.D. / Rochester, MN
Brian Karamian, M.D. / Salt Lake City, UT

AIMS: After hind-quarter amputations (hemipelvectomy (HP) and hip disarticulation (HD)), asymmetric axial loading patterns and altered trunk-pelvis kinematics may cause mechanical back pain, precipitate paraspinal muscular changes, and accelerate lumbar spondylosis. Due to the rarity of these procedures, studies reporting long-term spinal outcomes after these surgeries are limited. This study aimed to examine the long-term perioperative changes in lumbar bone quality, paraspinal muscle size and fat content, and facet degeneration after HP and HD.

METHODS:

All patients who underwent HP or HD for malignancy or infection at an academic center between 2003-2022 were retrospectively identified. Patients were required to have paired preoperative and postoperative CT at a minimum of one year after surgery. Preoperative to postoperative changes in multifidus, erector spinae, quadratus lumborum, and psoas cross-sectional area (CSA) and Hounsfield units (HU; capturing muscle radiographic attenuation associated with increased muscle lipid content) were calculated for the amputated and contralateral side at the level of the L3-4 disc space. Perioperative changes in lumbar vertebral HU and facet degeneration (CT Weishapt grade) were determined. Paired univariate analysis was utilized to compare preoperative and postoperative outcomes.

RESULTS:

A total of 16 patients (8 HP, 8 HD) met the inclusion/exclusion criteria. The pre- to postoperative changes in HUs in the L1, L3, and L5 vertebral bodies were -27.0 ($p=0.004$), -51.5 ($p=0.002$), and -48.1 ($p=0.001$), respectively. The decrease in L1 HU was greater for prosthesis non-users (user: -16.50, non-user: -51.32, $p=0.021$). L5-S1 segment facet degeneration increased postoperatively ($p=0.030$, $n=7$ progressed). There were significant pre- to postoperative changes in psoas CSA (preop: 1063.4, postop: 586.5, $p=0.005$) and psoas HU (preop: 50.95, postop: 33.55, $p<0.001$) on the amputated but not the contralateral side. Sub-analysis of the HP group demonstrated decreased quadratus lumborum CSA (preop: 495.1, postop: 240.0, $p=0.008$) and quadratus lumborum HU (preop: 51.35, postop: 30.95, $p=0.008$) on the amputated but not the contralateral side.

CONCLUSION:

Hind-quarter amputations were associated with decreased lumbar bone quality, progression of facet degeneration, and loss of amputated side psoas muscle tone. Daily prosthesis use was moderately protective for lumbar bone quality following amputation. HP but not HD was associated with postoperative loss of amputated side quadratus lumborum tone.

Osteosarcoma of the Scapula: A Review of 36 Cases from a Single Institution

Paper 213

Leilani Garayua-Cruz , B.S. / Rochester, MN

Co-Authors:

Leilani Garayua-Cruz , B.S. / Rochester, MN

Samuel E. Broida, M.D. / Rochester, MN

Steven Robinson, M.D. / Rochester, MN

Scott Okuno, M.D. / Rochester, MN

Peter S. Rose, M.D. / Rochester, MN

Matthew T. Houdek, M.D. / Rochester, MN

OBJECTIVE: Osteosarcoma of the scapula is extremely rare and data on outcomes are limited. We sought to describe the surgical and oncologic treatment and outcome of these tumors at our institution.

METHODS: 36 patients from a single institution surgically treated for OSS between 1983-2022 were retrospectively reviewed. Exclusion criteria included non-operative treatment, palliative surgical treatment, and metastases at diagnosis. The measures of outcome were local recurrence-free and metastasis-free survival, as well as postoperative complications and repeat surgeries.

RESULTS: 32 tumors were high grade. Twenty-five patients underwent partial scapulectomy and 10 patients underwent total scapulectomy. Four patients were reconstructed with allograft-prosthetic composite (13%), sixteen had spacers or suspensions (52%), six had fibrometal fusion or free fibula graft(19.4%), one had iliac crest autgraft (3.2%), and three patients did not require reconstruction. Thirty-five patients had margin-negative resection and one patient had microscopic positive margins at the brachial plexus. Eighteen patients experienced surgical complications, most commonly subluxation and loosening of prosthesis. Seven patients developed local recurrence. Recurrence-free survival of patients with scapular osteosarcoma was 67% at 1 year and 46% at 5 years. Disease-specific survival was 83% at 1 year and 59% at 5 years.

CONCLUSION: Osteosarcomas involving the scapula present a challenging disease process due to their location and soft tissue involvement. Furthermore, their oncologic outcomes are similarly poor with probable malignant transformation. While surgery can result in a favorable curative outcome for a small subset of patients, surgical intervention carries a high risk of complications and recurrence.

Low Utility of Pet CT in Staging of Extremity Synovial Sarcoma

Paper 214

Samuel E. Broida, M.D. / Rochester, MN

Co-Authors:

Samuel E. Broida, M.D. / Rochester, MN

Leilani Garayua-Cruz , B.S. / Rochester, MN

Peter S. Rose, M.D. / Rochester, MN

Matthew T. Houdek, M.D. / Rochester, MN

BACKGROUND: Synovial sarcoma has been shown to have similar rates of lymph node metastases compared to other soft tissue sarcomas, however providers still order PET-CT for initial staging based on the historical belief of increased risk of lymph node metastases. As such, we sought to determine whether there was added value of PET-CT in staging of extremity synovial sarcoma.

METHODS: We reviewed 154 patients with extremity synovial sarcoma at a single institution between 1995 and 2022. Data on preoperative imaging, biopsy, surgical treatment, and histopathology were reviewed.

RESULTS: 56 patients received a preoperative FDG PET-CT. Of these, 16 (29%) had avid regional lymph nodes, fourteen of which were biopsied or removed during resection. Pathology revealed tumor in the node in 5 of these 14 (35%). Of the 40 patients without avid nodes on PET, none underwent preoperative biopsy. Eight of these patients had histologic examination of lymph nodes during resection and all were negative. Of those without lymph node metastases, five (10%) had metastatic disease elsewhere including the lungs (n=4) and thoracic spine (n=1). All five metastases were also detected on preoperative chest CT.

CONCLUSION: FDG PET-CT did not provide additional value in the staging of patients with synovial sarcoma of the extremities. Lymph node involvement is rare and was detected in less than 10% of patients. Only one third of patients with avid nodes on PET-CT had histopathologic confirmation of tumor involvement in the lymph node. PET-CT did not detect any metastases that were not otherwise seen on dedicated chest CT.

Rotationplasty as an Effective Limb Salvage Option in the Adult Population

Paper 215

Mikaela H. Sullivan, M.D. / Rochester, MN

Co-Authors:

Mikaela H. Sullivan, M.D. / Rochester, MN

Alexandra M. Arguello, M.D. / Rochester, MN

Stephen A. Sems, M.D. / Rochester, MN

Matthew T. Houdek, M.D. / Rochester, MN

OBJECTIVE: Rotationplasty is a limb salvage option for musculoskeletal tumors of the lower extremity and was historically indicated for the pediatric population. Indications, however, have expanded considering the success of this procedure. The aim of this study is to evaluate functional outcomes and complications in adults undergoing rotationplasty for oncologic and non-oncologic indications.

METHODS: Six (2 male:4 female) adult patients undergoing rotationplasty at our institution were reviewed. Mean age was 33 ± 17 (range 22-65) years and mean follow up was 1 ± 0.4 years. Indications for rotationplasty included primary malignancy ($n=2$) and previous limb salvage attempts ($n=4$). One patient undergoing rotationplasty for malignancy experienced recurrence requiring hip disarticulation at 5 months. The remaining patients had a minimum one year follow up and were included in functional outcomes.

RESULTS: Prosthetic fitting occurred at mean 4 ± 2 months postoperatively in the 5 patients with rotationplasty at final follow up. All patients were ambulating without gait aids, and 4/5 returned to work. Four patients were functioning at a K-level 3 with their prosthesis, while one patient was functioning at a K-level 4. On examination, mean extension lag was $19\pm 14^\circ$. Mean MSTS score was $76\pm 30\%$.

Postoperative complications included expanding hematoma ($n=1$) requiring return to the operating room and delayed wound healing ($n=1$). At most recent follow up, 3/5 patients reported ongoing pain, including neuropathic pain, Achilles tendonitis, and residual limb sensitivity.

CONCLUSIONS: Rotationplasty is an effective option for limb salvage in the adult population with promising functional outcomes and should be considered in adult patients requiring resection of the knee joint.

A Multidisciplinary Protocol for Decreasing Door Openings in Elective Spine Surgery Operating Rooms

Paper 216

Parker Chrisler, B.S. / Madison, WI

Co-Authors:

Parker Chrisler, B.S. / Madison, WI

Rachael Tolsma, M.D. / Madison, WI

Seth Williams, M.D. / Madison, WI

Paul S. Whiting, M.D. / Madison, WI

INTRODUCTION: An increase in the openings of operating room doors is associated with increased airborne pathogenic organisms and a heightened risk for surgical site infections (SSIs). SSIs lead to worse patient outcomes, longer hospital stays, and increased health care costs. The incidence of SSIs in spine surgery ranges from 1-16%, with up to two-thirds of spine SSIs requiring reoperation. Though SSIs are a consequential complication and operating room foot traffic increases the risk of SSIs, there is a paucity of literature on foot traffic in orthopedic spine surgery. This prospective observational study assesses the change in operating room foot traffic before and after the implementation of multidisciplinary infection control interventions during twenty-eight pre-intervention and twenty post-intervention elective orthopedic spine cases.

METHODS: We began with a 4-week observational period identifying the number of door openings by door type and personnel type. Each surgical case was split into three phases 1) opening of sterile equipment to patient entering the room, 2) patient entering the room to incision, and 3) incision to wound coverage. We categorized door opening incidents by personnel type, door type, and phase of surgery. After the first 4-week observation period, we then implemented infection control interventions including personalized signage indicating when the sterile surgical equipment was open and relocating the alcohol-based surgical scrub stations into the operating room. Descriptive statistics for the number of door openings stratified by door type and staff type were compiled in the form of means (SD) and medians (IQR) with negative binomial modeling to model door openings as a count with surgical phase time used as an offset.

RESULTS: After implementation of the infection control interventions, we observed a significant decrease in door openings by nursing in all three phases of surgery (Phase 1: $P < 0.0001$, Phase 2: $P = 0.0056$, Phase 3: $P = 0.003$) and a significant decrease by the surgical team in Phase 2 ($P < 0.0001$). Regarding overall door opening counts, there was a statistically significant reduction in the rate of core door opening across all three phases of surgery (Phase 1: $P = 0.033$, Phase 2: $P = 0.0012$, Phase 3: $P = 0.013$) and a statistically significant reduction in the main door opening rate in Phases 1 and 2 (Phase 1: $P < 0.0001$, Phase 2: $P < 0.0001$).

CONCLUSION: Interdisciplinary infection control interventions can decrease door openings and potentially reduce surgical site infections in orthopedic spine surgeries.

OUTCOME MEASURES: Outcome measures include the number of door openings further characterized by personnel type, door type, and phase of surgery.

Multi-Disciplinary Care Pathway for High-Risk Scoliosis Patients

Paper 217

Kenzie D. Lundqvist, M.D. / Akron, OH

Co-Authors:

Kenzie D. Lundqvist, M.D. / Akron, OH

Michael T. Bigham, M.D., MBA / Akron, OH

Matthew B. Holloway, M.D. / Akron, OH

Richard P. Steiner, Ph.D. / Akron, OH

Todd F. Ritzman, M.D. / Akron, OH

Lorena V. Floccari, M.D. / Akron, OH

OBJECTIVE: Neuromuscular scoliosis (NMS) patients undergoing posterior spinal fusion (PSF) are at high risk for complication and prolonged hospitalization. Multi-disciplinary care standardization has been shown to positively affect patient outcomes in other patient populations, so a comprehensive perioperative pathway for high-risk NMS patients was implemented for optimization and standardization of perioperative care. The purpose of this study was to compare early patient outcomes pre- vs. post-implementation of the multidisciplinary NMS perioperative pathway.

METHODS: This was a retrospective comparative cohort study performed at a single freestanding tertiary children's hospital. A multidisciplinary team developed a standardized care pathway, which was implemented in May 2018. Consecutive high-risk scoliosis patients of syndromic and/or neuromuscular etiology with complex multi-system involvement who underwent PSF from 2014–2023 were included, and pre- vs. post-pathway comparison was performed. NMS patients who underwent a procedure other than the standard PSF surgery were excluded.

RESULTS: Ninety-one high-risk patients were included (30 pre-pathway, 61 post-pathway). There were no significant differences in preoperative demographic or curve characteristics between groups. In the post-pathway group, there were significantly more fusion levels than the pre-group (15.3 vs 14.4, $p=0.015$), greater frequency of pelvic instrumentation (43.3% vs 73.8%, $p=0.005$), and longer mean operative time (315.9 vs 357.0 minutes, $p=0.032$). Estimated blood loss was similar between groups ($p=0.327$). The mean pediatric intensive care unit (PICU) length of stay (LOS) significantly decreased from 3.8 to 2.5 nights after care pathway implementation ($p=0.017$). Similarly, mean total hospital LOS (8.3 vs 6.8 days, $p<0.001$) and median hospital LOS (7.5 vs 5.0 days, $p<0.001$) significantly decreased after pathway implementation. No significant differences were seen in early complications, including surgical site infection, emergency department (ED) visits, readmissions, or reoperations.

CONCLUSIONS: A comprehensive multidisciplinary perioperative pathway for high-risk NMS patients undergoing PSF results in 34% shorter PICU and 18% shorter total hospital LOS, despite greater use of pelvic instrumentation and longer operative duration, without increase in infection, ED visits, readmissions, or reoperations. This pathway conserves hospital resources and should decrease cost of hospitalization. Other institutions may utilize this example as a multi-disciplinary approach to scoliosis and modify it as appropriate for their facility.

How Long Can You Go? Estimating Blood Loss in AIS Surgery with Patient and Surgeon Specific Calculator

Paper 218

Anne Boeckmann, BESS / Fort Worth, TX

Co-Authors:

Anne Boeckmann, BESS / Fort Worth, TX

Lydia Klinkerman, B.S. / Dallas, TX

David Thornberg, B.S. / Fort Worth, TX

Amy L. McIntosh, M.D. / Dallas, TX

INTRODUCTION: Over the last decade, strategies to minimize blood loss and decrease the need for allogenic blood transfusions (ABT) during surgical treatment of adolescent idiopathic scoliosis (AIS) have expanded and now include hypotensive anesthesia, volume expansion, autologous blood transfusion, erythropoiesis-stimulating substances, and antifibrinolytic agents. Although several studies have identified surgical and patient risk factors correlated with blood loss, they often fail to consider the surgeon. Therefore, the goal of this study is to compare actual blood loss to blood loss predicted by a patient/surgeon specific calculator in relation to orders for packed red blood cells (pRBC). Secondly, this study hopes to assess the frequency of pRBC ordered versus transfused.

METHODS: A retrospective review of a prospectively collected cohort of AIS patients who underwent index posterior fusion from 11/2022 through 1/2024 were reviewed. A complete blood count (CBC) was obtained within 6 weeks of surgery. Predicted blood loss (PBL) was determined using a patient/surgeon specific calculator. The surgeon's average blood loss (mL/level) is determined through a rolling, continuous calculation from the actual blood loss documented in the anesthesia record from the EMR. Actual estimated blood loss (aEBL) was determined by the anesthesiologist via a formula-based estimation. The number of ordered and transfused units pRBC was also recorded.

RESULTS: 68 AIS PSF cases performed by 5 pediatric orthopedic surgeons were reviewed. The mean age at surgery was 14.63 ± 2.4 years and the mean Cobb angle was $60^\circ \pm 9.7^\circ$. The mean preoperative PBL from the surgeon/patient specific calculator was 429.9 ± 100 ml. The calculator tended to overestimate the blood loss by an average of 65ml which equated to $4.33 \pm 3.1\%$ of the patient's total blood volume. The mean aEBL was 364.9 ± 193.7 ml. 25 units of pRBCs were typed and crossed for 36.76% of the cases. 0/68 (0%) of the patients required an ABT, and the 25 units of pRBCs were returned to the blood bank.

DISCUSSION AND CONCLUSION: This novel preoperative blood loss calculator used surgeon specific (mL/level) and patient specific (weight and levels fused) factors to accurately predict intraoperative blood loss. The small aEBL (65mL) supports the accuracy and utility of this patient/surgeon specific calculator. This information has led our institution to modify its preoperative protocol for ordering pRBCs.

Correlation of 3D Spinal Parameters to Pulmonary Function Tests in Adolescent Idiopathic Scoliosis

Paper 219

Lorena V. Floccari, M.D. / Akron, OH

Co-Authors:

Omolola Fakunle, M.D. / Cleveland, OH

Kenzie D. Lundqvist, M.D. / Akron, OH

Alexandria Rundell, B.S. / Akron, OH

Richard P. Steiner, Ph.D. / Akron, OH

Todd F. Ritzman, M.D. / Akron, OH

Lorena V. Floccari, M.D. / Akron, OH

OBJECTIVE: Prior studies have demonstrated an inverse correlation between scoliosis Cobb angle and pulmonary function. However, axial plane deformity measured by the Nash-Moe method has not been found to correlate with pulmonary function test (PFT) impairment. 3D reconstructions more accurately describe deformity in adolescent idiopathic scoliosis (AIS), but it is unknown how 3D axial and sagittal plane deformity affects PFT results. The purpose of this study was to determine if a correlation exists between 3D measures of various planes in spinal deformity and PFTs.

METHODS: This prospective cross-sectional study was completed at a single freestanding tertiary children's hospital. PFTs were obtained prospectively in a cohort of consecutive preoperative AIS patients. Radiographic measurements were obtained via 3D reconstructions created from biplanar radiographs using SterEOS software. Correlations were performed between PFTs and 3D coronal, sagittal, and maximum axial plane deformity.

RESULTS: 101 AIS patients with a mean major Cobb of 60.5° (range 42-90°) were included, with mean 91.0% forced vital capacity (FVC), 88.2% predicted forced expiratory volume in one second (FEV1), and 88.2% predicted total lung capacity (TLC). 6% had moderate-severe pulmonary impairment (FEV1, FVC, TLC <65%), while 16% had mild impairment (65-80%). Main thoracic Cobb angle had moderate but significant correlation to %FEV1 ($r=0.38$), %FVC ($r=0.34$), and %TLC ($r=0.38$, all $p<0.001$), as did the upper thoracic Cobb ($r=0.35$, 0.29 , and 0.34 respectively, $p<0.001$). There was no significant correlation between lumbar Cobb angle, thoracic or lumbar flexibility indices, 3D T5-T12 kyphosis, or thoracic 3D axial rotation ($p>0.1$). There was significant correlation between thoracic rib prominence on scoliometer and %FEV1 ($r=0.40$, $p<0.001$), %FVC ($r=0.28$, $p=0.01$), and %TLC ($r=0.26$, $p=0.019$), but no significant correlation with lumbar prominence. On multivariate regression analysis, main thoracic Cobb accounts for 19.8% of variation in %FVC and 26.4% of variation in %FEV1 (partial $r^2=0.198$ and 0.264 respectively, $p<0.001$).

CONCLUSIONS: Thoracic curve magnitude, in both the main and upper Cobb angles, inversely correlates to preoperative PFTs. However, main thoracic Cobb magnitude only accounts for 19.8% of variation in FVC and 26.4% of variation in FEV1. While scoliometer measures likewise correlate to PFTs, 3D reconstruction measures of thoracic kyphosis, axial plane rotation, lumbar deformity, and curve flexibility do not correlate with PFT results. As 22% of AIS patients had evidence of preoperative pulmonary impairment, future research is needed to characterize other factors that may affect pulmonary function.

New-Onset Psychiatric Diagnoses and Implications After Surgery for Adolescent Idiopathic Scoliosis: A National Cohort Analysis

Paper 220

Logan Good, M.D. / Cleveland, OH

Co-Authors:

Andrew J. Moyal, M.D. / Cleveland, OH

Jeremy Adelstein, M.D. / Cleveland, OH

Logan Good, M.D. / Cleveland, OH

Robert J. Burkhart, M.D. / Cleveland, OH

Nate Cuttica, BA / Cleveland, OH

Bhargavi Maheshwer, M.D. / Cleveland, OH

Christina K. Hardesty, M.D. / Cleveland, OH

Michael P. Glotzbecker, M.D. / Cleveland, OH

Raymond W. Liu, M.D. / Cleveland, OH

INTRODUCTION: A diagnosis of Adolescent Idiopathic Scoliosis (AIS) along with the subsequent lifestyle changes, pain, bracing is known to correspond with greater incidence of mental health disorders among adolescent patients. While the impact of bracing has been highlighted in recent literature, the literature is limited when analyzing the effect of spinal fusion on mental health postoperatively. The purpose of this study is to analyze the short and long-term psychiatric trends following fusion in AIS patients.

METHODS: One cohort of 1,612 patients was created utilizing Current Procedural Terminology (CPT) and International Classification of Disease (ICD-10) codes in TriNetX, a large database. Criteria for the cohort included adolescent patients 10 - 18 years old, without any previous history of any psychiatric diagnosis, who underwent spinal fusion for AIS. Outcomes of interest included rates and types of psychiatric diagnoses, rates and types of medication prescriptions, and overall utilization of psychiatric services. Outcomes were assessed through one-month post-op to isolate the post-surgical period, and then from one-month through three-months and through two-years post-op.

RESULTS: In the immediate 1-month postoperative period, 1.6% of patients were diagnosed with a psychiatric condition. 70% of patients were prescribed a benzodiazepine derivative or other sedative, 72% of patients were prescribed an opiate medication and 1.2% of patients received a new antidepressant prescription. From one-month through three-months post-op, 1.7% of patients were diagnosed with any psychiatric condition, 2.7% patients were prescribed opiates, and 3.4% of patients were prescribed a benzodiazepine or derivative drug. From one-month through two-years post-op, 7.8% of patients were diagnosed with a psychiatric condition with a majority specifically due to anxiety-based disorders (4.7%), and a minority due to depression (1.7%). Within this period, 1.9% of patients were diagnosed with chronic pain and 12% were prescribed opiates. 16% of patients were prescribed a psychoactive medication, of which 12% were a benzodiazepine or derivative drug.

CONCLUSION: Spinal fusion does not seem to acutely increase the risk for psychiatric disorders in AIS patients during the immediate postoperative period. While 7.8% of patients will go on to receive some form of psychiatric diagnosis within 2-years post-op, a majority tend to be anxiety-based correlating with an increased prescription pattern of benzodiazepine medication. A minority appear to be mood or pain diagnoses, and even less are behavioral or substance-based disorders.

CT-Guided Aspiration Limits Reoperation, Improves Neurologic Symptoms in Patients Who Develop Acute Postoperative Seromas Following Spine Surgery

Paper 221

Ryder R.R. Reed, M.D. / Rochester, MN

Co-Authors:

Ryder R.R. Reed, M.D. / Rochester, MN

Tyler Allen, M.D. / Rochester, MN

Andrew Pumford / Rochester, MN

Hannah Levy, M.D. / Rochester, MN

Brett A. Freedman, M.D. / Rochester, MN

Ahmad N. Nassr, M.D. / Rochester, MN

Arjun S. Sebastian, M.D. / Rochester, MN

Benjamin Elder, M.D. / Rochester, MN

OBJECTIVE: There has been a deluge of research into new orthobiologics to promote fusion in spine surgery. One such adverse effect of many of these products is the rapid inflammatory response they incite and the concomittant seroma formation they promote. Seroma formation, often times in the setting of a functioning postoperative surgical site drain, can cause pain, wound drainage, and in severe cases, neural element compression with resultant neurologic deficits. Short of a formal irrigation and debridement in the operating room, our institution has experimented with CT-guided aspiration of postoperative seromas as a means to treat these seromas.

METHODS: A retrospective case series of patients who had posterior spine surgery between January 2019 and July 2023 were identified in the electronic medical record. In order to be included in this series, patients had to have had a CT-guided aspiration within 2 weeks of their most recent spine surgery. Patients who had an aspiration for infectious purposes were excluded from this study.

RESULTS: A total of 21 patients were identified who met criteria for inclusion. The median and mean time from surgery to aspiration was 7 days (range 3-13). The most common timepoint for aspiration was 3 days postoperatively (n=5) and all but two patients received their aspiration prior to discharge from the hospital. Of the 21 patients, CT-guided aspiration was able to prevent return to the operating room in 15 (71%) of cases. In this cohort, 8 patients developed new, worsening neurologic changes postoperatively attributable to seroma formation seen on MRI. Of those 6 patients, 5 (75%) had improvement in their neurologic change following aspiration. 2 of the remaining three went on to have operative evacuation of their seroma and subsequently recovered neurologic function.

CONCLUSIONS: Our experience with CT-guided aspiration has shown promise as an effective means of treating acute postoperative seroma and reducing the need for operative evacuation. Our case series also describes several instances where aspiration lead to improvement in neurologic function without formal reoperation. Further consideration should be given to this technique to evaluate its cost-effectiveness to be used on a more routine basis to lessen the need for reoperation and other seroma-related complications.

The Prevalence of Congenital Cervical Stenosis Differs Based on Race

Paper 222

Sia Cho / Chicago, IL

Co-Authors:

Sia Cho, BA / Chicago, IL

Freddy Jacome, B.S. / Chicago, IL

Jason Tegethoff, M.D. / Chicago, IL

Justin J. Lee, M.S. / Chicago, IL

David M. Hiltzik, M.D. / Chicago, IL

Srikanth N. Divi, M.D. / Chicago, IL

Alpesh A. Patel, M.D. / Chicago, IL

Wellington Hsu, M.D. / Chicago, IL

OBJECTIVE: Congenital cervical stenosis (CCS) is a rare condition involving a narrowed spinal canal due to developmental anomalies. CCS heightens the risk of neurologic deficits and acute spinal cord injury post-trauma, influencing return-to-play decisions for contact athletes. Additionally, CCS patients are prone to cervical myelopathy as degenerative changes progress with age. Limited evidence-based literature exists on the epidemiology of CCS, including racial effects. We sought to investigate the incidence of CCS as it pertains to race and ethnicity.

METHODS: We screened 5395 cervical MRIs from a single institution and identified CCS by a sagittal canal diameter (SCD) of less than 10 mm at 2+ vertebral levels (C3-7) at the pedicle. Exclusion criteria included patients under 18 and over 50 years, prior cervical spine surgery, congenital fusions, spinal column malignancy, or active smoking history. For each patient, axial measurements were taken at each level, including coronal vertebral body length, anteroposterior vertebral body length, pedicle width, pedicle length, laminar length, anteroposterior lateral mass length, posterior canal distance, apex-to-vertebral body, lamina-disc angle (LDA), lamina-pedicle angle, and anteroposterior spinal cord diameter.

RESULTS: A total of 343 patients met the criteria for CCS: 100 White, 98 Black, 70 Asian, and 75 Hispanic. CCS prevalence varied significantly among ethnic groups; Black (39.3%), Asian (33.6%), and Hispanic (22%) patients had higher CCS rates than White patients (7.5%) [χ^2 (3, N=343) = 30.04, $p < 0.05$]. The Interrater Correlation Coefficient for the SCD measurements across all levels and patients demonstrated excellent reliability (ICC = 0.926, 95% CI: 0.91-0.94). Black and Asian patients showed consistently smaller SCDs at all pedicle levels compared to White patients, who had the largest SCDs overall ($p < 0.001$). Average SCDs were 11.4 mm (White), 10.4 mm (Black), 10.5 mm (Asian), and 11 mm (Hispanic). Additionally, LDAs were larger in Asians, Blacks, and Hispanics compared to Whites, reducing cross-sectional canal area ($p < 0.001$).

CONCLUSIONS: Our study indicates a significant correlation between race/ethnicity and CCS prevalence. Black and Asian patients had the highest CCS rates, smallest SCDs, and largest LDAs. These anatomical differences suggest an increased risk of cervical myelopathy and neurological issues, particularly for contact sport athletes. This emphasizes the need for personalized clinical management and early intervention to address healthcare disparities and improve outcomes in vulnerable populations.

Social Vulnerability Index Influences Healthcare Utilization and Persistent Opioid Use After Lumbar Decompression Procedures

Paper 223

Tyler Compton, M.D. / Chicago, IL

Co-Authors:

Mark A. Plantz, M.D. / Chicago, IL
Tyler Compton, M.D. / Chicago, IL
Erik B. Gerlach, M.D. / Chicago, IL
Jason Tegethoff, M.D. / Chicago, IL

Henry Hilow, M.D. / Chicago, IL
Srikanth Divi, M.D. / Chicago, IL
Wellington K. Hsu, M.D. / Chicago, IL
Alpesh A. Patel, M.D., MBA / Chicago, IL

INTRODUCTION: Social determinants of health have been shown to influence various outcome measures after elective orthopedic procedures, including spine surgery. However, there has been limited research investigating the influence between social determinants of health and healthcare resource utilization after elective spine surgery. The purpose of this study was to investigate the influence of social vulnerability on healthcare utilization and patient-report outcome measures (PROMs) after elective lumbar decompression procedures.

METHODS: Patients undergoing elective 1- or 2- level lumbar decompression procedures at single tertiary medical center were retrospectively identified. Various demographic variables, including the ZIP code of residence for each patient were reported. The Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) scores were calculated for each patient. Social vulnerability was defined as combined socioeconomic and housing vulnerability scores in the upper quartile. Several outcome measures were compared between patients with or without social vulnerability. The outcomes of interest included 90-day medical and surgical complications, healthcare utilization within 1-year postoperatively, and patient-reported outcome measures – pain interference (PI) and physical function (PF). Healthcare utilization metrics included opioid use, emergency department visits, urgent care visits, MRI studies, pain management referrals, and revision surgeries. The minimal clinically important difference (MCID) was defined as eight for both PI and PF scores.

RESULTS: A total of 216 patients were included in the cohort –58 patients met criteria for social vulnerability. Patients with social vulnerability were more likely to be female and ASA class 2. Otherwise, patient demographics and medical comorbidities were similar between the two groups. 90-day medical and surgical complications were similar between groups. Patients with social vulnerability were more likely to utilize the emergency department within 1-year postoperatively and to have persistent opioid use at both 6 months and 1 year postoperatively. On multivariate regression, SVI was independently associated with preoperative opioid use, postoperative emergency department utilization, and persistent opioid use after surgery. Relative improvement in PI and PF scores and rates of MCID attainment were similar between groups.

CONCLUSIONS: Social vulnerability index was independently associated with postoperative emergency department utilization and persistent opioid use on multivariate analysis. Improvement in patient-reported outcome measures and achieving MCID were similar between those with and without social vulnerability.

Lumbar Facet Arthroplasty: An Analysis Comparing Two-Year Outcomes from a Prospective Randomized Clinical Trial Among Patients with Unstable vs. Stable Spondylolisthesis

Paper 224

Kristin A. Keith, D.O. / Temple, TX

Co-Authors:

Kristin A. Keith, D.O. / Temple, TX

Roland Kent, M.D. / Post Falls, ID

INTRODUCTION: Until recently surgical management for degenerative lumbar spondylolisthesis and stenosis has generally been limited to decompression-only or to decompression with fusion. The introduction of facet arthroplasty represents a new surgical modality that stabilizes a segment following complete decompression while maintaining a patient's normal biomechanical motion. Outcomes from a multi-center, prospective, randomized, Investigational Device Exemption (IDE) trial assessing the effectiveness of facet arthroplasty vs fusion among subjects with degenerative Grade 1 spondylolisthesis have previously been reported however longer-term effectiveness results are needed.

METHODS: This interim analysis examined 302 subjects that were randomly assigned (2:1) to either facet arthroplasty or to TLIF as part of the IDE trial. All subjects underwent decompressive laminectomy via a mid-line incision at one lumbar level followed by insertion of a facet arthroplasty device. Outcome measures after 48 months included improvement in patient reported outcomes as measured by Oswestry Disability Index (ODI) and visual analog scale (VAS) for leg and back pain as well as re-operation rate.

RESULTS: At the time of this analysis 106 subjects (TOPS=82, TLIF=24) had reported outcomes through 48 months or had undergone supplemental surgical intervention. At 48 months the average ODI score for the facet arthroplasty group decreased from 56.6 ± 12.1 at baseline to 9.5 ± 16.1 while the TLIF group decreased from 55.9 ± 13.0 at baseline to 14.0 ± 15.2 . VAS leg pain scores for the facet arthroplasty group dropped from 82.7 ± 13.4 at baseline to 11.0 ± 21.1 at while the TLIF group dropped from a baseline of 84.8 ± 11.1 to 10.3 ± 17.7 at 48 months. VAS back pain scores for the facet arthroplasty group dropped from 68.6 ± 23.3 at baseline to 8.6 ± 15.1 at 48 months while the TLIF group dropped from a baseline of 69.8 ± 22.1 to 25.4 ± 28.0 at 48 months. Rates of surgical re-intervention involving removal, revision, or supplemental fixation were 4.8% for the facet arthroplasty group and 9.4% for the TLIF group.

CONCLUSION: The interim results of facet arthroplasty demonstrate good clinical outcomes through 48 months compared to fusion. Re-operation rates are consistent with literature for surgical treatments to address spondylolisthesis with stenosis. Lumbar facet replacement appears to be a viable option for treatment of degenerative spondylolisthesis with excellent long-term results. Continued follow-up is required to validate early findings and evaluate differences between facet arthroplasty and fusion.

Patient-Reported Outcomes, Radiographic Results, and Complication Data Following 3- and 4-level ACDF: A Systematic Review

Paper 225

Ravi Ameet Patel, B.A. / Chicago, IL

Co-Authors:

Ravi Ameet Patel, B.A. / Chicago, IL

Rohan M. Shah, B.A. / Chicago, IL

Jacob Robert Staub, B.S. / Chicago, IL

Anitesh Bajaj, B.S. / Chicago, IL

Abhinav Reddy Balu, B.S. / Chicago, IL

Mark A. Plantz, M.D. / Chicago, IL

Tyler M. Compton, M.D. / Chicago, IL

Srikanth Divi, M.D. / Chicago, IL

OBJECTIVE: Anterior cervical discectomy and fusion (ACDF) is the gold standard treatment for complex, cervical myeloradiculopathy. Though there is robust literature evaluating efficacy of 1- and 2-level ACDF outcomes, a substantial gap remains in the safety and effectiveness of 3- and 4-level procedures. It is important to ensure that the increased complexity of larger surgeries does not compromise patient outcomes, including patient-reported outcomes, complications, and radiographic results.

METHODS: Study screening was performed across three online databases: PubMed, OVID Medline, and EMBASE, by three independent reviewers. Inclusion criteria were: English language studies, human studies, level of evidence I to IV, and studies investigating clinical outcomes in patients following 3- or 4-level ACDF. Data was collected and reviewed via Microsoft Excel and charted. Outcomes measured included demographic data, patient-reported outcomes (PROs), radiographic findings, and complications.

RESULTS: 80 cohorts across 63 studies were included. Cohort size ranged from 4 to 130 patients and mean follow-up ranged from 10.92 to 89.3 months. Regarding common PROs, mean preoperative NDI (29 cohorts) ranged from 12.8 to 78.29 (SD: 1.56 to 19.6), postoperative score ranged from 1.93 to 25.47 (SD: 0.87 to 24.2). Mean preoperative JOA (25 cohorts) ranged from 7.3 to 13.42 (SD: 0.5 to 3.1), postoperative score ranged from 13.26 to 18.75 (SD: 0.7 to 3.1). Regarding common radiographic outcomes, mean preoperative Cobb Angle (n= 42 cohorts) ranged from -11.9° to 15.43° (SD: 2.73 to 17.3), final follow-up (FFU) ranged from 1.28° to 24.27° (SD: 3.12 to 12.34). Mean fusion percentage was 91.15% (36 cohorts) and mean time-to-fusion was 8.93 months (10 cohorts). In 2502 patients, 723 complications (28.9%) were reported. Reported complications, in order, were dysphagia (49.5%), adjacent segment disease (21.9%), pseudoarthrosis (16.6%), graft/hardware failure (6.1%), C5 palsy (3.7%), hematoma (1.8%), and infection (0.4%). Readmission (2 studies) was 5.5% and reoperation (22 studies) was 7.8%.

CONCLUSIONS: Our study ultimately found robust evidence in the literature for the safety and effectiveness of multilevel ACDF. Across each of the most common patient reported outcomes in the literature, postoperative scores consistently showed substantial clinical improvement. There was a low rate of complications and reoperations in our included studies, bolstering the safety profile of this procedure. Future, high-quality studies are still needed to directly compare outcomes of multi-level fusions with 1- or 2-level counterparts.

Examining the Relationship Between Pyramidal Signs, Patient Symptoms, and the Modified Japanese Orthopedic Association (mJOA) Score in Patients with Cervical Spondylotic Myelopathy

Paper 226

Aakash K. Shah / Cleveland, OH

Co-Authors:

Aakash K. Shah / Cleveland, OH

Seth Meade / Cleveland, OH

Lauren Boden, M.D. / Cleveland, OH

William Sheppard, M.D. / Cleveland, OH

Michael Steinmetz, M.D. / Cleveland, OH

Thomas Mroz, M.D. / Cleveland, OH

OBJECTIVE: Cervical spondylotic myelopathy (CSM) is the most common cause of spinal cord dysfunction in individuals over the age of 55. Severity is often assessed with the validated modified Japanese Orthopedic Association (mJOA) score and used to track symptoms over time. While many surgeons use the pyramidal signs to dictate treatment plans, there is little evidence correlating these findings with severity of CSM. The purpose of this study was to prospectively evaluate the association between pyramidal signs, patient symptoms, and mJOA scores in patients initially presenting for CSM.

METHODS: All consenting patients without previous cervical spine surgeries presenting for an initial evaluation of CSM at our institution between over three months were prospectively enrolled in the study. Patients were administered the mJOA survey and completed their routine neurological physical examination with a special focus on tests for the pyramidal signs. Univariable and multivariable linear regressions were used to analyze the relationship between pyramidal signs and mJOA scores.

RESULTS: A total of 169 patients met inclusion criteria. There were 34, 40, and 49 patients with upper, lower, and any extremity hyperreflexia, respectively. The mean mJOA score was 15 ± 2 and ranged from 7 to 18. Positive patient symptoms were associated with lower mJOA scores with all patients presenting with dexterity problems having an mJOA less than 18. In the univariable model, all symptoms were significantly associated with increased CSM severity except for pain which was significantly associated with a decreased severity. In the multivariable model, gait and dexterity problems were significantly associated with increased CSM severity. In a subset analysis of 71 patients with moderate or severe CSM according to their mJOA scores, there were 14, 19, and 23 patients with upper, lower, and any extremity hyperreflexia, respectively. The mean mJOA score was 13 ± 2 . There were no significantly associated characteristics in the univariable or multivariable model.

CONCLUSION: Patient symptoms of numbness, weakness, gait dysfunction, and manual dexterity loss were correlated with a worse mJOA score, indicating the importance of taking a good history at initial presentation. A thorough interpretation of the history, physical and radiographic findings, without reliance on specific exam maneuvers such as hyperreflexia, should be utilized when diagnosing and managing CSM.

Risk Factors for Total Hip Arthroplasty Following Lumbar Fusion Surgery: A Large Propensity Matched Study

Paper 227

Joshua M. Wiener, B.S. / Cleveland, OH

Co-Authors:

Joshua M. Wiener, B.S. / Cleveland, OH

Parshva A. Sanghvi, B.S. / Cleveland, OH

Seth M. Meade B.S.E. / Cleveland, OH

Nicolas R. Thompson M.S. / Cleveland, OH

Michael D. Shost M.D. / Cleveland, OH

Thomas Mroz M.D. / Cleveland, OH

Michael P. Steinmetz M.D. / Cleveland, OH

INTRODUCTION: Degenerative diseases of the spine and osteoarthritis of the hip are some of the most common causes of disability in the aging population. Both conditions can be treated with lumbar fusion and total hip arthroplasty (THA) respectively when conservative management fails. Due to the complex biomechanical interactions of the hip and lower back along with shared clinical risk factors, hip pain can present similarly to lumbar spine pain, creating difficulty when attempting diagnosis. The objectives of this study were to examine the relationship between lumbar fusion and THA, identify clinical and surgical risk factors of the need for and timing of THA in the context of lumbar fusion, and finally explore the association of postoperative outcomes in lumbar fusion and THA.

METHODS: A retrospective cohort study was performed using electronic medical records from a major academic institution between 10/2009 and 10/2015. Cohorts consisted of adult patients undergoing lumbar fusion surgery for degenerative spine disease and a control group of patients seen by primary care physicians at the same time period. Patients were propensity score matched based on age, sex, race, ethnicity, body mass index, smoking status, and 16 other comorbidities. Analytical methods included time-to-event modeling using Cox proportional hazard models and multivariable cause-specific cox proportional hazard models.

RESULTS: The final cohort consisted of 25,379 patients (6,345 experimental, 19,304 controls) after matching with median follow up time of 11 years (IQR 8-14 years). At 10 years post lumbar fusion, 3.54% of controls and 5.54% of lumbar fusion patients had undergone THA. Overall, lumbar fusion patients had a 1.70 times higher risk of THA compared to control patients ($p < 0.001$). Age, hip arthritis, and knee arthritis were associated with greater risk of THA in both experimental and control groups. Diabetes was associated with lower risk of THA in the experimental (HR = 0.7 [0.50, 0.98], $p = 0.04$) and control groups (HR = 0.61 [0.57, 0.64], $p < 0.001$). Worse postoperative pain disability questionnaire (PDQ) total scores following lumbar fusion were associated with lower risk of THA.

CONCLUSION: Lumbar fusion is associated with greater risk of later THA. Specific risk factors such as age and arthritis may predispose patients to THA, while diabetes acts as a protective factor against later THA. There is a moderate association between worse lumbar fusion postoperative outcomes and reduced risk of THA.

H-Index and Gender are Associated with a Higher Likelihood of Receiving Private Funding in Orthopedic Sports Medicine

Paper 228

Isha K. Shah / Cleveland, OH

Co-Authors:

Aakash K. Shah / Cleveland, OH

Isha K. Shah / Cleveland, OH

Robert J. Burkhart, M.D. / Cleveland, OH

Heath P. Gould, M.D. / New York, NY

Jacob G. Calcei, M.D. / Cleveland, OH

Sabrina M. Strickland, M.D. / New York, NY

James E. Voos, M.D. / Cleveland, OH

OBJECTIVE: To promote financial transparency, the CMS established the Open Payments database (OPD) to track monetary payments between manufacturers and physicians greater than \$10 and classifies payments as either general or research payments. This study aims to identify trends in private payment distribution among sports medicine orthopedic surgeon, to explore potential disparities in payment, and predictors for payment.

METHODS: A cross-sectional analysis of the OPD was conducted from 2015 to 2021 for research payments to orthopedic sports medicine surgeons. H-index, number of published documents, and years out of training were collected from Scopus and the affiliated institution profile. Descriptive statistics were conducted for payments at the surgeon level. To assess the difference in payments between sex, Wilcoxon rank sum tests were employed.

RESULTS: Over the study period, a total of \$81,278,687 in private research payments was reported for orthopedic sports medicine surgery to 578 unique surgeons at 338 different institutions from 83 different manufacturers. In 2015, 188 unique sports medicine orthopedic surgeons received \$6,564,985 in private payments growing to 249 surgeons receiving \$12,371,178 in 2021 . Male surgeons compromised more than 94% of all orthopedic sports medicine surgeons per year and collected 98% of the payments ($P = 0.011$) over the study period. For each year, there was no statistically significant difference in payment between the median male and female payment . H-index, the number of published documents, male sex, and the number of years in practice were all significantly associated with an increased amount of payment in a univariate model ($P = <0.001$, $P = <0.001$, $P = 0.05$, and $P = 0.03$, respectively). The number of published documents was excluded from the multivariate model due to multicollinearity with H-Index ($VIF = 4.84$). H-index and the male sex were positively associated with an increased amount of payment in the multivariate model ($P = <0.001$ and $P = 0.005$) .

CONCLUSION: Our analysis found a significant range in the distribution of payments for orthopedic research, with a small group of surgeons receiving a large number of payments. There were no significant differences between the median payment to sports medicine orthopedic surgeons between sex; however, males received a majority of the funding. The gender disparity demonstrated in this study may inspire industry to increase funding to female sports medicine surgeons.

Clinical Outcomes After Proximal Hamstring Repair with Allograft Augmentation or Interposition for Chronic Tears: A Multicenter Propensity-Matched Analysis

Paper 229

Brandon C. Cabarcas, M.D. / Rochester, MN

Co-Authors:

Jared A. Hanson, M.D. / Rochester, MN

Sean C. Clark, M.S. / Rochester, MN

Brandon C. Cabarcas, M.D. / Rochester, MN

Dustin R. Lee, M.D. / Rochester, MN

Robert J. Spinner, M.D. / Rochester, MN

Kostas J. Economopoulos, M.D. / Phoenix, AZ

Mario Hevesi, M.D., Ph.D / Rochester, MN

Aaron J. Krych, M.D. / Rochester, MN

OBJECTIVE: The purpose of this study was to evaluate clinical outcomes of patients who underwent proximal hamstring repair with allograft augmentation or interposition and compare them to matched controls who underwent primary hamstring repair.

METHODS: A total of 117 patients who underwent proximal hamstring repair were included consisting of 19 allograft augmentations, 20 allograft interpositions, and 78 primary repairs. Allograft cohorts were propensity-matched based on age, sex, and body mass index to those who underwent primary repair in a 1:2 ratio. Clinical outcomes including Lower Extremity Functional Scale (LEFS), Tegner Activity Scale, pain with sitting, pain with activity, presence of muscle spasms, and reoperation data were obtained at final follow-up.

RESULTS: The median follow-up was 3.2 years. Forty-two percent of the augmentation cohort underwent prior surgery in comparison to 5.0% of the interposition cohort. The time from injury to surgery for the augmentation and primary repair cohorts was 6.4 and 1.3 months, respectively ($p < 0.001$), while for the interposition and primary repair cohorts it was 17.8 and 1.0 month(s), respectively ($p < 0.001$). Clinical outcomes including Tegner Activity Scale (3.0 vs. 3.0), pain with activity (47.4% vs. 23.7%), and muscle spasms (36.8 vs. 26.3%) were not significantly different between the augmentation and primary repair cohorts. The augmentation cohort had a significantly worse LEFS (64.0 vs. 75.0, $p < 0.001$), and were more likely to have pain with sitting (52.6% vs. 21.1%, $p = 0.034$) than the primary repair cohort. There was no significant difference in clinical outcomes between the interposition and primary repair cohorts (LEFS: 69.0 vs. 75.5, Tegner Activity Scale: 4.0 vs. 4.0; pain with sitting: 26.3% vs. 27.5%; pain with activity: 42.1% vs. 30.0%; muscle spasms: 26.3% vs. 30.0%). Revision rates were similar between cohorts ($p \geq 0.255$).

CONCLUSIONS: Proximal hamstring repair for chronic tears with allograft augmentation or interposition are reproducible procedures that result in satisfactory clinical outcomes and low reoperation rates and should be considered in patients with chronic tears that are not amendable to primary repair.

Systemic Hormonal Contraceptives Increase the Risk of Soft Tissue Pathology in the Knee: An Epidemiological Analysis of 1,294,435 Patients

Paper 230

Bhargavi Maheshwer, M.D. / Cleveland, OH

Co-Authors:

Aakash K. Shah / Cleveland, OH

Robert J. Burkhart, M.D. / Cleveland, OH

Isha K. Shah / Cleveland, OH

Bhargavi Maheshwer, M.D. / Cleveland, OH

Amanda Weiss-Kelly, M.D. / Cleveland, OH

Michael J. Salata, M.D. / Cleveland, OH

James E. Voos, M.D. / Cleveland, OH

Jacob G. Calcei, M.D. / Cleveland, OH

OBJECTIVE: Soft tissue injuries are more prevalent among female athletes compared to their male counterparts. Emerging evidence suggests that hormones such as estrogen and progesterone significantly influence this disparity. Estrogen has been shown to increase ACL laxity, while progesterone contributes to collateral ligament laxity. Despite the widespread use of hormonal contraceptives (HCs), there is limited research on the impact of different HC formulations on knee injuries. This study aims to determine whether various HC formulations affect the 5-year risk of soft tissue injuries in females.

METHODS: A retrospective cohort study was conducted using a national database to identify female patients between the ages of 13 and 50 who were prescribed HCs from 2005 to 2019. One-to-one propensity score matching was conducted to compare estrogen-only HCs, progestin-only HCs, and combined HCs to a control cohort. Soft tissue complications occurring within a minimum of 5 years after starting HCs were assessed.

RESULTS: A total of 1,294,435 patients were included in the final analysis. Females using any hormonal contraceptive formulation showed an increased risk of knee soft tissue injuries. The estrogen-only cohort was more likely to have a meniscal tear ($p = <0.001$) or any ligamentous pathology ($p = 0.036$). The progestin-only cohort had higher odds of having a meniscal tear ($p = <0.001$), collateral ligament tear ($p = <0.001$), and any ligamentous pathology ($p = <0.001$). The mixed HC cohort was more likely to have a meniscal tear ($p = <0.001$), ACL tear ($p = 0.024$), a collateral ligament tear ($p = <0.001$), and any ligamentous pathology ($p = <0.001$).

DISCUSSION: Our analysis found female patients who had been prescribed any therapy class of HC had higher odds of suffering from a knee-related orthopedic soft tissue complication compared to control patients. To our knowledge, this is the first study utilizing a large database to identify the association between different HC types and the long-term risk of soft tissue complications. The results of this analysis encourage further research into the advantages and costs associated with HC concerning soft tissue injuries. Given that a significant portion of female patients use some form of HCs, it is crucial to educate them about the potential increased risk of soft tissue injuries.

Epidemiology of Ulnar Collateral Ligament Surgeries in Major and Minor League Baseball Pitchers: A Comprehensive Report of 2,287 Cases

Paper 231

Fabien Meta, M.D. / Rochester, MN

Co-Authors:

Fabien Meta, M.D. / Rochester, MN

Sean C. Clark, M.S. / Rochester, MN

Brandon Cabarcas, M.D. / Rochester, MN

Jason Ina, M.D. / Rochester, MN

Timothy B. Griffith, M.D. / Rochester, MN

Christopher L. Camp, M.D. / Rochester, MN

OBJECTIVE: Injury to the medial ulnar collateral ligament (MUCL) has a large impact on the throwing athlete, particularly in baseball. The purpose of this study was to highlight the trends in MUCL repair and reconstruction in professional baseball pitchers, describe relevant outcomes for surgical repair and reconstruction, and distinguish what factors impact the outcomes of surgical intervention.

METHODS: The Major League Baseball (MLB) Health and Injury Tracking System (MLB HITS) database was used to procure data during the targeted study period (2010 – 2023). All professional pitchers who underwent MUCL surgery within the study period were included. Pitchers were excluded from the analysis if there was incomplete data regarding demographics, surgical construct, and return to play. Variables analyzed included age, career length, and level of play. Surgical variables included date of procedure, return to play (RTP) status, time required to RTP, career length before and after surgery, number of revision surgeries, and time between surgeries. The year 2020 was considered an outlier and omitted from the analysis due to the coronavirus pandemic.

RESULTS: A total of 2,287 pitchers underwent MUCL surgery during the study period. The annual number of MUCL surgeries on all pitchers has increased year over year ($R^2 = 0.821$, $p < 0.001$). RTP to any level for MLB pitchers was significantly higher compared to the same level of play (RTP at any level 93.2% vs. RTP at prior level 71.4%, $P < 0.001$). This difference was not noted in Minor League Baseball (MiLB) level of play (RTP at any level 76.3% vs. RTP at prior level 73.9%, $P = 0.142$). The percentage of players who RTP to any level following revision surgery was significantly lower compared to primary surgery (79.8% vs. 71.1% respectively, $P = 0.020$). A significant difference was found in the time to RTP across the various surgical techniques ($P < 0.001$).

CONCLUSIONS: MUCL surgery continues to increase, also leading to increasing numbers of revisions in professional pitchers. RTP after revision MUCL surgery was significantly longer than primary surgery. Surgical techniques continue to evolve as MUCL repairs and reconstructions with internal brace augmentation have increased in recent years. Additionally, time to RTP varied among surgical techniques. This study will help guide athlete expectations and drive surgeon decision-making.

Equivalent Early Outcomes After Rotator Cuff Repair Can Be Achieved in Patients with Lower Shoulder-Specific Health Literacy

Paper 232

Tanner R. Poppe, M.D. / Memphis, TN

Co-Authors:

Tanner R. Poppe, M.D. / Memphis, TN

Eric West, M.D. / Memphis, TN

Andrew Nahr, M.D. / Memphis, TN

Tyler J. Brolin, M.D. / Memphis, TN

Fred Azar, M.D. / Memphis, TN

Thomas W. Throckmorton, M.D. / Memphis, TN

Jeff Murphy / Memphis, TN

David L. Bernholt, M.D. / Memphis, TN

INTRODUCTION: Non-orthopedic medical literature has established that health literacy is an important predictor of a patient's health status. Recently, there has been investigation into musculoskeletal-specific health literacy by way of a validated assessment entitled Literacy in Musculoskeletal Problems (LiMP). In this study, we aim to 1) validate a new shoulder-specific health literacy test, entitled CASE (Campbell's Assessment of Shoulder Education), and 2) to use CASE to investigate associations with shoulder literacy and outcomes following rotator cuff surgery.

METHODS: 65 patients completed both the LiMP and CASE assessments. The LiMP and CASE scores were evaluated using a contingency table, sensitivity/specificity, and spearman correlation coefficients. Once CASE was validated, 110 patients who underwent rotator cuff surgery were asked to complete the assessment. We collected additional background information from enrolled patients including the highest level of patient education, background in healthcare, and history of previous orthopedic injuries in specific areas of the body. In addition, clinical outcomes were acquired both pre- and post-operatively.

RESULTS: When using LiMP to validate the CASE assessment, the sensitivity was 75.7% and specificity was 62.5%. The PPV was 67.5% and NPV was 71.4%. Spearman rank-order correlation results show that there is a strong positive association between LiMP and CASE score with $r=0.572$ with a p -value $<.0001$.

Of the 110 patients who completed CASE after undergoing rotator cuff surgery, 67 had higher literacy (CASE score > 5) and the remaining 43 had lower literacy (CASE score < 4). Patients with lower literacy as determined by CASE score demonstrated worse pre-op forward elevation and pre-op internal rotation; however, literacy levels did not predict postoperative range of motion. There was no association between CASE score and either pre- or postoperative patient reported outcome scores. A correlation was shown between higher education and CASE scores ($p < .05$). There was also no difference found between pre- and post-op VAS scores.

DISCUSSION AND CONCLUSION: CASE's sensitivity, specificity, and Spearman correlation compared to the LiMP indicate that it is a reliable tool in evaluating shoulder-specific health literacy. While lower shoulder health literacy was correlated with worse preoperative shoulder range of motion, it was not predictive of postoperative motion or patient-reported outcomes, as there was no difference in these outcomes based on CASE score. This suggests that although there are initial differences pre-operatively based upon health literacy, with appropriate care and rehabilitation, patients can achieve excellent outcomes regardless of their shoulder-specific health literacy.

NBA Combine Scores as a Predictive Measure of Lower Limb Surgery Over Ten Consecutive Seasons (2010-2020): A Retrospective Review

Paper 233

Michael O. Sohn, B.S. / Chicago, IL

Co-Authors:

Ravi Ameet Patel, B.A. / Chicago, IL

Rohan M. Shah, B.A. / Chicago, IL

Michael O. Sohn, B.S. / Chicago, IL

Tyler M. Hauer, M.D. / Toronto, Canada

Michael A. Terry, M.D. / Chicago, IL

Vehniah Tjong, M.D. / Chicago, IL

OBJECTIVE: The NBA draft combine is an athletic testing event showcasing athleticism and skill of selected athletes across the world. No research to date has investigated the relationship between NBA combine scores and future injury requiring surgery. The purpose of this study was to correlate NBA combine scores with future surgical lower limb injury to determine if NBA combine scores can be predictive of future surgery on the lower limb.

METHODS: A retrospective review of NBA surgical lower limb injuries was performed using a data set covering ten consecutive NBA seasons (2010-2020). All NBA combine data was obtained through the official NBA combine scores website. NBA combine data was matched to injury list and compared against non-injured control, described using means and standard deviations. Differences were evaluated using independent t-tests, with an a priori level of significance at $p < 0.05$.

RESULTS: A total of 27,105 injury transactions were reported and a total of 130 players were identified who had undergone lower limb surgical management. There was no statistically significant difference in anthropometric stats (weight, body fat %, height). Lane agility time, three quarter sprint, and max bench press showed no statistically significant differences. However, standing vertical leap and max vertical leap showed statistically significant differences, with values increased in injured group. Mean standing vertical was 29.08 inches (S.D. = 3.08) in non-injured and 29.92 inches (S.D. = 3.06) in injured group. Mean max vertical was 34.21 inches (S.D. = 3.69) in non-injured and 35.16 inches (S.D. = 3.61) in injured group. Knee injuries (80.0%) were most prevalent, followed by ankle (8.5%), calf (7.7%), and thigh (3.8%). Knee surgeries comprised of general surgery on knee (42.3%), meniscal surgery (20.2%), arthroscopic knee surgery (18.3%), ACL reconstruction (15.4%), and patellar tendon repair (3.8%).

CONCLUSIONS: Increased NBA combine scores of standing and maximum vertical leap may be related to future lower limb injury requiring surgical management among basketball players. The knee remains the most commonly injured joint with the majority of knee surgeries performed arthroscopically addressing meniscal pathology. Further research is required to strengthen the relationship between NBA combine measurements and injury, including analyzing play-style in conjunction with combine scores and preventative training measures.

Lower Socioeconomic Status is Correlated with Worse Outcomes After Arthroscopic Rotator Cuff Repair

Paper 234

Cassandra Keinath, M.D. / Detroit, MI

Co-Authors:

Nicholas Daher, B.S. / Detroit, MI

Julio Nerys-Figueroa, B.S. / Detroit, MI

Taylor Timoteo, D.O. / Detroit, MI

Cassandra Keinath, M.D. / Detroit, MI

Alexander Jurayj, B.A. / Detroit, MI

Aghdas Movassaghi, B.S. / Detroit, MI

Jared Mahylis, M.D. / Detroit, MI

Stephanie Muh, M.D. / Detroit, MI

INTRODUCTION: Socioeconomic status (SES) has been associated with differences in patient-reported outcome scores and complication rates across orthopedics. Area Deprivation Index (ADI) is a validated measure of an area's socioeconomic status based on 17 different census variables. ADI has been associated with complications following total knee arthroplasty and may be associated with clinical outcomes and complications following rotator cuff repair. The purpose of this study is to investigate the impact socioeconomic factors have on outcomes following primary arthroscopic rotator cuff repair.

METHODS: Patients who underwent primary rotator cuff repair at a single institution from 3/11/2014-9/29/2022 were identified. Patient demographics, pre- and postoperative Visual Analog Scale (VAS) scores, Patient-Reported Outcomes Measurement Information System (PROMIS) scores—specifically PROMIS Upper Extremity (UE) function, PROMIS Pain Interference (PI), and PROMIS Depression (D)—range of motion, complications, and subsequent ipsilateral shoulder surgeries were collected. ADI was collected from an online mapping database using each patient's home address. Patients were split into ADI terciles, with ADI 1 representing the least disadvantaged group and ADI 3 representing the most disadvantaged group. ANOVA, T-test and chi-square analyses were conducted for continuous variables and categorical variables, respectively.

RESULTS: In total 467 patients underwent rotator cuff repair and had complete demographic data and postoperative follow-up through one year. There was a significant difference in race, with 78.2% of patients identifying as black in ADI 3 vs. 18.1% in ADI 1 ($P<0.001$). Preoperative PROMIS-PI, VAS, forward flexion (FF), and abduction (ABD) were significantly worse in ADI 3 compared to ADI 1 ($P=0.001$, $P<0.001$, $P=0.012$, $P=0.023$). Patients in ADI 3 had significantly worse PROMIS-UE score, PROMIS-PI, VAS, FF and ABD at 1-year postoperatively compared to ADI 1 ($P=0.016$, $P<0.001$, $P<0.001$, $P<0.001$, $P=0.034$). 9.8% of patients in ADI 1, 32.6% in ADI 2 and 57.6% in ADI 3 experienced a postoperative complication ($P=0.54$). Retears were more common in ADI 3 (62%) compared to ADI 2 (28%) and ADI 1 (10%) ($P=0.47$). There was a greater but not significant number of reoperations performed for patients in ADI 3 (63.4%) compared to ADI 2 (31.7%) and ADI 1 (4.9%) ($P=0.22$).

CONCLUSION: Lower socioeconomic status measured by ADI is associated with worse preoperative and 1-year postoperative pain, shoulder function and range of motion following rotator cuff repair, but no difference in reoperation or complications.

A High Percentage of Healthy Volunteers Fail to Pass Criteria-Based Return-to-Sport Testing for Arthroscopic Bankart Repair

Paper 235

Audria Wood, M.P.H. / Birmingham, AL

Co-Authors:

Audria Wood, M.P.H. / Birmingham, AL
Mathew Hargreaves, B.S. / Birmingham, AL
Nick Manfredi, B.S. / Birmingham, AL
Katie Higgins Pyrz, B.S. / Birmingham, AL
Eugene W. Brabston, M.D. / Birmingham, AL

Aaron J. Casp, M.D. / Birmingham, AL
Thomas Evely, D.O. / Birmingham, AL
Michael Bagwell, P.T., D.P.T. / Birmingham, AL
Kevin E. Wilk, P.T., D.P.T. / Birmingham, AL
Amit M. Momaya, M.D. / Birmingham, AL

INTRODUCTION: The rate of recurrent shoulder instability following return to sport (RTS) after Bankart repair remains unsatisfactory. This has led to the establishment of criteria-based return to sport (CBRTS) protocols which help providers determine if athletes are ready to return to their previous level of activity. However, there is a lack of evidence supporting passing thresholds for CBRTS protocols. This study aims to evaluate whether healthy volunteers can pass a previously published CBRTS protocol.

METHODS: This was a single-institution prospective single cohort study. The study was conducted in March 2024 and included 26 volunteers with no previous history of upper extremity injury or surgery. Volunteers were assessed according to a previously published CBRTS protocol: (i) isometric testing of external rotation (ER) and internal rotation (IR) in the supine and prone position at 0° and 90° as assessed by hand-held dynamometry; (ii) isokinetic strength testing of ER and IR at 60°/s and 180°/s as assessed by Biodex Isokinetic Dynamometer; (iii) endurance testing of side lying ER, prone ER, and prone Y test; and (iv) functional testing via closed kinetic chain upper extremity (CKCUE) stability test and unilateral shot put test. A limb symmetry index (LSI) and proportion of volunteers that passed each test were calculated for each test. LSI was calculated as the non-dominant arm value divided by dominant arm value for each test. A passing LSI value for all of the tests was defined as LSI within 10% of the contralateral side, except for the shot put test, for which a passing value was defined as $80\% \leq \text{LSI} \leq 110\%$. A passing score for the CKCUE stability test was greater than or equal to 21.

RESULTS: The 26 study participants had an average age of 24.8 years (range, 23-35) and included 14 males and 12 females. Despite the mean LSI for each of the isokinetic tests falling within the passing range, the proportion of volunteers passing the isokinetic tests ranged from 30.8% to 57.7%. For isometric testing, the proportion of volunteers passing each test ranged from 46.2% to 69.2%. For endurance testing, the proportion of volunteers passing each test ranged from 19.2% to 30.8%. Lastly, 50% of volunteers passed the CKCUE stability test, while 96.2% of volunteers passed the unilateral shot put test. A non-dominant arm deficit was apparent in 10 of the 12 tests that involved bilateral testing.

CONCLUSION: This study demonstrates that a high percentage of healthy individuals are unable to pass many of the post-Bankart repair CBRTS protocol tests. Clinicians should take such findings into account when utilizing CBRTS testing for athletes after arthroscopic Bankart repair. The benchmark LSI should be set at a value that is practical while still protecting against recurrent instability.

The Association Between Body Mass index, Age and Severity of Musculoskeletal Injuries Sustained During High School Contact Sports: A 15-Year Epidemiological Study

Paper 236

Pranav Bajaj / Chicago, IL

Co-Authors:

Pranav Bajaj, BA / Chicago, IL

Connor Workman, B.S. / Chicago, IL

Hunter Angileri, B.S. / Chicago, IL

Samantha Watson, BA / Chicago, IL

Sia Cho, BA / Chicago, IL

Joseph Tanenbaum, Ph.D. / Chicago, IL

Christy Collins, Ph.D. / Indianapolis, IN

Vehniah Tjong, M.D. / Chicago, IL

INTRODUCTION: Over 7.8 million students participate in high school (HS) sports and collectively sustain over 2 million sport-related injuries yearly. This study quantifies the association between athlete-specific characteristics (BMI and age) and severity of MSK injuries among high school sport participants to identify injury prevention strategies.

METHODS: De-identified, national HS sports injury data for boys' and girls' soccer, boys' and girls' basketball, boys' wrestling, and football were obtained from the High School Reporting Information Online (RIO) Study. RIO is a data collection tool capturing injury information from participating high schools from 2005/06-2018/19. The primary outcome was injury severity, measured by time to return to preinjury activity (RTA) under the assumption that more severe injuries have a longer time to RTA. A sport-specific logistic regression model was applied to assess the relationship between BMI and age and time to RTA that controlled for anatomic region of injury, type of injury (e.g. dislocation or fracture), level of play, geographic region, event type (competition vs practice), and timing of injury during the season.

RESULTS: Total nationwide injury observations from 2005/06-2018/19 yielded 33,486 MSK injuries (N = 11,068,855) with boys' football players sustaining over 50% of weighted reported injuries (n = 17,753; N = 5,100,845). Ligament sprains were most prevalent, representing 37.6% of reported injuries. Athletes most often reported knee and ankle injuries across all BMI designations. In the regression models, there was a significant association between BMI and RTA within 6 days or less in boys' football (OR = .99, 95% CI .98-.99, P = .003) and girls' basketball (OR = 1.04, 95% CI 1.0-1.1, P = 0.017). Lower BMIs among boys' football players and higher BMIs among girls' basketball players were significant with RTA greater than 6 days. Player age was not associated with RTA of 6 days or less.

CONCLUSION: Lower BMIs among boys' football players and greater BMIs among girls' basketball players were significant with RTA greater than 6 days, a proxy for injury severity. Lower BMIs may be unfavorable in football due to repetitive collisions, and higher BMIs may be unfavorable in basketball due to repetitive pivoting. Targeted injury prevention measures including stretching and neuromuscular training programs could be directed toward these demographics. Given the strength of these relationships, we suggest BMI be considered in a multifactorial analysis—including past injury history and position—of a player's injury risk.

Lower Socioeconomic Status is Associated with Delay to Surgery Before Anterior Cruciate Ligament Reconstruction

Paper 237

Muhammed Abbas, M.D. / Detroit, MI

Co-Authors:

Michael A. Gaudiani, M.D. / Detroit, MI

Brittaney Pratt, B.S / Detroit, MI

Joshua P. Castle, M.D. / Detroit, MI

Muhammad Abbas, M.D. / Detroit, MI

Marquisha Myles, B.S. / Detroit, MI

Nicolas Daher, B.S. / Detroit, MI

Jhamal J. Wallace, B.S. / Detroit, MI

T. Sean Lynch, M.D. / Detroit, MI

Vasilios Moutzouros, M.D. / Detroit, MI

INTRODUCTION: There is a growing recognition of the importance of social determinants of health (SDOH) on orthopedic surgery and their influence on surgical outcomes. Access to specialized care and surgery can also be negatively influenced by SDOH. The purpose of this study was to investigate the association between SDOH and the presentation to clinic and timing of surgery in anterior cruciate ligament reconstruction (ACLR) patients.

METHODS: A retrospective cohort review of patients undergoing ACLR patients at a single healthcare system in a large metropolitan area was conducted. Patients' demographic variables, mean household income (MHI) and Area of Deprivation Index (ADI) were collected using the electronic medical record and online mapping data tools based on zip codes. The primary outcome was to compare time from injury to presentation to a sports medicine clinic and time to surgical intervention. The secondary outcome was to compare Patient-Reported Outcome Measurement Information System (PROMIS) scores for Physical Function (PROMIS-PF) and Pain Interference (PROMIS-PI) scores at preoperative and postoperative time points.

RESULTS: Three-hundred and ninety-eight ACLR patients were included. Black patients were more frequently in the lowest median household income (MHI) quartile compared to white patients (54% vs. 9%, respectively; $P < .001$). White patients were more frequently in the lowest area deprivation index (ADI) quartile when compared with Black patients (50% vs 9%, respectively; $P < .001$). No significant difference was found between patient race in injury to presentation and time to surgery. Compared to the least deprived ADI quartile, those in the highest ADI quartile experienced a significantly longer delay to surgery (5.57 wks. vs. 3.0 wks. respectively, $p < 0.001$). Patients in the lowest income quartile experienced significantly longer delay to surgery than patients in MHI quartile 4, (5.14 wks. vs 3.86 wks. respectively; $p = 0.016$). Increasing age was correlated with longer times from injury to presentation ($r_s = 0.268$, $p < 0.001$) and presentation to surgery ($r_s = 0.210$, $p < 0.001$). Increasing BMI was correlated with increased time from injury to presentation ($r_s = 0.132$, $p = 0.009$). The lowest income quartile (MHI Q4) demonstrated worse PROMIS-PI (52 vs. 50 $p = 0.035$) and PROMIS-PF (49 vs. 52, $p = 0.018$) scores compared to the highest MHI quartile at one year post-op.

CONCLUSION: Patients in the most socioeconomically deprived and lowest incomes quartiles experienced significant delays in presentation and time to ACLR. These socioeconomic differences appear to be associated with worse pain and physical function for these patients at 1 year after ACLR.

Effect of the 'FIFA 11+ Kids' Neuromuscular Training Program on Physical Performance in Preadolescent Female Soccer Players

Paper 238

Bradley S. Lambert, Ph.D. / Houston, TX

Co-Authors:

Alysa Birnbrich, M.D. / Houston, TX

Brendan Holderread, M.D. / Houston, TX

Roxanne Miller / Houston, TX

Jordan Ankersen, Ph.D. / Houston, TX

Bradley Lambert, Ph.D. / Houston, TX

Shari Liberman, M.D. / Houston, TX

OBJECTIVE: Lower extremity injury risk in youth soccer is often attributed to lower extremity strength deficits/imbbalances and lack of dynamic stability. The 'FIFA11+Kids' program is a neuromuscular training (NMT) program designed to address these issues in youth soccer players. However, its effectiveness has not been evaluated in preadolescent females, despite studies showing an elevated risk of such injuries in compared to males. The purpose of this study was to assess the impact of the 'FIFA11+Kids' training on dynamic stability, agility, power, and lower body strength in preadolescent female competitive soccer players.

METHODS: Seventy-four female youth soccer players were recruited and completed this study spanning a competitive season (~13wks) following allocation to either the NMT($n=45/10\pm 1$ yrs) or CONTROL($n=29/10\pm 1$ yrs) groups randomized by team. The NMT group completed the 'FIFA11+Kids' program at practice biweekly incorporated into their standardized warm-up. The CONTROL group performed a standardized warm-up alone. Functional testing was performed before and after the intervention: Y-balance (YBT) for balance and dynamic stability; Strength testing (knee extension/flexion); Agility and power testing assessed via the pro-agility test and hop testing (HT). A 2x2 ANCOVA repeated on time and covaried on baseline testing was used to compare changes in measures within and between groups. Correlation and Z-test analysis evaluated the relationship between age and test performance. (Type-I error, $\alpha=0.05$).

RESULTS: The NMT group was observed to have improvements in posteromedial($\uparrow 3.54\%\pm 2.44$, $p=0.001$) and posterolateral($\uparrow 3.25\%\pm 2.79$, $p=0.013$) YBT reach. The CONTROL group experienced a $\downarrow 2.54\%\pm 2.17$ reduction in anterior reach ($p=0.012$). Following training, only the NMT group recorded faster times on the pro-agility test ($\downarrow 0.2\pm 0.09$ seconds, $p=0.049$) and compared to the CONTROL group at post-intervention ($\downarrow 0.33\pm 0.11$ seconds, $p=0.003$). Both groups improved similarly in single-leg hop distance, with only the CONTROL group demonstrating improvement in triple-hop distance. Age was observed to be correlated with all performance measures ($p<0.05$), having a stronger relationship with agility($r=0.603$) and power($r=0.594$) measures compared to YBT($r=0.374$)($p<0.05$).

CONCLUSIONS: The "FIFA11+Kids" program led to modest but significant improvements in dynamic stability and agility in preadolescent female soccer players, which may reduce risk. However, it did not improve strength or the knee flexion/extension ratios often linked to injury risk reduction. We conclude the FIFA11+Kids program may benefit from including additional lower extremity strengthening activities. While age was correlated with improved performance measures, natural improvement in dynamic stability with age appears to be less likely compared to other metrics, emphasizing a potential need to train these qualities in preadolescent female athletes.

Dangerous Games: A National Cross-Sectional Study of Pediatric Sport-Related Fractures

Paper 239

Garrett Flynn / Boca Raton, FL

Co-Authors:

Connor Fritz / Houston, TX

Taylor Rakauskas, B.S. / Boca Raton, FL

Nikhil Gattu / Houston, TX

Garrett Flynn / Boca Raton, FL

Safa Herfat / San Francisco, CA

Meir Marmor / San Francisco, CA

OBJECTIVE: Previous studies on pediatric sport-related fractures lack extensive injury-type descriptions and often focus on a single activity, limiting the ability to compare and analyze data across sports. The purpose of this study was to identify sports with higher fracture incidence and odds of severe outcome in children (age 6-12) and adolescents (13-17).

METHODS: Case-level data corresponding U.S. emergency department visits was downloaded from the National Electronic Injury Surveillance System (NEISS). Cases corresponding to sport-related fractures were isolated. Data was collected for the years 2019 to 2022, and for patients ages 6 to 17. Using statistical weights provided through NEISS, we calculated estimates and 95% confidence intervals for the national incidence of fractures across sports. We divided these estimates by sport participation estimates from Project Play to compare fracture rates across sports. We used multivariable logistic regression to study associations between sport, patient sex, patient age, and severe outcomes. A patient was considered to have experienced a severe outcome if they were hospitalized, transferred, or held for observation, rather than being treated and released.

RESULTS: A total of 21,869 sport-related fractures were evaluated. The median age was 13.0 (IQR 11.0-15.0). Fracture locations varied widely between sports. The highest fracture rates reported as number of fractures per 10,000 persons at risk were in wrestling (122.7 fractures, 95% CI: 69.55-175.7), football (118.8 fractures, 95% CI: 103.08-134.56), and soccer (65.9 fractures, 95% CI: 54.86-76.9). In a multivariable analysis, females presenting with sports-related fractures were less likely to experience severe outcomes than males (OR=0.63, $p < 0.001$). When compared to football, sports involving vaulting had higher rates of severe outcomes after presentation (track and field (OR 1.54, $p = 0.012$), cheerleading (OR 2.11, $p < 0.001$), gymnastics (OR 2.56, $p < 0.001$)). Golf also had higher odds (OR 6.97, $p < 0.001$), likely due to the high proportion of cranial fractures in this sport.

DISCUSSION AND CONCLUSION: While fractures were much more prevalent in certain sports - such as wrestling and football - fracture locations and the odds of severe outcomes differed dramatically. The insights gained from this study may increase our understanding of the epidemiology of sports-related fractures and may have implications for injury prevention initiatives in pediatric sports.

Anterior Cruciate Ligament Injuries in National Football League Players from 2012-2022: A Descriptive Epidemiology Study

Paper 240

Ashwin R. Garlapaty / Denton, TX

Co-Authors:

Ashwin R. Garlapaty, B.S. / Columbia, MO

Morgan Kluge, B.S. / Columbia, MO

Rown Parola, M.D. / Columbia, MO

Quin Blankenship, B.S. / Columbia, MO

Abdoulie Njai, M.D. / Columbia, MO

James T. Stannard, M.D. / Columbia, MO

Caleb Bischoff, D.O. / Columbia, MO

James L. Cook, DVM, PhD / Columbia, MO

Steven DeFroda, M.D. / Columbia, MO

Clayton Nuelle, M.D. / Columbia, MO

OBJECTIVES: There is a high incidence of anterior cruciate ligament (ACL) tears in National Football League (NFL) players. There is a relative paucity of long-term data characterizing the effects of artificial versus natural playing surfaces on ACL tear incidence. The purpose of this study was to determine the incidence of ACL tears sustained by NFL players playing on artificial turf versus natural surfaces from 2012-2022 and characterize tear trends by player position and injury timing. Secondary aims of this study included characterizing ACL tears by preseason, season, and post-season week, ACL tears by a contact or non-contact injury mechanism, ACL tears torn in the practice or game setting, and incidence of ACL tears by player position and position group.

METHODS: A comprehensive search of publicly available data identified any NFL player who sustained an ACL injury from 2012-2022. The publicly available databases allowed for characterization of playing surface, player position, timing of injury in season, mechanism of injury, and player age. Incidence of ACL injuries by playing surface, player position, and position group relative to all other positions or position groups were compared by Fisher's exact tests. Correlates of in-game ACL injury were determined by multivariate logistic regression.

RESULTS: 520 NFL players experienced an ACL tear between seasons 2012-2013 and 2022-2023. There was no significant difference in incidence of ACL tears on artificial turf versus natural playing surfaces (265 versus 255, $p=0.670$). Wide receivers ($p=0.027$) were associated with a significantly higher incidence of ACL tears compared to other positions. Receivers (wide receivers and tight ends) ($p=0.007$) and specialists (punters, kickers, and long snappers) ($p<0.001$) were associated with significantly higher incidence of ACL tears compared to other position groups. Significantly more ACL tears occurred before week 8 than after week 8 ($p=0.002$) in-season, and the proportion of ACL tears occurring during a game (67%) was significantly higher than those occurring during practice.

CONCLUSIONS: There was no statistically significant difference in incidence of ACL tears in NFL players from the 2012-2013 to 2022-2023 seasons based on playing surface (artificial versus natural). Wide receivers had a significantly higher incidence of ACL tears compared to other positions and tears were more common during games and before week 8 in-season.

Bridging the Gap: Utilizing Porcine Stifle Joints for Enhanced Understanding of Human Knee Mechanics and Treatment

Paper 241

Cadence F. Lee, AB, ScM / Chicago, IL

Co-Authors:

Cadence F. Lee, AB, ScM / Chicago, IL

Yvon M. Bogdonoff, B.S. / Chicago, IL

Jared M. Rubin, BA / Chicago, IL

Mark Hutchinson, M.D. / Chicago, IL

Farid Amirouche, Ph.D. / Chicago, IL

Jason Koh, MD / Chicago, IL

INTRODUCTION: Male porcine models are increasingly used in orthopedic research due to their anatomical and physiological similarities with humans, especially for knee studies. This study compares the osteology and meniscus anatomy of male porcine stifle joints to human counterparts, validating their suitability for experimental orthopedics.

METHODS: Sixty male Yorkshire porcine stifle joints were dissected and measured. Anatomical features analyzed included distal femur and proximal tibia dimensions, meniscal morphology, and volume, using digital calipers and ImageJ software. Statistical analyses included Intraclass Correlation Coefficients (ICC) for measurement reliability and unpaired Student's t-tests to compare porcine data with human benchmarks.

RESULTS: Bone Morphology: Porcine femoral condyle aspect ratios were 1.04 ± 0.04 and 1.08 ± 0.05 (caliper and software measurements, respectively), closely mirroring human data. Tibial aspect ratios were 0.65 ± 0.02 for both methods, confirming anatomical similarity.

Meniscal Dimensions: Significant differences were observed between the medial and lateral menisci of porcine models. Average widths were 13.31 ± 1.859 mm (medial) and 15.383 ± 1.9 mm (lateral), with a notable difference ($p < 0.05$). Meniscal volumes were 4.30 ± 0.13 ml (medial) and 5.9 ± 0.29 ml (lateral), aligning closely with human data. This finding is crucial for replicating human meniscal injuries and repair techniques in porcine models.

Notch Width Index (NWI) and Notch Shape Index (NSI): NWI for porcine samples aged less than 3 months averaged 0.143 ± 0.014 , while for those aged more than 3 months it was 0.203 ± 0.0305 . NSI values were 3.24 ± 0.463 for younger and 2.088 ± 0.398 for older specimens, showing significant age-related differences ($p < 0.001$). The ICC confirmed measurement consistency.

CONCLUSION: This study confirms the porcine stifle joint as a viable model for knee, ACL, and meniscus research. The anatomical similarities with human joints, cost-effectiveness, and ease of procurement make porcine specimens ideal for pre-clinical studies. Our findings on age-related morphological variations enhance model selection for research, contributing valuable insights to orthopedic science.

Early Specialization in Youth Sports is Associated with Hip Pain and Surgical Treatment in College-Age Athletes

Paper 242

Michael C. Willey, MD / Iowa City, IA

Co-Authors:

Elle M. McCormick, BBA / Iowa City, IA

Natalie A. Glass, Ph.D. / Iowa City, IA

Robert W. Westermann, M.D. / Iowa City, IA

Alisa Drapeaux, Ph.D. / Des Moines, IA

Jessica E. Goetz, Ph.D. / Iowa City, IA

Courtney Seffker, PA-C / Iowa City, IA

Ashley Kochuyt, B.S. / Iowa City, IA

John Davison, M.D., MPH / Iowa City, IA

Michael C. Willey, M.D. / Iowa City, Iowa

INTRODUCTION: Youth sports participation and early specialization has drastically increased, but there is limited investigation into the impact on physical and mental health. Power sports participation during hip development (8 to 14 years old) can increase the risk of abnormal hip morphology resulting in femoroacetabular impingement (FAI) and hip dysplasia. The goal of this study was to assess the impact of youth sport specialization from 8-14 years old on musculoskeletal injury and mental health in college-age young adults.

METHODS: College students aged 18 to 22 years were enrolled at five universities to complete a survey documenting sports participation and specialization between 8 and 14 years old. The survey characterized musculoskeletal injury and treatment, physical and mental health, and current sport participation and level. Participants also completed the International Hip Outcomes Tool (IHOT) to characterize hip pain and function. Participants were grouped according to whether they specialized year-round in a single youth sport from 8 to 14 years old. Differences between groups were evaluated using chi-square or Wilcoxon Rank Sum tests, for categorical or continuous variables, respectively.

RESULTS: Of 1,018 young adults who completed the survey, 749 (73.6%) were female. 375 (37%) respondents quit other sports entirely between the ages of 8- to 14-years-old to specialize in their primary sport. Youth athletes that reported specialization more commonly had hip/groin pain (62.7% vs 53.3% $p=0.0035$) and were more likely to quit their primary sport entirely due to injury (68.0% vs 55.4%, $p<0.0001$).

Of patients that reported hip or groin pain, early specialization was associated with surgical treatment of the hip (21.3% vs 12.4%, $p=0.0328$). Hip arthroscopy was the most common hip surgery (39 participants). Early specialization was also associated with lower iHOT scores ($p=0.0005$), but was not associated with non-hip orthopedic surgeries and did not result in lower mental health ratings. Females had higher rates of hip/groin pain than males (58.6% vs. 49.8%) with higher rates of non-surgical (57.5% vs. 44.7%) and surgical (6.1% vs. 2.0%) treatment of hip conditions.

DISCUSSION: Youth sport specialization from 8 to 14 years old was common in over 1000 college-age young adults. Specialization was associated with hip pain and surgical treatment of hip conditions. Youth athletes should be discouraged from early specialization to avoid future hip pain and dysfunction.

Predictors of Matrix-Induced Autologous Chondrocyte Implantation (MACI) Following Articular Cartilage Biopsy

Paper 243

Zachary C. Paragas / Columbus, OH

Co-Authors:

Zachary C. Paragas / Columbus, OH

David C. Flanigan, M.D. / Columbus, OH

Robert Magnussen M.D., MPH / Columbus, OH

Tyler Barker, Ph.D. / Columbus, OH

Parker Cavendish, M.D. / Columbus, OH

Eric Milliron, M.D. / Columbus, OH

James Kirven, M.D. / Columbus, OH

Noah Mallory / Columbus, OH

OBJECTIVES: Repair of articular cartilage defects presents a significant challenge in orthopedics. Matrix-Induced Autologous Chondrocyte Implantation (MACI) is an advanced intervention aimed at treating these defects. Despite its growing application, the decision-making process for undergoing MACI remains complex. This study aimed to identify predictive variables influencing the likelihood of undergoing MACI following an articular cartilage biopsy.

METHODS: This retrospective chart review included 254 patients who underwent articular cartilage biopsy from January 2017 to December 2022 at an academic medical center. Patients who subsequently underwent the MACI procedure were categorized as the MACI group, while those who did not were categorized as the non-MACI group. Binary Logistic Regression analysis was employed to evaluate predictors of undergoing MACI. Potential predictors included patient age at the time of biopsy, sex, BMI, pain level, intraoperative total cartilage defect size, and initial intent to perform MACI. Intention was categorized according as: 1) Biopsy planned with intent to treat the cartilage defect (G1, n = 80), incidental findings at the time of surgery (G2, n = 6), and plan for post-biopsy reassessment of symptoms and decision for MACI (G3, n = 167). Final model selection was performed to maximize goodness of fit according to the HosmerLemeshow test.

RESULTS: The sample was composed of 142 men and 112 women with an average age of 27.7 years and BMI of 27.9 kg/m². A total of 80 out of 254 (31.5%) underwent the MACI procedure. The final regression model included patient age at the time of biopsy (OR = -0.031, p = 0.140), initial intention group ([G2 OR = 0.087, p = 0.030] [G3 OR = 0.058, p < 0.001]), and total defect size (OR = 0.13, p = 0.008). The model demonstrated a strong predictive accuracy (87.3% Specificity, 72.5% Sensitivity). Controlling for initial intention group and age, each 1 cm² increase in defect size corresponded to a 14.0% increase in the likelihood of undergoing MACI. Similarly, controlling for initial intention group and defect size, there was a 3.1% decrease in the odds of undergoing MACI for each additional year of age.

CONCLUSIONS: Younger patient age, larger defect size, and an initial plan for subsequent MACI were significant predictors of a patient proceeding with the MACI procedure.

The Hawkins Sign: Inter-Rater Variability & Overall Reliability in Predicting Preservation of Talar Vascularity

Poster 02

Richard T. Laughlin, M.D. / Cincinnati, OH

Co-Authors:

Logan P. Lake, B.S. / Cincinnati, OH

Paul McMillan, M.D. / Cincinnati, OH

Sarah Kurkowski, M.D. / Cincinnati, OH

Henry Kuechly, B.S. / Cincinnati, OH

Augusto Roca Fernandez, BS / Cincinnati, OH

Richard Laughlin, M.D. / Cincinnati, OH

OBJECTIVE: The vertical talar neck fracture is an uncommon injury pattern associated with a high risk of postoperative complications, namely avascular necrosis (AVN). Literature suggests the incidence of AVN among Hawkins type III talus fractures falls between 40-70%. The Hawkins sign, characterized as the presence of subchondral lucency seen in the talar dome on radiographs taken 6-8 weeks after the injury, is widely accepted as an indication of preserved talar vascularity, and consequently, as a strong predictor for positive prognostic outcomes. This study aims to evaluate the overall reliability and inter-rater variability of the Hawkins sign as a predictor for patient outcomes after Type III Hawkins fractures.

METHODS: A retrospective study of Hawkins III talar neck fractures presenting to a level-I trauma center from 2018-2022 was conducted. A fellowship-trained foot and ankle surgeon examined six-week postoperative radiographs to determine the presence or absence of the Hawkins sign. Subsequently, four additional orthopedic surgeons independently evaluated the radiographs for evidence of the Hawkins sign. The incidence of AVN was determined via thorough review of patient records throughout the 1-year follow up period.

RESULTS: In total, 17 patients with Hawkins III talar neck fractures were identified. The Hawkins sign was observed on 2 radiographs, 1 of which went on to develop AVN. Of the 15 tali without Hawkins sign, 6 developed AVN. In assessing the reliability of Hawkins sign as a diagnostic test for predicting the likelihood of AVN, we obtain a sensitivity of 86%, specificity of 10%, and positive & negative predictive values of 40% and 50%, respectively. Interobserver reliability in evaluation of the Hawkins sign resulted in a kappa value of 0.04 (95% CI, -.035 to .115), which was not statistically significant, $p=0.294$. There was complete agreement between all five surgeons for 5/17 (29.4%) cases.

CONCLUSIONS: Similar to conclusions drawn by others, we surmise that while a positive Hawkins sign is a strong indication of preserved vascularity and a relatively low likelihood of developing AVN, the absence of Hawkins sign does not, with significance, predict the onset of osteonecrosis. Although surgeon responses appear inconsistent, the lack of a statistically significant variability among raters further suggests Hawkins sign is a valid, albeit inherently subjective, tool for predicting outcomes among patients with Hawkins III talus fractures. Further investigation of this topic with a larger sample size, evaluation of patient factors, and with controlling for intra-rater reliability is warranted.

Bariatric Surgery and Carpal Tunnel Syndrome: Implications for Surgical Outcomes and Care Strategies

Poster 03

Nirav Mungalpara, M.D. / Chicago, IL

Co-Authors:

Brett Drake, B.S. / Chicago, IL

Apurva Choubey, M.D. / Chicago, IL

Vennela Challagondla, B.S., MPH / Chicago, IL

Nirav Mungalpara, M.D. / Chicago, IL

Mark Gonzalez, M.D., Ph.D. / Chicago, IL

OBJECTIVE: The purpose of this study was to assess and compare the occurrence of carpal tunnel syndrome and postoperative outcomes after carpal tunnel surgery in patients with and without prior bariatric surgery.

METHODS: Data from the PearlDiver Mariner database, covering over 165 million patients from 2010 to 2022, were analyzed. Patients diagnosed with carpal tunnel syndrome and those undergoing carpal tunnel surgery were identified using ICD-9, ICD-10, and CPT codes. They were divided into two groups: those with and without prior bariatric surgery, matched 1:10 by age, sex, and Charlson Comorbidity Index. Demographics, comorbidities, and postoperative outcomes—nerve injury, complex regional pain syndrome (CRPS), additional carpal tunnel surgeries, and emergency department (ED) visits—were compared using Chi-square and Student's t-tests. A Kaplan-Meier curve showed the time from initial carpal tunnel surgery to subsequent surgeries.

RESULTS: The study compared 26,309 patients with prior bariatric surgery and carpal tunnel syndrome to 263,069 patients without such surgery, revealing significant differences. Patients with prior bariatric surgery had higher rates of comorbidities, including anemia, depression, diabetes, electrolyte disorders, hypertension, hypothyroidism, autoimmune diseases, cervical radiculopathy, vitamin B12 deficiency, and peripheral neuropathy (all $p < 0.001$). They were also more likely to undergo carpal tunnel surgery (25.90% vs. 18.44%, $p < 0.001$), cubital tunnel surgery (4.38% vs. 2.79%, $p < 0.001$), and visit the emergency department (83.36% vs. 76.21%, $p < 0.001$) than those without prior surgery. Postoperatively, among 5,918 patients with prior bariatric surgery and 59,140 without, similar trends in comorbidities persisted. Rates of postoperative nerve injury and CRPS were not statistically different. Patients with previous bariatric surgery were significantly more likely to undergo additional carpal tunnel surgery within 2 years of the initial operation.

CONCLUSION: This study highlights that patients with prior bariatric surgery and carpal tunnel syndrome have more comorbidities, frequent carpal and cubital tunnel surgeries, and poorer postoperative outcomes. Nutritional deficiencies and metabolic changes may worsen neuropathy, increasing intervention needs. Higher rates of cervical radiculopathy and peripheral neuropathy suggest double crush syndrome, underscoring the need for tailored preoperative and postoperative care.

Comparison of Patient-Reported Outcomes After Different Surgical Treatment Methods for Thumb RCL Tear

Poster 05

Sarah Ridenour, M.D. / Rochester, MN

Co-Authors:

Sarah Townsley, M.D. / Rochester, MN

Jacob Schaefer, M.D. / Rochester, MN

Sanjeev Kakar, M.D. / Rochester, MN

OBJECTIVE: Complete injury to the radial collateral ligament (RCL) of the thumb metacarpophalangeal (MCP) joint may be treated operatively or nonoperatively with immobilization. Surgical treatment options may include reconstruction, repair alone, or repair with suture tape augmentation in which the repaired tendon is spanned with a suture tape construct to provide immediate stability. The purpose of our study was to present and compare patient reported outcomes after various surgical treatments methods of thumb MCP RCL tears.

METHODS: After institutional review board approval, we prospectively administered the Michigan Hand Questionnaire (MHQ) to a group of patients in a retrospectively compiled database at a single institution who underwent open thumb RCL repair or reconstruction from 1989-2021. Lower scores on the MHQ indicate worse outcomes. T-test was used to analyze continuous variables. $P < .05$ was considered significant.

RESULTS: Fifteen patients received open surgical treatment of a thumb MCP RCL tear and completed the MHQ postoperatively. Average age of the included patients was 25 years at the time of surgery. Two patients underwent RCL repair with suture tape augmentation, twelve underwent RCL repair without suture tape augmentation and one patient underwent reconstruction with tendon allograft. For the patient who underwent RCL reconstruction, the MHQ was significantly lower than patients who underwent repair (50.7 vs 91.5; $p = .003$). There was no significant difference in MHQ score for patients who underwent RCL repair with or without suture tape augmentation (91.3 vs 88.4; $p = .81$). The MHQ was significantly lower if the dominant hand was affected than if the nondominant hand was affected with a mean score of 99.0 for nondominant hand injury vs 89.1 for dominant hand injury ($p = .01$). Mean time from surgery to completing the questionnaire was 14.7 years. Patients who underwent suture tape augmentation had a significantly shorter time between surgery and completion of the MHQ (4.2 years vs 16.3 years; $p = .0002$). The minimal clinically important difference has not yet been established for this treatment.

CONCLUSIONS: Thumb MCP RCL repair both with and without suture tape augmentation were associated with similar patient reported outcomes based on the MHQ, while reconstruction was associated with a significantly worse MHQ score.

Low Preoperative Vitamin D Associated with Lower Baseline PROMs But Greater Improvement Following Total Joint Arthroplasty

Poster 06

Sarthak Aggarwal, B.S. / Chicago, IL

Co-Authors:

Sarthak Aggarwal, B.S. / Chicago, IL

Malik Scott, B.A. / Chicago, IL

Michael Koch, B.S. / Chicago, IL

Chuanhong Liao, M.S. / Chicago, IL

Sara J.S. Wallace, M.D., MPH / Chicago, IL

OBJECTIVE: 25-OH-vitamin-D (25(OH)D) deficiency is becoming increasingly prevalent and has been associated with poorer outcomes in total joint arthroplasty (TJA). The purpose of this study was to investigate whether low preoperative 25(OH)D is associated with worse patient-reported outcome measures (PROMs) and higher odds of postoperative complications following TJA in a diverse population with high prevalence of low 25(OH)D.

METHODS: This was a retrospective study of patients undergoing total hip (THA) or knee arthroplasty (TKA) at an urban tertiary care center between 2020-2023. A total of 488 patients were included, representing 538 surgeries. Patients identified as 25(OH)D deficient (<12 nmol/L) or insufficient (12–30 nmol/L) were prescribed supplementation before or at the time of surgery per institution protocol. We analyzed the association between 25(OH)D level and Hip dysfunction and Osteoarthritis Outcome Score for Joint Replacement (HOOS, JR) or Knee injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS, JR) preoperatively, at 6 weeks, and at 90-days post-surgery, as well as 90-day complications.

RESULTS: Low preoperative 25(OH)D was observed in 46.5% of surgeries and disproportionately impacted Black patients. Lower 25(OH)D was associated with younger age, higher body mass index, and lower preoperative HOOS, JR score. Improvement in HOOS, JR score at 90-days postoperatively was significantly greater in the 25(OH)D deficient group ($P = .043$). A similar trend was observed among KOOS, JR scores but did not achieve significance. Low preoperative 25(OH)D did not increase odds of re-operation ($P = .484$), readmission ($P = .385$), wound complications ($P = .595$), or overall complications ($P = .656$).

CONCLUSIONS: Our results suggest that low 25(OH)D is associated with lower preoperative HOOS, JR score and greater improvement in HOOS, JR score following THA; a similar trend was observed in TKA but was not significant. Nonetheless, TJA coupled with 25(OH)D supplementation in patients with low 25(OH)D may result in similar postoperative outcomes as those with normal preoperative 25(OH)D levels, both in terms of improvement in function and low odds of complications.

Deep Learning Identification of Hip Joint Morphology

Poster 08

Lainey G. Bukowiec, M.D. / Rochester, MN

Co-Authors:

Lainey G. Bukowiec, M.D. / Rochester, MN

Anish Kanabar, M.S. / Rochester, MN

John P. Mickley, M.D. / Rochester, MN

Kellen Mulford, Ph.D. / Rochester, MN

Cody C. Wyles, M.D. / Rochester, MN

OBJECTIVE: This study aimed to develop a specialized deep learning (DL) model to characterize patient radiographs based on morphology and joint degeneration metrics. This approach can be leveraged to determine a patient's joint morphology and joint space width which can serve as a diagnostic aid and a metric to prognosticate the progression to various stages of osteoarthritis.

METHODS: A DL FlexibleUNet model was trained to automatically segment the acetabular sourcil, the femoral head and a portion of the femoral neck. The model performed an 85:15 train/test split on a retrospective dataset of 294 AP pelvic radiographs. Ground truth for the model consisted of radiographs annotated by two human annotators within the orthopedic surgery department who underwent training to be able to reliably and consistently detect the aforementioned structures. Performance metrics including dice coefficients were calculated for the annotated portion of the femur and the sourcil for the training and testing sets.

RESULTS: Dice coefficients for the annotation of the sourcil and femoral head/neck for the training set was 0.902 for the sourcil and 0.928 for the femoral head/neck. Dice coefficients for the testing set was 0.783 overall, 0.657 for the sourcil and 0.909 for the femoral head/neck. Algorithm and manual measurements by two independent reviewers in 294 randomly selected patients were compared. The measurement discrepancy did not demonstrate a systematic tendency between human and machine. Automatic and manual measurements were strongly correlated and showed no significant differences.

CONCLUSIONS: A DL convolutional neural network classifier was trained to a moderately high degree of accuracy to identify the femoral head/neck and the acetabular sourcil. The identification of the sourcil was less precise than that of the femoral head/neck. This discrepancy predictably arises because the sourcil is a smaller structure, and the algorithm's accuracy is determined by the number of correctly identified pixels. In contrast to the manual approach, the DL tool needs no user input to perform annotations. Developing tools to automatically detect these structures has the potential to allow for automated detection of joint space width, a correlate of cartilage thinning and compression that is seen in osteoarthritis hips. Segmentation of these structures also has potential in developing further models to automatically classify hip morphology, which is pertinent in radiographs of developmental dysplasia of the hip or femoroacetabular impingement.

Should We Use the Largest Femoral Head with the Smallest Acetabular Component in Primary THA?

Poster 09

Brett R. Bukowski, M.D. / Rochester, MN

Co-Authors:

Mark Wu, M.D. / Rochester, MN

Brett R. Bukowski, M.D. / Rochester, MN

Kristin M. Fruth, B.S. / Rochester, MN

Robert T. Trousdale, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Tad M. Mabry, M.D. / Rochester, MN

OBJECTIVE: There has been increasing use of larger femoral head sizes in an effort to mitigate the risk of dislocation after total hip arthroplasty (THA). As such, manufacturers have created thinner highly cross-linked polyethylene (HXLPE) liners to maximize effective head size. We investigated if there was a decreased dislocation risk or a survivorship penalty if the largest head was chosen at the smallest compatible acetabular component size.

METHODS: We reviewed 1886 posterior approach primary THAs with HXLPE from 2005 – 2021. Subjects were divided into 3 groups based on acetabular component transition points at which a larger femoral head could be used: Group 1 was 28-mm (n=19) vs. 32-mm (n=89) heads, Group 2 was 32-mm (n=383) vs. 36-mm (n=441) heads, and Group 3 was 36-mm (n=815) vs. 40-mm (n=139) heads. Mean age was 66 years, 75% were female, and mean BMI was 30 kg/m². Forty-eight percent had ceramic and 52% had cobalt-chrome heads. Mean follow-up was 6 years.

RESULTS: There were no liner fractures and 2 (0.1%) liner dissociations. The 10-year survivorships free of dislocation, any revision, and any reoperation were 95%, 95% and 93%, respectively. The 5-year survivorship free of dislocation for Group 1 was 95% for 28-mm and 99% for 32-mm heads; for Group 2, 96% for 32-mm and 99% for 36-mm heads, and for Group 3, 96% for 36-mm and 96% for 40-mm heads. Cox regression demonstrated no difference in reoperation or revision rates between head sizes in any group.

CONCLUSIONS: Choosing the largest femoral head with the smallest compatible cup for 32-mm, 36-mm, and 40-mm heads did not increase risk for liner-related complications, revisions, or reoperations. There was no difference in dislocation risk when using the larger femoral head at transitional cup sizes, though this study was underpowered to detect this difference.

Diagnostic Accuracy of Alpha-Defensin in Total Hip and Total Knee Arthroplasties

Poster 10

Brett R. Bukowski, M.D. / Rochester, MN

Co-Authors:

Mark Wu, M.D. / Rochester, MN

Brett R. Bukowski, M.D. / Rochester, MN

Joel A. Hickman / Rochester, MN

Elitza S. Theel, Ph.D. / Rochester, MN

Robin Patel, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

OBJECTIVE: Accurate and timely diagnosis of periprosthetic joint infection (PJI) remains suboptimal. One available test is the alpha defensin lateral flow assay (ADLFA). This study assessed ADLFA for diagnosis of PJI in total hip arthroplasties (THAs) and total knee arthroplasties (TKAs). The hypothesis was that ADLFA would have high specificity and sensitivity for diagnosing PJI, but that certain clinical features would influence test reliability.

METHODS: We reviewed 473 ADLFA tests from 141 THAs and 332 TKAs performed in routine clinical practice from 2020 – 2023 at a single institution. Mean age was 66 years, 51% were female, and mean BMI was 32 kg/m². There were 142 PJIs (2018 MSIS criteria excluding ADLFA). Overall, 49% were primary and 51% revision procedures, 22% were on antibiotics within 2 weeks of arthrocentesis, 18% had an inflammatory arthropathy, and 7% had an in situ spacer.

RESULTS: The overall sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of ADLFA were 80%, 97%, 92%, and 92%, respectively. Six percent of the entire cohort (29/473) had false negative results, of which 38% were on antibiotics within 2 weeks of arthrocentesis. Twenty-one percent of FNs were spacer aspirations. Two percent (10/473) of the entire cohort had false positive ADLFA results. NPV was lower for those with recent antibiotic use (76%) compared to without (94%; $p<0.001$). There was lower sensitivity (57%) in spacer compared to non-spacer aspirations (82%; $p=0.04$). Furthermore, the sensitivity in THA (67%) was lower compared to TKA (84%; $p=0.033$). In TKAs, there was lower specificity (91%) for those with inflammatory arthropathies compared to without (99%; $p=0.02$).

CONCLUSIONS: ADLFA is highly specific in diagnosing PJI, but less sensitive in patients with antibiotic spacers and those with THAs compared to TKAs. Additionally, underlying inflammatory arthropathies may decrease specificity, yielding false positive results, specifically in TKAs.

Long-Term Outcomes of Cemented vs. Cementless Total Hip Arthroplasty Following Displaced Femoral Neck Fracture

Poster 11

Xiao Tony Chen, M.D. / Rochester, MN

Co-Authors:

Xiao Tony Chen, M.D. / Rochester, MN

Brian D. Wahlig, M.D. / Rochester, MN

Lionel Fotso Kamga, B.S. / Rochester, MN

Charles P. Hannon, M.D. / Rochester, MN

Brandon J. Yuan, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

INTRODUCTION: Cemented femoral fixation is recommended for hip arthroplasty performed in elderly patients with femoral neck fractures. However, the optimal choice of femoral fixation is unknown for younger patients. The purpose of this study was to compare long-term outcomes of cemented vs. cementless femoral fixation in total hip arthroplasty (THA) performed in patients less than 65 years of age with a femoral neck fracture.

METHODS: We identified 139 patients under 65 years of age treated with primary THA for femoral neck fracture from 1970-2020 at a single institution. Of these, 70 received cemented and 69 received cementless femoral fixation. The mean age of the entire cohort was 59 and 68% were female. There were 6 Dorr A (4%), 97 Dorr B (70%), and 16 Dorr C (13%) femurs. Gray's tests were used to compare cumulative incidence of each endpoint between cemented and cementless THA groups with mortality as a competing risk. Mean follow up was 10 years.

RESULTS: There were no differences in the 10-year cumulative incidence of any revision (3% vs 9%, $p=0.8$), any reoperation (10% vs 14%, $p=0.72$) or reoperation for femoral loosening (3% vs 2%, $p=0.26$) when comparing cemented vs. cementless femoral components. The 10-year cumulative incidence of periprosthetic femur fracture was 2% for the cemented cohort and 10% for the cementless cohort, but the difference was not significant ($p=0.06$). Cemented femoral fixation was more commonly used in females and those with Dorr C bone, though there was no difference in mean age between groups (70 vs 69 years, $p=0.08$).

CONCLUSION: Selective use of cementless femoral fixation in patients less than 65 years of age with a femoral neck fracture did not result in increased risk of revision or reoperation at 10-years compared to cemented fixation. Although not statistically significant, the five-fold increased risk of periprosthetic fracture in cementless femurs must be considered when choosing femoral fixation in this population and warrants future study.

Patient Satisfaction Following Operative Treatment of Early Periprosthetic Fracture After Total Hip Arthroplasty

Poster 12

Siddhartha Dandamudi / Canton, MI

Co-Authors:

Siddhartha Dandamudi, B.B.A. / Chicago, IL

Ilyass Majji, B.S. / Chicago, IL

John Higgins, M.D. / Chicago, IL

Jamil Kendall, M.D. / Chicago, IL

Anne DeBenedetti, M.S.c / Chicago, IL

Tad L Gerlinger, M.D. / Chicago, IL

INTRODUCTION: Periprosthetic fracture (PPF) after primary total hip arthroplasty (THA) remains a devastating complication in the early postoperative period. While these injuries have been associated with an increased risk for various complications, no studies have explored patient reported outcomes (PROs) after PPF treatment.

METHODS: A retrospective study of THAs was performed at a single academic medical center between 2012 – 2023. There were 57 patients identified who either had an intraoperative PPF or a PPF within 6 weeks of an index THA. Patients were propensity matched 2:1 to THA patients without PPF based on gender, body mass index (BMI), smoking status, the American Society of Anesthesiologists (ASA) score and Charleston Comorbidity Index (CCI) score for a total cohort of 171 patients. All patients included in the analysis had at least 1-year follow-up. All demographics, medical and surgical complications postoperatively, and latest follow-up PROs were extracted.

RESULTS: The PPF group had 38 (66.7%) women with a mean BMI of 31.0 ± 7.4 kg/m² and CCI of 2.6 ± 1.4 . The Harris Hip Score (HHS) of the PPF group was significantly lower at 74.8 ± 20.0 compared to 83.3 ± 14.1 ($p=0.006$) in the non-PPF group. The Hip Dysfunction and Osteoarthritis Score (HOOS Jr) of the PPF group was significantly lower at 78.5 ± 18.3 compared to 85.1 ± 16.1 in the non-PPF group. The Veterans Rand 12-Item (VR 12) Mental score of the PPF was significantly lower at 50 ± 12 compared to 58.7 ± 7.5 ($p<0.001$) in the non-PPF group. There were no differences in the other PROs evaluated. The PPF group had a 19.3% complication rate compared to 7% in the non-PPF ($p=0.016$). There were no differences between groups in readmissions or revision surgery rate.

CONCLUSION: Patients experience less satisfaction following treatment for early PPF following primary THA compared to those without fracture. In addition to the potential for increased complications, surgeons should include this in their perioperative discussion before treatment of these injuries.

Aseptic Revision Total Hip Arthroplasty in Octogenarians: Is there a Higher Incidence of Early Complications?

Poster 13

Ilyass Majji, B.S. / Canton, MI

Co-Authors:

Siddhartha Dandamudi, B.B.A. / Chicago, IL

Conor M Jones, M.D. / Chicago, IL

Ilyass Majji, B.S. / Chicago, IL

Mark L Dunleavy, M.D. / Chicago, IL

Brett R Levine, M.D., M.S. / Chicago, IL

Omar A Behery, M.D., M.P.H. / Chicago, IL

INTRODUCTION: The volume of revision total hip arthroplasties (rTHA) continues to rise annually. While evidence supporting the clinical benefit of aseptic rTHA in the octogenarian population exists, there is mixed evidence on whether there are increased complications rates compared to younger patients. This study's goal is to compare differences in early medical and surgical complications in rTHA between patients ≥ 80 years old and those <80 years old.

METHODS: All patients who underwent aseptic revision THA between 2002-2023 were identified and stratified by age; ≥ 80 years old and those <80 years old. Any patient with hip infection history, <90 -day follow-up, or missing information were excluded. 124 patients ≥ 80 years old were eligible. Patients <80 years old were propensity score matched 2:1 with the octogenarian cohort based on type of revision (modular exchange vs. component revision), body mass index (BMI), sex, and American Society of Anesthesiologist (ASA) score. Retrospective review was performed and demographic data as well as any medical or surgical complications within 90-day period were recorded.

RESULTS: Charlson Comorbidity Index scores were higher in the octogenarian group ($p<0.0001$). There were no differences in revision indications ($p>0.16$ for all), or overall percentage of patients experiencing postoperative medical or surgical complications between the groups ($p=0.24$). The octogenarian group experienced lower rates of dislocations (OR 0.33[0.12 - 0.95]; $p=0.03$) and were less likely to undergo re-operation (OR 0.3 [0.13 - 0.66]; $p=0.0019$).

CONCLUSION: These findings suggest that despite octogenarians having a higher co-morbidity index, there are no differences in postoperative medical and surgical complications, and we found lower a dislocation rate and less frequent reoperations compared younger patients. When appropriately indicated and medically optimized, rTHA may be safely performed in octogenarian patients.

Preoperative, Intraoperative, and Postoperative Factors for Persistent Pain Following Revision for Prosthetic Joint Infection

Poster 14

Austin M. DeBoer, B.S. / Minneapolis, MN

Co-Authors:

Austin M. DeBoer, B.S. / Minneapolis, MN

Nickolas VanRoekel, M.D. / Minneapolis, MN

Travis Parkulo, M.D. / Minneapolis, MN

Gaonhia Moua, B.S. / Minneapolis, MN

Sandy Vang, B.S. / Minneapolis, MN

Scott Marston, M.D. / Minneapolis, MN

OBJECTIVE: Persistent pain following revision for prosthetic joint infection can have a negative impact on the patient's quality of life and can be frustrating for both the patient and the surgeon. The purpose of this study was to identify preoperative, intraoperative, and postoperative chronic pain predictors in patients who underwent a one-stage or two-stage revision for prosthetic joint infection (PJI).

METHODS: This was a retrospective review of 129 patients who underwent a one-stage or two-stage revision for chronic PJI between 2009-2020. Persistent pain was determined using a visual analogue scale from no pain (0) to unbearable pain (10). The study cohort was evaluated at a 2-year follow-up.

RESULTS: Of the 129 patients, 93 patients (72%) had minimal to no pain and 36 patients (28%) had moderate to unbearable pain at the 2-year follow-up. The moderate to unbearable pain patients were older (69.8 vs 61.1 years), had a higher BMI (45.2 vs 33.5 kg/m²), increased tobacco use (21 vs 7 patients), failed previous revision for PJI (59 vs 14 patients), and postoperative drainage >7 days (35 vs 11 patients). Separate Cox's regression models identified the following independent risk factors for moderate to unbearable pain: age (HR 2.73, 95% CI 1.22-8.14), BMI (HR 2.77, 95% CI 1.11-6.54), tobacco use (4.32, 95% CI 1.88-8.56), failed previous revision for PJI (5.25, 95% CI 1.48-15.12), and postoperative draining >7 days (HR 3.38, 95% CI 1.43-10.28).

CONCLUSIONS: This study identified several modifiable risk factors that could be addressed with patient optimization prior to revision such as BMI and tobacco use to help reduce rates of persistent pain following revision for PJI.

Primary Total Hip Arthroplasty with Concomitant Gluteus Medius Repair: Mid-Term Outcomes with Nested Propensity-Matched Benchmark Control

Poster 15

Roger Quesada-Jimenez, M.D. / Chicago, IL

Co-Authors:

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Yasemin E. Kingham, BA / Des Plaines, IL

Tyler R. McCarroll, M.D. / Des Plaines, IL

Jessica C. Keane, B.S. / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: It is established that patients who undergo total hip arthroplasty (THA) without addressing gluteus medius (GM) pathology tend to experience inferior patient-reported outcomes (PROs). The study aim is to evaluate mid-term outcomes in patients who underwent a primary THA with concomitant GM tear repair, as compared to a benchmark control group of primary THA patients that did not have GM pathology.

METHODS: Data was prospectively collected and retrospectively analyzed from patients who underwent a primary THA with a concomitant GM repair between 2015 and 2018. Included patients completed preoperative and minimum five-year questionnaires for Harris Hip Score (HHS, visual analog scale (VAS), Veteran Rand 12-item health survey for physical outcomes (VR-12), 12-item Short Form health survey for physical outcomes (SF-12), Forgotten Joint Score (FJS), and the Hip Disability and Osteoarthritis Outcome Score for Joint Replacement (HOOS-JR). The GM cohort was matched in a 1:3 ratio based on age at surgery, body mass index (BMI), sex, approach, and use of robotic assistance to a benchmark control group of primary THAs without GM pathology. Thresholds for functional hip outcome were included for the analysis.

RESULTS: Forty patients undergoing concomitant primary THA and GM repair were included. There were significant improvements in the reported HHS, VAS, VR-12 Physical, VR-12 Mental, SF-12 Physical, and SF-12 Mental scores in the study group. The PRO improvements and rate of achievement of minimally clinically important difference (MCID) and patient acceptable symptom state (PASS) were comparable between the groups.

CONCLUSIONS: Total Hip Arthroplasty with concomitant GM repair yielded significant improvement in functional status and clinical outcomes, which compared favorably to a benchmark control group without GM tears. Given that THA patients with unrepaired GM tears have previously been associated with inferior outcomes and that the present study showed positive outcomes of THA with concomitant GM repair, surgeons may consider addressing GM tears during a primary THA.

Would Placing a Prophylactic Calcar or Diaphyseal Wire Decrease Risk of Periprosthetic Fracture in Taper-Slip-Type Cemented Stems? A Biomechanical Study

Poster 16

Sergio F. Guarin Perez, M.D. / Rochester, MN

Co-Authors:

Sergio F. Guarin Perez, M.D. / Rochester, MN

Gongyin Zhao, M.D. / Rochester, MN

Ichiro Tsukamoto, M.D. / Rochester, MN

Joshua R. Labott, M.D. / Rochester, MN

Diego J. Restrepo, M.D. / Rochester, MN

Allison Tanner, B.S. / Rochester, MN

Alexander W Hooke, M.S. / Rochester, MN

Lawrence J Berglund, B.S. / Rochester, MN

Chunfeng Zhao, M.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

INTRODUCTION: Previous studies have shown differences in the risk of periprosthetic fracture between tapered slip (TS) and composite beam (CB) stems. This biomechanical study explored the occurrence of periprosthetic fractures around these stems and the impact of adding a 16-gauge calcar or diaphyseal wire to TS stems on their resistance to torque.

METHODS: A power analysis was conducted and assuming a standard deviation of 14.8 Nm in peak torque, a sample size of 7 specimens per group was determined to provide 90% power to detect a difference of at least 30 Nm between groups. Twenty-one TS stems (eight alone, six with calcar wiring, seven with diaphyseal wiring placed 2 cm distal to the lesser trochanter) and seven CB stems were cemented into standard Sawbones. A servo-hydraulic test machine applied 1000 N of load and increase in 1 degree of rotation per second until failure. The peak torque at failure was measured and the fracture location was recorded for each construct. Comparisons were performed using two-sample t-tests, and p-values were adjusted for multiple comparisons using the Benjamini-Hochberg method.

RESULTS: CB exhibited a significantly higher peak torque at failure (205.3 Nm) than TS (159.5 Nm, $p = 0.020$). Calcar-wire-TS (148.2 Nm, $p = 0.036$) and diaphyseal-wire-TS (164.9 Nm, $p = 0.036$) were both weaker than CB stems. Wired TS stems were no different than non-wired TS stems. Additionally, the study cannot conclude that calcar wiring is stronger than diaphyseal wiring. All TS fractures were at the mid-portion of the stem, simulating a B-type fracture, and the addition of the diaphyseal wire changed the fracture location to more distal in four of the seven stems ($p = 0.0699$).

CONCLUSIONS: This biomechanical study supports clinical evidence of higher risk of periprosthetic fracture for TS stems. The addition of calcar or diaphyseal wires to the TS resulted in no significant changes in the peak torque to fracture. Surgeons wishing to cement, may consider the use of a CB stem in high-risk patients to decrease the risk of periprosthetic fracture.

Fiber Wire Suture is as Strong as 16-Gauge Wire for Calcar Prophylaxis the Time of THA: A Biomechanical Study

Poster 17

Sergio F. Guarin Perez, M.D. / Rochester, MN

Co-Authors:

Sergio F. Guarin Perez, M.D. / Rochester, MN

Gongyin Zhao, M.D. / Rochester, MN

Ichiro Tsukamoto, M.D. / Rochester, MN

Joshua R. Labott, M.D. / Rochester, MN

Diego J. Restrepo, M.D. / Rochester, MN

Alex W. Hooke, M.S. / Rochester, MN

Lawrence J. Berglund, B.S. / Rochester, MN

Chunfeng Zhao, M.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

INTRODUCTION: Prophylaxis against fracture or treatment of calcar cracks is often needed during total hip arthroplasty (THA). Traditionally treatment has been performed with wire or cables. The use of FiberWire suture fixation is novel and its use in this scenario has not been studied. The purpose of this study is to compare the torque to failure of cemented and cementless stems implanted into sawbones with and without wire and FiberWire suture prophylactic fixation.

METHODS: We compared 16-gauge wire to 2 mm FiberTape suture. Sixteen collarless stems (eight with calcar wiring and eight with calcar suture) and twenty-seven Taper-Slip (TS) stems (seven with each of calcar wiring, calcar suture, diaphyseal wiring, and diaphyseal suture) were press-fit or cemented into standard sawbones. Suture or wire was placed above the lesser trochanter for calcar prophylaxis and 2 cm below the trochanter for diaphyseal prophylaxis. A servohydraulic test machine applied a 1000 N load and 1 degree/second rotation until failure. With a standard deviation of 14.8 Nm, a sample size of 7 per group provided 90% power to detect a 30 Nm difference. Two-sample t-tests and noninferiority tests were used for comparisons.

RESULTS: The mean peak torque at failure was 92.7 Nm (SD 11.4) for the collarless stem with calcar wiring, while it was higher at 102.6 Nm (SD 41.4) for the collarless stem with calcar suture. The collarless stem with calcar suture was non-inferior to the collarless stem with calcar wiring ($p = 0.041$). For the TS variants, the mean torque at failure was 148.2 Nm (SD 38.6) for the stem with calcar wiring, 118.3 Nm (SD 30.2) with calcar suture, 164.9 Nm (SD 21.5) for diaphyseal wiring, and 159.4 Nm (SD 30) for diaphyseal suture. With the numbers available, we cannot conclude that TS stems with calcar or diaphyseal sutures were non-inferior to TS stems with calcar or diaphyseal wiring. Interestingly, TS stem with calcar suture had a lower mean torque at failure compared to the TS stem with diaphyseal suture ($p = 0.041$).

CONCLUSIONS: Collarless stems with calcar sutures match wiring. For TS stems, sutures did not show clear non-inferiority. Both methods prevent periprosthetic fractures. Calcar suturing with FiberTape offers benefits like non-abrasiveness, radiographic invisibility, and adjustable tension.

A Collarless Cementless Stem with a Prophylactic Calcar Wire is as Strong as a Collared Cementless Stem in Preventing Periprosthetic Fracture: A Biomechanical Study

Poster 18

Sergio F. Guarin Perez, M.D. / Rochester, MN

Co-Authors:

Sergio F. Guarin Perez, M.D. / Rochester, MN

Gongyin Zhao, M.D. / Rochester, MN

Ichiro Tsukamoto, M.D. / Rochester, MN

Joshua R. Labott, M.D. / Rochester, MN

Diego J. Restrepo, M.D. / Rochester, MN

Alex W. Hooke, M.S. / Rochester, MN

Lawrence J. Berglund, B.S. / Rochester, MN

Chunfeng Zhao, M.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

INTRODUCTION: There is growing evidence in the literature that collared cementless stems may be protective against early periprosthetic fracture after total hip arthroplasty (THA). How these stems compare biomechanically to a cementless collarless stem placed with the addition of a prophylactic wire is not known. The aim of this biomechanical study was to compare peak torque at failure between collared and collarless stems with and without placement of a 16-gauge prophylactic calcar wire.

METHODS: 15 collarless (8 with and 7 without calcar wiring) and 8 Collared (All Actis, DePuy) stems were press-fit into standard sawbones. A servo-hydraulic test machine applied load of 1000N and a rotation of 1 degree per second until failure occurred. The peak torque at failure was measured and the location of the fracture was collected. Assuming a standard deviation of 14.8 Nm in peak torque, a sample size of 8 specimens per group was determined to provide 90% power to detect a difference of at least 27 Nm between the groups. Comparisons were performed using two-sample t-tests, and non-inferiority was evaluated with a non-inferiority margin of -25 Nm.

RESULTS: The mean peak torque at failure was 102.9 Nm (SD 15.6) for collared stems and 87.2 Nm (SD 14.1) for collarless stems. With the numbers available, there was no significant difference between collared and collarless stems peak torque to failure ($p=0.090$). The peak torque to failure for calcar-wired cementless collarless stems was 92.7 Nm (SD 11.4). The peak torque to failure of this latter stem was not inferior than a cementless collared stem ($p=0.041$). All fractures occurred within the proximal and mid portion of the stem, simulating a B-type fracture.

CONCLUSIONS: In this biomechanical study we were unable to statistically show a difference in peak torque to failure between collared and collarless stems with and without a calcar-wire. In high-risk patients, if a cementless collared stem is not available, adding a calcar wire prophylactically provides similar protection against periprosthetic fracture than implanting a collared stem.

Patient-Reported Outcome Measures After Direct Anterior Total Hip Arthroplasty are Comparable Between Patients with Developmental Dysplasia of the Hip and Osteoarthritis: A Propensity-Matched Analysis

Poster 19

Louis S. Kang, B.S. / Rochester, MN

Co-Authors:

Sean C. Clark, M.S. / Rochester, MN

Breydan H. Wright, M.D. / Rochester, MN

Louis S. Kang, B.S. / Rochester, MN

Aliya G. Feroe, M.D. / Rochester, MN

Brandon C. Cabarcas, M.D. / Rochester, MN

Sanathan Iyer, B.S / Rochester, MN

Gavin H. Ward, B.S. / Rochester, MN

Jason G. Ina, M.D. / Rochester, MN

Cory G. Couch, M.D. / Rochester, MN

Michael J. Taunton, M.D. / Rochester, MN

OBJECTIVE: Degenerative changes secondary to hip dysplasia may be treated with total hip arthroplasty (THA) through a direct anterior approach, anticipating potentially altered dysplasia-related pathoanatomy at the time of surgery. The purpose of this study was to compare patient-reported outcome measures between patients with hip dysplasia and matched controls with osteoarthritis who underwent direct anterior THA.

METHODS: All patients who underwent direct anterior THA at a single academic institution from 2010 to 2022 were retrospectively reviewed. Dysplastic hips were propensity-matched to hips with osteoarthritis on a 1:4 basis. Patient-reported outcome measures including Visual Analog Scale (VAS) pain at rest and with use, Hip Disability and Osteoarthritis Outcome Score (HOOS) Pain, and Forgotten Joint Score-12 (FJS-12) were obtained at follow-up. Additionally, modified Harris Hip Scores (mHHS) were obtained both preoperatively and at final follow-up.

RESULTS: Thirty-eight hips with dysplasia and 152 control hips were followed for a mean of 5.1 ± 2.8 years. Eighty-seven percent were Crowe classification grade I, 5.3% were grade II, 2.6% were grade III, and 5.3% were grade IV. Both cohorts demonstrated significant postoperative improvements in mHHS ($p < 0.001$). No differences were observed at final follow-up between hip dysplasia and osteoarthritis cohorts for VAS at rest (0.5 vs. 0.5, $p = 0.828$), VAS with use (0.7 vs. 1.1, $p = 0.231$), HOOS Pain (93.8 vs. 92.3, $p = 0.518$), FJS-12 (82.2 vs. 81.4, $p = 0.856$), and mHHS (91.9 vs. 91.4, $p = 0.793$). One dysplastic hip had an intraoperative periprosthetic femur fracture. Revision rates were comparable between the dysplasia and osteoarthritis cohorts (5.3% vs. 1.3%, $p = 0.179$).

CONCLUSIONS: Patients with hip dysplasia and osteoarthritis who underwent direct anterior THA achieved comparable outcomes in this propensity-matched analysis. Patients with hip dysplasia can expect reduced pain, improved functional outcomes, and similar reoperation rates to those with osteoarthritis following primary THA.

Unveiling the Hidden Risks: Nutritional Competency and Postoperative Complications in Underweight Patients Undergoing Total Hip Arthroplasty

Poster 20

Jibreel Hussain, MBA / Chicago, IL

Co-Authors:

Jibreel Hussain, MBA / Chicago, IL

Brett Drake, B.S. / Chicago, IL

Apurva Choubey, M.D. / Chicago, IL

Nasiruddin Shaik, B.S. / Chicago, IL

Nezar Abunnur, B.S. / Chicago, IL

Esa Syed, B.S. / Chicago, IL

Malyika Hussain, AS / Chicago, IL

Nirav Mungalpara, M.D. / Chicago, IL

INTRODUCTION: Nutritional competency and postoperative complications in underweight patients after Total Hip Arthroplasty (THA) remain understudied in orthopedics. This study aims to classify complications and assess nutritional competency between Underweight and Normal Weight groups after THA, while adjusting for demographic factors, comorbidities, and preoperative albumin levels.

METHODS: Data from the ACS-NSQIP database (2012-2021) identified patients undergoing primary THA (CPT code 27130), categorized into two BMI groups: Normal weight (18.5-24.99) and Underweight (<18.5). Patients were further grouped by preoperative albumin levels: normal (3.5-5.5) and hypoalbuminemia (<3.5). Multivariate analysis assessed associations between postoperative outcomes, BMI, and preoperative albumin, adjusting for age, race, ethnicity, ASA class, and comorbidities.

RESULTS: Among 322,418 patients who underwent primary THA, 64,856 were included. Underweight patients exhibited significantly higher risks of postoperative bleeding (OR 1.54, $p < 0.001$), cardiac arrest (OR 2.47, $p < 0.01$), readmission (OR 1.21, $p < 0.05$), and death (OR 2.98, $p < 0.001$) compared to Normal weight patients. Hypoalbuminemic Underweight patients also demonstrated increased risks of bleeding, urinary tract infection (UTI), readmission, and death compared to Underweight normoalbuminemic patients and Normal Weight patients with normal albumin levels.

DISCUSSION: While obesity's impacts in THAs are extensively studied, underweight patients receive less attention. Among Underweight patients, malnutrition, particularly hypoalbuminemia, is associated with increased risks of various complications. Implementing albumin monitoring in preoperative patients may help manage outcome risk levels. Optimizing nutritional status alongside BMI may be more beneficial than solely focusing on nutrition initiatives to mitigate risk and optimize care.

Long-Term Outcomes of Robotic Assisted Total Hip Arthroplasty with a Nested Comparison to Conventional Total Hip Arthroplasty

Poster 22

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Co-Authors:

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Drashti Sikligar, MEng / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Benjamin D. Kuhns, M.D. / Des Plaines, IL

Mark F. Schinsky, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Robotic-assisted primary total hip arthroplasty (rTHA) has been shown to provide more precise and accurate acetabular component placement than manual total hip arthroplasty (mTHA). However, it is still unclear if there is an increased long term clinical benefit.

PURPOSE: The purpose of this study is to compare minimum 10-year radiographic and clinical outcomes between a propensity matched primary rTHA and mTHA group.

METHODS: Prospectively collected patient data was retrospectively reviewed for robotic-assisted primary THA recipients from May 2008 to January 2014. Patients with complete minimum 10-year follow up were considered eligible. Clinical, radiographic, and Patient Reported Outcomes (PROs) were collected. Radiographic variables included acetabular component version, inclination, and leg length discrepancy. Clinical outcomes included complications and revision rates. Lewinnek and Callanan safe zones were used to evaluate acetabular component position. A propensity matched subgroup analysis with mTHA patients was also performed to identify differences in functional or radiographic outcomes between the two groups.

RESULTS: 57 rTHAs were matched to 57 mTHAs. There were no significant differences in Harris Hip Score, Hip dysfunction and Osteoarthritis Outcome Score for Joint Replacement, Forgotten Joint Score-12, or Visual Analog Scale ($p > 0.05$). The rTHA cohort demonstrated a significantly higher rate of achieving PASS for mHHS compared to the mTHA cohort ($p < 0.05$) and had lower odds of having acetabular implant placement outside both the Lewinnek (odds ratio [OR] 0.32, 95% CI 0.11 – 0.98; $p < 0.05$) and Callanan safe zone (OR 0.14, 95% CI 0.05 - 0.41; $p < 0.001$). There was no significant difference in rate of complication ($p > 0.05$) or revision ($p > 0.05$) between cohorts.

CONCLUSION: Patients who underwent rTHA reported favorable outcomes at minimum 10-year follow-up. When comparing matched cohorts, rTHAs reported similar PRO scores, higher rates of achieving clinically significant thresholds and a reduced risk of acetabular cup placement beyond established component safety zones.

Which Patients without Significant Radiographic Joint Space Loss Benefit from Hip Arthroplasty? An MRI-Based Decision-Making Algorithm

Poster 23

Benjamin D. Kuhns, M.D., M.S. / Des Plaines, IL

Co-Authors:

Benjamin D. Kuhns, M.D., M.S. / Des Plaines, IL

Tyler R. McCarroll, M.D. / Des Plaines, IL

Yasemin E. Kingham, BA / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Ali Parsa, M.D. / Des Plaines, IL

Veer Shah, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Hip arthroplasty is rarely indicated for patients with a preserved joint space; however, it may be the preferred surgical option when advanced imaging reveals evidence of severe chondral and subchondral pathology. The purpose of this study was to validate a Magnetic Resonance Imaging (MRI) based algorithm to assist surgical decision-making when treating patients without advanced radiographic joint space loss.

METHODS: Consecutive patients without severe radiographic hip osteoarthritis (Tonnis grade 0/1, Joint Space Width (JSW) > 3mm) who received primary total hip arthroplasty with a preoperative MRI were included in the study. This cohort was then propensity matched by Tonnis grade and JSW to a population of patients undergoing hip preservation surgery. Preoperative MRIs were evaluated according to the Scoring of Hip Osteoarthritis in MRI (SHOMRI) grading system. SHOMRI scores were compared between the arthroplasty and hip preservation cohorts with receiver operator curves (ROC) constructed to determine predictive threshold scores. Minimum two-year patient reported outcomes were compared between the two groups.

RESULTS: There were 27 patients included in both the arthroplasty and hip preservation cohorts with no significant differences in demographic or radiographic variables between the two groups. Patients undergoing arthroplasty had significantly greater SHOMRI total scores as well as cartilage component scores. Threshold values were calculated for the total and cartilage component SHOMRI scores that accurately predicted treatment pathways between the two groups ($p < 0.001$). Both groups had significantly improved surgical outcomes with no postoperative differences between cohorts.

CONCLUSION: Thresholds identified through the SHOMRI grading system successfully validated the utilization of an MRI based decision making algorithm by distinguishing treatment pathways in patients receiving hip arthroplasty or hip reconstruction in the absence of severe radiographic joint space loss. Successful postoperative outcomes were reported for both the hip preservation and reconstruction groups.

Spine-Abductor Syndrome: Novel Associations Between Lumbar Spine Disease and Hip Gluteal Muscle Pathology

Poster 24

Monish S. Lavu, MHM / Cleveland, OH

Co-Authors:

Monish S. Lavu, MHM / Cleveland, OH

Christian J. Hecht II, B.S. / Cleveland, OH

David C. Kaelber, M.D., Ph.D., MPH / Cleveland, OH

Yasuhiro Homma, M.D. Ph.D. / Tokyo, Japan

Atul F. Kamath, M.D., MBA / Cleveland, OH

OBJECTIVE: Risk factors for hip abductor pathology include age-related deterioration, female sex, and increased body mass index. As the literature supporting the sagittal relationship between the lumbar spine and hip is increasing, there may be a parallel relationship between the perturbations in spinopelvic alignment caused by lumbar spine disease and gluteal tears. As no prior studies report upon this phenomenon beyond single-institution series, we investigated the spine-abductor syndrome at the population level.

METHODS: This study utilized TriNetX, a federated research network that continuously aggregates de-identified electronic health record data from over 92 million patients across the United States. Relative risks of gluteal tear encounter diagnoses and procedures were calculated for the following: age greater than or equal to 45 years, female sex, obesity, lumbar spine pathologies, lumbar spine injections, and lumbar spine surgery. Also, we analyzed a subgroup of patients who were either diagnosed with a lumbar pathology, administered a lumbar injection, or received lumbar surgery for abductor tear-free survival over a 10-plus year period, utilizing a Cox proportional hazard model.

RESULTS: Of the 8,475,800 patients with lumbar spine diagnoses, injections, or surgeries, 458,311 patients (5.4%) had gluteal tears, representing a relative risk of 13.6 (95% Confidence Interval [CI]: 13.6-13.6). After controlling for age, sex, and obesity, survival analysis showed markedly increased hazard ratios for patients having a gluteal tear encounter diagnosis in the intervening 13 years (2010-2023) if they had lumbar spine pathology encounter diagnoses (Hazard Ratio [HR]: 4.8, 95% CI: 4.5-5.1), spine injections (HR: 7.7, 95% CI: 6.2-9.5), or spine surgery (HR: 6.6, 95% CI: 5.3-8.1) in 2010.

CONCLUSIONS: These findings suggest a strong association between lumbar spine pathology and abductor tears. Further biomechanical and neuroanatomic studies may elucidate the effects of lumbar spine disease in relation to gluteal tears. Additionally, there may be a need to optimize diagnostic protocols for lateral hip pain in patients with a history of lumbar spine disease.

Contemporary Glucagon-like Peptide-1 (GLP-1) Receptor Agonists: What is the Impact on Hip and Knee Osteoarthritis Onset, Severity, and Conversion to Arthroplasty?

Poster 25

Joshua R. Porto, M.S. / Cleveland, OH

Co-Authors:

Joshua R. Porto, M.S. / Cleveland, OH

Monish S. Lavu, MHM / Cleveland, OH

Christian J. Hecht II, B.S. / Cleveland, OH

David C. Kaelber, M.D., Ph.D., MPH / Cleveland, OH

Peter K. Sculco, M.D. / Cleveland, OH

Nathanael D. Heckmann, M.D. / Los Angeles, CA

Atul F. Kamath, M.D., MBA / Cleveland, OH

OBJECTIVE: The growing popularity of glucagon-like peptide-1 receptor agonists (GLP-1-RAs) for weight loss could significantly impact joint preservation and arthroplasty. While this will in part be driven by the association between obesity, osteoarthritis (OA), and total joint arthroplasty (TJA), recent evidence also indicates that GLP-1-RAs may have direct joint-protective, anti-inflammatory effects. The purpose of this study was to evaluate the association between GLP-1-RA use and the onset and progression of hip and knee OA in an obese population.

METHODS: A national health network was queried for patients with an index visit from June 1, 2021, to January 1, 2023, and a body mass index (BMI) ≥ 30 . Patients were stratified into groups with pre-existing hip and/or knee OA ($n=1,092,225$) and without ($n=237,043$). One-to-one propensity score matching (PSM) was used to balance GLP-1-RA use based on age, sex, race, BMI, and comorbid type 2 diabetes mellitus. Primary outcomes were incidence of hip OA, knee OA, major joint injections, total hip arthroplasty (THA), and total knee arthroplasty (TKA) within one year. Cox proportional hazards models were used to estimate hazard ratios (HR) between cohorts prescribed and not prescribed GLP-1-RAs.

RESULTS: In patients with pre-existing OA, GLP-1-RA use correlated with reduced odds of conversion to THA (1.1 vs. 2.2%; HR: 0.6, 95% CI: 0.5-0.8) and TKA (1.3 vs. 1.9%; HR: 0.8, 95% CI: 0.6-0.9) within one year. GLP-1-RA users without pre-existing OA demonstrated increased incidence of hip OA (0.9 vs. 0.7%; HR: 1.4, 95% CI: 1.2-1.6), knee OA (2.1 vs. 1.9%; HR: 1.3, 95% CI: 1.2-3.1), major joint injections (2.2 vs. 1.8%; HR: 1.4, 95% CI: 1.3-1.5), and TKA (0.1% vs. 0.0%; HR: 2.6, 95% CI: 1.6-4.3).

CONCLUSIONS: GLP-1-RAs may provide direct disease-modifying behaviors in patients with pre-existing OA, per a reduced risk of conversion to TJA not attributable to weight loss. Further investigation is also needed to elucidate the association between GLP-1-RA use and the increased incidence of OA diagnosis and conversion to TKA in patients with no pre-existing OA.

Impact of Surgical Sequence on THA-Related Complication Rates in Hip-Spine Syndrome: A Comparative Analysis of Lumbar Fusion and Total Hip Arthroplasty

Poster 26

Makenna Isley / Chicago, IL

Co-Authors:

Ryan Lee / Chicago, IL

Makenna Isley / Chicago, IL

Brett Drake / Peoria, IL

Nirav Mungalpara, M.D. MRCS / Chicago, IL

Apurva Swapnill Choubey, M.D. / Chicago, IL

Mark H. Gonzalez, M.D. / Chicago, IL

INTRODUCTION: Patients with hip-spine syndrome, the concurrent existence of degenerative conditions of both the hip joint and the spine, may during the course of their treatment, undergo spinal fusion and Total Hip Arthroplasty (THA). There is disagreement among prior studies regarding whether patients who undergo THA and spinal fusion are at increased risk of THA dislocation and other hip-related complications.

It has not been fully determined whether THA or Spine Fusion should be performed first. Our study aims to assess the risk of complications related to THA in patients who underwent a spinal fusion before or after having THA.

METHODS: The PearlDiver Mariner 165 (M165) database, a HIPAA-compliant national database covering 165 million patients with private insurance and Medicare claims from 2010 to 2022, was queried for this study, using CPT and ICD-10 codes for Lumbar Fusion (LF) performed before or after THA. The cohort that underwent LF after THA was further analyzed to compare the complication rates of THA before LF and the 2 years after LF. ICD-10 codes for THA-related complications identified as our primary outcomes: ICD-10-D-T84021A, ICD-10-D-T84020A, ICD-10-D-T84010A, ICD-10-D-T84011A, ICD-10-D-T8451XA, ICD-10-D-T8452XA. Demographic data such as age, sex, ECI, and complication rates were compared between the stratified and matched cohorts, and a chi-squared test was used to assess differences between the groups.

RESULTS: We identified 863,193 primary THA cases from 2010-2022. Of these, 12,188 had LF followed by THA, and 20,277 had LF before THA. Patients who underwent THA prior to LF were less likely to have hip periprosthetic fractures (OR=0.52, 95%CI: 1.24-3.01, $p < 0.004$), THA revision (OR=0.82, 95%CI: 1.06-1.39, $p < 0.001$), and LF revision (OR=0.85, 95%CI: 1.08-1.28, $p < 0.001$), compared to LF prior to THA. Further analysis was conducted on the cohort that underwent THA prior to LF, comparing THA-related complications before and up to two years after the LF procedure. It shows that there is no significant difference in all THA-related complications compared to before and 2 years after LF surgery.

CONCLUSION: Our study found higher THA-related complications in patients who had THA after LF compared to those who had LF after THA. Undergoing LF after THA does not significantly increase THA-related complications. The increased risk in those with prior LF warrants further investigation.

ChatGPT is a Suitable Option for Common Patient Questions Regarding Total Joint Arthroplasty

Poster 27

Noah Hodson, M.D. / Detroit, MI

Co-Authors:

Noah Hodson, M.D. / Detroit, MI

Hamza Raja, B.S. / Detroit, MI

Idris Nagarwala BS / Detroit, MI

Hamza Kanchwala BS / Detroit, MI

Michael A. Charters, M.D. / Detroit, MI

Wayne T. North, M.D. / Detroit, MI

OBJECTIVE: This study investigates the suitability of ChatGPT responses, determined by surgeon preference, medical accuracy, appropriateness, and readability, to common patient questions regarding total hip and total knee arthroplasty compared to current reputable online information.

METHODS: A series of 30 common patient questions and responses taken from the “Frequently Asked Questions” webpages of reputable academic institutions (control), were asked to ChatGPT on November 15, 2023 and the responses were recorded (AI). The original questions, the blinded control responses, and the blinded ChatGPT responses were provided to 2 fellowship-trained orthopedic adult reconstruction surgeons to grade for preference, medical accuracy, and appropriateness. Accuracy and appropriateness were graded using a Likert scale, with Likert scale 1 and 2 defined as disagreement and Likert scale 4 and 5 defined as agreement. Readability was calculated using the Flesch-Kincaid Grade Level.

RESULTS: There was no significant surgeon preference between blinded AI and blinded control responses ($p > 0.05$). Additionally, there was no significant difference in response accuracy (control: $73.3 \pm 14.1\%$; AI: $68.3 \pm 11.8\%$; $p > 0.05$) or appropriateness (control: $71.7 \pm 21.2\%$; AI: $78.3 \pm 21.2\%$; $p > 0.05$). Both responses demonstrated similar levels of inaccuracy (control: $18.3 \pm 16.5\%$; AI: $21.7 \pm 7.1\%$; $p > 0.05$) and inappropriateness (control: $13.3 \pm 18.9\%$; AI: $8.3 \pm 11.8\%$; $p > 0.05$). Both responses exceeded recommended reading levels (control: 10.04 ± 2.41 years; AI: 16.45 ± 2.40 years; $p < 0.05$).

CONCLUSION: Responses by ChatGPT were comparable in accuracy and appropriateness to responses by reputable academic institutions, offering a valuable alternative to information online. As with online searches, patients should express caution with information presented and defer to surgeon counseling when making treatment decisions.

Can EOAP After TJA Decrease Risk for PJI in Patients Receiving Non-Cephalosporin Prophylaxis?

Poster 28

Sarah T. Levey, M.D. / Fishers, IN

Co-Authors:

Sarah T. Levey, M.D. / Indianapolis, IN

Michael M. Kheir, M.D. / Ann Arbor, MI

Evan R. Deckard, B.S.E / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Patients undergoing primary total hip or knee arthroplasty (THA, TKA) who receive a non-cephalosporin antibiotic perioperatively are at 1.6x higher risk for developing periprosthetic joint infection (PJI). Studies using 7-day extended oral antibiotic prophylaxis (EOAP) protocol in high-risk patients demonstrate a 3-fold decrease in one-year PJI rates. Currently, no data exist on the effect of modern EOAP protocols for patients who receive non-cephalosporins for perioperative prophylaxis. This study aims to evaluate the incidence of PJI for patients who received a non-cephalosporin for perioperative prophylaxis and a 7-day EOAP protocol.

METHODS: A total of 7,220 consecutive primary THAs and TKAs performed between 2011 and 2022 at a suburban academic hospital with modern perioperative and infection-prevention protocols were retrospectively reviewed. Patients who did not receive a perioperative cephalosporin antibiotic were identified. In addition, patients who received a non-cephalosporin EOAP (Bactrim, doxycycline or clindamycin) were identified. The incidence of PJI meeting MSIS criteria and infection-related reoperations were evaluated up to 1-year using data from a statewide healthcare system.

RESULTS: There were 159 patients (2.2%) who received a non-cephalosporin for perioperative antibiotic prophylaxis as well as EOAP. The incidence of PJI within 1 year was 0.6% with numbers available (1 case required an irrigation and debridement with polyethylene exchange and implant retention). Another case required a superficial irrigation and debridement within 1 year postoperatively. No further evidence of infection occurred postoperatively for any patient receiving EOAP protocols.

CONCLUSION: Study results demonstrated that an EOAP protocol was associated with a decreased 1-year PJI rate of 0.6% for patients who received non-cephalosporin perioperative prophylaxis. Thus, EOAP protocols may be a simple measure to effectively mitigate risk associated with non-cephalosporin antibiotics. Multi-center, randomized control trials remain warranted to validate study results.

Revision Total Hip Replacement in Geriatric Patients Compared to a Matched Cohort of Younger Patients

Poster 29

Harold G. Moore, M.D. / Dallas, TX

Co-Authors:

Mikaela Bankston, B.S. / Dallas, TX

Harold G. Moore, M.D. / Dallas, TX

Garen A. Collett, M.D. / Dallas, TX

Michael H. Huo, M.D. / Dallas, TX

INTRODUCTION: Revision total hip replacements (rTHR) have increased in the United States along with longer life expectancy. This study aims to compare postoperative complications and postoperative mortality in the geriatric patients undergoing rTHR compared to a matched younger cohort.

METHODS: A retrospective review was conducted using an institutional database of patients undergoing rTHR performed over a 10-year period. Patients were divided into ≥ 65 and ≥ 75 cohorts and matched by year and type of revision surgery (single vs. both components). Electronic records were reviewed to obtain demographic, perioperative, and postoperative variables. Statistical analysis was performed using R.

RESULTS: A total of 826 patients undergoing rTHR were identified. 292 patients were ≥ 65 and 185 patients were ≥ 75 . Of these, 100 consecutive patients were included in each cohort after matching. The median age of ≥ 65 and ≥ 75 cohorts was 53 and 80 years respectively. Median follow-up, as defined by the most recent clinic visit, re-operation, or death was 98 months and 84 months, respectively. The geriatric cohort had a higher frailty index (FI) and were more likely to be discharged to a subacute care facility ($p < 0.001$); however, there was no difference between cohorts regarding preoperative Charlson Comorbidity Index (CCI), transfusion, length of stay, and time from surgery to death. Preoperative FI > 2 was the strongest predictor of time to death in the ≥ 75 cohort ($p = 0.03$). There was no association between FI and time to death in the ≥ 65 cohort.

CONCLUSIONS: There was no significant difference in the incidence of perioperative complications between the geriatric and the younger cohorts. Notably, preoperative FI and CCI correlated with patient survival after revision surgery for the ≥ 75 cohort. These findings would be useful for preoperative counseling for patients and their families. Additionally, the data may serve as a basis for further study of risk optimization in geriatric patients undergoing rTHR.

Primary THA in Patients Less Than 30: Durable But Not Free of Complications

Poster 30

Diego J. Restrepo, M.D. / Rochester, MN

Co-Authors:

Diego J. Restrepo, M.D. / Rochester, MN

Sergio F. Guarin Perez, M.D. / Rochester, MN

Breydan H. Wright, M.D. / Rochester, MN

Robert T Trousdale, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

David G. Lewallen, M.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

BACKGROUND: Primary total hip arthroplasty (THA) in young patients presents surgical challenges due to preoperative conditions and the likelihood of an active postoperative lifestyle. This study assesses mid- to long-term survivorship and risk factors for reoperations and revisions in patients aged 30 years or younger undergoing primary THA.

METHODS: 347 patients (418 hips) aged 30 years or younger who underwent primary THA between 2000 and 2020 were reviewed. The average follow-up period was 7.5 years (range:2-22). The mean age at surgery was 23 years (range:11-30), with 51% of patients being female. The average BMI was 27 kg/m² (range: 15-51). Common diagnoses included avascular necrosis (30%), congenital dysplasia (26%), and osteoarthritis (14%). All acetabular components were cementless with bearing surfaces comprising ceramic-on-highly-cross-linked-polyethylene (CoHXLPE) in 184 hips (44%), ceramic-on-ceramic (CoC) in 156 hips (37%), and metal-on-HXLPE (MoHXLPE) in 78 hips (19%). Additionally, 92% of stems were cementless. Data on revision, reoperation, and the latest follow-up were utilized as endpoints in survivorship analysis, employing a Cox regression model to identify influencing variables.

RESULTS: Survivorship free of revision was 97%, 94%, and 88% at 5, 10, and 15 years, respectively, while survivorship free of any reoperation was 96%, 93%, and 87% at the same intervals. Complications occurred in 65 cases, with instability being the most common (29%), followed by intraoperative fractures (17%) and prosthetic joint infection (13%). Index THA secondary to infection significantly increased the risk of reoperation (HR=8.48, p=0.0047). Cemented femoral component usage, common in diverse unusual diagnoses, was associated with complications (HR=2.59, p<0.0032), revision (HR=7.65, p<0.0001), and reoperation (HR=6.49, p<0.0001). No other variables correlated with failure.

CONCLUSION: At 15 years, patients under 30 undergoing modern THA showed high survivorship. Factors indicating increased complexity, such as the use of cemented stems and a preoperative diagnosis of infection were associated with higher failure rates.

Gluteal Tendon Pathology in Patients Undergoing Primary Total Hip Arthroplasty: A Magnetic Resonance Imaging-Based Analysis of Prevalence and Patient-Reported Outcomes

Poster 31

Samuel S. Rudisill, M.D. / Rochester, MN

Co-Authors:

Samuel S. Rudisill, M.D. / Rochester, MN
Sean C. Clark, M.S. / Rochester, MN
Jacob J. Schaefer, M.D. / Rochester, MN
Christopher V. Nagelli, Ph.D. / Rochester, MN
Luke S. Spencer-Gardner, M.D. / Jacksonville, FL

Cory G. Couch, M.D. / Rochester, MN
Naveen S. Murthy, M.D. / Rochester, MN
Michael J. Taunton, M.D. / Rochester, MN
Mario Hevesi, M.D., Ph.D. / Rochester, MN

OBJECTIVE: The gluteus medius and minimus muscles play a crucial role in hip biomechanics, and gluteal pathology has been suggested to influence pain, function, and satisfaction following total hip arthroplasty (THA). This study aimed to determine the prevalence of gluteal tendon pathology among patients with osteoarthritis (OA) undergoing THA and to examine any effects on postoperative outcomes.

METHODS: Patients who underwent direct anterior (DA) THA for management of symptomatic OA between 2010-2022 were identified using an institutional total joint registry. Those with magnetic resonance imaging (MRI) of the operative hip obtained within 1 year prior to surgery were included, and scans were evaluated to assess gluteal tendon pathology and fatty degeneration. Patients were categorized according to the presence of gluteal tear, tendinopathy, or no pathology, and differences in postoperative outcomes were evaluated according to measures of Visual Analog Scale (VAS) at rest, VAS with use, Hip Disability and Osteoarthritis Outcome Score (HOOS) Pain, Forgotten Joint Score-12 (FJS-12), and modified Harris Hip Score (mHHS). Subsequent injections and reoperations were also recorded.

RESULTS: Twenty-three hips with gluteal tear (9/23 male, mean age 63.5 ± 29.3 years), 48 with gluteal tendinopathy (20/48 male, mean age 58.8 ± 10.4 years), and 8 controls with no gluteal pathology on MRI (6/8 male, mean age 42.4 ± 18.9 years) were followed for 4.9 ± 3.0 years (range 1.2 – 13.2 years) following DA THA. Among patients found to have gluteal tear or tendinopathy, preoperative MRI was performed for suspected gluteal pathology in only 3 (13.0%) and 2 (4.2%) cases, respectively, with most instances of pathology noted incidentally. Nevertheless, all patients experienced significant improvement in pain, satisfaction, and functional outcomes following surgery as indicated by mHHS score ($p \leq 0.001$ for all), and there were no differences in VAS at rest ($p = 0.303$), VAS with use ($p = 0.577$), HOOS Pain ($p = 0.908$), or FJS-12 ($p = 0.715$) between groups. There were 2 instances of postoperative injection and 2 subsequent surgeries in patients with gluteal tendinopathy.

CONCLUSIONS: Gluteal tear or tendinopathy was detected in 89.9% of patients undergoing DA THA for management of symptomatic OA, however these patients can expect comparable improvements in pain and function to those without gluteal pathology. Preoperative MRI is not recommended without clear indication as identification of partial gluteal tear or tendinopathy does not warrant intervention to improve postoperative outcomes.

The Impact of Preoperative Weight Loss Timing on Total Hip Arthroplasty

Poster 32

Michael W. Seward, M.D. / Rochester, MN

Co-Authors:

Michael W. Seward, M.D. / Rochester, MN

Jessica A. Grimm, M.S. / Rochester, MN

Charles P. Hannon, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

OBJECTIVE: Many surgeons recommend weight loss before total hip arthroplasty (THA) for patients with obesity, but weight loss just before surgery could be detrimental. This study determined how many patients lost weight before THA, weight loss methods, and if the timing of weight loss before surgery affected postoperative outcomes.

METHODS: Among 31,684 primary THAs performed between 2000 and 2021, we identified 3241 patients with preoperative BMI ≥ 30 kg/m² measured 1-24 months before surgery who lost or maintained weight before surgery. The mean age was 66 years with 50% female. The mean BMI preoperatively and at surgery was 36 and 34 kg/m², respectively. Univariable Cox proportional hazards models evaluated patients who lost at least 5% of their body weight <1 year (short-term) and 1 to 2 years (long-term) before surgery compared to those with <5-pound weight change (maintained weight). Multivariable analyses adjusted for weight loss timing, age, sex, BMI, and Charlson Comorbidity Index. Mean follow-up was 7 years.

RESULTS: Overall, 60% maintained weight, 10% had short-term weight loss, and 30% had long-term weight loss. Among patients with short-term and long-term weight loss, 6% and 13% used weight loss medications, while 1% and 4% had bariatric surgery, respectively. Compared to maintaining weight, neither short-term nor long-term weight loss were associated with complications, revisions, or reoperations in multivariable analysis. However, BMI at surgery was associated with complications (HR 1.1; $p < 0.01$). Age was associated with decreased risk of revisions (HR 0.7; $p < 0.01$) and reoperations (HR 0.8; $p < 0.01$). Charlson Comorbidity Index was associated with revisions (HR 1.1; $p < 0.01$) and reoperations (HR 1.1; $p < 0.01$).

CONCLUSIONS: Although most (30%) losing meaningful weight before THA started ≥ 1 year preoperatively, even those losing weight <1 year before surgery (10%) had no increased risks. While weight loss may benefit overall health, preoperative weight loss may not be sufficient to reduce risks regardless of proximity to THA.

Assessing the Impact of GLP-1 Therapy on Total Hip Arthroplasty Outcomes

Poster 33

Nasiruddin Shaik, B.S. / Chicago, IL

Co-Authors:

Nasiruddin Shaik, B.S. / Chicago, IL

Apurva S. Choubey, M.D. / Chicago, IL

Nezar Abunnur, B.S. / Chicago, IL

Mudassir Khan, B.S. / Chicago, IL

Brett Drake, B.S. / Chicago, IL

Nirav Mungalpara, M.D. / Chicago, IL

Jibreel Hussain, MBA / Chicago, IL

Yasser R. Farid, M.D., Ph.D. / Chicago, IL

OBJECTIVE: Glucagon-like Peptide-1 Receptor Agonists (GLP-1 RA) are effective in managing diabetes and obesity, with benefits such as reduced adiposity, improved blood glucose control, and anti-inflammatory effects. These advantages may reduce postoperative complications in orthopedic patients. This study investigates the impact of GLP-1 RA on outcomes following Total Hip Arthroplasty (THA).

METHODS: Using the Pearl Diver Mariner 165 claims database (2010-2022), patients who underwent primary THA were identified with CPT code 27130. THA patients on GLP-1 RA therapy (variable) were matched 10:1 with those not on the therapy (control), controlling for age, gender, Elixhauser Comorbidity Index, diabetes, obesity, and hypertension. Paired T-tests and Pearson's Chi-square tests compared the groups.

RESULTS: The study included 96,789 THA patients, with 8,825 in the variable group and 87,964 in the control group. Control group patients had higher odds of: Periprosthetic fracture (1.67 times) Prosthesis dislocation (1.32 times) Revision surgery (1.57 times) No significant difference was found in prosthetic joint infection (OR 0.90, $p=0.16$). The control group had higher rates of: Postoperative transfusion (OR 1.85, $p<0.001$) Hematoma Pulmonary embolism (PE) Deep vein thrombosis (DVT) Urinary tract infection (UTI) The control group also had more 90-day ED visits.

CONCLUSION: This study highlights significant reductions in postoperative complications associated with GLP-1 RA therapy in THA patients. Those on GLP-1 RA therapy had lower incidences of periprosthetic fractures, prosthesis dislocation, revision surgeries, PE, transfusion requirement, and hematoma. These findings suggest the potential benefits of GLP-1 RA therapy in reducing postoperative complications for THA patients. Further research is needed to confirm these benefits in broader patient populations.

Should Patients with BMI Over 40 Be Prohibited From THA and TKA in an Ambulatory Surgery Center?

Poster 34

Sarah T. Levey, M.D. / Fishers, IN

Co-Authors:

Sarah T. Levey, M.D. / Indianapolis, IN

Kevin A. Sonn, M.D. / Indianapolis, IN

Evan R. Deckard, B.S.E / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: The migration of total hip and knee arthroplasty (THA, TKA) from the hospital into the ambulatory surgery centers (ASC) is continuing. However, patient selection criteria for the ASC setting remain vague and many obese patients are prohibited from the ASC for unclear and arbitrary reasons. This study purpose was to evaluate safety and 90-day readmission for obese patients in an ASC compared to those performed in a hospital setting.

METHODS: 3,881 primary THAs and TKAs performed in the ASC and hospital setting were retrospectively reviewed. 1,189 (31%) patients were discharged on the same day of surgery (809 ASC, 380 hospital). 10% (81/809) and 17% (65/380) of patients had a BMI ≥ 40 in the ASC and hospital settings, respectively. Demographics, covariates, and readmissions within 90-days of surgery were queried from patient charts within a statewide healthcare system. Statistical analysis was performed at a significance level of 0.05.

RESULTS: Overall, the all-cause readmission rate within 90-days of surgery for same-day discharge patients was 2.2% (26 of 1,189). Groups stratified by location and BMI differed by demographics and covariates ($P \leq 0.021$); however those covariates did not affect readmission rates ($P \geq 0.427$) with numbers available. Interestingly, the readmission rate for patients with BMI ≥ 40 performed in the ASC was the lowest (1.2%) followed by BMI ≥ 40 performed in the hospital (1.5%), patients with BMI < 40 in the ASC (2.2%), and those with BMI < 40 performed in the hospital (2.5%).

CONCLUSION: These study results refute the contention that obese patients should be prohibited from having a hip or knee arthroplasty in the ASC based on a BMI > 40 alone. 90-day readmissions did not differ by location or BMI cutoff ≥ 40 . With appropriate perioperative optimization, obese patients should not be restricted from access to THA and TKA in an ASC, or a hospital, when appropriately indicated.

Intraosseous Vancomycin Is Safe and Effective in Primary Total Hip Arthroplasty

Poster 35

Kwan J. Park, M.D. / Houston, TX

Co-Authors:

Kwan J. Park, M.D. / Houston, TX

Charles M. Granade, M.D. / Houston, TX

Thomas C. Sullivan, B.S. / Houston, TX

Bradley S. Lambert, Ph.D / Houston, TX

Timothy S. Brown, M.D. / Houston, TX

Stephen J. Incavo, M.D. / Houston, TX

Terry A. Clyburn, M.D. / Houston, TX

OBJECTIVE: Postoperative infection continues to be a major cause for revision in total hip arthroplasty (THA). To combat the increased incidence in methicillin-resistant *Staphylococcus aureus* (MRSA) infections, vancomycin has been added as an additional antibiotic in total hip and knee arthroplasty. Intraosseous (IO) administration of vancomycin eliminates the logistical difficulties associated with prolonged infusion times of intravenous (IV) vancomycin. This study seeks to determine if IO administration of vancomycin is a safe alternative to IV administration in primary THA.

METHODS: A single-institution retrospective chart review from 12/2020 to 2/2024 was performed to identify patients who underwent primary THA with administration of 500 mg vancomycin IO injected into the greater trochanter. A total of 326 IO patients were identified which were matched to 326 patients who were administered a weight-based dose of IV vancomycin. Patient charts were reviewed for wound complications, prosthetic joint infection (PJI), anesthesia complications, postoperative fractures, acute kidney injury (AKI), and rates of deep vein thrombosis (DVT) or pulmonary embolism (PE).

RESULTS: At 30-day follow-up, there was 1 (0.3%) PJI in the IO group vs 2 (0.6%) in the IV group ($P=1.0$). At 90 days, there was 1 PJI (0.4%) in the IO group compared to 3 (0.9%) in the IV group ($P=0.63$). The incidence of DVT was 1.5% in the IO group vs 1.2% in the IV group ($P=1.0$). The IO group had a total of 3 (0.9%) PE compared to 1 (0.3%) in the IV group ($P=0.64$). There were no differences in wound complications, anesthesia complications, or AKI rates between groups.

CONCLUSIONS: This study demonstrated no difference between patients who received IO or IV vancomycin regarding rates of infection and perioperative complications. IO administration of vancomycin is effective for infection prevention without increasing complication risk in primary THA.

Impact of Proton Pump Inhibitors on Postoperative Outcomes in Total Hip Arthroplasty Patients

Poster 37

Blaire Peterson, B.S. / San Antonio, TX

Co-Authors:

Travis Kotzur, B.S. / San Antonio, TX

Aaron Singh, BA / San Antonio, TX

Blaire Peterson, B.S. / San Antonio, TX

Casey McDonald, M.D. / San Antonio, TX

Chance Moore, M.D. / San Antonio, TX

Frank Buttacavoli, M.D. / San Antonio, TX

INTRODUCTION: Proton pump inhibitors (PPIs) are extensively used to treat gastrointestinal disorders and are often prescribed to patients undergoing total hip arthroplasty (THA). Although PPIs are beneficial for managing gastrointestinal issues, they have been linked to adverse effects, such as osteoporotic fracture and infection. This study aims to evaluate the postoperative outcomes in THA patients using PPIs compared to those who do not.

METHODS: In this retrospective cohort study, data from the TriNetX Research Network, covering over 85 healthcare organizations and more than 120 million patient records, were analyzed. Patients who underwent THA were identified through Current Procedural Terminology (CPT) codes, and those with a PPI prescription within six months of the THA procedure were identified using Anatomical Therapeutic Chemical (ATC) codes. Propensity score matching was performed based on age, sex, and comorbidities to ensure comparability between groups. The study assessed the odds of periprosthetic fractures, postoperative joint infections, mechanical complications, and revision surgeries within one year following the THA procedure.

RESULTS: The study included a total of 194,992 patients undergoing THA, with 111,429 (57.1%) recorded as PPI users and 83,563 (42.9%) as non-users. After matching, both the PPI and non-PPI groups consisted of 76,309 patients each. Findings indicated that PPI users had significantly higher odds of developing postoperative joint infections (OR 1.92, $p < 0.001$), periprosthetic fractures (OR 1.83, $p < 0.001$), and mechanical complications (OR 1.70, $p < 0.001$). Furthermore, the likelihood of requiring a revision surgery within one year was also elevated in PPI users (OR 1.92, $p < 0.001$).

DISCUSSION: This investigation reveals that THA patients using PPIs are at a greater risk of experiencing postoperative complications, including infections and the necessity for revision surgeries within a year. These findings highlight the importance of assessing modifiable risk factors, such as PPI use, in patients scheduled for THA. Consequently, clinicians should carefully evaluate the risks and benefits of PPI therapy in this patient population to optimize surgical outcomes.

Custom Triflange Components in Revision Total Hip Arthroplasty: 20% Re-Revision Rate at 5 Years

Poster 38

Matthew L. Hadley, M.D. / Rochester, MN

Co-Authors:

Matthew T. Weintraub, M.D. / Rochester, MN

Matthew L. Hadley, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Michael J. Taunton, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

OBJECTIVE: Custom triflange acetabular components (CTACs) are utilized for severe bone loss in revision total hip arthroplasties (THAs). Prior studies are limited by low patient numbers and short follow-up. The purpose of this study was to evaluate implant survivorship, complications, and clinical outcomes of CTACs in revision THAs.

METHODS: Forty-five patients who underwent revision THA using a CTAC at a single institution between 2012 - 2023 were retrospectively reviewed. The mean age was 69 years, mean BMI was 30 kg/m², and 80% were female. Indications for acetabular revision were aseptic loosening (n=35) and reimplantation during two-stage exchange arthroplasty (n=10). Twenty-six patients (58%) had a concurrent pelvic discontinuity. Implant survivorship, radiographs, and clinical outcomes were evaluated. Mean follow-up was 5 years.

RESULTS: The 5-year cumulative incidence of any re-revision was 20%. There were 8 re-revisions for dislocation (n=5), periprosthetic joint infection (PJI; n=2), and aseptic loosening (n=1). The 5-year cumulative incidence of CTAC removal was 11%. The indications for CTAC removal included PJI (n=3) and aseptic loosening (n=1). The 5-year cumulative incidences of any reoperation, re-revision for dislocation, and re-revision for aseptic loosening were 27%, 12%, and 3%, respectively. Osteointegration to the ileum was associated with lower risk of CTAC removal (p=0.04). At final follow-up, 81% of pelvic discontinuities were radiographically healed. All but one unrevised CTACs were well-fixed radiographically. The mean Harris hip score was 68.

CONCLUSIONS: Custom triflanges in revision THAs demonstrated a 20% re-revision rate at 5 years with 11% of them removed. The most common indications for re-revision and removal were dislocation and PJI.

Patient Demographics are Associated with Patient-Reported Scores in Primary Total Hip Arthroplasty

Poster 39

George E. Yacoub, B.A. / Ann Arbor, MI

Co-Authors:

George E. Yacoub, B.A. / Ann Arbor, MI

Zhaorui Wang, M.D. / Ann Arbor, MI

Ramzy Meremikwu, M.D. / Ann Arbor, MI

Michelle S. Caird, M.D. / Ann Arbor, MI

Michael M. Kheir, M.D. / Ann Arbor, MI

PURPOSE: Disparities in access and outcomes of total hip replacement care persist, particularly among racial minorities and socioeconomically disadvantaged groups. Patient-reported outcome measures (PROMs) have come to be understood as a valuable tool in assessing quality of care in medicine. The Hip dysfunction and Osteoarthritis Outcome Score for Joint Replacement (HOOS, JR) is a validated PROM survey to assess function and pain for patients undergoing total hip arthroplasty. Our goal is to examine whether certain patient demographics are associated with preoperative and postoperative HOOS scores.

METHODS: This is a retrospective study of 3,307 THAs at a single large academic institution from 2015-2023. Multivariate regression analyses were performed to determine effects of race, sex, marital status, age, and insurance type on length of stay, discharge disposition, preop HOOS, 6-week postop HOOS, 1-year postop HOOS, and changes in HOOS score over time. We controlled for confounders of body mass index, Elixhauser comorbidity index, and surgical approach.

RESULTS: Longer hospital stay was associated with older age, unmarried status, black race, and female sex ($p < 0.05$). Discharge to a rehab facility was associated with older age, government payer, unmarried status, and female sex ($p < 0.05$). Lower preoperative HOOS scores were associated with younger age, government payer, unmarried status, black race, and female sex ($p < 0.05$). Lower 6-week postoperative HOOS scores were associated with younger age ($p = 0.04$) and black race ($p < 0.01$). Lower 1-year postoperative HOOS scores were associated with black race ($p = 0.03$) and female sex ($p = 0.03$). A decreased improvement from preoperative to 6-week HOOS scores was associated with older age, private payers, unmarried status, and male sex ($p < 0.05$). A decreased improvement from preoperative to 1-year HOOS scores was associated only with older age ($p < 0.001$).

CONCLUSION: We found that several social determinants of health such as marital status, age, and sex are associated with length of stay and discharge disposition. While black race was consistently associated with lower absolute HOOS scores at all time-points studied, the change in HOOS scores did not differ by race, implying a similar amount of improvement from preoperative function after a hip arthroplasty. Further research is warranted into why black patients present with lower HOOS scores preoperatively, and whether these patients delay evaluation or whether they are indicated for surgery later, among other potential reasons.

Mid-Term Clinical Outcomes in Revision Total Knee Arthroplasty for Flexion Instability

Poster 40

Evan R. Deckard, BSE / Indianapolis, IN

Co-Authors:

Luke R. Lovro, M.D. / Indianapolis, IN

Cooper R. Parish, B.S. / Indianapolis, IN

Leonard T. Buller, M.D. / Indianapolis, IN

Evan R. Deckard, B.S.E / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Flexion instability is challenging to diagnose and treat yet remains a leading cause of revision total knee arthroplasty (TKA). Previous studies report modest improvements in early patient-reported outcome measures (PROMs) following revision for flexion instability compared to other etiologies; however longer-term follow-up is lacking. This study evaluated outcomes after revision TKA for flexion instability at mid-term follow-up in a large patient cohort.

METHODS: 987 consecutive revision TKAs performed by five surgeons from 2011 to 2021 were retrospectively reviewed. 224 (22.7%) were revised for flexion instability, of which 73% (N=163) were without concomitant diagnoses. Consistent clinical and radiographic diagnostic criteria for flexion instability were used as described by Abdel et al at Mayo Clinic. PROMs at latest follow-up and improvement from pre-revision baseline were evaluated. Covariates, minimal clinically important difference (MCIDs), substantial clinical benefit (SCB), and patient acceptable symptom state (PASS) thresholds were documented. Statistical significance for analyses is $p < 0.05$.

RESULTS: The sample was 66% female, with mean age and body mass index (BMI) of 65 years and 33 kg/m², respectively. 80% of patients achieved minimum 1-year follow-up with a mean of 3.2 years (range, 1-12). Aseptic revision-free survivorship was 90.6% (95%CI, 83-98) out to 11.7 years, respectively. Only 1.2% of cases required a re-revision for flexion instability. Postoperative improvement in all PROMs exceeded established MCIDs ($P \leq 0.001$). MCID, SCB and PASS thresholds for KOOS JR were achieved in 69%, 54% and 50% of cases, respectively. Furthermore, 51% of patients reported being 'satisfied or very satisfied' and 58% of patients reported their knee 'sometimes' or 'always' felt normal at latest follow-up.

CONCLUSIONS: Although frequently a challenging diagnosis, patients and surgeons can expect clinically meaningful improvement in PROMs and low re-revision rates when undergoing revision for flexion instability when employing consistent and established diagnostic criteria and surgical correction techniques.

Preoperative Gait Kinematics May Impact Total Knee Arthroplasty Outcomes: Insight on Bearing Design

Poster 41

Evan R. Deckard, BSE / Noblesville, IN

Co-Authors:

Remi Courteille, M.S.cA / Quebec, Canada

Evan R. Deckard, B.S.E / Indianapolis, IN

Alex Fuentes, Ph.D. / Quebec, Canada

Nicola Hagemeister, Ph.D. / Quebec, Canada

Laurence Chèze, Ph.D. / Lyon, France

Scott A. Banks, Ph.D. / Gainesville, FL

Leonard T. Buller, M.D. / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: It is widely held that mimicking the native knee pivot pattern is essential for restoring optimal function after total knee arthroplasty (TKA). Fluoroscopic studies on healthy knees report a predominant central or lateral pivot during stance and medial-pivot patterns are observed during deep-flexion. This study purpose was to determine whether the patient's preoperative knee pivot pattern during gait affects outcomes after TKA utilizing an asymmetric conforming bearing designed to guide kinematic motion.

METHODS: Twenty-three individuals received the same dual-pivot bearing TKA designed to facilitate a central/lateral pivot in early knee flexion and a medial-pivot in greater flexion. Three-dimensional knee kinematics were captured in clinic during treadmill walking with a Knee Kinesiography exam before and 4-month post-surgery. Knee pivot patterns (translation, lateral, medial, or central) were determined independently in four stance sub-phases (loading, mid-stance, end-stance, and push-off). Associations between patient-reported outcomes and preoperative/postoperative pivot patterns were evaluated with statistical significance set at $P < 0.05$.

RESULTS: The majority of patients (73.9%) exhibited a preoperative and postoperative central or lateral kinematic pivot during early-flexion stance. This group reported better satisfaction levels ($P = 0.04$) and a statistical trend towards higher improvements in KOOS-JR (+21.8pts vs +10.1pts; $P = 0.076$) compared to the sub-group of patients which exhibited a predominant medial-pivot pattern pre-TKA. Most patients (83.3%) from this sub-group showed a changed pivot pattern and a prevalent non-medial pivot post-surgery.

CONCLUSION: This study provides insights to answer the question of whether preoperative native knee pivot motion influences TKA outcomes. Results show that patients preserving their own native pivot pattern with a conforming bearing TKA presented higher satisfaction levels at 4-month follow-up. These findings support the value of preoperative kinematic assessment to determine native pivot pattern, as it may ultimately influence whether a patient should get a medial pivot, symmetric or dual-pivot bearing to create a personalized TKA.

Pivot Motion After Conforming Bearing Total Knee Arthroplasty: Association of PCL Status and PROMS

Poster 43

Evan R. Deckard, BSE / Noblesville, IN

Co-Authors:

Remi Courteille, M.S.cA / Quebec, Canada

Evan R. Deckard, B.S.E / Indianapolis, IN

Nicola Hagemeister, Ph.D. / Quebec, Canada

Laurence ChÃ¨ze, Ph.D. / Lyon, France

Scott A. Banks, Ph.D. / Gainesville, FL

Leonard T. Buller, M.D. / Indianapolis, IN

R. Michael Meneghini, M.D. / Indianapolis, IN

OBJECTIVE: Conforming bearings in total knee arthroplasty (TKA) aim to replicate native knee kinematics and facilitate certain centers of rotation (COR) (ie. pivot patterns) throughout motion. Whether to release or preserve the posterior cruciate ligament (PCL) remains unanswered. This study evaluated the relationship of knee COR during gait and outcomes in a dual-pivot conforming bearing with and without preservation of the PCL.

METHODS: Twenty-three patients who underwent TKA with a dual-pivot bearing were included. Three-dimensional knee kinematics were evaluated during treadmill walking with a Knee Kinesiology exam before surgery and at 4-month follow-up. The knee COR was determined independently in seven gait cycle sub-phases. Patients exhibiting either a “Lateral/lateralized” (LL)-pattern or “Medial/medialized” (MM)-pattern post-surgery were compared. PCL status data (full release [PCL-], intact/partial release [PCL+]) were compiled. Patient-reported outcomes were evaluated at 4-month and 1-year follow-ups (significance level $\alpha=0.05$).

RESULTS: Postoperatively, most patients (63%) were categorized as LL-pattern during stance sub-phases ($<20^\circ$ flexion) with the MM-pattern being most prevalent during swing ($>45^\circ$ flexion). Postoperatively, 73% of knees exhibited a predominantly lateral-pivot during loading and mid-stance regardless of PCL status. However, patients in the PCL- group continued to exhibit a LL-pivot at push-off (80.0% vs 33.3%) and early-swing (44.4% vs 20.0%) compared to PCL+ patients ($P=0.055$ and 0.259 respectively). KOOS-JR scores were significantly higher in the PCL+ group at 4-months (75.8 vs 67.0, $P=0.017$), but not at 1-year follow-up (87.7 vs 84.5, $P=0.617$). Almost all PCL+ patients (91.7%) reported their knee ‘sometimes or always’ felt normal compared to 72.7% of PCL- patients ($P=0.261$).

CONCLUSION: This dual-pivot bearing appears to globally drive post-TKA knees into its intended motion. Results also suggest that the PCL status is associated with differences in knee COR during push-off. Furthermore, fully/partially intact PCLs may allow knees to feel more normal postoperatively and achieve higher overall knee health.

Trends in Payments for Ambulatory Surgery Center Facility Fees and Surgeon Professional Fees for Hip and Knee Arthroplasty

Poster 44

Enrico M. Forlenza, M.D. / Chicago, IL

Co-Authors:

Enrico M. Forlenza, M.D. / Chicago, IL

Alexander J. Acuña, M.D. / Chicago, IL

Vincent P. Federico, M.D. / Chicago, IL

Conor M. Jones, M.D. / Chicago, IL

Denis Nam, M.D., M.S.c / Chicago, IL

Craig J. Della Valle, M.D. / Chicago, IL

BACKGROUND: Ambulatory Surgery Centers (ASCs) have been shown to deliver high quality care to patients at significant cost savings to the healthcare system. The objective of this investigation was to examine trends in the Medicare facility and surgeon professional fee payments for hip and knee arthroplasty.

METHODS: Publicly available Medicare data was analyzed to determine professional and facility fee payments for unicompartmental knee arthroplasty (UKA), total knee arthroplasty (TKA) and total hip arthroplasty (THA) to ASCs and hospitals between 2018-2024. The Physician Fee Schedule Lookup Tool and the Medicare ASC Payment Rates files were used to determine professional fee payments and facility fee reimbursements, respectively. Descriptive statistics were used to calculate means and percent change over time. The compound annual growth rates (CAGR) were calculated. Dollar amounts were adjusted for inflation using the Consumer Price Index.

RESULTS: After adjusting for inflation, Medicare professional fees declined significantly over the study period for UKA (\$1,487.44 vs. \$1,147.50; $p=0.003$), TKA (\$1,738.99 vs. \$1,278.59; $p=0.003$) and THA (\$1,740.73 vs. \$1,280.52; $p=0.003$). Medicare ASC facility fees also declined, albeit to a lesser degree for UKA (\$9,007.62 vs. \$8,905.71; $p=0.764$), TKA (\$10,204.46 vs. \$9,048.76; $p=0.027$) and THA (\$9,982.66 vs. \$9,238.05; $p=0.308$). Facility fee reimbursement decreased year over year, with annual percent change ranging from -0.19% for UKA to -2.49% for THA. Trends in Medicare hospital facility fees directly mirrored ASC facility fees over the study period. Professional fees also declined year over year, with annual percent changes ranging from -3.81% for UKA to -4.41% for TKA and THA.

CONCLUSIONS: ASC facility fees and professional fees both declined over the study period, with declines in professional fees far outpacing those of facility fees. Urgent reform of the Medicare payment structure is needed to ensure orthopedic practice solvency and access to high quality care for beneficiaries.

Examining the Efficacy of Intraoperative Augmented Reality in Enhancing Outcomes After Primary Total Knee Arthroplasty

Poster 45

Austin F. Grove / Rochester, MN

Co-Authors:

Austin F. Grove / Rochester, MN

Elizabeth S. Kaji / Rochester, MN

Brett Bukowski, M.D. / Rochester, MN

Kellen Mulford, Ph.D. / Rochester, MN

Dirk R. Larson, M.S. / Rochester, MN

Michael J. Taunton, M.D. / Rochester, MN

OBJECTIVE: Augmented reality (AR) surgical guidance is being explored to mitigate the increasing costs of large surgical navigation systems and to improve efficiency. This study aimed to evaluate the efficacy of one AR surgical guidance system in achieving reliable postoperative alignment based coronal and sagittal measurements, focusing on the performance of a single surgeon.

METHODS: A retrospective analysis was conducted on 114 patients who underwent TKA utilizing AR technology. Twenty-eight patients (22F, 6M, average age and BMI were 68.96 years and 33.33) were eligible for image analysis. Patients were included for image analysis if they had preoperative hip-knee-ankle radiographs within 3 months of surgery and a follow-up HKA radiographic image at one month postoperatively. Two reviewers recorded pre- and postoperative coronal alignment measurements and postoperative sagittal alignment measurements. Interrater reliability scores were calculated by intraclass correlation coefficients. Preoperative and 2-year follow-up Knee Society Scores (KSS) were calculated.

RESULTS: Mean preoperative long leg alignment was 3.55 +/- 2.19 degrees. For surgical execution, the surgeon's goal was 1 degree of varus for long leg alignment. The mean postoperative long leg alignment was 1.43 +/- 1.22 degrees. For sagittal alignment, the surgeon's goal was 3 and 0 degrees of femoral flexion (FF) and tibial slope (TS), respectively. Postoperative FF and TS were 3.01 +/- 2.65 and 2.81 +/- 2.61 degrees, respectively. Interrater reliability scores were excellent for all measurements (ICC = 0.92-0.99). Mean preoperative and 2-year follow-up KSSs were 32.4 and 74.5, respectively.

CONCLUSIONS: Augmented reality facilitates precise alignment in TKA, as demonstrated by the outcomes of a single surgeon. Adopting AR surgical guidance systems in arthroplasty may improve outcomes and mitigate the cost and spatial constraints associated with bulkier navigation systems in the operating room.

Undernourished and Overlooked: Nutritional Competency and Postoperative Complications in Underweight Patients Undergoing Total Knee Arthroplasty

Poster 46

Jibreel Hussain, MBA / Chicago, IL

Co-Authors:

Jibreel Hussain, MBA / Chicago, IL

Nezar Abunnur, B.S. / Chicago, IL

Apurva Choubey, M.D. / Chicago, IL

Brett Drake, B.S. / Chicago, IL

Nasiruddin Shaik, B.S. / Chicago, IL

Esa Syed, B.S. / Chicago, IL

Malyika Hussain, AS / Chicago, IL

Nirav Mungalpara, M.D. / Chicago, IL

Mark Gonzalez, M.D., Ph.D. / Chicago, IL

INTRODUCTION: Nutritional competency and postoperative complications in underweight patients after Total Knee Arthroplasty (TKA) remain understudied in orthopedics. This study aims to classify complications and assess nutritional competency between Underweight and Normal weight groups after TKA, adjusting for demographic factors and comorbidities.

METHODS: Data from the ACS-NSQIP database (2012-2021) identified patients undergoing primary TKA (CPT code 27447), categorized into two BMI groups: Normal weight (18.5-24.99) and Underweight (<18.5). Patients were further grouped by preoperative albumin levels: normal (3.5-5.5) and hypoalbuminemia (<3.5). Multivariate analysis assessed associations between postoperative outcomes, BMI, and preoperative albumin, adjusting for age, race, ethnicity, ASA class, and comorbidities.

RESULTS: Among 505,360 patients who underwent primary TKA, 48,802 were included. Underweight patients had a significantly greater risk of postoperative bleeding (OR 1.23, $p < 0.05$) and wound dehiscence (OR 2.33, $p < 0.05$) compared to Normal Weight patients. Hypoalbuminemic Underweight patients showed increased risks of bleeding, readmission, and reoperation compared to Underweight normoalbuminemic patients and Normal Weight patients with normal albumin levels.

DISCUSSION: While obesity's impacts in TKAs are extensively studied, underweight patients receive less attention. Malnutrition, particularly hypoalbuminemia, is associated with increased risks of bleeding, readmission, reoperation, and death among Underweight patients. Implementing albumin monitoring in preoperative patients may help manage outcome risk levels. Optimizing nutritional status alongside BMI may be more beneficial than solely focusing on nutrition initiatives to mitigate risk and optimize care.

Identification of Compounding and Mitigating Risk Factors for Postoperative Total Knee Arthroplasty Revisions in Patients with Elevated Body Mass Index: An Analysis of 357,860 Patients

Poster 47

Rana Ahmad, B.S. / Chicago, IL

Co-Authors:

Benjamin Johnson, B.S. / Chicago, IL

Rana Ahmad, B.S. / Chicago, IL

Brett Drake, B.S. / Chicago, IL

Apurva Choubey, M.D. / Chicago, IL

Nirav Mungalpara, M.D. / Chicago, IL

Mahveen Jahan, MPH / Chicago, IL

Mark Gonzalez, M.D., Ph.D. / Chicago, IL

OBJECTIVES: Elevated body mass index (BMI) is one of many risk factors associated with adverse outcomes in patients undergoing total knee arthroplasty (TKA), however, little is known about how additional patient-specific factors contribute to outcomes following TKA in this patient population. This study identified several compounding and mitigating risk factors influencing TKA outcomes in patients with a BMI >30.

METHODS: Patients aged 65 and over with 2-year minimum follow-up from primary TKA between 2012 to 2022 from the American Joint Replacement Registry and Centers for Medicaid and Medicare databases were analyzed. Patient demographics and additional medical comorbidities were compared in specific BMI domains of >30 and <30.

RESULTS: 357,860 patients were analyzed. Patients undergoing TKA with BMI >30 had greater rates of <90 day ($p<0.001$) and <2-year revisions ($p<0.001$) compared to BMI <30. African-Americans and smokers with BMIs >30 had significantly higher risk of all cause 2-year revision (HR 1.323; $p=0.002$, and HR 1.248; $p<0.001$, respectively), however, obese females had significantly less risk of revision than obese males (HR 0.756, $p<0.001$). Having diabetes, other races, hospital teaching status, and hospital size did not significantly impact revision rates in the elevated BMI population. In patients with BMI <30, smoking (HR 1.350; $p<0.001$), Black or African American race (HR 1.695; $p<0.001$), and being two or more races (HR 1.929; $p=0.007$) are considered compounding risk factors, while female sex (HR 0.802; $p<0.001$), Asian race (HR 0.561; $p=0.006$), and undergoing the procedure at a minor teaching hospital (HR 0.836; $p=0.009$) are considered mitigating factors for revision.

CONCLUSIONS: Obese patients are at greater risk of short and long-term revisions. Among obese patients, race and smoking status are considered compounding risk factors in both BMI populations, and female sex is a mitigating risk factor in both. Asian race and teaching hospital status are only protective in lower BMI patients and having two or more races is only considered compounding in lower BMI patients. Interestingly, diabetes was not associated with increased risk of revision when stratified. Future studies are needed to better understand the role of specific risk factors based on BMI to better guide postoperative expectations.

Efficacy of A Vancomycin/Tobramycin-Doped Dicalcium Phosphate Dehydrate (P-DCPD) Composite in A Mouse Pouch infection Model Implanted with 3D-Printed Porous Titanium Cylinders

Poster 48

Adam J. Miller, M.D. / Novi, MI

Co-Authors:

Adam J. Miller, M.D. / Southfield, MI

Michael H. Kaminski / Grand Rapids, MI

Therese Bou-Akl, M.D., P.h.D. / Southfield, MI

Paula Dietz, M.S. / Southfield, MI

David C. Markel, M.D. / Novi, MI

INTRODUCTION: Prosthetic joint infection (PJI) remains a challenging problem. Various strategies have been applied to prevent implant-associated bacterial infections with varying levels of success. Intraoperative saline irrigation is commonly used as a preventative measure; however, bacterial infection and biofilm formation are generally not effectively treated with saline irrigation alone. This study evaluated the effect of antibiotic doped polymeric dicalcium phosphate dehydrate (P-DCPD) in a mouse pouch infection model implanted with 3D printed porous titanium (Ti) cylinders (400 μ m pore size). The printing process for these cylinders is identical that used in commercial total joint replacement products.

METHODS: Air pouches were created in 30 female BalBc mice by subcutaneous injection of air (n=10 per group). Pouches were then implanted with either porous Ti cylinders only (negative control), Ti cylinders and *Staphylococcus aureus* (*S. aureus*) (1X10⁶ colony forming units (cfu)) (positive control), or Ti cylinders preloaded with antibiotic-loaded P-DCPD and *S. aureus* (1X10⁶ cfu) (treatment group). Mice were sacrificed 28 days after implantation. At sacrifice, pouches were washed with 3 ml of sterile saline, and the washout was collected for quantitative bacterial analysis. The Ti cylinders were also collected and sonicated for quantitative bacterial analysis.

RESULTS: There were no detectable bacteria in either the pouch washings or the Ti cylinder sonicate (0 cfu/ml) following treatment with antibiotic doped P-DCPD or in the negative control group. There was significantly less bacteria in the pouch washout of mice treated with antibiotic doped P-DCPD (0 cfu/ml) when compared to the positive control (1894 \pm 2455 cfu/ml) ($P < 0.001$). Similarly, sonication analysis of the Ti discs showed significantly less bacteria in the treatment group when compared to positive controls (0 cfu/ml vs 22233 \pm 33735 cfu/ml, $P = 0.002$).

CONCLUSION: Porous Ti implants are vulnerable to bacterial infection and biofilm formation. Pre-treatment of these implants with Vancomycin and Tobramycin doped P-DCPD led to a significant reduction in bacterial infection in this mouse pouch model. In fact, there were no detectable bacterial colony forming units in any of the treated animals. Antibiotic doped P-DCPD as an implant precoat may represent an effective means of decreasing or preventing PJI.

Effect of Tibial Slope on Knee Mechanics for PCL Deficient Cruciate-Retaining Total Knee Arthroplasty

Poster 49

Nicholas B. Frisch, M.D., MBA / Warren, MI

Co-Authors:

Adrian Olson, D.O. / Warren, MI

Kyle Snethen, Ph.D. / Warsaw, IN

Eik Siggelkow / Winterthur, Switzerland

Marc Bandi / Winterthur, Switzerland

Craig Silverton, DO / Detroit, MI

Nicholas Frisch, M.D./MBA / Rochester Hills, MI

INTRODUCTION: Debate persists on the optimal tibial slope for cruciate-retaining (CR) vs. cruciate-sacrificing total knee arthroplasty (TKA). In CR-TKA systems accommodating both posterior cruciate ligament (PCL) retention or sacrifice, questions arise on adjusting tibial slope if the PCL is compromised. This study aims to assess the impact of tibial slope on knee mechanics during CR-TKA with a deficient PCL to inform surgical decisions.

METHODS: A robotic simulator tested ten cadaveric knees pre and post-TKA (Persona® Medial-Congruent®, Zimmer Biomet) with PCL intact vs. resected at tibial slopes of 0°, 3°, 5°, and 7°. Passive laxity assessments and simulated lunge were conducted at knee flexion angles 15°, 30°, 45°, 60°, and 90° by applying ± 6 Nm internal-external (IE) torque, ± 12 Nm varus-valgus (VV) torque, ± 100 N anterior-posterior (AP) force, and ± 100 N medial-lateral (ML) force. Tibial slope adjustments were made with rapid prototyped tibial bearings without additional bone cuts. Statistical analysis involved Two-way ANOVA ($\alpha=0.05$) with post-hoc pairwise multiple comparisons to evaluate laxities among tibial slopes at each flexion angle.

RESULTS: Tibial slope had no significant ($\alpha=0.05$) effect on IE, VV, AP or ML knee laxity through all flexion points or on lunge kinematics. There was no clear trend in AP laxity with a change in tibial slope; however, the joint shifted posteriorly by an average of 2.2mm with each incremental slope increase.

CONCLUSION: Increasing tibial slope did not significantly influence knee laxity throughout flexion suggesting slope should not be adjusted to correct for flexion/extension gap balancing in CR-TKA. While an increase in tibial slope shifts the dwell point of the knee slightly posteriorly, it had no significant effect on knee laxity or joint kinematics in the absence of an intact PCL. Therefore, if the PCL is compromised during a CR-TKA procedure, it is not necessary to recut the tibial slope.

Superior Clinical Results with Intraosseous Vancomycin in Primary Total Knee Arthroplasty

Poster 50

Kwan J. Park, M.D. / Houston, TX

Co-Authors:

Kwan J. Park, M.D. / Houston, TX

Austin E. Wininger, M.D. / Houston, TX

Thomas C. Sullivan, B.S. / Houston, TX

Blesson Varghese, B.S. / Houston, TX

Terry A. Clyburn, M.D. / Houston, TX

Stephen J. Incavo, M.D. / Houston, TX

OBJECTIVE: Periprosthetic joint infection (PJI) remains a feared complications after total knee arthroplasty (TKA). The authors previously reported reduced 90-day incidence of PJI using intraosseous (IO) compared to intravenous (IV) vancomycin for antibiotic prophylaxis during primary TKA. The purpose of this study is to examine the incidence of PJI, adverse reactions, and complications of our cohort with increased clinical follow-up.

METHODS: A retrospective review on 1932 knees (1645 patients) who received either IV or IO vancomycin at the time of primary TKA between May 2016 and May 2023 with minimum 90-day follow-up. There were 564 cases in the IV group and 1368 in the IO group. The IV group received a weight-based dose of vancomycin prior to incision and the IO group received 500mg of vancomycin in the proximal tibia after tourniquet inflation. All patients also received a weight-based dose of IV cefazolin perioperatively. The 2018 Musculoskeletal Infection Society criteria were used to diagnose PJI. Non-operative wound complications were counted only when postoperative oral antibiotics were prescribed. Lastly, acute kidney injury (AKI) was defined as a creatinine increase of 0.3mg/dL.

RESULTS: The IO group demonstrated a significantly lower incidence of PJI compared to the IV group at 90-day (0.5% vs. 1.6%, $P = 0.017$), 1-year (0.7% vs. 1.8%, $P = 0.046$), and 2-year (0.9% vs. 2.4%, $P = 0.031$) follow-up. The IO group also demonstrated lower rates of non-operative wound complications compared to the IV group at 30-day (2.2% vs. 4.3%, $P = 0.021$) and 90-day (2.6% vs. 5.4%, $P = 0.003$) follow-up. There was a significantly lower incidence of AKI in the IO group (1.5% vs. 3.4%, $P=0.0279$). There was no difference for the IO compared to IV group in the incidence of deep vein thrombosis (0.6% vs. 0.9%, $P=0.46$) and pulmonary embolism (0.5% vs. 0.2%, $P=0.45$).

CONCLUSIONS: For our primary TKA cohort with increased clinical follow-up, IO vancomycin demonstrated superior clinical outcomes over IV vancomycin with a reduced incidence of PJI at 90-day, 1-year, and 2-year follow-up. Secondary benefits of IO vancomycin included a reduced incidence of AKI after primary TKA and reduced non-operative wound complications where oral antibiotics were prescribed.

Conversion TKA with Pre-Existing Hardware: Lower Survivorship and More Complications

Poster 51

Andrew D. Pumford, B.A. / Rochester, MN

Co-Authors:

Andrew D. Pumford, B.A. / Rochester, MN

Harold I. Salmons, M. D. / Rochester, MN

Mark W. Pagnano, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

INTRODUCTION: There are limited data on the outcomes of total knee arthroplasty (TKA) performed with previously placed hardware around the knee. We evaluated implant survivorship, complications, and clinical outcomes in a large series of aseptic conversion TKAs with knee hardware in situ at the time of surgery.

METHODS: We identified 102 patients (103 knees) who underwent TKA in the setting of existing hardware between 2015-2022. Mean age was 66 years, mean BMI was 32 kg/m², and 50% were female. Hardware was from prior open reduction and internal fixation (ORIF; 76%), intramedullary nailing (IMN; 17%), ORIF and IMN (3%), ligamentous reconstruction (2%), or osteotomy (2%). Hardware was in the femur in 41% of cases, tibia in 39%, both in 12%, and the patella in 8%. The hardware was partially removed in 62% and completely removed in 17% of cases. About 30% had a preoperative ESR/CRP, which was normal in 83%, and 7 had an aspiration, which were all normal. Posterior-stabilized constructs were implanted in 67% of cases, varus-valgus constrained in 18%, and cruciate-retaining in 13%. Mean follow-up was 4 years.

RESULTS: The 5-year survivorship free of any revision was 92%, with revisions performed for periprosthetic joint infection (n=4), tibial aseptic loosening (n=1), and periprosthetic femur fracture (n=1). The 5-year survivorship free of any reoperation was 87%, with reoperations performed for tibial fracture (n=1), femoral IMN removal for femoral neck fracture (n=1), and arthrofibrosis (n=1). There were 14 non-operative complications (14%), of which 5 involved the in situ TKA. These included 2 periprosthetic tibia fractures, 2 patellofemoral crepitus, and one flexion instability. There were no intraoperative complications.

CONCLUSIONS: Aseptic conversion TKAs performed in the presence of pre-existing hardware demonstrated a 5-year survivorship of 92%, which is lower than most series without in situ hardware. Infection was the most common reason for revision.

SUMMARY: TKAs done with pre-existing hardware were technically more demanding and had a somewhat lower survivorship than expected at 5 years.

Stacked Cones for Treatment of Massive Bone Loss in Revision TKA: 50% Reoperation Rate at 5 Years

Poster 52

Andrew D. Pumford, B.A. / Rochester, MN

Co-Authors:

Andrew D. Pumford, B.A. / Rochester, MN

Breydan H. Wright, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Cody C. Wyles, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

INTRODUCTION: Metaphyseal cones are utilized to both address bone loss and obtain reliable biologic fixation in revision total knee arthroplasties (TKAs). However, sometimes the defect mandates utilizing more than one cone on either the femoral or tibial side. The purpose of this study was to evaluate implant survivorship, radiographic results, and clinical outcomes of revision TKAs with multiple stacked cones at mid-term follow-up.

METHODS: We identified 50 revision TKAs utilizing stacked cones performed at a single academic institution from 2011 to 2021. Multiple stacked cones were used in the femur in 22 patients (44%), tibia in 26 patients (52%), and both in 2 patients (4%). The mean age was 69 years, mean BMI was 33 kg/m², and 74% were male. The indications for revision TKA were aseptic loosening in 56% and PJI in 34%. AORI Type 2B or 3 bone loss was present in all cases. Kaplan-Meier survivorship curves were calculated, radiographs were reviewed, and clinical outcomes were evaluated with Knee Society function scores (KSS). Mean follow-up was 4 years.

RESULTS: The 5-year survivorship free of aseptic loosening leading to stacked cones removal was 93% and free of any stacked cones removal was 75%. Nine stacked cones (6 femoral, 3 tibial) were re-revised, with PJI (n=7) and aseptic loosening (n=2) being the indications for re-revision. The 5-year survivorship free of any re-revision and any re-reoperation were 58% and 50%, respectively. There were 17 re-revisions, with PJI (n=8) and aseptic loosening (n=7) being the most common. There were 2 unrevised stacked cones that had signs of radiographic loosening. All other unrevised revision TKAs were well fixed. The mean KSS was 54.

CONCLUSIONS: Stacked cones demonstrated modest survivorship at midterm follow-up with a low rate of aseptic loosening. However, 50% of these cases required a reoperation, which highlights this complex patient cohort.

SUMMARY: In this series of 50 revision TKAs with stacked cones, the 5-year survivorship free of stacked cone re-revision was 75%, and 50% had a reoperation.

Mid-Term Outcomes After Contemporary Cementless vs. Cemented Primary TKA: Some Subtle Differences

Poster 53

Harold I. Salmons, M.D. / Rochester, MN

Co-Authors:

Harold I. Salmons, M.D. / Rochester, MN
Michael W. Seward, M.D. / Rochester, MN
Caden J. Messer, B.S. / Rochester, MN
Nicholas A. Bedard, M.D. / Rochester, MN
Michael J. Taunton, M.D. / Rochester, MN
Kevin I. Perry, M.D. / Rochester, MN
Mark W. Pagnano, M.D. / Rochester, MN
Robert T. Trousdale, M.D. / Rochester, MN
Cody C. Wyles, M.D. / Rochester, MN

OBJECTIVE: Cementless total knee arthroplasty (TKA) has garnered renewed interest due to the potential for improved long-term survivorship and ease of use. However, the data on contemporary cementless TKA remains scarce. We investigated implant survivorship and outcomes following contemporary cementless vs. cemented TKA.

METHODS: We identified 3763 primary TKAs performed for osteoarthritis between 2016-2023 using our institutional total joint registry. 598 TKAs were cementless and 3165 TKAs were cemented. Cementless tibial components were porous titanium (Ti) in 509 knees and beaded cobalt-chromium (CoCr) in 89. We excluded all-polyethylene tibias, stemmed tibias, & revision constructs. Mean age was 68 years, mean BMI was 32 kg/m² and 56% were women. The cementless group was younger and contained more men ($p<0.05$). Kaplan-Meier analyses and Cox regression analyses adjusted for age, sex, BMI, and surgical year were performed. Mean follow-up was 3 years.

RESULTS: There were 61 revisions (1.6%), with 11 (1.8%) in the cementless and 50 (1.6%) in the cemented groups. Revisions were done predominately for infection ($N=31$) and aseptic loosening ($N=9$). All 4 cases of loosening following cementless TKA involved CoCr tibias, <1 year postoperative. All 5 cases of cemented TKA loosening occurred between 2-5 years. The 5-year survivorships free of revision were 92% and 97% in cementless vs. cemented TKAs, respectively ($HR=3$; $p<0.05$). Excluding CoCr tibias, the survivorship of Ti cementless tibias was 97%. The 5-year survivorships free from revision for infection were 98% and 99% in the cementless and cemented groups, respectively ($HR=3$; $p<0.05$). No differences in periprosthetic fracture risk were observed ($p=0.5$).

CONCLUSIONS: We identified subtle differences in mid-term outcomes between contemporary cementless and cemented primary TKA. We found a slightly increased risk of infection in the cementless group, similar excellent durability between Ti cementless & cemented tibias, and an elevated risk of loosening with CoCr cementless tibias.

Multicenter Randomized Clinical Trial of HXLPE vs. Conventional PE in 500 Primary TKAs at 10 Years

Poster 54

Harold I. Salmons, M.D. / Rochester, MN

Co-Authors:

Harold I. Salmons, M.D. / Rochester, MN

Dirk R. Larson, M.S. / Rochester, MN

Cedric J. Ortiguera, M.D. / Jacksonville, FL

Henry D. Clarke, M.D. / Phoenix, AZ

Mark J. Spangehl, M.D. / Phoenix, AZ

Mark W. Pagnano, M.D. / Rochester, MN

Michael J. Stuart, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

OBJECTIVE: Second generation highly cross-linked polyethylene (HXLPE) has revolutionized total hip arthroplasties. However, the long-term risks and benefits of HXLPE in primary total knee arthroplasties (TKAs) remain unknown. This randomized clinical trial (RCT) evaluated the implant survivorship, complications, radiographic results, and clinical outcomes of HXLPE vs. conventional ultra-high-molecular-weight polyethylene (UHMWPE) inserts in primary TKAs.

METHODS: 518 patients (518 knees) who underwent primary TKA were enrolled across 3 centers within one tertiary referral network. Mean age was 67 years, mean BMI was 32 kg/m², and 58% were women. All received cemented primary TKA with a posterior stabilized tibial insert and patellar resurfacing. Randomization proceeded via stratified dynamic allocation. Patients were blinded. Controls (254 knees) received TKA with UHMWPE (N2Vac; Stryker, Mahwah, NJ). The treatment group (264 knees) received HXLPE (X3; Stryker). Kaplan-Meier survivorship, radiographic results, and clinical outcomes were assessed. This trial was registered with ClinicalTrials.gov. Mean follow-up was 11 years.

RESULTS: The 10-year overall survivorships free from any revision or reoperation were 96% and 94%, respectively. There were no differences in the risk of revision or reoperation between groups ($p>0.05$). There were 19 total revisions. Revision indications included periprosthetic joint infection (14 knees), instability (4 knees), and one ORIF for patella fracture due to osteolysis around a UHMWPE insert. There was no PE wear, osteolysis, or fractures of the post in the HXLPE group. Radiographic results and clinical outcomes were otherwise similar.

CONCLUSIONS: In this multicenter RCT, HXLPE vs. UHMWPE tibial inserts had equivalent long-term implant survivorship, radiographic results, and clinical outcomes with no mechanical fractures of the post. Notably, no wear-related failures were identified in the HXLPE group, but there was one case of osteolysis in the UHMWPE group.

Does Robotic TKA Planning with Non-Weightbearing CT Translate to Postoperative Weightbearing Images?

Poster 55

Maria T. Schwabe, M.D., MPHS / St. Louis, MO

Co-Authors:

Maria T. Schwabe, M.D., M.P.H.S / St. Louis, MO

Caroline J. Granger, M.D. / St. Louis, MO

Ryan M. Nunley, M.D. / St. Louis, MO

Robert L. Barrack, M.D. / St. Louis, MO

Charles P. Hannon, M.D., M.B.A / Rochester, MN

INTRODUCTION: Robotic-assisted total knee arthroplasty (RA-TKA) has become popular due to improved accuracy and precision in implant placement. Some robotic systems rely on a non-weightbearing computer tomography (CT) for preoperative and intraoperative planning. A potential source of alignment variability with image-based RA-TKA includes weightbearing status and lower extremity rotation. The purpose of this study was to compare TKA implant position measured on a CT-based robotic system to postoperative weightbearing measurements using 3-Dimensional radiographs.

METHODS: This single-center retrospective review evaluated 163 patients who underwent RA-TKA between 2021–2022. The position of implanted femoral and tibial components in the coronal, sagittal and axial planes as reported by the CT-based robotic system were recorded. Postoperative EOS weightbearing radiographs were independently reviewed by two investigators. Mechanical axis alignment (MAA), femoral coronal alignment (FCA), tibial coronal alignment (TCA), tibial sagittal alignment (TSA), femoral sagittal alignment (FSA) measurements were recorded. EOS measurements were compared with position reported by the robotic system.

RESULTS: For the femoral component, the absolute difference between measured FCA on the robotic system and postoperative EOS was $1.28^\circ \pm 1.01^\circ$ ($p < 0.01$) and 85% of measurements were within 2° . The absolute difference for FSA was $1.55^\circ \pm 1.45^\circ$ ($p < 0.01$) and 77% of measurements were within 2° . For the tibial component, the absolute difference for TCA was $1.09^\circ \pm 1.10^\circ$ ($p < 0.01$) and 91% of measurements were within 2° . The absolute difference for TSA was $1.31^\circ \pm 1.10^\circ$ ($p < 0.01$) and 85% of measurements were within 2° . The absolute difference for MAA was $1.75^\circ \pm 1.78^\circ$ ($p < 0.01$) and 75% of measurements were within 2° .

CONCLUSION: TKA implant position measured on weightbearing radiographs and a CT-based robotic system were slightly different, but 75%-91% of measurements were within 2° . Weightbearing status and rotation are potential sources of subtle alignment variability and should be considered when planning for non-weightbearing CT-based RA-TKA.

Epidemiology of Periprosthetic Fracture in 6,582 Revision TKAs Over 50 Years

Poster 56

Nicolas A. Selemon, M.D. / Rochester, MN

Co-Authors:

Nicolas A. Selemon, M.D. / Rochester, MN

Ahmadreza Nezameslami, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Henry D. Clarke, M.D. / Phoenix, AZ

Bryan D. Springer, M.D. / Jacksonville, FL

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

INTRODUCTION: The incidence and epidemiology of periprosthetic fracture in revision total knee arthroplasty (TKA) are unknown. The purpose of this study was to describe the cumulative incidence, nature, chronology, and risk factors of periprosthetic fractures in revision TKAs.

METHODS: Utilizing our institutional total joint registry, we reviewed all 6,582 revision TKAs performed at our institution between 1970 – 2020 and identified all intraoperative and postoperative periprosthetic fractures. Fracture location, timing, and type were collected along with risk factors for fracture.

RESULTS: Overall, there were 194 periprosthetic fractures, including 60 (31%) intraoperative fractures. Of the 60 intraoperative fractures, 29 (48%) were femur fractures, 25 (42%) were tibia fractures, and 5 (8%) were patella fractures. Intraoperative fractures were more common in females (HR 1.9, $p=0.02$). The 10-year survivorship free of any revision and any reoperation after intraoperative periprosthetic fracture were 84% and 78%, respectively.

The 20-year probability of suffering a postoperative periprosthetic fracture after revision TKA was 6%. There were 134 postoperative periprosthetic fractures, which included 59 (44%) patella fractures, 53 (40%) femur fractures, and 21 (16%) tibia fractures. The 10-year survivorship free of any revision and any reoperation after postoperative periprosthetic fracture in revision TKA were 44% and 34%, respectively. The 5-year mortality after a periprosthetic fracture after revision TKA was 22%.

CONCLUSION: Periprosthetic fracture after revision TKA is a rare, but devastating injury. Intraoperative fractures are less common and are associated with modest survivorship when identified and treated. Female sex is correlated with an increased risk of intraoperative periprosthetic fracture. Postoperative periprosthetic fractures after revision TKA are associated with a poor 10-year revision-free survivorship of 44%.

Valgus vs. Varus Knees: What's the Difference?

Poster 57

Timothy S. Brown, M.D. / Houston, TX

Co-Authors:

Timothy S. Brown, M.D. / Houston, TX

Jennifer Liu, M.D. / Houston, TX

Thomas C. Sullivan, B.S. / Houston, TX

Haitham K. Awdeh, M.D. / Houston, TX

Kwan J. Park, M.D. / Houston, TX

Terry A. Clyburn, M.D. / Houston, TX

Stephen J. Incavo, M.D. / Houston, TX

OBJECTIVE: The purpose of this study was to use computed tomography (CT) and long-leg radiographs to evaluate differences in femoral version, femoral condyle height, and tibial angulation of varus and valgus knees.

METOHDS: This was a single institution retrospective study of patients who had primary TKA for osteoarthritis between 2016-2023 with preoperative lower extremity CT scans and full leg-length radiographs who had $>5^\circ$ of varus or valgus angulation. Tibial bowing angle was considered significant if $\geq 3^\circ$. Femoral condyle height was measured on axial CT scans of the knee. Femoral version was measured as the angle between the proximal femoral neck axis and the distal posterior femoral condylar axis on axial CT scans of the hip and knee.

RESULTS: In total, 44 valgus knees and 65 varus knees were included in this study. 47.7% of valgus knees had significant valgus tibial shaft bowing ($\geq 3^\circ$) compared to only 3% of varus knees ($P < 0.01$). The average femoral version for valgus knees was $5.5^\circ \pm 12.2^\circ$, compared to $10.4^\circ \pm 6.8^\circ$ for varus knees ($P = 0.02$). In valgus knees, 55% had femoral version within normal range ($0-20^\circ$), compared to 89% of varus knees ($P < 0.01$). Additionally, 34% of valgus knees had femoral retroversion ($< 0^\circ$) compared to 3% of varus knees ($P < 0.01$). Lastly, 11% of valgus knees and 9% of varus knees had excessive femoral anteversion ($> 20^\circ$). There were no significant differences in medial or lateral femoral condyle height between groups.

CONCLUSIONS: We found that valgus knee alignment is associated with decreased femoral version and increased tibial valgus bowing. Additionally, we found that valgus knee alignment was not associated with lateral condyle hypoplasia. These findings have implications for component placement during primary and revision TKA. We believe that during TKA when the knee is flexed to 90° , femoral retroversion contributes to the appearance of lateral condyle deficiency.

DAIR for Acute PJI: Results of 168 Primary TKAs at Extended Follow-up of 5 Years

Poster 58

E. Bailey Terhune, M.D. / Rochester, MN

Co-Authors:

E. Bailey Terhune, M.D. / Rochester, MN

Khaled A. Elmenawi, M.D. / Rochester, MN

Jessica A. Grimm, M.S. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Elie F. Berbari, M.D. / Rochester, MN

Daniel J. Berry, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

INTRODUCTION: There is renewed interest in either single or double debridement, antibiotics, and implant retention (DAIR) for acute periprosthetic joint infections (PJIs). The purpose of this study was to assess the contemporary results of single DAIRs for acute PJI after primary total knee arthroplasty (TKA) with extended follow-up.

METHODS: We identified 168 primary TKAs treated with DAIR followed by chronic antibiotic suppression for acute PJI between 2000-2021 at a single high-volume academic institution. Acute postoperative PJI was defined as infection within four weeks of primary TKA, and acute hematogenous PJI was defined as infection occurring more than four weeks after primary TKA with symptoms for less than 21 days. The mean age was 69 years, 36% were female, and mean BMI was 35 kg/m². PJI diagnosis was based on the 2011 MSIS criteria. Kaplan-Meier survivorship analyses were performed. Mean follow-up was 5 years.

RESULTS: Survivorship free of reinfection was 87% at 1 year, 76 % at 2 years, and 68% at 5 years. There was no significant difference in reinfection between early postoperative and acute hematogenous PJIs ($p=0.8$). Reinfection were caused by the original infecting organism in 43%. BMI, host grade, and extremity grade were not predictive of reinfection ($p>0.05$). Median time to reinfection was 10 months. Survivorship free of any revision was 85% at 1 year, 75% at 2 years, and 66% at 5 years. Indications for revision included recurrent PJI (91%), patellar instability (5%), and other aseptic failures (4%). Mean KSS improved from 62 to 78 at 5 years ($p=0.6$).

CONCLUSIONS: In this large series of acute PJIs after primary TKAs treated with a single DAIR, infection-free survival was 68% at 5 years. With a rigorous definition of acute PJI and careful patient selection, results are markedly improved at extended follow-up when compared to most historical series.

Failure of Manipulation Under Anesthesia with or without Lysis of Adhesions After Primary Total Knee Arthroplasty

Poster 59

Justin M. Walsh, M.D. / Houston, TX

Co-Authors:

Justin M. Walsh, M.D. / Houston, TX

Thomas C. Sullivan, B.S. / Houston, TX

Blesson Varghese, B.S. / Houston, TX

Karen L. Hernandez, B.S. / Houston, TX

Stephen J. Incavo, M.D. / Houston, TX

Timothy S. Brown, M.D. / Houston, TX

Kwan J. Park M.D. / Houston, TX

BACKGROUND: Stiffness after total knee arthroplasty (TKA) remains a frustrating complication for both patients and clinicians, affecting approximately 1.3-5.8% of patients undergoing TKA. The purpose of this study was to evaluate the outcomes of manipulation under anesthesia (MUA) with or without arthroscopic lysis of adhesions (LOA) following primary TKA and investigate the effect of patient demographic and perioperative variables on its outcomes.

METHODS: A single-institution retrospective cohort study on patients who underwent an MUA with or without LOA after primary TKA between August 2016 and March 2024. 17,000 primary TKAs by 34 surgeons across 8 clinical sites at our institution were available for review. Any patients in the database who underwent MUA or LOA after primary TKA were included in the study. Indication for MUA/LOA was individualized to each patient and per surgeon clinical judgement. Exclusion criteria included revision TKA, previous incision and drainage, and neuromuscular disorders. Patient clinical history and demographics, perioperative variables, and postoperative outcomes were collected. Failure of MUA/LOA was defined as repeat MUA or LOA, revision TKA for arthrofibrosis, or failure to gain $\geq 50\%$ of flexion achieved intraoperatively. Chi-squared and unpaired t-tests were used for categorical and continuous variables, respectively.

RESULTS: 654 patients (678 knees, 726 MUA/LOAs) including 54 repeat interventions with an average follow-up of 263.8 ± 375.9 days met inclusion criteria (64% female, 63.1 ± 9.3 years of age, 31.9 ± 6.1 BMI). 293 patients underwent repeat MUA/LOA, revision TKA for arthrofibrosis or failed to gain $\geq 50\%$ of flexion achieved intraoperatively and were thus deemed unsuccessful. Compared with successful MUA/LOAs, unsuccessful cases were more likely to have a cruciate retaining implant (49% vs 35%, $P < 0.001$), be slightly less healthy (Elixhauser Comorbidity Index 3.0 vs 2.5, $P = 0.009$), and be a current smoker (5.1% vs 8.5%, $P = 0.067$). Unsuccessful interventions were more likely to have demonstrated loss of or no change in knee flexion at the first postoperative visit and failed to recover thereafter. Successful cases achieved 29.3° of knee flexion at final follow-up, compared with 7.1° in unsuccessful cases ($P < 0.001$).

CONCLUSIONS: MUA and LOA+MUA are reliable interventions for treating stiffness after primary TKA. While successful interventions achieve roughly 30° of knee flexion, unsuccessful MUA/LOAs gain significantly less knee flexion postoperatively which typically manifests by the first postoperative visit and fails to recover thereafter.

Tibial Tubercle Osteotomy in Revision Total Knee Arthroplasty: High Re-Revision Rate

Poster 60

Matthew T. Weintraub, M.D. / Rochester, MN

Co-Authors:

Matthew T. Weintraub, M.D. / Rochester, MN

Nicholas A. Bedard, M.D. / Rochester, MN

Mark J. Spangehl, M.D. / Rochester, MN

Matthew P. Abdel, M.D. / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

Charles P. Hannon, M.D., MBA / Rochester, MN

OBJECTIVE: Tibial tubercle osteotomy (TTO) may facilitate exposure or implant removal in revision total knee arthroplasty (TKA), however, there is a paucity of literature on this technique. The purpose of this study was to evaluate implant survivorship and radiographic union of TTOs in revision TKAs.

METHODS: We identified 36 revision TKAs that included a TTO performed between 1996 - 2022. Mean age was 65 years, mean BMI was 33 kg/m², and 58% were male. Mean number of prior knee operations was 5. Twenty patients (56%) had cemented tibial stems, 4 (11%) had sleeves, and 2 (6%) had cones. Twenty-two patients (61%) had a history of periprosthetic joint infection (PJI), with 13 (36%) having failed two-stage exchange arthroplasty. Indications for TTO included implant removal (n=17), exposure (n=13), exposure and implant removal (n=4), and correction of patella baja (n=2). Indications for revision TKA included explant for PJI (n=17), reimplantation (n=7), loosening (n=5), stiffness (n=2), implant failure (n=2), femoral periprosthetic fracture nonunion (n=2), and instability (n=1). Wires (n=35) and screws (n=1) were used for fixation. Mean follow-up was 10 years.

RESULTS: Excluding the 14 planned reimplantations, there were 13 re-revisions (59%) at mean 26 months after TTO. There was one TTO-specific re-revision (8%) for fixation failure and displacement. Other indications for re-revision included PJI (n=9), aseptic loosening (n=2), and instability (n=1). Two additional TTO-specific postoperative complications (8%) included ORIF for a periprosthetic tibial fracture and a nonoperatively managed proximal tibia fracture. Both patients had radiographically healed osteotomies. The overall rate of TTO radiographic union was 94%.

CONCLUSIONS: Complex revision TKAs requiring TTO demonstrated high re-revision rates of 59%. However, union rates were high at 94% and TTO-specific re-revisions had an acceptable incidence of 8%. TTO remains a valuable option to aid in exposure or implant removal in revision TKAs with stiffness or well-fixed components.

Cementless vs. Cemented Robotic-Assisted Total Knee Arthroplasty Outcomes: A Single Center MARCQI-Based Study

Poster 61

Alexander Ziedas / Dearborn, MI

Co-Authors:

Alexander Ziedas, M.D. / Southfield, MI

Simarjeet Puri, M.D. / Southfield, MI

Michael Laker, M.D. / Southfield, MI

William Kesto, M.D. / Southfield, MI

Jefferey Michaelson, M.D. / Southfield, MI

David Knesek, M.D. / Southfield, MI

Todd Frush, M.D. / Southfield, MI

David Markel, M.D. / Southfield, MI

PURPOSE: Robotic-assisted total knee arthroplasty (RA-TKA) has become increasingly popular. The purpose of this study was to determine whether a difference exists between cementless and cemented RA-TKA techniques with regards to revision rate and 90-day outcomes. We hypothesized that cementless RA-TKA would have comparable survivorship and 90-day complications to cemented RA-TKA.

METHODS: A single center's data from the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) was queried for all primary RA-TKAs from January 2018 to July 2023. Cementless and cemented RA-TKA cohorts were compared for revisions and 90-day complications including emergency department visits, readmissions, and returns to the OR. Chi-square and Fisher's exact tests were used for categorical data and t-tests for continuous data.

RESULTS: Of 1003 RA-TKAs identified (mean age 65.8 ± 9.1 years, 53% female), 730 were cementless and 273 cemented. There were no statistically significant differences between cohorts relative to age, BMI, gender, race, 90-day events or revision rate. The specific nature of the 90-day events did not correlate with technique. Logistical regression modeling showed no difference in odds of a 90-day event based on patient factors. Cemented RA-TKA had longer mean surgical time (111.8 ± 30.4 vs 91.2 ± 19.8 minutes, $p=0.0001$) and mean length of stay (40.6 ± 26.8 vs 30.8 ± 22.0 hours, $p=0.0001$). Twenty-two revisions were performed (13 cementless 1.7%, 9 cemented 3.2% ($p=0.1514$)). Mean time to revision was shorter for cementless RA-TKA (0.80 ± 0.46 vs 1.4 ± 1.1 years, $p=0.0001$). Cumulative percent revision (CPR) at five years was 1.8% for cementless and 3.9% for cemented RA-TKA ($p=0.1671$).

CONCLUSION: Cementless and cemented RA-TKA had comparable revision rates and 90-day complications. Cementless RA-TKA had a shorter mean surgical time, shorter length of stay, and less time to revision compared to cemented RA-TKA. The overall RA-TKA revision rate herein was comparable to that of conventional TKA reported in MARCQI.

Opioid Sparing and Analgesic Efficacy of Metamizole After Orthopedic Surgery: A Systematic Review

Poster 63

Michael Braman, BBmE / Roeland Park, KS

Co-Authors:

Michael Braman, BBmE / Kansas City, KS

Laura Jackson, Ph.D. / Kansas City, KS

Johnathan Dallman, M.D. / Kansas City, KS

Archie Heddings, M.D. / Kansas City, KS

OBJECTIVE: Postoperative pain control is critical in the setting of orthopedic surgery. While efficacious analgesics, opiates have rapid tolerance and addictive potential. Metamizole is a non-opioid analgesic primarily working by inhibiting COX-3 commonly used in Europe and South America but banned in the US due to concerns about agranulocytosis risk, though recent reviews have not shown significant agranulocytosis. This review is to assess the analgesic efficacy of metamizole in orthopedic surgery.

METHODS: An electronic review was conducted of PubMed, Web of Science, Cochrane, Embase, OVID Medline in October 2023. Studies for inclusion were limited to those in which metamizole use was a primary focus and in the setting of orthopedic surgery.

RESULTS: 1112 studies were identified and 15 (1.3%) met inclusion criteria. The use of metamizole as a single agent or in combination therapy was described to be superior or noninferior to alternative analgesics in 10 (66.7%) studies. Metamizole decreased rescue analgesia in 5 (33.3%) studies. No patients experienced agranulocytosis

CONCLUSION: Metamizole was found to be as efficacious as other non-opioid analgesics and demonstrated an opioid sparing effect in a third of studies. Metamizole did not have significant differences in incidence or severity of side effects and no cases of agranulocytosis were seen across all studies. These results indicate the potential for metamizole's use as part of analgesia in the setting of orthopedic surgery. Future studies should focus on larger cohorts to continue to assess efficacy and risk of agranulocytosis when using metamizole in the orthopedic setting.

Changes in Resting Energy Expenditure After Skeletal Trauma and Orthopedic Surgery: A Scoping Review

Poster 64

Michael Braman, BBmE / Kansas City, KS

Co-Authors:

Michael Braman, BBmE / Kansas City, KS

Ian Harmon, M.D. / Kansas City, KS

Matthew Freeman, M.D. / Kansas City, KS

Bryan Vopat, M.D. / Kansas City, KS

OBJECTIVE: Surgery induces a stress response triggering the body to undergo a catabolic cascade favoring glycogenolysis, lipolysis, gluconeogenesis, and subsequent lean tissue loss. Lean tissue loss from the surgical insult with concomitant atrophy from post-surgical immobilization is associated with worse outcomes after orthopedic surgery. Despite thorough understanding of the catabolic cascade, the magnitude of metabolic change following surgical intervention is still largely unknown. Therefore, the perioperative nutritional requirements to supplement these losses are unknown. There is a paucity of literature on this topic and the relationship of metabolic changes on outcomes associated with orthopedic surgical intervention.

METHODS: This scoping review utilized PubMed, Embase, Cochrane, and Web of Science, and the search was conducted in July 2023.

RESULTS: 5430 unique studies were identified on the initial search. Upon further inspection, seven met full inclusion criteria for the scoping review. Resting energy expenditure (REE) increased significantly across all participants experiencing musculoskeletal trauma or orthopedic surgery and ranged from 20-41% maximal elevation and with return to metabolic baseline occurring between 6-42 days. Predictive equations for energy expenditure tended to underestimate requirements after trauma.

CONCLUSION: Following skeletal trauma or orthopedic surgery, current literature suggests that REE increases and peaks around day 10, and gradually returns to baseline around day 42. Patient age may influence metabolic response as one study examining children demonstrated no postoperative change in REE. Overall, there is a dearth of literature examining postoperative changes in metabolism after skeletal trauma or orthopedic surgery. Current studies have a small population size, thus reducing external validity. Further research should be conducted on larger populations assessing the magnitude of the catabolic cascade following skeletal trauma or orthopedic surgery, as well as what nutritional and dietary interventions can be utilized to reduce lean tissue loss and improve patient outcomes.

Efficacy of Commercial Irrigation Solutions in a Rat Titanium Cylinder Implant Infection Model

Poster 65

Harjot Uppal, M.D. / Berkley, MI

Co-Authors:

Jake D. Foote, M.D. / Southfield, MI

Adam Miller, M.D. / Southfield, MI

Harjot Uppal, M.D. / Southfield, MI

Thomas Z. Paull, M.D. / Southfield, MI

Paula Pawlitz, M.S. / Southfield, MI

Therese Bou-Akl, Ph.D. / Southfield, MI

David C. Markel, M.D. / Novi, MI

OBJECTIVE: Prosthetic joint infection (PJI) is a devastating complication in total joint arthroplasty. The efficacy of saline irrigation alone for the treatment of PJI in the setting of metallic implants is limited. A variety of commercially available irrigation solutions are available for use in the setting of infection. We sought to analyze the efficacy of various irrigation solutions in a rat model of PJI. It was hypothesized that some or all tested solutions would perform better than a no-irrigation control, and that there may be differences between solutions.

METHODS: Porous titanium cylinders (400 µm pore size) were implanted into the distal femur intercondylar notch in male rats (Sprague Dawley). The implant and knee joint were then inoculated with a staph aureus (1×10^6 CFU) broth immediately prior to capsular closure. After seven days, the rats were sacrificed, the knee opened, and then treatment applied with the irrigation solution per manufacturer protocol. Solutions used were Xperience, Betadine, Irrisept, Bactisure, Prontosan, Biasurge, with 10 rats per group. Titanium implants were then serially sonicated, with the sonicate then analyzed for bacterial quantity remaining (colony forming units, CFU). ANOVA and Tukey-Kramer Post-Hoc analyses were then applied.

RESULTS: All tested solutions (Xperience, Betadine, Irrisept, Bactisure, Prontosan, Biasurge) reduced CFUs relative to the control, though this did not reach significance. ANOVA showed an overall significant difference between irrigated specimens and the control ($p=0.007$). Post-hoc Tukey-Kramer analysis demonstrated better performance than the control for Prontosan ($p=0.03$) and Biasurge ($p=0.014$), while Bactisure ($p=0.057$) and Xperience ($p=0.063$) neared statistical significance. There were not significant differences found on this analysis when comparing between the irrigation solutions.

CONCLUSIONS: Both Prontosan and Biasurge demonstrated improved performance over control in their ability to reduce bacterial load in a rat PJI model.

Trends in Orthopedic Surgeon Compensation: A Comparative Analysis over Twenty Years

Poster 66

Nicholas B. Frisch, M.D., MBA / Bloomfield Hills, MI

Co-Authors:

Daniel E Pereira, M.D. / St Louis, MO

Charles P Hannon, M.D./MBA / Rochester, MN

P. Maxwell Courtney, MND / Philadelphia, PA

Adam J Rana, M.D. / Portland, Main

Nicholas B Frisch, M.D., MBA / Bloomfield Hills, MI

INTRODUCTION: Healthcare finance in the United States is continually changing with increased consolidation of health care organizations, fluctuating reimbursement cycles, and shifting institutional and federal policy. The economics of practicing medicine is dynamic and challenging relative to other professions. The purpose of this study is to analyze compensation trends in orthopedic surgery over the past 20 years compared to other professions.

METHODS: Income data for orthopedic surgeons and other professions every five years from 2000 to 2020 was collected from the United States Bureau of Labor Statistics and peer-reviewed literature. Income data were adjusted for inflation and analyzed to identify trends in compensation.

RESULTS: The rate of absolute income trajectory over two decades for orthopedic surgeons when adjusted for inflation was -38%. Outside of healthcare professions, economists, lawyers, and engineers saw some of the highest increases with inflation adjusted increases at +31%, 26%, 24%, respectively. Orthopaedic surgeon salary rates declined the most of all professions analyzed, including all healthcare workers.

CONCLUSION: Adjusted orthopedic surgeon compensation has declined significantly in the two decades between 2000 to 2020. Compared to other high-skilled professions, Orthopedic compensation showed the greatest decline in adjusted rates over time. This trend carries significant implications for the future of the field, potentially affecting recruitment, satisfaction, burnout, and patient access to care. It underscores the need for a reevaluation of compensation models in orthopedic surgery to ensure sustainability.

Hyperglycemia and Osteoblast Function: Implications for Bone Health in Diabetics

Poster 67

Kyra Grove, B.S. / Kalamazoo, MI

Co-Authors:

Kyra Grove, B.S. / Kalamazoo, MI

Mitchell Kenter, M.S. / Kalamazoo, MI

Keith Kenter, M.D. / Kalamazoo, MI

Adil Akkouch, Ph.D. / Kalamazoo, MI

OBJECTIVE: Diabetes mellitus includes an array of metabolic diseases characterized by chronic hyperglycemia due to insulin dysfunction, either decreased insulin production or decreased insulin sensitivity. Diabetes mellitus is a growing pandemic affecting 10% of the world's population and patients with the disease, especially type 1, have an increased fracture risk and decreased bone mineral density. The purpose of this study is to understand the effects of chronic hyperglycemia on the proliferation and the osteogenic differentiation of osteoblasts. We hypothesize that chronic hyperglycemia will inhibit the proliferation and differentiation of osteoblasts when compared to normoglycemia.

METHODS: Human osteosarcoma cells (SAOS-2) were cultured in low (0.9 mg/mL), medium (2 mg/mL), or high (28 mg/mL) glucose concentrations in either normal completed growth medium (GM) or osteogenic differentiation medium (DM). The DM contained dexamethasone, ascorbic acid, and β -glycerol-phosphate. AlamarBlue Assay was used to assess cellular proliferation. Osteogenic differentiation was assessed via Alkaline Phosphatase Activity (ALP) assay, and Alizarin Red S (ARS) staining was used. The red stain was extracted using cetylpyridinium chloride and the optical density was measured at 550 nm. Total RNA was extracted at 3, 5, 7 and 14 days, and gene expression of inflammatory (IL-6), osteogenic (osteocalcin), and adipogenic (PPAR γ) markers was analyzed using RT-qPCR. Statistical difference was determined by paired 2-tailed student's test. $P < 0.05$ was considered statistically significant.

RESULTS: AlamarBlue results demonstrated that osteoblasts cultured in high glucose concentrations showed decreased cell proliferation at all time points. Furthermore, decreased osteoblast ALP activity and mineralization was observed in cells cultured in high glucose concentrations when compared to cultured cells on low and medium glucose concentrations. High glucose in growth medium resulted in significant increase in the gene expression of both IL-6 and PPAR γ and a decrease in osteocalcin at 7 days.

CONCLUSION: Our research suggests that chronic hyperglycemia is a potential cause of the adverse effects of diabetes mellitus on bone health. Further research is necessary to elucidate the specific mechanism of hyperglycemic effects on osteogenic differentiation and proliferation. In the future, we will study the synergistic effect of anti-diabetic drugs and high glucose levels on the osteogenic potential of osteoblasts. Clinically these data may have a significance in improving the treatment of diabetic patients and preventing the deleterious effects of chronic hyperglycemia on bone health.

Changes in Orthopedic Prescribing Patterns of Gabapentin Associated with State Prescribing Restrictions: A Large Database Study

Poster 68

Joshua R. Porto, M.S. / Cleveland, OH

Co-Authors:

Maura R. Guyler, B.A. / Cleveland, OH

Christian J. Hecht II, B.S. / Cleveland, OH

Joshua R. Porto, M.S. / Cleveland, OH

Atul F. Kamath, M.D., MBA / Cleveland, OH

BACKGROUND: Safety concerns have emerged regarding gabapentin, and as a result several states have recently adopted regulations for prescribing gabapentin. As gabapentin has been commonly used off-label for pain management in orthopedics, a retrospective analysis was conducted to investigate trends in orthopedic prescriptions of gabapentin considering novel state regulations.

METHODS: The study analyzed gabapentin prescription patterns of orthopedic surgeons from 2013 to 2021 recorded in annual Medicare Part D Public Use Files across the fifty states and Washington DC. Datasets were filtered to only include orthopedic providers. Gabapentin prescriptions were grouped based on state of practice for each surgeon per year for total gabapentin claims, supply in days, and beneficiaries. Twelve states classified gabapentin as a Schedule V drug, seven instituted a Prescription Drug Monitoring Program (PDMP), and 32 had no restrictions. States were grouped by prescription restriction type. Two-tailed t-tests were conducted to compare the annual average percent of change for gabapentin claims, supply, and beneficiaries per state following regulation.

RESULTS: Following regulation, the general trend of gabapentin claims, beneficiaries, and supply was a blunting in the annual rate of change. States with PDMPs for gabapentin had the lowest overall claims, supply, and beneficiaries. States with no regulation eclipsed states with Schedule V classifications for the most beneficiaries and supply in 2019 and claims in 2020. Six of 11 PDMP states had significant reductions across gabapentin claims, beneficiaries, and supply following regulation, compared to three of seven Schedule V states.

CONCLUSION: The impact that state-based regulations had on gabapentin claims, supply, and beneficiaries was variable, likely due to different requirements in the enactment of their novel PDMP or Schedule V classifications. To optimize the implementation of these regulatory programs, public health authorities may adopt regulatory strategies that resemble those from states that were more effective in regulating gabapentin prescriptions.

Orthopedic Surgery <50 Days Following COVID-19 Infection is not Associated with Increased Postoperative Complications

Poster 69

Nicolas O. Noiseux, M.D., M.S., FRCSC / Iowa City, IA

Co-Authors:

Katelyn T. Koschmeder, M.D. / Iowa City, IA

Taylor Den Hartog, M.D. / Iowa City, IA

Brendan Patterson, M.D. / Iowa City, IA

Catherine Olinger, M.D. / Iowa City, IA

Nicolas O. Noiseux, M.D., M.S., FRCSC / Iowa City, IA

OBJECTIVES: Recent literature indicates that COVID-19 infection is a negative predictor of good outcomes following elective orthopedic surgery. However, the ideal timing of surgery after infection is unclear. The purpose of this study was to compare the rates of postoperative complications between those who underwent elective orthopedic surgery <50 days and >50 days after COVID-19 infection.

METHODS: This is a pilot study utilizing retrospective review of 28 adult subjects who underwent orthopedic surgery including 17 total-knee arthroplasties, seven total-hip arthroplasties, three posterior spinal fusions, and one common peroneal decompression. These subjects were indicated for an orthopedic surgery that was canceled due to positive preoperative COVID-19 testing. The subjects were rescheduled for surgery between March 2020-December 2022.

There were two cohorts: those who underwent surgery <50 days after COVID-19 infection (n=14) and subjects who underwent surgery >50 days after COVID-19 infection (n=14). Demographics, preoperative comorbid conditions, and postoperative complications were recorded and compared.

RESULTS: There were no significant demographic differences between the two cohorts with respect to age, body mass index, weight, and American Society of Anesthesiologists (ASA) grade. The two cohorts had no significant difference in pre-existing comorbid conditions with hypertension and peripheral vascular disease being the most common comorbidities overall. There were six postoperative complications involving four subjects within 90 days of surgery. One subject developed a postoperative pulmonary embolism (PE), and another subject developed a surgical-site infection, sepsis, and renal failure; both in the >50 days cohort. One patient in each cohort required reoperation. There was no difference in postoperative complications such as deep vein thrombosis (DVT), PE, sepsis, renal failure, and intensive care unit (ICU) admission between the two cohorts.

CONCLUSIONS: This pilot cohort study demonstrates that COVID-19 infection within 50 days of orthopedic surgery does not significantly increase the risk of postoperative complications such as DVT, PE, surgical site infection, renal failure, ICU admission, reoperation, or death. Further evaluation of the effects of COVID-19 on surgical outcomes in larger cohorts is warranted.

Analysis of Female Medical Student Matriculation into Orthopedic Surgery Nationally

Poster 70

Annemarie K. Leonard, M.D. / Omaha, NE

Co-Authors:

Annemarie Leonard, M.D. / Omaha, NE

Frances Akwuole / Chicago, IL

Thomas Leonard / Maywood, IL

Mazie Atteberry / Omaha, NE

Sara Putnam / Omaha, NE

OBJECTIVE: Despite the achievement of gender parity within medical school classes, orthopedics remains one of the lowest matriculation rates of females matching into orthopedic surgery residencies. This project categorizes available individual medical schools' female match rates into orthopedic surgery residencies to further efforts towards addressing the field's gender discrepancy.

METHODS: All allopathic and osteopathic medical schools in the United States publicly published match data with identifiable student information was analyzed by applicant gender. Both two-tailed t-tests and one-way ANOVA were performed for statistical analysis ($p < 0.05$).

RESULTS: Data from 58 medical schools with a total of 491 female applicants matriculating into orthopedic surgery (18.2%). No significant differences were found stratifying medical schools by region. The school with the highest female matriculation rate was Albany Medical College with 42.1% (8/19) over the last 4 years. Conversely, four schools lacked any female matriculants despite matching 16 students within available years of match data.

The variance of the sample set was analyzed with schools with at least 10 years and 15 years of match results. For schools with at least 10 years of data, two schools with the highest proportion of matriculating female students were Texas Tech University Health Sciences Center in El Paso with 31.03% (9/29) in 12 years and University of Minnesota with 29.42% (25/85) in 11 years. University of Iowa with 18.54% (28/151) in 26 years and Wright State University with 14.61% (13/89) in 23 years had the highest proportion of female matriculants for schools with at least 15 years of data. The three lowest schools with at least 10 years of data were University of Nebraska with 7.32% (6/82) in 24 years, University of Mississippi with 3.49% (2/58) in 15 years, and University of Oklahoma-Tulsa with 0% (0/4) in 15 years. The variance between the highest and lowest match rates for schools with match results for at least 10 years ($p = 0.004$) and 15 years ($p = 0.030$) of match results was significant. When this was analyzed for schools with >20 total matriculants, variance between the highest and lowest match rates for schools with match results for at least 10 years ($p = 0.0071$) was significant and 15 years approached significance ($p = 0.056$).

CONCLUSION: There exists great variability in female medical student matriculation into orthopedic surgery based upon medical school. Characterizing this variability is important in the multitude of efforts addressing the gender discrepancies and in initiatives working towards gender equity in the orthopedic profession.

The Patient Perspective of the Impact of Mental Health and Orthopedic Injuries

Poster 71

Michael A. Gaudiani, M.D. / Detroit, MI

Co-Authors:

Michael A. Gaudiani, M.D. / Detroit, MI

Noah K. Elagamy, M.D. / Detroit, MI

Kamran Haq, M.D. / Detroit, MI

Zahin Hussain, M.D. / Detroit, MI

Cal Riutta, M.D. / Detroit, MI

Eric C. Makhni, M.D. / Detroit, MI

INTRODUCTION: Orthopedic injuries have been shown to increase the risk for developing depression and anxiety and poor mental health negatively impacts orthopedic surgery outcomes. The purpose of this study was to explore the relationship between orthopedic injuries and mental health from the patient's perspective to help guide future standards of care in orthopedic surgery.

METHODS: This prospective survey study reviewed questionnaire responses from patients presenting to orthopedic clinics in a single health system from August 2023 to December 2023. A novel survey was designed and distributed to patients who presented as a first-time patient to an outpatient orthopedic clinic. Orthopedic surgery subspecialty clinics included were Trauma, Hand, Total Joint Reconstruction, Foot and Ankle, Shoulder/Elbow, and Sports Medicine. Exclusion criteria consisted of duplicate surveys, patients presenting for follow up or postoperative visits, patients with restricted charts, and patients under the age of 18.

RESULTS: A total of 2,384 surveys were assigned to patients with 1,315 surveys completed (55.2%). Patients included in the study had a mean age of 51 ± 18 years, and 732 patients were female (55.7%). There were 725 (55.1%) White patients and 401 (30.5%) Black patients included, as well as 51 Hispanic/Latino (3.9%) patients. The mean household income of the patient sample was \$66,093. 191 patients (15%) were currently being treated for a mental health condition. In the entire cohort, 165 patients (15.3%) were currently being treated for a mental health condition. The majority of patients did not believe their mental health negatively impacted their orthopedic recovery (92%) and a majority (88%) did not desire further conversations regarding mental health with their orthopedic provider. Most patients did not believe their orthopedic injury impacted their mental health (75%). Across subspecialties, most patients felt that their mental health was being adequately managed (64%) since their injury, with the highest response amongst Hand patients ($n=141$, 72.3%) and the lowest being Trauma ($n=154$, 56%). Trauma patients had the highest positive response that their mental health was adequately addressed by their orthopedic surgeon compared to the other subspecialty clinics ($n=53$, 30.3%).

CONCLUSION: We observed a mildly prevalent co-occurrence of self-reported mental health issues with orthopedic injuries. According to the survey results, most patients did not feel that their mental health was negatively impacting their orthopedic recovery nor was their orthopedic injury impacting their mental health. The majority of patients did not desire further conversations about mental health with their orthopedic provider and most patients believed that their mental health was well-managed since their orthopedic injury.

Quantifying the Scope of Artificial Intelligence-Assisted Writing in Orthopaedic Medical Literature: An Analysis of Prevalence and Validation of AI-Detection Software

Poster 72

Joshua R. Porto, M.S. / Cleveland, OH

Co-Authors:

Joshua Porto / Cleveland, OH

Christian J Hecht / Cleveland, OH

Kerry Morgan / Cleveland, OH

Robert J. Burkhart, M.D. / Cleveland, OH

Raymond W. Liu, M.D. / Cleveland, OH

BACKGROUND: The popularization of generative artificial intelligence (AI), such as ChatGPT, has raised concerns for the accuracy and integrity of academic literature. This study asked: 1) Has the popularization of publicly available generative AI increased the prevalence of AI-generated orthopedic literature? 2) Can AI-detectors accurately identify AI-generated text in the literature? 3) Are there associations between article characteristics and the likelihood that it was AI-generated?

METHODS: PubMed was searched across 6 major orthopedic journals to identify articles received for publication after January 1, 2023, one post release of ChatGPT. 240 articles were randomly selected and the text was entered into 3 popular AI-detectors. 20 articles published by each journal before the release of ChatGPT were randomly selected as negative controls and inputted into each detector. 36 positive controls (6 per journal) were created by altering 25%, 50%, and 100% of text from negative control articles using ChatGPT and were then used to validate each of the 3 detectors. The mean percentage of text detected as written by AI per detector was compared between pre- and post- ChatGPT release articles using independent t-test. Multivariate regression was performed using percentage AI-generated text per journal, study design (i.e., cohort, clinical trial, review), and month of submission.

RESULTS: There was a modest increase in the mean percentage AI detected by two validated detectors for the articles received post release of ChatGPT (+2.1%, $p=0.02$; +1.8%, $p=0.01$). One AI-detector consistently and accurately identified AI-generated text in positive controls. Regression analysis showed no consistent associations between likelihood of AI-generated text per journal, study design, or month of submission.

CONCLUSIONS: As this study found an early, albeit modest impact of popularly utilized generative AI on the recent orthopedic literature, proper oversight will play a critical role in maintaining authorship integrity and accurate information. Based on the strong performance demonstrated by one AI-detector, these technologies may play a critical role in regulatory efforts, and resources should be invested into their further development.

Cost Analysis of Surgical Scrub Options at a Level I Trauma Center: A 2022 Review

Poster 73

Alexander Driessche, M.S.E. / Detroit, MI

Co-Authors:

Hamza M. Raja, B.S. / Detroit, MI

Nicholas I. Chiaramonti, M.S. / Detroit, MI

Batul Shakir, B.S. / Detroit, MI

Lindsay Maier, M.D. / Detroit, MI

Alexander Driessche, M.S.E. / Detroit, MI

S. Trent Guthrie, M.D. / Detroit, MI

William Hakeos, M.D. / Detroit, MI

Joseph Hoegler, M.D. / Detroit, MI

OBJECTIVE: Prior studies have extensively explored the efficacy of various surgical scrub options, revealing that the waterless surgical rub and 4% chlorhexidine gluconate (CHG) impregnated sponge demonstrate superior effectiveness compared to the povidone iodine (PI) impregnated sponge. Despite variations in efficacy, all options remain medically acceptable. Building upon this foundation, the present study conducts a comprehensive cost analysis at a large, multi-center academic hospital to illuminate the financial implications of different surgical scrub choices.

METHODS: The study involved a review of accounting records for the year 2022, focusing on three surgical scrub options: 4% chlorhexidine gluconate (CHG) impregnated sponge, povidone iodine (PI) impregnated sponge, and a waterless surgical rub (Avagard). Calculations considered the presence of 30 sponges per box and approximately 62.5 uses per 500mL Avagard unit, as advertised.

RESULTS: The quantities used during this period were 2,974 boxes of 4% CHG sponges, 920 boxes of PI sponges, and 1,863 units of Avagard. The average cost per box and unit were as follows: \$16.86/box (\$0.56/sponge) for 4% CHG sponges, \$13.10/box (\$0.44/sponge) for PI sponges, and \$34.60/unit (\$0.55/use) for Avagard. In addition to product cost, sponge options utilized significantly more space incurring additional expenses related to storage and disposal. The volume of 1 sponge was 160cm³, while an Avagard unit (500cm³) approximated 8cm³ per use. Over a 1 year period, this totaled to 14.3meter³ for 4% CHG, 4.4meter³ for PI, and 0.9m³ for Avagard. Sponge options have additional associated costs including increased water usage and time, however these were not calculated. The waterless rub option had negligible one-time costs associated with accessories like wall brackets and foot pumps.

CONCLUSION: We provide valuable insights into the economic considerations associated with different surgical scrub options. While the waterless rub option incurs higher upfront costs, it may present long-term savings due to lower associated expenses, including storage, disposal, water usage, and time. This study bridges the gap between efficacy and cost-effectiveness, allowing surgeons to make informed decisions on the most appropriate surgical scrub options for their institution.

Incidence of Allergic Contact Dermatitis to Dermabond™ Prineo™ in Total Joint Arthroplasty

Poster 74

Timothy S. Brown, M.D. / Houston, TX

Co-Authors:

Richard S. Fuld / Houston, TX

Thomas C. Sullivan, B.S. / Houston, TX

Robert S. Neff, M.D. / Houston, TX

Terry A. Clyburn, M.D. / Houston, TX

Kwan J. Park, M.D. / Houston, TX

Timothy S. Brown, M.D. / Houston, TX

OBJECTIVE: Orthopedic surgeons continue to investigate what the best materials are to use for skin closure to minimize wound complications and potential infections. The DermabondTM PrineoTM skin closure system combines a chemical liquid adhesive and polyester mesh directly over the wound to form a waterproof microbial barrier. Allergic contact dermatitis (ACD) has been reported in the literature as a complication of Prineo use. Previous studies have shown that the incidence of ACD with PrineoTM use in orthopedic surgery ranges from 0.5 to 2.3%. The purpose of this study is to investigate the incidence of PrineoTM-associated ACD in primary total joint arthroplasty at a high-volume tertiary referral center.

METHODS: A retrospective case series of subjects that underwent primary total hip arthroplasty (THA) and total knee arthroplasty (TKA) that utilized PrineoTM a single tertiary referral institution from 10/2021 through 11/2023, with one primary surgeon. The primary outcome was development of ACD, which was diagnosed as a rash in outline of PrineoTM mesh. The diagnosis was made by senior author at the first postoperative visit.

RESULTS: 185 TKA and 154 THA procedures were performed utilizing PrineoTM for skin closure. All patients had first postoperative visit at 2 weeks and minimum of three month follow up. Overall incidence of ACD associated with PrineoTM DermabondTM was 3.8% (13/339). Incidence of ACD in TKA was 3.8% (7/185) and 3.9% (6/154) in THA. All skin reactions were diagnosed at first postoperative visit. Patients were treated with a combination of medications including topical steroids (15.4%), oral steroids (46.1%), both topical and oral steroids (30.8%), or no steroids (7.7%) in addition to oral antihistamines (38.5%), and oral antibiotics (53.8%), though there was no one regimen used for all patients. All skin reactions had resolved at 3 month follow up. None of the patients with ACD have yet developed PJI, though one patient required surgery for a suture abscess.

CONCLUSIONS: The incidence of allergic contact dermatitis after primary total hip (n=154) and knee (n=185) arthroplasty was 3.8% at short-term follow-up. ACD is a known complication of PrineoTM use. These reactions can sometimes be very severe and appear similar in nature to a prosthetic joint infection. Previous studies have indicated that the incidence of these reactions is between 0.5% and 2.3%. ACD can predictably be treated with routine use of steroids, antihistamines, and antibiotics. There was no evidence of increased risk of PJI in patients that had a PrineoTM reaction.

Machine Learning Identification of FAI and DDH

Poster 75

Lainey G. Bukowiec, M.D. / Rochester, MN

Co-Authors:

Lainey G. Bukowiec, M.D. / Rochester, MN

Bardia Khosravi, M.D., M.P.H., M.H.P.E / New Haven, CT

Austin F. Grove / Rochester, MN

John P. Mickley, M.D. / Jacksonville, FL

Emmanouil Grigoriou, M.D. / Rochester, MN

Michael J. Taunton, M.D. / Rochester, MN

Cody C. Wyles, M.D. / Rochester, MN

OBJECTIVES: Abnormal hip morphology is a risk factor for pain, functional decline, and osteoarthritis.¹ Expert classification of morphological abnormalities seen in FAI and DDH has shown poor inter- and intra-rater reliability. Thus, this study aimed to evaluate the efficacy of deep learning (DL) models in classifying hip morphology compared to human expert evaluation. The authors hypothesized that DL-augmented image interpretation would show moderate performance given the difficulty in establishing a consensus human-driven ground truth.

METHODS: Two research assistants annotated 400 AP pelvic radiographs, identifying: (a) ischial spine sign; (b) cam deformity; (c) hip dysplasia; (d) any abnormalities including the previous categories and others. Ground truth for a hold-out test set of 100 images was determined by a fellowship trained hip surgeon. A previously validated object detection model localized regions of interest.

A convolution-based DL model, ConvNeXt-Tiny was used to analyze hip morphology by predicting the aforementioned joint characteristics (a-d) and patient sex. The auxiliary prediction of patient sex served to stabilize the model's training.

RESULTS: Radiographs from 500 patients (mean age of 47 years, 49% female) were analyzed. The ensemble pipeline processes each radiograph in 832 ms.

The model achieved high accuracy and AUROC scores. The model demonstrated high specificity for ischial spine sign (96.0%) and all abnormalities (85.3%). Sensitivity was high for cam deformity (80.0%) and dysplasia (75.0%). The positive predictive value was high for all abnormalities (93.5%) and ischial spine sign (87.5%). Gwet's AC1 was substantial for dysplasia (0.83) and all abnormalities (0.88), and moderate for ischial spine sign (0.75) and cam deformity (0.61).

CONCLUSION: A DL model with ConvNeXt-Tiny architecture was developed for the automated detection of morphological hip pathologies – FAI and DDH. The model achieved moderate accuracy in predicting various hip joint characteristics. Human expert inter-rater reliability was also moderate. Taken together, these results show the promise and current limitations of both using plain radiographs for simple morphological hip classifications, and the downstream impact this has on developing reliable DL models. The findings suggest a promising avenue for leveraging AI-driven technologies to enhance musculoskeletal radiographic interpretation, but also introduce a note of caution in training models based on metrics upon which even experts have poor consensus which will ultimately influence model capability.

Recurrence Rates and Outcomes of Shoulder Stabilization Surgery in Patients with Depression

Poster 76

Benjamin L. Brej, B.S. / Columbus, OH

Co-Authors:

Benjamin L. Brej, B.S. / Columbus, OH
Collin Todd, B.S. / Columbus, OH
Brent Henderson, BA / Columbus, OH
George Matta, B.S. / Columbus, OH
Erryk S. Katayama, BA / Columbus, OH

Louis W. Barry, B.S. / Columbus, OH
Grant Jones, M.D. / Columbus, OH
Ryan C. Rauck, M.D. / Columbus, OH
Gregory Cvetanovich, M.D. / Columbus, OH
Julie Y. Bishop, M.D. / Columbus, OH

OBJECTIVE: Depression is more prevalent in patients undergoing arthroscopic shoulder procedures and is associated with worse functional outcomes after shoulder stabilization surgery; however, no previous studies have quantified the relationship between depression and postoperative recurrent instability or reoperation. The objective of this study was to investigate the association between preoperative depression and postoperative recurrent instability rates, reoperation-free survival, and functional outcomes in patients undergoing shoulder stabilization surgery.

METHODS: This is a retrospective analysis of 426 patients undergoing shoulder stabilization surgery for recurrent shoulder instability between 07/06/2009 and 10/31/2023 with a minimum of six months follow-up. Primary procedures performed by seven surgeons included Bankart repair, Latarjet, distal tibial allograft, Hill-Sachs bone grafting, and remplissage. Depression status was determined based on preoperative medical history, and PHQ-9 score was recorded when available.

RESULTS: Of the 426 patients undergoing shoulder stabilization surgery, 120 (28%) had a preoperative diagnosis of depression (average PHQ-9 score of 9.1 ± 5.6). The mean age was significantly higher in patients with depression (31.4 ± 10.0 years) compared to those without (26.9 ± 9.2 years; $p < 0.001$). The average postoperative follow-up period did not differ significantly between the groups (depression = 1.9 ± 2.5 years; no depression = 2.0 ± 2.6 years; $p = 0.654$). American Society of Anesthesiology (ASA) scores were higher in the depression group (1.9 ± 0.6 vs 1.5 ± 0.6 ; $p < 0.001$). Depression was associated with higher smoking rates (25% vs 15%), higher BMI (28.6 ± 6.8 kg/m² vs 26.8 ± 5.3 kg/m²), more comorbid anxiety (48% vs 10%), and more comorbid substance abuse (18% vs 3%; all $p < 0.05$). Preoperative range of motion for forward elevation (FE) ($147^\circ \pm 33^\circ$ vs $160^\circ \pm 26^\circ$; $p < 0.001$), external rotation (ER) ($59^\circ \pm 22^\circ$ vs $64^\circ \pm 19^\circ$; $p < 0.05$), and internal rotation (IR) (T11 vs T10; $p < 0.05$) was significantly lower in the depression group. Postoperatively, only ER remained significantly lower in patients with depression ($53^\circ \pm 17^\circ$ vs $62^\circ \pm 17^\circ$; $p < 0.001$). Lifetime recurrent instability rates were higher in the depression group (28% vs 16%; $p = 0.002$). Depression was associated with lower recurrence-free survival at 2 years (65% vs 81%) and 5 years (47% vs 63%; $p = 0.047$), but reoperation rates did not differ significantly.

CONCLUSION: Patients with depression experience increased rates of recurrent instability and lower recurrence-free survival rates at 2- and 5-years following shoulder stabilization surgery. While depression was associated with lower preoperative range of motion in FE, ER, and IR, only ER remained lower postoperatively.

Blueprint Templating Software Does Not Predict Postoperative Active Range of Motion or Patient-Reported Outcomes After Reverse Total Shoulder Arthroplasty

Poster 77

Thomas G. Stanila, B.S. / Maywood, IL

Co-Authors:

Amir Boubekri, M.D. / Maywood, IL
Michael Murphy, M.D. / Maywood, IL
Krishin Shivdasani, M.D., M.P.H. / Maywood, IL
Michael Scheidt, M.D. / Maywood, IL
Andrew Chen, M.D. / Maywood, IL
Nickolas Garbis, M.D. / Maywood, IL
Dane Salazar, M.D., M.B.A. / Maywood, IL
Thomas G. Stanila / Maywood, IL

OBJECTIVE: Blueprint templating software, a recent innovation in shoulder arthroplasty, utilizes three-dimensional computed tomography reconstruction to predict impingement-free range of motion (ROM). The primary aim was to assess the association between Blueprint-predicted ROM and postoperative ROM at final follow-up of patients who underwent primary reverse total shoulder arthroplasty (RSA). Secondary aims were to identify predictors of final ROM and patient-reported outcomes.

METHODS: Patients underwent preoperative planning using Blueprint software prior to having RSA from 2020 to 2023. Revision arthroplasties and those without minimum 12 months follow-up were excluded. After exclusions, 66 patients remained. Blueprint-predicted impingement-free ROM, planned RSA component characteristics were recorded. At final follow-up, ROM and patient-reported outcomes were recorded. Univariate analysis assessed differences between Blueprint-predicted ROM and final postoperative ROM. Multivariate analysis identified predictors of superior ROM and patient-reported outcomes.

RESULTS: Blueprint-predicted estimates were significantly different from mean postoperative measurements in the outpatient clinic for active forward flexion (aFF) ($p < 0.0001$). Blueprint-predicted adducted external rotation (aER) was linearly associated with clinically measured final aER ($p = .010$, $R^2 = .303$). Blueprint variables were not predictive of final ASES ($p = .117$) or VAS score ($p = .126$). Ability to sleep on the operative shoulder was associated with greater age ($p = .027$), decreased glenoid retroversion ($p = .008$), greater planned collar size ($p = .028$) and greater predicted aFF ($p = .008$).

CONCLUSIONS: Blueprint-predicted ROM estimates are not associated with postoperative ROM at final follow-up after RSA. While demographic factors and certain Blueprint characteristics can predict some aspects of patient-reported outcomes, Blueprint software should not guide surgeon-patient discussions on expectations of postoperative ROM.

Artificial Intelligence Machine Learning Algorithms vs. Traditional Linear Demographic Analysis in Predicting Component Size of Anatomic and Reverse Total Shoulder Arthroplasty

Poster 78

Thomas G. Stanila, B.S. / Maywood, IL

Co-Authors:

Amir Boubekri, M.D. / Maywood, IL
Michael Murphy, M.D. / Maywood, IL
Michael Scheidt, M.D. / Maywood, IL
Krishin Shivdasani, M.D., M.P.H. / Maywood, IL
Joshua Anderson, B.S. / Maywood, IL
Andrew Chen, M.D. / Maywood, IL
Nickolas Garbis, M.D. / Maywood, IL
Dane Salazar, M.D., M.B.A. / Maywood, IL
Thomas G. Stanila / Maywood, IL

OBJECTIVE: Accurate and precise templating is paramount for anatomic (TSA) and reverse total shoulder arthroplasty (RSA) to enhance preoperative planning, streamline surgery, and improve component positioning. We aim to evaluate the predictive potential of readily available patient demographic data in TSA and RSA component sizing, independent of implant design.

METHODS: 578 consecutive, primary, non-cemented shoulder arthroplasty cases were retrospectively reviewed. Demographic variables and implant characteristics were recorded. Multivariate linear regressions were performed to predict implant sizes using patient demographic variables.

RESULTS: Linear models accurately predict TSA component sizes within 2 millimeters of humerus stem sizes 75.3% of the time, head diameter 82.1%, head height 82.1%, and RSA glenosphere diameter 77.6% of the time. Linear models predict glenoid component sizes accurately 68.2% and polyethylene thickness 76.6% of the time, and within 1 size 100% and 95.7% of the time, respectively.

CONCLUSIONS: Linear models accurately predict shoulder arthroplasty component sizes from demographic data. No significant statistical differences were observed between linear models and machine learning algorithms, although the analysis was underpowered. Future sufficiently powered studies are required for more robust assessment of machine learning models in predicting primary shoulder arthroplasty implant sizes based on patient demographics.

Evaluation of Racial/Ethnic Concordance of NBA and MLB Players and Team Physicians

Poster 79

Andrew Gaetano, B.S. / Maywood, IL

Co-Authors:

Krishin Shivdasani, M.D., M.P.H. / Maywood, IL

Andrew Gaetano, B.S. / Maywood, IL

Andrew Chen, M.D. / Maywood, IL

Nickolas Garbis, M.D. / Maywood, IL

Dane Salazar, M.D., M.B.A. / Maywood, IL

OBJECTIVE: Recent efforts aim to determine if patient-provider race-concordance improves health outcomes for minority patient populations. Patient-physician racial/ethnic discordance is uniquely elevated in professional athletics. The purpose of this study was to evaluate racial/ethnic concordance between rostered National Basketball Association (NBA) and Major League Baseball (MLB) players and their respective team physicians.

METHODS: Two major US professional sports leagues were evaluated: the NBA and the MLB. Publicly available data were collected in June of 2023 to identify players and team physicians. Reported or perceived race and sex of the players and team physicians was determined by 2 independent observers who analyzed reported demographic data, photographs, and names of these individuals, with disagreements resolved by a third independent observer. Team physicians' style of training, medical specialty, languages spoken, and years in practice were obtained using publicly available internet-based sources or contacting the clinical staff directly.

RESULTS: For both the NBA and the MLB, there was a statistically significant difference in racial composition between players and team physicians. Additionally for the MLB, just 15% of MLB team physicians spoke a foreign language, and greater than 50% of MLB organizations lacked a team physician that spoke Spanish despite a high percentage (30.7%) of Hispanic/Latino players.

CONCLUSIONS: There is substantial racial/ethnic discordance among professional athletes and head team physicians. Physicians more closely mirroring the patient populations that we treat, including professional athletes, may positively impact healthcare relationships and improve patient/provider barriers.

Outcomes of Shoulder Arthroplasty Revision Following Infection

Poster 80

Brent Henderson / Columbus, OH

Co-Authors:

Brent Henderson, B.A. / Columbus, OH

George Matta, B.S. / Columbus, OH

Louis W. Barry, B.S. / Columbus, OH

Erryk Katayama, B.A. / Columbus, OH

John S. Barnett, B.S. / Columbus, OH

Ryan Rauck, M.D. / Columbus, OH

Julie Y. Bishop, M.D. / Columbus, OH

Gregory Cvetanovich, M.D. / Columbus, OH

INTRODUCTION: Revision shoulder arthroplasty (SA) has become increasingly common as the prevalence of SA grows. Despite the surgical advancements made, postoperative infections still challenge favorable outcomes. This study aims to evaluate the functional outcomes of patients with postoperative infections following SA.

METHODS: A single institution, retrospective analysis was conducted on patients who underwent revision surgery following shoulder replacement between 2009 and 2019. Demographic, baseline variables, and infection variables were extracted from medical records. Patients were called retrospectively to obtain PROs.

RESULTS: Of the 124 patients (69 females, 55 males) that underwent SA revision, 21 were due to infection (16.9%) at age 66.1 ± 11.6 years with an average of 1.7 ± 2.2 years of follow up. The infected population had a mean BMI of 28.59 ± 4.67 kg/m², ASA score of 2.9 ± 0.45 , CCI of 2.47 ± 0.70 , and 3.6 ± 1.4 total lifetime surgeries on the affected shoulder. The most frequently identified organisms were *P. acnes* (n=5), *S. aureus* (n=5), and culture-negative samples (n= 8), with inflammatory serology showing: (n=17, CRP= 33 ± 5 mg/L1, ESR= 41 ± 31 mm/hr, WBC= 9.1 ± 3.1 K/uL). Treatment included debridement (n=17), resection arthroplasty (n=2), removal of prosthesis and insertion of antibiotic spacer (n=18), and chronic antibiotic administration (n=18), with vancomycin (n=18) and clindamycin (n=4) most commonly given. The infected population had significantly less preoperative external rotation (infected vs non-infected (n=103): $21 \pm 17^\circ$ vs. $30 \pm 19^\circ$, $p=0.0485$), forward elevation ($53 \pm 40^\circ$ vs $91 \pm 38^\circ$, $p=0.0007$), and internal rotation (Glute vs. Sacrum, $p=0.013$). There was no difference in postoperative strength, IR, or ER, but the infected population had significantly less postoperative forward elevation ($97.5 \pm 36.1^\circ$) compared to the uninfected population ($125.5 \pm 33.7^\circ$, $p=0.005$). The infected population had a higher postoperative VAS pain score (2.35 ± 2.91 vs. 0.33 ± 0.58 , $p=0.003$). There was a 48% (n=10) second revision rate in the infected population (60% due to re-infection), compared to 15% in the uninfected population (20% due to infection).

CONCLUSION: Infection following SA is a difficult problem surgeons face as the pathology is diverse. We found that the infected population showed higher pain scores and lower postoperative forward elevation which may indicate a sacrifice in functionality, or that infection causes a more severe pathology to treat.

Radiographic Analysis of Total Shoulder Arthroplasty Using a Single Inferior Subscapularis-Sparing Approach

Poster 81

Adam J. Miller, M.D. / Novi, MI

Co-Authors:

Adam J. Miller, M.D. / Novi, MI

Rishi Chatterji, M.D. / Novi, MI

Diana R. Silas, DO / Novi, MI

Sean F. Bak, M.D. / Novi, MI

INTRODUCTION: A well-known complication of traditional methods of subscapularis management in anatomic total shoulder arthroplasty (TSA) is failure of the subscapularis muscle postoperatively. To help avoid this issue, several subscapularis-sparing methods have been described. This study compared radiographic outcomes of the subscapularis-sparing approach that involves release and repair of the inferior third window to the traditional lesser tuberosity osteotomy (LTO) in TSA.

MATERIALS & METHODS: Patients who underwent TSA with either the subscapularis-sparing approach or a LTO were evaluated retrospectively. Preoperative and postoperative radiographic measurements of Humeral Head Height (HHH), Humeral Head Diameter (HHD), Humeral Head Centering (HHC), Humeral Head Medial Offset (HHMO), and Humeral Neck Angle (HNA) were calculated. Differences between these preoperative and postoperative measurements were then calculated. The Anatomic Reconstruction Index (ARI) was calculated as well. The size of any residual postoperative osteophytes were measured. The subscapularis-sparing and LTO groups were then compared using paired t-tests.

RESULTS: 60 patients (30 sparing, 30 LTO) were included in the final analysis. The mean ARI and mean preoperative vs. postoperative HHH and HHC were not found to have a statistically significant difference for subscapularis-sparing vs. LTO groups (6.4 vs. 6.8, $p = 0.113$), (1.9mm vs. 1.8mm, $p = 0.861$), and (2.8mm vs 2.6mm, $p = 0.773$) respectively. Significant differences were found between subscapularis-sparing and LTO groups for HHD (2.2mm vs. 3.6mm, $p = 0.010$), HHMO (6.6mm vs. 3.4mm, $p < 0.001$), and HNA (13.8° vs. 4.7°, $p < 0.001$). Mean postoperative residual osteophyte size was not significantly different between the subscapularis-sparing vs. LTO groups (2.7mm vs. 2.4mm, $p = 0.820$).

DISCUSSION: This study directly compared radiographic findings from the inferior window subscapularis-sparing technique and the traditional LTO technique. We found no significant difference in the ARI between the two groups. The ARI considers all radiographic measurements and combines them into one scoring system. The subscapularis sparing approach was found to better approximate preoperative HHD compared to the LTO group. Additionally, there was no difference in 2 of the 4 other radiographic measurements (HHH and HHC) or in the size of residual osteophytes. The inferior window subscapularis-sparing approach produces similar postoperative approximation of preoperative anatomy when compared to traditional LTO for TSA and seems to be a reasonable alternative.

Ceramic Bearing Surfaces Are a Viable Option for Shoulder Arthroplasty

Poster 82

Chandler Harris, B.S. / Birmingham, AL

Co-Authors:

Chandler Harris, B.S. / Birmingham, AL

Saad M. Ibrahim, B.S. / Birmingham, AL

Mathew Hargreaves, B.S. / Birmingham, AL

Clay Rahaman, B.A. / Birmingham, AL

Maxwell Harrell, B.S. / Birmingham, AL

Aaron J. Casp, M.D. / Birmingham, AL

Thomas Evely, D.O. / Birmingham, AL

Amit M. Momaya, M.D. / Birmingham, AL

Eugene W. Brabston, M.D. / Birmingham, AL

OBJECTIVE: Total shoulder arthroplasty has been used for over 50 years to treat glenohumeral arthritis. In recent years, one area of innovation has been the use of ceramic-bearing surfaces. The advantages of ceramic bearing surfaces include utility in stemless implants and hemiarthroplasty, where their use potentially allows for expanded anatomic reconstruction indications, reduction in peri-prosthetic humeral shaft fractures, facilitating revision of humeral components, and reduced surgical time and blood loss. With interest in these ceramics continuing to grow, the purpose of this systematic review is to consolidate recent clinical findings involving ceramic-bearing surfaces to determine their suitability for anatomic shoulder replacement.

METHODS: Medline, Embase, and Cochrane Library were searched up to November 2023 according to PRISMA guidelines. Metrics analyzed include patient-reported outcome measures (PROMs), postoperative complications, and radiographic findings. Secondary outcomes included forward flexion, external rotation, and abduction.

RESULTS: Eight studies comparing 716 patients were included. The mean age for the study population was 67.7 years old. All eight studies included cohorts that had undergone shoulder arthroplasty with an implant with a ceramic humeral head component. All studies showed significant improvement postoperatively and up to 2 years after the patient's initial operation. Patient satisfaction was similarly positive, with 97% of patients reporting satisfactory results. These patient-reported outcomes are further bolstered by significant increases in range of motion, especially with flexion and shoulder abduction, which showed significant increases in all papers which measured pre and postoperative values.

CONCLUSIONS: Anatomic shoulder replacements using ceramic-bearing surfaces have similar radiographic and clinical outcomes to cobalt chromium bearing surfaces at numerous follow-up intervals and should be considered a viable option for shoulder pathologies requiring arthroplasty.

Uncemented vs. Cemented Humeral Fixation in Reverse Shoulder Arthroplasty for Proximal Humerus Fractures in the Elderly: A Multicenter Retrospective Cohort Study

Poster 83

Johnny Kasto, M.D. / Detroit, MI

Co-Authors:

Johnny Kasto, M.D. / Detroit, MI

Thomas Throckmorton, M.D. / Detroit, MI

Tyler Brolin, M.D. / Detroit, MI

H. Mike Kim, M.D. / Detroit, MI

Curtis Noel, M.D. / Detroit, MI

J Michael Wiater, M.D. / Detroit, MI

Thomas Wright, M.D. / Detroit, MI

Stephanie Muh, M.D. / Detroit, MI

INTRODUCTION: Among surgical interventions for proximal humerus fractures (PHFs), RSA has demonstrated superior or noninferior outcomes to hemiarthroplasty or open reduction internal fixation. Cemented humeral fixation in RSA has been the traditional treatment method for PHFs, however, there is a growing interest in uncemented humeral fixation. Both cemented and cementless RSA are currently used to treat PHFs with few studies comparing postoperative outcomes of these 2 techniques. This study aims to compare postoperative outcomes between cemented and uncemented humeral fixation following primary reverse total shoulder arthroplasty (RSA) for PHFs.

METHODS: This was a multicenter retrospective review of patients who underwent primary RSA for PHFs between 2017 and 2020. Patients without at least 2-year follow-up and those undergoing revisions were excluded. Basic demographic and operative data were collected. The patients shoulder range of motion and visual analog scale (VAS) for pain were evaluated preoperatively and at final follow-up. Postoperative radiographic assessment was performed at minimum 2-year follow-up.

RESULTS: A total of 107 patients undergoing RSA for PHF with a minimum of 2 years follow-up were identified. Of these, 67 (62.6%) underwent cementless humeral fixation while 40 (37.4%) underwent cemented humeral fixation. Demographic variables were similar between groups. A history of osteoporosis was found to be higher in the cemented group (22.5% vs. 4.0%; $p=0.008$), but other diagnoses were similar between groups. Mean operative time (minutes) was significantly lower in uncemented fixation (123 ± 37 vs. 180 ± 47 , $p<0.001$) while length of stay (days) was significantly longer in uncemented fixation (3.9 ± 3.5 vs. 2.1 ± 2.2 , $p=0.002$). Preoperative and final follow-up VAS pain scores were similar between groups ($p>0.05$). External rotation was greater in the uncemented group ($33^\circ\pm18^\circ$ vs. $28^\circ\pm15^\circ$, $p=0.034$) while forward flexion and abduction were similar. Total postoperative complications were similar between groups and 4 (10.0%) required revision in the cemented group compared to 2 (3.0%, $p>0.05$) in the uncemented group. At final follow-up, 10 (27.8%) cemented stems demonstrated radiographic humeral stem lucency compared to 6 (10.9%, $p=0.039$) uncemented stems. Glenoid lucency, scapular notching, humeral stem migration, and tuberosity healing were similar between groups ($p>0.05$).

CONCLUSION: Uncemented RSA for treatment of PHFs demonstrated decreased operative time and decreased rates of radiographic loosening when compared to cemented RSA. Despite longer length of stay, the use of uncemented stems in RSA does not result in inferior outcomes.

Timing from Diagnostic Imaging to Rotator Cuff Repair is Not Associated with Differences in Patient-Reported Outcomes at One-year Follow-Up

Poster 84

Nathan Li, B.S. / Detroit, MI

Co-Authors:

Nathan Li, B.S. / Detroit, MI

Era Cobani, B.S. / Detroit, MI

Josh Castle, M.D. / Detroit, MI

Julio Nerys-Figueroa, B.S. / Detroit, MI

Alexander Jurayj, B.A. / Detroit, MI

Johnny Kasto, M.D. / Detroit, MI

Jared Mahylis, M.D. / Detroit, MI

Stephanie Muh, M.D. / Detroit, MI

INTRODUCTION: For those with symptomatic rotator cuff tears, the decision to pursue rotator cuff repair (RCR) surgery is multifactorial. While previous literature has examined factors leading to successful nonoperative vs. operative management, it remains unclear how the timing of diagnostic imaging to surgery affects postoperative outcomes. This study aims to determine whether the time from a patient's diagnostic MRI or ultrasound imaging to RCR affects their postoperative outcomes.

METHODS: A retrospective review identifying patients who underwent RCR from 2014 to 2022 was performed. Patients were divided into two cohorts: those who had surgery <3 months and ≥3 months from MRI or US. Patients' demographics, preoperative and postoperative Visual Analog Scale (VAS) score, and active and passive range of motion in forward flexion (FF), abduction (ABD), and external rotation (ER) were utilized. A sub-analysis was performed between traumatic tears and non-traumatic tears. Complications were collected and compared between the two cohorts in terms of re-tears, adhesive capsulitis, or unresolved chronic pain. Unpaired t-test and chi-square analyses were performed for continuous and categorical variables, respectively.

RESULTS: A total of 487 patients were included in our analysis with 342 in the <3 months cohort and 145 ≥ 3 months cohort. There was a significant difference in VAS at 1-year follow-up (2.7 ± 2.7 vs. 3.3 ± 3.3 ; $p=0.05$). Range of motion was not significantly different between the two cohorts up to 1-year follow up in terms of active forward flexion (149.3 ± 28.8 vs. 151.5 ± 23.1 ; $p=0.44$), active abduction (113.2 ± 38.1 vs. 118.01 ± 38.5 ; $p=0.57$), and active external rotation (50.9 ± 19.4 vs. 52.9 ± 20.4 ; $p=0.35$). In addition, 17% of patients in the <3 months to RCR cohort reported complications compared to 20% in the ≥3 months but there was no significant difference in overall rate ($p=0.43$) or in occurrences of retears (9.36% vs. 11.72%; $p=0.43$), adhesive capsulitis (5.56% vs. 3.45%; $p=0.33$), and prolonged postoperative pain (1.75% vs. 4.14%; $p=0.12$). There was non-significant difference in pain or range of motion between patients with traumatic and non-traumatic rotator cuff tears at 1-week and 1-year follow-ups ($p>0.05$).

CONCLUSION: Patients who undergo RCR within 3 months of imaging report lower VAS pain scores at 1-year follow-ups. There was no significant difference in range of motion or the rate of complications between the cohorts. There was also no significant difference in outcomes between traumatic and non-traumatic rotator cuff tears.

The Relationship Between Shoulder Arthroscopic Compartment Pressure Change, Operative Variables, and Early Postoperative Pain

Poster 85

Cassandra Keinath, M.D. / Detroit, MI

Co-Authors:

Cassandra Keinath, M.D. / Detroit, MI
Julio Nerys-Figueroa, B.S. / Detroit, MI
Michelle Hertzberg, M.D. / Detroit, MI
Alexander Jurayj, B.A. / Detroit, MI
Johnny Kasto, M.D. / Detroit, MI

Nathan Li, B.S. / Detroit, MI
Christopher Nikolopoulos, B.S. / Detroit, MI
Jordan Akins, B.S. / Detroit, MI
Stephanie Muh, M.D. / Detroit, MI

INTRODUCTION: Postoperative pain following shoulder arthroscopic surgery (SAS) is influenced by multiple factors. There is limited data on the relationship between intra-articular shoulder pressure and postoperative pain. The purpose is to evaluate the correlation between changes in intra-articular joint pressure, length of surgery (LOS), rotator cuff tear size, and volume of fluid used during shoulder arthroscopic surgery with early postoperative pain and postoperative opioid consumption.

METHODS: Fifty-two patients who underwent SAS for either rotator cuff repair (RCR), labral repair, debridement or diagnostic arthroscopic surgery were included. Joint pressure was measured during surgery via insertion of an intra-compartmental pressure monitoring needle into the shoulder joint. Three intra-articular joint pressure measurements were taken before and after surgery, and the average change in joint pressure was calculated. LOS, rotator cuff tear size, volume of fluid used, and postoperative opioid oral morphine milligram equivalent (MME) were recorded. Preoperative and one-week postoperative pain was obtained via the visual analog scale (VAS).

RESULTS: The mean pre-surgical intraarticular pressure was 4.6 mmHg, and the mean postoperative pressure was 33.9 mmHg for a mean pressure change of 29.3 mmHg. The average LOS was 77.13 minutes, the average tear size was 16.6 mm, and the average volume of arthroscopy fluid was 7.9 liters. There was a significant negative correlation between change in pressure and VAS difference ($r = -0.23$, $P = 0.047$). Additionally, there was a significant positive correlation for change in joint pressure, length of surgery, and tear size with total MME ($r = 0.30$, $P=0.02$; $r = 0.35$, $P = 0.006$, $r = 0.25$, $P = 0.04$), respectively. However, there was a non-significant correlation between average change in pressure, LOS, rotator cuff tear, and fluid volume with mean postoperative pain.

CONCLUSION: These results suggest that an increased change in shoulder pressure is associated with less pain relief after surgery. Additionally, the greater change in pressure and increased length of surgery are both associated with increased postoperative narcotics consumption. Demonstrating that getting surgery done faster and keeping pressure lower is important.

A Comparative Biomechanical Study of Superior Capsular Reconstruction (SCR) and Lower Trapezius Tendon Transfer (LTT) in Massive Rotator Cuff Tear Using a Novel Shoulder Testing System

Poster 86

Nirav K. Mungalpara, M.D., MRCS / Chicago, IL

Co-Authors:

Nirav K. Mungalpara, M.D., MRCS / Chicago, IL

Sunjung Kim, Ph.D. / New York, NY

Hayden Baker, M.D. / Chicago, IL

Cody Lee, M.D. / Chicago, IL

Ashish Shakya, M.S. / Chicago, IL

Kevin Chen, B.A. / Chicago, IL

Nicholas H. Maassen, M.D. / Chicago, IL

Aravind Athiviraham, M.D. / Chicago, IL

Jason Koh, M.D. / Chicago, IL

Bassem Elhassan, M.D. / Boston, MA

INTRODUCTION: Treatment for irreparable Massive Rotator Cuff Tears (MRCTs) is controversial, particularly for younger, active patients. Joint-preserving options like Superior Capsular Reconstruction (SCR) and Lower Trapezius Transfer (LTT) are preferred. This study compares the biomechanical effectiveness of SCR and LTT using a cadaveric model.

METHODS: Eight fresh-frozen human shoulder specimens from donors aged 55 to 75 (mean = 63.75 yrs) were used, balanced for gender, averaging 219.5 lbs. The cadaveric hemithorax was mounted on polycarbonate glass for biomechanical loading. Rotator cuff and deltoid tendons were connected to force sensors via a pulley system. A novel testing system allowed unrestricted humeral abduction from 0 to 90 degrees, preloading all rotator cuff muscles for smooth abduction.

Experimental Conditions: Data was collected across six conditions: 1) intact rotator cuff (control), 2) incised supraspinatus and superior capsule, 3) incised infraspinatus and underlying capsule, 4) lower trapezius tendon transfer (LTT) with Achilles allograft, 5) superior capsular reconstruction (SCR) with human dermal allograft, and 6) SCR with incised LTT.

RESULTS: Deltoid Cumulative Forces: Friedman's ANOVA revealed significant differences in cumulative deltoid forces across the six conditions. Transitioning from intact to MRCT reduced deltoid force by 28% ($p = 0.023$). LTT increased deltoid force by 27.25% ($p = 0.166$). SCR alone decreased deltoid force by 34% ($p = 0.208$). Combining LTT with SCR increased deltoid force by 32.57% compared to SCR alone ($p = 0.023$) and decreased it by 13.6% compared to LTT alone ($p = 0.017$). Combined LTT and SCR reduced deltoid force by 20.9% from the intact condition ($p = 0.001$).

Humeral Head Translation (HHT) and Subacromial Peak Pressure: Friedman test revealed significant differences in subacromial peak pressures across conditions ($p < 0.001$). Post-hoc comparisons showed significant differences between the intact condition and the Supra + Infra Tear, LTT, SCR + LTT, and SCR conditions ($p < 0.05$). The Supraspinatus tear condition also differed significantly from the SCR condition ($p < 0.05$).

CONCLUSION: Neither SCR nor LTT alone replicated native shoulder kinematics fully, but their combination showed significant biomechanical advantages. Combining SCR and LTT optimally corrects HHT. Subacromial peak pressure was most effectively corrected by SCR, followed by the combination of SCR and LTT.

The Impact of Health Literacy on Outcomes After Shoulder Arthroplasty

Poster 87

Andrew Nahr, M.D. / Memphis, TN

Co-Authors:

Andrew Nahr M.D. / Memphis, TN

Tanner Poppe M.D. / Memphis, TN

Derek Dixon B.S. / Memphis, TN

Tyler J. Brolin, M.D. / Memphis, TN

Thomas W. Throckmorton, M.D. / Memphis, TN

David L. Bernholt, M.D. / Memphis, TN

OBJECTIVE: The importance of health literacy has become increasingly popular within healthcare circles, with evidence correlating low health literacy with worse outcomes, increased cost, and higher dissatisfaction. It's relationship to surgical outcomes in the orthopedic literature continues to be plagued by lack of evidence-based metrics. To date, no specific assessment of shoulder health literacy has been validated, and it is unclear what role it plays in the outcomes of shoulder-arthroplasty. Our study aimed to validate a shoulder-specific health literacy assessment with the hypothesis that lower health literacy is associated with worse outcomes in patients undergoing shoulder arthroplasty.

METHODS: A retrospective cohort of 202 patients undergoing shoulder arthroplasty was selected to be powered to detect a clinically significant difference in forward elevation (α 0.05). The Campbell Assessment of Shoulder Education (CASE) questionnaire was created and administered to patients via mail at three months post-shoulder arthroplasty along with the Literacy in Musculoskeletal Problems survey form (LiMP), a previously validated health literacy metric. Pearson correlation testing was then used to calculate an association between CASE and LiMP results. Finally, pre- and postoperative demographics, ASES, VAS, SANE, and range of motion scores were compared between differing levels of health literacy.

RESULTS: 202 total patients responded. There was a strong positive association between LIMP and CASE score ($P < 0.0001$). Patients with poor shoulder literacy (CASE \leq 4) demonstrated higher preoperative VAS score (6.4 vs. 5.4, $P = .005$), however this difference was diminished at 3 months post-op (2.2 vs 1.8, $P = 0.121$). Patients with poor shoulder literacy did not show inferior ASES (67.7 vs. 69.3, $P = 0.548$) or SANE (62.9 vs. 61.2, $P = 0.612$) scores at 3 months post-op. There was no difference in external rotation (36.6 vs. 39.7, $P = 0.143$). internal rotation (40.7 vs. 40.0, $P = 0.724$), or forward elevation (128.1 vs 136.0, $P = 0.081$) between the groups at the 3-month timepoint.

CONCLUSION: CASE's sensitivity, specificity, and Spearman correlation testing compared with the previously validated LiMP assessment indicate that it is a reliable tool in evaluating musculoskeletal-specific health literacy. While inferior shoulder health literacy was correlated with worse preoperative VAS score, it was not predictive of postoperative motion or patient-reported outcomes. This suggests that initial differences preoperatively based upon health literacy can be overcome with appropriate care and rehabilitation regardless of their shoulder-specific health literacy.

Comparing Patient-Reported Outcomes in Cubital Tunnel Syndrome: Novel Two-Incision Technique vs. Open Ulnar Nerve Release

Poster 88

Nirav K. Mungalpara, M.D., MRCS / Chicago, IL

Co-Authors:

Sanders S. Salomon / Chicago, IL

Daniyal A. Mehmood / Rockford, IL

Apurva Choubey, M.D. / Chicago, IL

Brett Drake, B.S. / Chicago, IL

Nirav Mungalpara, M.D. / Chicago, IL

Mark Gonzalez, M.D., Ph.D. / Chicago, IL

OBJECTIVE: Open cubital tunnel release alleviates ulnar nerve compression in cubital tunnel syndrome, the second most common upper extremity compressive neuropathy after carpal tunnel syndrome. While the traditional open release is standard, less invasive techniques aim to improve clinical and cosmetic outcomes. Our study compares a novel and less invasive two-incision technique to the traditional open-release technique based on patient-reported outcomes.

METHODS: We included a total of 109 patients who underwent cubital tunnel release at our institute over the past eight years and met the inclusion criteria. Of these, 37 patients underwent the two-incision technique, the rest were operated by the traditional open cubital tunnel release. A retrospective review of patient medical records was done, assessing postoperative numbness, tingling, grip strength, patient-reported pain scores, and the incidence of clawing. This review aimed to determine the comparative efficacy of the two-incision technique vs. the traditional method in alleviating symptoms and improving physical exam findings.

RESULTS: We evaluated patient demographics, including age, sex, and BMI, and found no significant differences between the two-incision technique and the traditional OCuTR technique. However, the two-incision technique resulted in a longer surgical time compared to the traditional method (111.3 minutes vs. 73.84 minutes). In terms of patient-reported outcomes, there were no significant differences between the two techniques in postoperative pain (2.8 vs. 2.7; $p=0.457$), numbness (2.9 vs. 2.6; $p=0.127$), tingling (2.7 vs. 2.6; $p=0.427$), grip strength (4.0 vs. 3.9; $p=0.498$), and postoperative clawing (2.1 for both; $p=0.438$).

CONCLUSION: Both techniques effectively treat CuTS. The two-incision limited technique offers potential cosmetic benefits with reduced scarring and smaller incisions, despite longer average surgery duration compared to traditional release. It presents a viable alternative, particularly for patients prioritizing cosmesis. Incorporating less invasive techniques can enhance cosmetic results without compromising effectiveness. Future research should explore the long-term benefits and limitations of the two-incision approach to ensure surgical practices align with patient expectations.

Does Lumbar Lordosis Distribution Impact Outcomes After Lumbar Fusion Surgery?

Poster 89

Parker Brush, M.D. / Springfield, IL

Co-Authors:

Parker Brush, M.D. / Springfield, IL

Emily Ducaji, B.S. / Springfield, IL

D. Gordon Allan, M.D. / Springfield, IL

OBJECTIVE: Sagittal balance of the lumbar spine involves a distribution of lordosis favoring the lower segments. Patients with an abnormal lordosis distribution index (LDI) after fusion surgery are described as having higher short-term revision rates for adjacent segment disease (ASD), especially if they are hypolordotic. However, these data are based on small populations and do not consider patient reported outcomes (PROs). This study evaluates if revision surgery rates or PROs are impacted by the LDI after lumbar fusion surgery.

METHODS: Retrospective review of patients with degenerative spine disease receiving a 1- to 2-level lumbar fusion surgery with preoperative and six-month postoperative standing lateral lumbar spine radiographs. The LDI was calculated by dividing the L4-S1 lordosis by the L1-S1 lordosis. Patients were grouped based on their postoperative LDI with hypolordotic spines having a value less than 0.5, normal spines between 0.5 and 0.8, and hyperlordotic spines greater than 0.8. Rates of revision surgery for adjacent segment disease (ASD) and same-level disease within 2 years of surgery, the 12-item short form survey physical (PCS-12) and mental health components (MCS-12), Oswestry disability index (ODI), and back (VAS-B) and leg (VAS-L) pain scores by the visual analog scale were compared between groups. Delta PROs were calculated by subtracting the preoperative value from the postoperative value.

RESULTS: There were a total of 267 patients identified that underwent 1 to 2 level fusion included in this study with 102 hypolordotic, 138 normal, and 28 hyperlordotic spines after surgery. The groups had no significant differences with regards to age, BMI, smoking status, CCI, and Elixhauser Comorbidity Index. The groups had similar rates of 90-day readmission ($p=0.815$), 90-day complications ($p=0.147$), all-cause revision ($p=0.406$), revision for ASD ($p=0.707$), and revision for same-level disease ($p=0.224$). The groups had similar postoperative and delta PROs for ODI, VAS-Back and Leg, PCS-12, and MCS-12 ($p>0.05$).

CONCLUSIONS: Patients with abnormal postoperative LDI are not at higher risk for revision surgery for adjacent or same-level disease following short construct lumbar fusion surgery. In addition, regardless of LDI patients tend to experience a similar functional and symptomatic improvement.

Predictors of Academic Career Trajectory Based on Spine Fellows Applications

Poster 90

Hannah A. Levy, M.D. / Rochester, MN

Co-Authors:

Hannah A. Levy, M.D. / Rochester, MN

John Paulik, B.S. / Philadelphia, PA

John Bodnar, M.S. / Philadelphia, PA

Ahmad Nassr, M.D. / Rochester, MN

Brett Freedman, M.D. / Rochester, MN

Arjun Sebastian, M.D. / Rochester, MN

Darrel Brodke, M.D. / Salt Lake City, UT

Alan Hilibrand, M.D. / Philadelphia, PA

Brian Karamian, M.D. / Salt Lake City, UT

INTRODUCTION: Producing academic surgeons remains a core mission of many residency and fellowship programs. While spine surgery careers are influenced by a multitude of professional and personal factors, predictors of academic career trajectories may be identifiable at the spine fellow applicant stage. This study aimed to 1) determine factors predictive of academic spine surgery careers and 2) compare the application metrics identified as most important to an academic career by spine surgery program directors (PD) to those identified from prior spine fellows applications.

METHODS: All applications of individuals applying for spine fellowship training between 2017-2021 at a single academic institution were reviewed. Application metrics pertaining to research achievement, academic achievement, prior and current education, extracurricular involvement, leadership, examination scores, applicant interests, and recommendation writer reputation were extracted. The careers of all prior spine fellow applicants were grouped by full time university appointment and non-academic groups. A survey sent to spine PDs asked them to rank the importance of application factors to academic career trajectory using analogous metrics to the application review. Univariate and regression analysis compared application factors based on career trajectory.

RESULTS: A total of 310 applications were reviewed. Residency publications (odds ratio [OR]:1.09, $p=0.0116$), basic science publications (OR:1.24, $p=0.0447$), and academic interest (OR:2.25, $p=0.0229$) predicted academic career trajectories. In the PD survey ($n=37$), the metrics predicting academic trajectory were ranked: research achievements, physician scientist interest, academic interest, leadership positions, LOR writers' reputation, prestige of training, and USMLE scores. Research year(s), advanced degrees, and society involvement, though theoretically deemed important by PDs, were in actuality minor contributors to academic trajectory of spine fellows applicants. Conversely, H-index, highest impact factor publication, recommendation writer reputation, and allopathic training, proved more important for academic careers than expected.

CONCLUSIONS: Spine fellow academic interest, residency publications, and basic science publications were independent predictors of academic career trajectory.

The Hospital Frailty Risk Score and Risk Stratification for Anterior Cervical Discectomy and Fusion

Poster 91

Blaire Peterson, B.S. / San Antonio, TX

Co-Authors:

Blaire Peterson, B.S. / San Antonio, TX

Aaron Singh, BA / San Antonio, TX

Travis Kotzur, B.S. / San Antonio, TX

Chimboi Emukah, M.D. / San Antonio, TX

Ezekial Koslosky, M.D. / San Antonio, TX

Christopher Chaput, M.D. / San Antonio, TX

INTRODUCTION: The Hospital Frailty Risk Score is a validated measure of frailty. While exact definitions vary, models of accumulated deficits are commonly accepted criteria. This score can automatically assess a weighted frailty score utilizing a patient's preexisting ICD-10 diagnoses upon admission to the hospital, making this measure easily integrated into the clinical setting. The aim of this study is to assess the predictive power of this frailty measure in the setting of Anterior Cervical Discectomy and Fusion (ACDF).

METHODS: This was a retrospective cohort study utilizing the National Readmissions Database, years 2016-2019. All patients undergoing ACDF were identified. The Hospital Frailty Risk Score, using ICD-10 codes, was used to calculate a frailty score for each patient. Each comorbidity was assigned a weighted score, and a total patient score of 5 or greater indicates frail status. Multivariate regression was performed to assess postoperative outcomes between frail and non-frail patients. Negative binomial regression was performed to assess 30-day readmission and discharge disposition. Quasi-Poisson regression was performed to assess length of stay (LOS) and total charges. Patient demographics and comorbidities, measured via the Elixhauser comorbidity index, were both controlled for in our regression analysis.

RESULTS: A total of 173,904 patients undergoing ACDF were included in our analysis. 35,774 (20.57%) were frail. Frail patients had increased odds of medical (Odds Ratio (OR) 2.80; $p < 0.001$) and surgical complications (OR 1.60; $p < 0.001$). Specifically, frail patients had increased odds of joint infection (OR 2.38; $p < 0.001$), mechanical complication (1.64; $p < 0.001$), and postoperative neurological complications (2.47; $p < 0.001$). Frail patients also had increased odds of readmission (OR 1.45; $p < 0.001$), reduced odds of a routine discharge (OR 0.84; $p < 0.001$) and increased odds of mortality (OR 13.40; $p < 0.001$). They also had longer length of stay (OR 2.2; $p < 0.001$) and greater total charges (OR 1.34; $p < 0.001$).

CONCLUSION: Frailty, assessed via the Hospital Frailty Risk Score, is common in the ACDF population, with 20.57% identified in this higher risk group. Frail patients had increased medical and surgical complications and worse hospital related outcomes, including longer hospital stays, more readmissions and adverse discharges, and higher total charges. These findings indicate that the Hospital Frailty Risk Score is a clinically useful measure in the setting of ACDF.

Radiographic and Clinical Outcomes After Posterior Cervical Fusion Are Similar with Upper-Level Instrumentation at C2 vs. C3 for Cervical Spondylotic Myelopathy

Poster 92

Tyler Compton, M.D. / Chicago, IL

Co-Authors:

Mark A. Plantz, M.D. / Chicago, IL
Joseph Weiner, M.D. / Kansas City, KS
Tyler Compton, M.D. / Chicago, IL
Jeremy Marx, M.D. / Chicago, IL
Erik B. Gerlach, M.D. / Chicago, IL

Peter R. Swiatek, M.D. / Philadelphia, PA
Srikanth Divi, M.D. / Chicago, IL
Alpesh A. Patel, M.D., MBA / Chicago, IL
Wellington K. Hsu, M.D. / Chicago, IL

OBJECTIVE: Posterior cervical decompression and fusion (PCDF) is a common procedure for treatment of multilevel cervical spondylotic myelopathy. The evidence is sparse as to whether C2 vs. C3 is the optimal upper instrumented vertebra (UIV). Prior studies have identified biomechanical advantages of obtaining fixation in C2, however, the long-term clinical outcomes are less clear. This study analyzes postoperative clinical and radiographic outcomes after PCDF with UIV at C2 vs. C3.

METHODS: Adult patients undergoing PCDF for CSM from 2014 to 2019 at a single center were identified. Patients with UIV at either C2 or C3, and a lower instrumented vertebra (LIV) up to T2, were included. Demographic data, surgical characteristics, clinical outcomes, and various sagittal radiographic metrics were compared between groups. Student's t test for continuous variables and Chi-squared or Fisher exact tests for categorical variables were utilized to compare outcomes. Multivariate logistic regression analyses were utilized to determine the effect of UIV on clinical and radiographic outcomes.

RESULTS: A total of 135 patients were included, of whom 47 (34.8%) had a UIV at C2 and 88 (65.2%) had a UIV at C3. Patients with UIV at C2 tended to be older (66.1 vs 59.7, $p = 0.002$), more predominately female (55.3% vs 36.8%, $p = 0.039$), and have more medical comorbidities (CCI 3.2 vs 2.3, $p = 0.004$). There was no difference in number of levels fused, estimated blood loss, or use of osteotomies ($p > 0.05$) between patients with UIV at C2 vs. C3. UIV at C3 resulted in significantly shorter operative time compared to C2 UIV (291.3 min vs 387.8 min, $p = 0.036$). Overall, there was no difference in 90-day readmission or 2-year reoperation between the groups ($p > 0.05$). The mean difference from baseline to final follow-up in cSVA, T1 slope, CL, TS-CL, and C0-C2, metrics were statistically similar between groups ($p > 0.05$). Multivariate analysis controlling for demographic factors and operative factors, did not reveal any correlation between UIV and radiographic outcomes ($p > 0.05$).

CONCLUSIONS: After adjusting for other factors, there was no significant difference in postoperative clinical and radiographic outcomes in C2 vs. C3 UIV groups. The added complexity of C2 instrumentation does not appear to be critical in successful radiographic and clinical outcomes after posterior cervical decompression and fusion for myelopathy.

A Comparison of Charlson Comorbidity, Elixhauser Comorbidity, Frailty Indices to Predict Outcomes Following Anterior Cervical Discectomy and Fusion

Poster 93

Aaron Singh / San Antonio, TX

Co-Authors:

Aaron Singh / San Antonio, TX

Travis Kotzur / San Antonio, TX

Blaire Peterson / San Antonio, TX

Chimobi Emukah, M.D. / San Antonio, TX

Ezekial Koslosky, M.D. / San Antonio, TX

Christopher Chaput, M.D. / San Antonio, TX

INTRODUCTION: Proper preoperative assessments are an integral part of appropriate patient selection. A number of tools exist to aid surgeons in risk assessment, including the Charlson Comorbidity Index (CCI), the Elixhauser Comorbidity Index (ECI), and various measures of frailty, such as the Hospital Frailty Risk Score (HFR). These tools can provide a one-number summary of a patient's overall health status, and while they have been validated for general use, the best assessment tool for spine surgery specifically is still debated. The aim of this study is to compare the predictive power of the CCI, ECI, and HFR in the setting of anterior cervical discectomy and fusion (ACDF).

METHODS: All patients who underwent ACDF were identified via ICD-10 code from the National Readmissions Database, years 2016-2019. Patient demographics, perioperative complications, and hospital associated outcomes were recorded. Receiver Operating Characteristic (ROC) curves were created and Area Under the Curve (AUC) evaluated to gauge the predictive capabilities of each risk assessment tool (CCI, ECI, and HFR) across a range of outcomes.

RESULTS: 173,633 patients undergoing ACDF were included in our analysis. For mortality, ECI was most predictive (0.94 Area Under the Curve (AUC)), followed by HFR (0.84 AUC), and CCI (0.81 AUC). For 30-day readmission, ECI was most predictive (0.8 AUC), while HFR (0.65 AUC) and CCI (0.64 AUC) were less predictive. Similarly, for 30-day reoperation, ECI was most predictive (0.71 AUC), followed by HFR (0.67 AUC) and CCI (0.62 AUC). For postoperative infection, ECI was most predictive (0.81 AUC), followed by HFR (0.76 AUC) and CCI (0.62 AUC).

CONCLUSION: Our analysis indicates that ECI is a stronger risk assessment tool in the setting of ACDF relative to CCI and HFR. Surgeons should consider integrating ECI into their preoperative patient risk assessments. This information can aid surgeons in appropriate patient selection and provide more granular data to assist in preoperative counseling.

Prosthesis-Associated Sarcoma: A Review of 8 High-Grade Lesions Arising Around a Total Joint Arthroplasty Implant

Poster 94

Samuel E. Broida, M.D. / Rochester, MN

Co-Authors:

Samuel E. Broida, M.D. / Rochester, MN

Leilani Garayua-Cruz, B.S. / Rochester, MN

Reed Salmons, M.D. / Rochester, MN

Peter S. Rose, M.D. / Rochester, MN

Matthew Houdek, M.D. / Rochester, MN

BACKGROUND: Rare instances of sarcoma arising near a metallic implant have been described. We sought to present a cohort of patients who developed high-grade sarcoma around an arthroplasty prosthesis.

METHODS: A retrospective record review was conducted for 8 patients who were diagnosed with sarcoma arising around a joint prosthesis. All patients were evaluated at a single institution between 2008 and 2021. Mean age of patients at sarcoma diagnosis was 65 years and 63% of patients were male. The indication for the index joint replacement was osteoarthritis in seven patients and developmental hip dysplasia in a single patient. The mean time from prosthesis implantation to sarcoma diagnosis was 10.7 years (range 4-26).

RESULTS: All sarcomas were discovered around a lower extremity prosthesis. Two tumors were associated with a distal femur TKA prosthesis, three were associated with a proximal femoral THA stem, and three were located within the hip joint of patients with THA prostheses. Four lesions were detected on intraoperative pathology, three were detected on radiographs indicated by joint pain, and one was detected via surveillance PET-CT for melanoma.

All lesions were high-grade. Seven of eight tumors had a soft tissue component in addition to osseous involvement. Histologically, 4 tumors were undifferentiated pleomorphic sarcomas, two angiosarcomas were seen, one of which showed predominantly epithelioid morphology and was originally confused with metastatic carcinoma, and two cases showed formation of osteocartilaginous matrix by pleomorphic spindled and epithelioid cells and were classified as osteosarcomas.

Four patients had developed metastatic disease (lung [n=3] and scapula [n=1] prior to treatment. Six patients underwent surgical resection in the form of limb salvage (n=3) or amputation (n=3). Five patients were treated with chemotherapy and two patients received radiotherapy. One patient developed local recurrence 10 months following limb salvage. Another patient developed lung metastases 10 months following hip disarticulation. Four patients died of disease at a mean 8.3 months (range-2-14) from diagnosis. The remaining four patients were alive at final follow-up (mean survival 28 months, range 15-57).

CONCLUSION: Sarcoma arising around an arthroplasty prosthesis is a rare entity and occurs years after implantation. In our series, these were most commonly discovered incidentally on intraoperative pathology or via surveillance imaging and all were high-grade lesions. Fifty-percent of patients presented with metastatic disease or developed metastases prior to initiation of treatment. Outcomes in this population are poor with half of patients succumbing to disease within 14 months.

Arthroscopic Treatment of Hip Labral Tears and Femoroacetabular Impingement in Young Adults: Above 90% Survivorship at 10-Year Follow-Up

Poster 97

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Co-Authors:

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

Rachel E. Bruning, B.S. / Des Plaines, IL

Andrew J. Curley, M.D. / Des Plaines, IL

Andrew D. Carbone, M.D. / Des Plaines, IL

Ali Parsa, M.D. / Des Plaines, IL

INTRODUCTION: Previous studies have shown good mid-term outcomes of hip labral tear treatment with arthroscopy. However, long-term results are limited within the young adult population. The purpose of this study was to report survivorship and patient-reported outcome measures (PROMs) at minimum 10-year follow-up in young adult patients following primary hip arthroscopy with labral repair or debridement.

METHODS: Data were prospectively collected and retrospectively reviewed on all patients who underwent primary hip arthroscopy between June 2008 and August 2012. Young adult patients aged greater than 19 and less than 40 years who underwent labral repair were included. Preoperative and minimum 10-year follow-up for multiple patients reported outcomes (PROs) were collected. Rates of achieving the minimal clinically important difference (MCID) and the patient acceptable symptomatic state (PASS), as well as hip joint survival from conversion to total hip arthroplasty (THA) and progression to subsequent ipsilateral revision hip arthroscopy were reported.

RESULTS: Of the 241 hips eligible for analysis, 194 hips (80.5%) had minimum 10-year follow-up. There were 122 females (62.9%) and 72 males (37.1%) included in the present analysis with a mean age and BMI of 28.9 years and 24.8 kg/m², respectively. The 10-year survivorship for young adult patients was 91.8%, and 12.9% of patients progressed to a subsequent ipsilateral revision arthroscopy at mean 36.8 months. There was significant improvement in all PROMs from baseline to minimum 10-year follow-up, including mHHS, NAHS, HOS-SSS, VAS, iHOT-12, and Patient Satisfaction ($P < 0.05$). All patients aged 19-40 years achieved high rates of MCID, for mHHS, NAHS, and VAS, as well as high rates of PASS for mHHS.

CONCLUSION: Young adults who underwent primary hip arthroscopy with labral treatment demonstrated overall 10-year survivorship of 91.8%, significant improvement in PROMs, and high rates of achievement of PASS for mHHS and MCID for mHHS, NAHS, and VAS.

Is Periacetabular Osteotomy with Hip Arthroscopy Superior to Periacetabular Osteotomy Alone? A Systematic Review and Meta-Analysis

Poster 98

Sanathan Iyer, B.S. / Rochester, MN

Co-Authors:

Sean C. Clark, M.S. / Rochester, MN

Jason G. Ina, M.D. / Rochester, MN

Christopher V. Nagelli / Rochester, MN

Xuankang Pan, B.S. / Rochester, MN

Karrisa N. Simon, B.S. / Rochester, MN

Louis S. Kang, B.S. / Rochester, MN

Sanathan Iyer, B.S. / Rochester, MN

Gavin H. Ward, B.S. / Rochester, MN

Brandon C. Cabarcas / Rochester, MN

Rafael J. Sierra, M.D. / Rochester, MN

OBJECTIVE: There is ongoing debate regarding the optimal treatment strategy of hip dysplasia with some advocating for the addition of concomitant hip arthroscopy to PAO. The purpose of this systematic review was to compare the clinical outcomes, complications, and long-term joint preservation of PAO and PAO with hip arthroscopy.

METHODS: A comprehensive literature search was performed according to the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines. Studies were included if they reported outcomes of PAO with concomitant hip arthroscopy, PAO with staged hip arthroscopy, or compared outcomes of PAO alone vs. PAO with hip arthroscopy.

RESULTS: Twenty studies were included in this review. Pooled analysis of preoperative to postoperative change in modified Harris Hip Score trended in favor of PAO with concomitant hip arthroscopy over PAO alone but was not statistically significant ($p = 0.24$). Three of six studies that compared PAO with hip arthroscopy to PAO alone showed a significant postoperative improvement for select outcome scores for the PAO plus hip arthroscopy group, but not for the PAO alone group. All studies revealed that more than 65% of the patients who underwent PAO in conjunction with hip arthroscopy exhibited labral pathology. The rates of complications and conversion to total hip arthroplasty (cTHA) of both procedures were notably similar.

CONCLUSIONS: The included studies demonstrated good outcomes for both PAO and PAO with hip arthroscopy, although only a select few showed a significant difference in outcomes between the two surgical techniques. The minimal difference in outcomes and rate of cTHA may be attributed to the relatively limited sample size and absence of long-term follow-up in the included studies. Randomized controlled studies are needed to better understand the potential difference in long-term outcomes and rate of cTHA between these procedures.

Outcomes of Arthroscopic vs. Open Iliopsoas Release after Total Hip Arthroplasty

Poster 99

Karissa N. Simon, B.S. / Rochester, MN

Co-Authors:

Charles L. Holliday, M.D. / Rochester, MN

Karissa N. Simon, B.S. / Rochester, MN

Robert T. Trousdale, M.D. / Rochester, MN

Michael J. Taunton, M.D. / Rochester, MN

Bruce A. Levy, M.D. / Orlando, FL

Mario Hevesi, M.D. Ph.D. / Rochester, MN

PURPOSE: To compare the outcomes of arthroscopic iliopsoas fractional lengthening (IPFL) vs. open iliopsoas (IP) tenotomy for the treatment of IP tendinitis following total hip arthroplasty (THA).

METHODS: Patients who underwent arthroscopic IPFL or open tenotomy for IP tendinitis following THA between 1988 and 2023 were identified. Fifty-two patients (36 arthroscopic, 16 open) were followed for an average 68.7 months. Patient records were reviewed and patient reported outcomes were collected via electronic survey.

RESULTS: Overall surgery satisfaction was 7.9 (scale 0-10) following arthroscopic IPFL and 6.0 following open tenotomy ($p = 0.178$). Eighty-six percent of patients reported improvement in their anterior groin pain following arthroscopic IPFL, compared to 45% following open tenotomy ($p = 0.065$). In the arthroscopic cohort, 64% reported improved hip flexion strength, compared to 36% in the open cohort ($p = 0.158$).

Visual Analog Scale pain at rest was lower following arthroscopic tenotomy (1.1 ± 2.2 vs 3.3 ± 3.2 , $p = 0.0092$), while pain with use did not differ between cohorts (3.1 ± 1.3 vs 2.6 ± 1.1 , $p = 0.786$). There were no differences in postoperative Tegner (3.1 ± 1.3 vs 2.6 ± 1.1 , $p = 0.302$), mHHS (77.0 ± 19.0 vs 69.2 ± 26.9 , $p = 0.073$), or SANE (70.9 ± 28.7 vs 66.7 ± 31.8 , $p = 0.571$) scores between arthroscopic and open cohorts. Revision THA rates did not differ following arthroscopic or open procedures (8.3% vs 25%, $p = 0.104$).

CONCLUSIONS: Patients have improved pain at rest following arthroscopic IPFL when compared to open tenotomy for IP tendinitis following THA. Arthroscopic IPFL may also confer improved overall pain, function, and hip flexion strength, however these trends did not reach significance. Overall complication and reoperation rates were low for both techniques.

It's Not Arthritis! Congenitally Narrow Joint Space Does Not Portend Inferior Outcomes Following Hip Arthroscopy for Femoroacetabular Impingement

Poster 100

Benjamin D. Kuhns, M.D., M.S. / Des Plaines, IL

Co-Authors:

Benjamin D. Kuhns, M.D., M.S. / Des Plaines, IL

Tyler R. McCarroll, M.D. / Des Plaines, IL

Yasemin E. Kingham, BA / Des Plaines, IL

Jessica C. Keane, B.S. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

INTRODUCTION: Hip preservation surgery is often contraindicated in the setting of radiographic osteoarthritis and decreased joint space. The purpose of this study was to evaluate the outcomes of hip preservation surgery in patients with a symmetric congenitally narrowed hip joint space without radiographic evidence of degenerative changes.

METHODS: Consecutive patients with Tonnis grade 0 undergoing hip arthroscopy with labral repair and correction of femoroacetabular impingement with minimum 5-year outcomes were eligible for inclusion in the study. Subjects were considered congenitally narrowed if they had an average bilateral joint space width less than 3mm without radiographic evidence of osteoarthritis. This cohort was propensity matched to patients with an average joint space greater than 4mm. Preoperative demographic and radiographic variables, intraoperative findings and procedures, and postoperative outcomes were compared between the two groups.

RESULTS: 78 patients were included in each group. There were no differences in age, gender, BMI, or radiographic variables other than joint space width between cohorts. The congenitally narrow group had an average joint space width of 2.7 ± 0.2 compared to 4.7 ± 0.5 mm ($p < 0.001$). The congenitally narrow group had lower rates of severe (Outerbridge grade III/IV) femoral head chondral damage than the control cohort (0% vs. 9%; $p = 0.02$), but no significant differences in acetabular cartilage quality. There was significant improvement for both groups with no differences in preoperative or postoperative patient reported outcome scores or satisfaction with surgery ($p > 0.05$ for all). There were no differences in rates of secondary surgery between groups (2 patients requiring arthroplasty in both groups; 2.6%).

CONCLUSIONS: Patients with congenitally narrowed hip joint space < 3 mm without evidence of osteoarthritis have improved outcomes following arthroscopic surgery for femoroacetabular impingement without differences in outcomes or arthroplasty rates compared to a propensity matched cohort. Care should be taken to rule out early hip osteoarthritis with advanced imaging or serial radiographs when indicating patients with narrow joint space for hip preservation surgery.

Ten-Year Outcomes of Hip Arthroscopy for the Treatment of FAI and Labral Tears in Patients with Workers Compensation Claims

Poster 101

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Co-Authors:

Benjamin G. Domb, M.D. / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Drashti Sikligar, MEng / Des Plaines, IL

Jessica C. Keane, B.S. / Des Plaines, IL

Tyler R. McCarroll, M.D. / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

BACKGROUND: Workers' compensation (WC) status has been associated with inferior outcomes in orthopedic procedures. Therefore, it is usually excluded from clinical outcome studies.

PURPOSE: To determine the impact WC status has on outcomes for patients undergoing hip arthroscopy for femoroacetabular impingement (FAI) and labral tears at a minimum 10-year follow-up, and to compare these findings with a propensity score-matched 1:3 benchmark control group without WC claims.

METHODS: Data was retrospectively analyzed for patients who underwent hip arthroscopy as treatment for FAI and labral tears between 2008 and 2013 with a WC claims. Included patients had complete pre- and postoperative questionnaires at minimum 10-years follow-up for mHHS, NAHS, HOS-SSS, patient satisfaction, and VAS or documented an endpoint during the study time frame. Patients were propensity matched in a 1:3 ratio to a benchmark control group without WC claims based on age at surgery, sex, body mass index (BMI), acetabular outerbridge grade and capsular treatment. Clinically significant thresholds for hip arthroscopy, complications, revision hip arthroscopy, conversion total hip arthroplasty (THA) rates, type of work and return to work rates were included in the analysis.

RESULTS: A total of 280 patients were included in the study. WC patients displayed significant improvements across all PROs and reported high patient satisfaction. When compared to the benchmark control group, the WC group started with significantly lower baseline preoperative scores for all PROs. The study group displayed a significantly higher magnitude of improvement for mHHS, NAHS, HOS-SSS, and VAS. Both groups reached similar postoperative scores across all PROs, reaching the MCID and PASS for mHHS, NAHS, HOS-SSS, and VAS at similar rates at the latest follow-up. Importantly, 74.3% of patients were able to return to work at an average of 8.04 ± 7.40 months. However, the WC group showed a higher revision hip arthroscopy rate ($p < 0.05$).

CONCLUSION: Hip arthroscopy for the treatment of FAI and labral tear in patients with WC claims showed favorable outcomes and a high return-to-work rate at a minimum 10-year follow-up. These results were comparable to a benchmark control group with no WC claims. However, the WC group had a significantly higher rate of revision hip arthroscopy with a 3-fold relative risk. ($p < 0.01$).

Minimum Five-Year Outcomes of Arthroscopic Hip Labral Reconstruction in Adolescents

Poster 102

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Co-Authors:

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Andrew R. Schab, B.S. / Des Plaines, IL

Jessica C. Keane, B.S. / Des Plaines, IL

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Femoroacetabular impingement (FAI) and labral tears have been identified as a common source of pain in adolescents. In cases of an irreparable labrum, labral reconstruction has emerged as an efficacious treatment option.

PURPOSE: Report minimum 5-year outcomes of adolescents undergoing hip arthroscopy with labral reconstruction (RC) and compare their results to a benchmark control group of labral repairs (SR).

METHODS: Data was retrospectively reviewed from 2010 to 2018 for patients who underwent hip arthroscopy as treatment for FAI and labral tears. Patients were included if they were adolescents and had pre- and 5-year minimum postoperative data for the mHHS, NAHS, HOS-SSS, and VAS. Patients were included in the study group if they received labral reconstruction, and were propensity matched to a control group of patients who received labral repairs in a 1:2 ratio based on age, sex, BMI, and Tonnis Grade. Patient characteristics, radiographic measurements, intraoperative findings, and surgical procedures were analyzed. Rates of meeting clinically relevant thresholds, revision arthroscopy, and conversion to arthroplasty were compared between the groups.

RESULTS: Sixty-six hips were included in the study. With a mean age of 19.56 ± 2.03 for the RC group and 19.57 ± 2.00 for the SR group. Significant and comparable magnitudes of improvement were seen across all PROs in both groups. The RC group reached lower postoperative scores across all PROs and had lower patient satisfaction at minimum 5 year follow up ($p < 0.01$). No deteriorations in PROs were seen between 2 to 5 years time points. The RC cohort met PASS for mHHS and MOI for NAHS and HOS-SSS at lower rates ($p < 0.05$). The study group underwent revision arthroscopy at higher rates when compared with SRs (31.82% vs. 2.27%; $p < 0.01$).

CONCLUSION: Adolescents undergoing labral reconstruction showed favorable outcomes after hip arthroscopy at a minimum 5-year follow-up. However, the RC group reached lower postoperative PRO and satisfaction scores and met clinically relevant hip arthroscopy thresholds at lower rates ($p < 0.05$). Moreover, RCs faced a 14-fold increased relative risk for revision arthroscopy compared to the control group.

Clinical Outcomes After Hip Arthroscopy for Patients with Inflammatory Joint Disease: A Matched Control Study with Minimum Five-Year Follow-Up

Poster 103

Drashti Sikligar, MEng / Des Plaines, IL

Co-Authors:

Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL

Andrew R. Schab, B.S. / Des Plaines, IL

Drashti Sikligar, MEng / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Benjamin D. Kuhns, M.D. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: There is paucity in the literature regarding midterm outcomes of primary hip arthroscopy who have pre-existing inflammatory joint diseases (IJD).

Hypothesis/PURPOSE: We hypothesized that patients with IJDs undergoing hip arthroscopy would have significant postoperative improvement, but overall inferior outcomes compared to the control group.

STUDY DESIGN: Retrospective cohort study. Level III

METHODS: Data was prospectively collected on all hip arthroscopies performed between February 2008-December 2018. Patients with IJD undergoing primary hip arthroscopy for the treatment of femoroacetabular impingement (FAI) with labral tears were included in this study. Patients were excluded if they had previous ipsilateral hip conditions other than IJDs and Tonnis grade greater than 1. Patients with minimum five-year follow-up and preoperative IJD diagnoses were 1:3 matched to controls without IJD based on age at surgery, sex, BMI, and Tonnis Grade. Patient-reported outcomes and rates of achieving clinically relevant thresholds were compared between the two groups.

RESULTS: 27 hips (23 patients) with IJD were matched to a control group of 81 hips (79 patients). At minimum five-year follow-up both groups showed significant improvement in all PROs and VAS with similar magnitudes of improvement. The IJD group had lower postoperative PRO scores when compared to the control group and had fewer patients meet PASS for NAHS, while the IJD and control group met MCID, SCB, and PASS for remaining PROs at similar frequency. The IJD group had a 3.60-increased relative risk of a second hip surgery [relative risk: 3.60; 95% CI: 1.19 to 10.86; $p < 0.05$] and 4.50-increased risk of conversion to hip arthroplasty [relative risk: 4.50; 95% CI: 1.37 to 14.76; $p < 0.05$].

CONCLUSION: Patients with IJD undergoing hip arthroscopy demonstrate significant improvement in all PROs at minimum five-year Follow-up. However, they reach lower postoperative PROs, achieved clinically significant benchmarks less frequently, and experienced a higher rate of revision arthroscopy and conversion to arthroplasty with a relative risk of 3.6 and 4.5 respectively when compared to a benchmark control group.

Hip Range of Motion Simulation for Surgical Management of Ischiofemoral Impingement: A Three Dimensional Computed Tomography-Based Model

Poster 104

Gavin H. Ward, B.S. / Rochester, MN

Co-Authors:

Gavin H. Ward, B.S. / Rochester, MN

Xuankang Pan, B.S. / Rochester, MN

Megan L. Loghry, B.S. / Rochester, MN

Adam J. Wentworth, M.S. / Rochester, MN

William R. Schulz, M.D. / Rochester, MN

Christopher V. Nagelli, Ph.D. / Rochester, MN

Sean C. Clark, B.S. / Rochester, MN

Nicholas G. Rhodes, M.D. / Rochester, MN

Jonathan M. Morris, M.D. / Rochester, MN

Aaron J. Krych, M.D. / Rochester, MN

Mario Hevesi, M.D. Ph.D. / Rochester, MN

OBJECTIVE: Ischiofemoral Impingement (IFI) and its surgical management is an evolving topic in the field of orthopedic surgery. It has been previously characterized that patients presenting with symptoms of IFI demonstrated significantly narrower ischiofemoral space on MRI imaging. However, there is currently limited comparative clinical outcomes of IFI, as available literature is typically limited to small case series. The purpose of this study was to improve the characterization of IFI, and determine the areas where impingement occur, and ideal surgical targets for resection.

METHODS: CT pelvis scans from 30 patients with symptomatic femoroacetabular impingement (FAI) were queried from the institutional PACS system. These files were imported into MIMICS, a 3-D medical image processing software specialized for computer aided design (CAD) applications. These were subsequently imported into the 3-MATIC CAD software for collision simulations. The femur and pelvis were selected for as collision objects. Permutations of adduction and extension were conducted at three discrete levels of external rotation: 0, 15, and 30 degrees. To simulate the presence of soft tissue, these simulations of adduction, extension, and external rotation were conducted with 0 mm, 2.5 mm, and 5 mm of simulated soft tissue between the femur and ischium. Data from these simulations were displayed on a heat map.

RESULTS: Data from range of motion analysis successfully demonstrated the probability of collisions between the ischium at various degrees of extension and adduction for 0 mm soft tissue at 0, 15, and 30 degrees of external rotation; 2.5 mm of soft tissue at 0 15, and 30 degrees of external rotation; and 5 mm of soft tissue at 0, 15, 30 degrees of external rotation. Visualization of the collision demonstrated majority collisions occurring on the anterior surface of the ischium and the lesser trochanter at all iterations of adduction, extension, and external rotation.

CONCLUSIONS: The difference in range of motion between clearance levels suggests a theoretical benefit of bony resecting in efforts to alleviate IFI symptoms. In treating IFI, addressing clear anatomic abnormalities should take precedence. However, in circumstances where there are no clear structural abnormalities leading to decreased ischiofemoral space, consideration should be given to a lesser trochanteric resection given focal impingement localized to this area in comparison to broader impingement at the ischium.

The Association Between Pain Self-Efficacy and Patient-Reported Outcomes Among Adults Recovering from Hip Arthroscopy for Femoroacetabular Impingement

Poster 105

W. Kelton Vasileff, M.D. / Columbus, OH

Co-Authors:

Tyler Barker Ph.D. / Columbus OH

Marcia Edwards PsyD / Columbus OH

William Vasileff, M.D. / Columbus OH

BACKGROUND: Evidence shows that psychological factors can hinder the rehabilitation process and contribute to suboptimal patient-reported outcomes following hip arthroscopy for femoroacetabular impingement (FAI). However, little is known about the impact of preoperative and postoperative pain self-efficacy on patient-reported outcomes following hip arthroscopy for FAI. This study examined the relationship between preoperative and postoperative pain self-efficacy and hip specific patient-reported outcomes following hip arthroscopy for FAI. The findings of this study may help identify modifiable attributes that could enhance postoperative outcomes.

METHODS: We analyzed patient-reported outcomes data collected from hip arthroscopy patients using Patient IQ, a patient engagement technology. Patients reported their pain self-efficacy prior to surgery and at 3-, 6- and 12-months post-surgery using the Pain Self-Efficacy Questionnaire (PSEQ). Patient-reported outcomes were assessed at 3-, 6-, and 12-months post-surgery using the iHOT33 and the Hip Outcome Score Activity of Daily Living (HOS ADL) Scale. We examined the relationship between preoperative PSEQ scores and postoperative iHOT33 and HOS ADL scores using Spearman's correlations. We examined the effect of postoperative PSEQ scores on the odds of achieving a minimally clinically important difference (MCID) for the iHOT33 and HOS ADL using linear regressions.

RESULTS: Of the 332 patients, most were female (n = 244, 73.5%) and White (n = 297, 89.5%). We found a significant relationship between preoperative PSEQ scores and iHOT33 and HOS ADL scores, respectively, at 3- (r = 0.76, 95% CI = 0.61-0.86; r = 0.72, 95% CI = 0.56-0.83), 6- (r = 0.75, 95% CI = 0.56-0.86; r = 0.71, 95% CI = 0.53-0.83) and 12-months (r = 0.79, 0.63-0.89; r = 0.82, 95% CI = 0.69-0.90) post-surgery. No significant associations were found between postoperative PSEQ scores and the odds of achieving MCID.

CONCLUSIONS: We observed a significant association of preoperative PSEQ scores on hip-specific patient-reported outcomes at 3-, 6-, and 12-months following hip arthroscopy. Our findings suggest that self-efficacy-enhancing interventions may be a promising tool to improve hip-specific patient-reported outcomes following hip arthroscopy for FAI. Further research is needed to confirm our findings.

Defining Clinically Meaningful Thresholds for Hip Outcome Score Sport-Specific Subscale in Athletes Undergoing Hip Arthroscopy for Femoroacetabular Impingement Syndrome At Midterm Follow-Up

Poster 106

Elizabeth G. Walsh, B.S. / Des Plaines, IL

Co-Authors:

Elizabeth G. Walsh, B.S. / Des Plaines, IL

Roger Quesada-Jimenez, M.D. / Des Plaines, IL

Andrew R. Schab, B.S. / Des Plaines, IL

Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: Clinometric outcome thresholds have been utilized to provide insight into postoperative functional status and patient satisfaction. The purpose of this study is to define and evaluate minimal clinically important difference (MCID), patient acceptable symptomatic state (PASS), substantial clinical benefit (SCB), and maximum outcome improvement (MOI) satisfaction threshold values for Hip Outcome Score Sport-Specific Subscale (HOS-SS) in athletes undergoing primary hip arthroscopy for femoroacetabular impingement syndrome (FAIS) at minimum 5-year follow-up.

METHODS: Data was retrospectively reviewed for athletes who underwent primary hip arthroscopy for FAIS from 2011-2019. Patients were considered an athlete if they were participating in sports 1 year before surgery at the professional, collegiate, high school, organized amateur, or recreational/fitness level. Athletes were considered eligible for the present analysis if they underwent primary hip arthroscopy for FAIS during the study period; were younger than 50 years old; answered anchor questions; had preoperative and 5-year follow-up PRO scores for modified Harris Hip Score (mHHS), Non-Arthritic Hip Score (NAHS), HOS-SSS, and visual analog scale (VAS) for pain; and completed a return to sport (RTS) survey. Follow-up was considered complete if patients had all PRO measures, RTS data, and answers to anchor questions at minimum 5-year follow-up. Patients were excluded from the study if they had a Tonnis Grade of osteoarthritis >1 , hip dysplasia (lateral center-edge angle ≤ 18), a workers compensation claim, previous ipsilateral hip surgery, or a previous hip condition. The PASS, SCB, and MOI thresholds for HOS-SSS were defined using the anchor-based method, MCID was defined using the distribution method.

RESULTS: A total of 336 were included in the study. Area under the curve (AUC) for all defined thresholds indicated acceptable (AUC > 0.7) to excellent discrimination (AUC > 0.8). The thresholds for HOS-SSS were defined as follows: PASS 73.6, MOI 77.8%, SCB 89.8, and MCID 11.3; with athletes achieving these thresholds at high rates: 75.0%, 54.8%, 54.2%, and 81.5% respectively.

CONCLUSION: This study defined values for the HOS-SSS that can be used to evaluate athletes after primary hip arthroscopy for FAIS. The PASS, MOI satisfaction threshold, SCB, and MCID for the HOS-SSS at minimum 5-year follow-up were 73.6, 77.8%, 89.8, and 11.3.

Clinically Relevant Thresholds in Patient Reported Outcomes: Do Patient's Expectations Evolve Over Long-Term Follow-Up?

Poster 107

Elizabeth G. Walsh, B.S. / Des Plaines, IL

Co-Authors:

Elizabeth G. Walsh, B.S. / Des Plaines, IL
Tyler R. McCarroll, M.D. / Des Plaines, IL
Benjamin D. Kuhns, M.D. / Des Plaines, IL
Ady H. Kahana-Rojkind, M.D. / Des Plaines, IL
Roger Quesada-Jimenez, M.D. / Des Plaines, IL
Benjamin G. Domb, M.D. / Des Plaines, IL

BACKGROUND: In hip arthroscopy, clinically relevant outcome thresholds have been utilized to provide insight into postoperative functional status and patient satisfaction.

PURPOSE: To define and evaluate minimal clinically important difference (MCID), patient acceptable symptomatic state (PASS), and substantial clinical benefit (SCB) thresholds over the 2-, 5-, and 10-year timepoints for modified Harris Hip Score (mHHS), Hip Outcome Score Sports-Specific Subscale (HOS-SSS), and the International Hip Outcome Tool (iHOT12).

METHODS: Data was retrospectively reviewed for patients who underwent primary hip arthroscopy from 2008-2021. Inclusion criteria included complete patient reported outcome (PRO) scores with anchor questions at either the 2-, 5-, or 10-year timepoint. Groups were propensity-score matched 1:1:1 based on age, body mass index, sex, lateral center edge angle, and surgical procedure. The PASS, SCB, and MCID thresholds were defined using the anchor-based method for mHHS, HOS-SSS, and iHOT12 at the follow-up timepoints.

RESULTS: A total of 405 hips were included in the study, 135 hips in each group. Area under the curve for all defined thresholds indicated acceptable to excellent discrimination. The threshold for achieving PASS, defined at the 2-, 5-, and 10-year follow-up respectively, were as follows: mHHS (82.0, 87.5, 78.5), HOS-SSS (63.2, 76.4, 67.7), and iHOT12 (76.2, 76.9, 57.4). The percentage of patients achieving PASS increased from 2- to 10-years, with the highest percentage at 10-years. The threshold for achieving SCB were defined as follows: mHHS (93.0, 96.5, 93.0), HOS-SSS (97.1, 92.7, 90.5), and iHOT12 (90.0, 96.4, 82.5). The percentage of patients achieving SCB increased from 2- to 10-years. The mean changes required to achieve MCID were defined as follows: mHHS (7.883, 7.375, 7.487), HOS-SSS (10.904, 10.794, 11.115), and iHOT12 (9.567, 10.553, -). The MCID and percentage of patients achieving MCID remained constant over 2- to 10-years.

CONCLUSION: Thresholds for PASS and SCB peaked at the 5-year timepoint and significantly decreased between 5- and 10-year for all PROs. However, patients continue to meet MCID, PASS, and SCB at high rates over a 10-year period. Our findings suggest patients' expectations change over time leading to continued, and at times increasing, patient satisfaction.

Key terms: hip arthroscopy, femoroacetabular impingement syndrome, patient expectations, 10-year follow-up, MCID, PASS, SCB

Training to Stay in the Game: A Systematic Review and Meta-Analysis of ACL injury Prevention Programs

Poster 108

Samantha L. Watson, B.S. / Chicago, IL

Co-Authors:

Samantha L. Watson / Chicago, IL
Chetan Gohal, M.D. / New York, NY
Madeline M. Owen / Chicago, IL

Pranav M. Bajaj / Chicago, IL
Mark A. Plantz, M.D. / Chicago, IL
Vehniah K. Tjong, M.D. / Chicago, IL

INTRODUCTION: Approximately 400,000 ACL reconstructions are performed each year in the United States. Effective ACL injury prevention programs may be paramount in reducing this significant injury burden. **OBJECTIVE:** To determine the effectiveness of ACL injury prevention programs and generate updated guidelines that can be implemented to protect athletes from these injuries.

METHODS: Embase, PubMed, and Ovid (MEDLINE) were searched in accordance with PRISMA guidelines. Included studies focused on ACL injury prevention as opposed to treatment and provided data on ACL injury rates after intervention implementation. Using random-effects models, the pooled risk ratio (RR) was generated for all data. Sub-analyses were completed for female-only, high school vs. collegiate/professional, handball, soccer, and balance board data.

RESULTS: A total of 18 articles were identified (9 randomized control trials, 9 prospective cohort studies). The 25,166 studied athletes played handball, soccer, basketball, or volleyball (mean age = 19.3, SD = 3.6 years; >85% female). All interventions were studied for a minimum of one season (mean = 1.3, SD = 0.59). Athletes who participated in an ACL injury prevention program were significantly less likely to sustain an ACL rupture with a pooled RR of 0.46 (95% CI, 0.36-0.57; $P < 0.01$; $I^2 = 49\%$). When analyzed by age, there was a significant risk reduction in ACL rupture for collegiate/professional athletes over age 18 (RR = 0.50; 95% CI, 0.38-0.64; $P < 0.01$; $I^2 = 66\%$) but no significant change for players under age 18 (RR = 0.35; 95% CI, 0.22-0.55; $P = 0.47$; $I^2 = 0\%$). Of the 12 studies including female players, the pooled RR was 0.57 and not statistically significant (95% CI, 0.43-0.74; $P = 0.13$; $I^2 = 32\%$). There was no significant RR for athletes playing soccer (RR = 0.30; 95% CI, 0.19-0.46; $P = 0.06$; $I^2 = 47\%$) or handball (RR = 0.66; 95% CI, 0.46-0.96; $P = 0.38$; $I^2 = 5\%$). Players who participated in programs including balance boards exhibited a significantly lower risk of ACL rupture (RR = 0.49; 95% CI, 0.35-0.67; $P < 0.01$; $I^2 = 74\%$).

CONCLUSION: Athletes who did not partake in an ACL injury prevention program were nearly twice as likely to sustain an ACL rupture compared to those who did, with particular ACL injury risk reduction in collegiate/professional athletes and those who used balance boards. This study provides strong support for using neuromuscular training programs to significantly reduce the risk of ACL rupture among athletes.

Factors That Influence the Quality of Letters of Recommendation for Orthopedic Trauma Fellowship Applicants: A Survey of Fellowship Directors

Poster 109

Ashwin R. Garlapaty / Columbia, MO

Co-Authors:

Ashwin R. Garlapaty, B.S. / Columbia, MO

Nathan Cherian, M.D. / Omaha, NE

Brett Crist, M.D. / Columbia, MO

OBJECTIVE: Letters of recommendation (LoR) have been identified as one of the most important factors for interview selection and ranking applicants in the orthopedic trauma fellowship match. There have been no previous investigations into what specific factors orthopedic trauma fellowship program directors (PD) use to characterize an applicant unqualified for fellowship training and how this affects an applicant's LoR.

METHODS: A survey was sent to all 66 orthopedic trauma fellowship PDs. PDs were asked how they would respond to an applicant requesting a LoR who they deem unqualified for orthopedic trauma fellowship training. PDs were then presented with a list of 10 factors that may deem an applicant unqualified for orthopedic trauma fellowship, which they ranked in order of importance. A weighted score was calculated for each factor. PDs were also given the opportunity to provide additional factors in a free response.

RESULTS: The five-question survey yielded 42 responses from PDs (42/66 PDs; 64%). When faced with a request for a LoR from an 'unqualified' applicant, 22 PDs suggested they would not write a LoR for the applicant (52%), 19 PDs indicated they would write an underwhelming LoR (45%) and a single PD stated they would write a supportive LoR (2%). The highest-rated factors when deeming an applicant unqualified were lack of professionalism and personal responsibility. Low Orthopaedic In-Training Examination scores, lack of published research in specialty/subspecialty, and low total number of publications were ranked as the least important factors.

CONCLUSIONS: Orthopaedic trauma fellowship PDs specifically identified lack of personal responsibility and professionalism as the most important factors when deeming an applicant 'unqualified' for fellowship training. Prior to requesting LoR, applicants should prioritize personal responsibility and make every effort to display professionalism when building relationships with orthopedic trauma faculty.

Stratified Perioperative Management to Reduce Complications and Improve Outcomes in Below-Knee Amputations

Poster 110

Ashwin R. Garlapaty / Columbia, MO

Co-Authors:

Ashwin R. Garlapaty, B.S. / Columbia, MO

Caleb Bischoff, B.S. / Columbia, MO

Joshua Scheiderer, B.S. / Columbia, MO

Emily Leary, Ph.D. / Columbia, MO

Brett Crist, M.D. / Columbia, MO

OBJECTIVE: This study investigates risk factors for unplanned reoperations, readmissions, and complications following below-knee amputation (BKA). It identifies predictors impacting patient outcomes and healthcare systems, seeking insights for better patient care and resource use.

METHODS: Using Current Procedural Terminology codes, adult patients who underwent BKA from December 2005 to December 2022 at a single Level 1 Academic Trauma Center were identified and retrospectively reviewed. Demographics, comorbidities, operative details, postoperative complications, readmissions, unplanned reoperations, and mortality were recorded. Multivariate logistic regression modeling was performed on the collected data to assess for independent predictors of complications, readmission, unplanned reoperation, and mortality. Statistical significance was set at $p < 0.05$. Mortality rates were obtained at 30 days, 6 months, and 1 year.

RESULTS: 376 BKAs were identified. The average age was 51.43 years old, and the average BMI was 32.67. BKA-related complications (infection, dehiscence, limb pain) were experienced by 28.19% (106/376). 25.80% (97/376) underwent unplanned reoperations, with the majority being debridement/secondary closure (67/97, 69.07%) and BKA revision (23/97, 23.71%). Mortality rates at 30 days, 6 months, and 1 year were 2.65% (10/376), 6.12% (23/376), and 17.02% (64/376). Controlling for confounders, bleeding disorders significantly increase BKA-related complication risk (OR 6.80; $p=0.0189$). Congestive heart failure diagnosis (OR 2.40; $p=0.0171$) and history of alcohol/drug abuse (OR 2.63; $p=0.0089$) were significant predictors of increased readmission risk.

Gram-negative bacterial infections emerged as a significant predictor of reoperation (OR 6.78; $p=0.0102$). Elevated mortality risk was significantly associated with ASA 4-5 (OR 7.31; $p=0.0043$) and diagnosis of cancer (OR 3.23; $p=0.0180$).

CONCLUSION: BKAs have a higher risk for complication, reoperation, and mortality than currently reported in studies that use a 30-day postoperative period. Significant independent risk factors, such as bleeding disorders, congestive heart failure, and substance abuse, contribute to postoperative complications. Gram-negative bacterial infections, advanced ASA class, and cancer are critical predictors of mortality. These findings accentuate the necessity for preemptive medical intervention and vigilant postoperative monitoring individualized to patient-specific risk factors. Optimized perioperative care for at-risk patients can substantially mitigate complications, enhance patient prognosis, and alleviate long-term impacts on healthcare resources.

Presentation and Treatment Differences Between Upper Extremity and Lower Extremity Fracture-Related Infections

Poster 111

Ashley Nicole Kimbel / Birmingham, AL

Co-Authors:

Nigel O. Blackwood, M.D. / Birmingham, AL

Ashley Nicole Kimbel / Birmingham, AL

Doriann Alcaide, M.D. / Birmingham, AL

Matthew Yeager, B.S. / Birmingham, AL

Clay Spitler, M.D. / Birmingham, AL

Joseph Johnson / Birmingham, AL

Hassan Ghomrawi / Birmingham, AL

INTRODUCTION: Postoperative infections are a leading cause of morbidity following fracture repair. Limited data exists looking at treatment protocols and outcomes of these complications, and further investigation may lead to more specific and effective treatments. The purpose of this retrospective study was to analyze presentation, treatment and outcomes of surgical treatment in upper versus lower extremity fracture related infections (FRI).

METHODS: We identified adults with FRIs who were treated at a single level-I trauma center from 2013 to 2020. Data were retrieved from an institutional database on musculoskeletal infections maintained jointly by the infectious disease division and the orthopedic surgery department. We included patients who had fractures of the clavicle, humerus, olecranon, radius, ulna, pelvis, femur, tibia, or calcaneus with a FRI and were operatively managed and had follow-up for at least 180 days. We excluded patients with infected chronic osteomyelitis from a non-fracture related pathology. Presentation characteristics (demographics, comorbidities, injury characteristics, perioperative data, and microbiology) were recorded. Treatment (number of operations and debridements) and outcomes (complications) were compared between upper and lower extremity fractures with and without implant removal.

RESULTS: One hundred fifty-five patients with FRI were included. Forty-six patients had upper extremity FRI, and 109 patients had lower extremity FRI. Upper extremity FRI were more likely to be infected with *C. acnes* (13.2% vs. 0.4%, $P < .001$) compared to lower extremity FRI. Incomplete bone healing at the time of FRI diagnosis (76.1% vs. 62.9%, $P = .048$) and implant failure (54.4% vs. 37.5%, $P = .013$) were more common in upper extremity FRI as compared to lower extremity FRI. Patients with upper extremity FRI retained a similar proportion of their initial fixation implants to lower extremity FRI patients (three (6.5%) vs. 13 (11.9%); $p = .312$). The number of reoperations until FRI resolution was lower in upper extremity FRI compared to lower extremity FRI (2.46 vs. 3.25, $p = .01$). The total number of reoperations (4.92 vs. 5.33, $P = .398$), debridements (2.12 vs 2.66, $P = .237$), and unplanned reoperations (.02 vs .08, $P = .052$) were not significantly different between groups. Treatment with one debridement, antibiotics, and implant retention successfully eradicated FRI in two of three (66%) upper extremity FRI and three of thirteen (23%, $P = .162$) lower extremity FRI, when that was the preoperative treatment strategy. Debridement, antibiotics, and implant exchange was required in 38 of 46 (82%) upper extremity FRI and 75 of 109 (68%, $P = .077$) lower extremity FRI. Debridement, antibiotics, and implant removal without exchange was performed in 5 of 46 (10%) upper extremity FRI and 21 of 109 (19%, $P = .201$) lower extremity FRI.

CONCLUSION: This study described the presentation and surgical treatment of upper versus lower extremity FRI. Upper extremity FRI seem to have greater complications related to fracture healing and hardware, while treatment therapies remain similar. Given this, further studies should investigate best practices for treating upper and lower extremity FRIs as they seem to act as clinically distinct entities.

LEVEL OF EVIDENCE: III

High Failure Rate of Nonoperative Management of Adult Midshaft Humerus Fractures

Poster 112

Austen L. Thompson, M.D., Ph.D. / Rochester, MN

Co-Authors:

Bailey R. MacInnis, M.D. / Rochester, MN

Ankur Khanna, B.S. / Rochester, MN

Austen L. Thompson, M.D., Ph.D. / Rochester, MN

Jennifer Tangtiphaiboonana, M.D. / Rochester, MN

Krystin A. Hidden, M.D. / Rochester, MN

Brandon J. Yuan, M.D. / Rochester, MN

Jonathan D. Barlow, M.D. / Rochester, MN

INTRODUCTION: Nonoperative management has remained the gold standard for initial treatment of many humerus fractures, including fractures of the midshaft. Despite this, there exist few studies to evaluate the outcomes of and predictors of success for nonoperative management of midshaft humerus fractures.

METHODS: A geographic medical records-linkage system was reviewed to identify a population-based cohort of 63 patients in Olmstead County, MN who sustained midshaft humerus fractures over a 20-year period from 2003 to 2022. Data were collected on patient demographics, fracture characteristics, time to union, and time to secondary management with surgery. Univariate analysis was performed to identify baseline differences, and multivariate analysis was employed to assess significant differences in the cohorts' demographic, comorbidities, and fracture characteristics.

RESULTS: A total of 124 adult patients were treated nonoperatively for midshaft humerus fractures during the 20-year period with an average age of 59.0 ± 20.5 years. Thirty-seven patients (29.8%) failed nonoperative management: 19 patients for nonunion, 17 for pending nonunion, and 1 for malrotation. Of these 37 patients, 30 (81.0%) underwent ORIF at an average of 3.4 ± 3.7 months after the date of their fracture.

Patients successfully treated nonoperatively and those requiring late operation were statistically similar in age, sex, BMI, comorbid conditions, and injury mechanism. However, patients had significantly greater success with nonoperative management if they had a transverse fracture pattern (adjusted odds ratio [aOR]=7.20, $p=0.02$), an oblique fracture pattern (aOR=7.16, $p=0.02$), or an AO/OTA class 12B fracture (aOR=7.07, $p<0.01$).

CONCLUSIONS: Prior studies have demonstrated nonunion rates of 0.2% to 23% in all humeral shaft fractures treated nonoperatively. The present study suggests that nonunion rate for midshaft humeral fractures is higher (29.8%) than the previously reported nonunion rates for all humeral shaft fractures. In addition, certain fracture patterns more so than patient specific characteristics, appear to be important predictors of success with nonoperative management.

ChatGPT Answers are Comparable to Reputable Online Sources for Common Patient Questions in Orthopedic Trauma

Poster 113

Muhammed Abbas, M.D. / Detroit, MI

Co-Authors:

Hamza Raja, B.S. / Detroit, MI

Muhammad Abbas, M.D. / Detroit, MI

Hamza Kanchwala, B.S. / Detroit, MI

Idris Nagarwala, B.S. / Detroit, MI

S. Trent Guthrie, M.D. / Detroit, MI

Joseph Hoegler, M.D. / Detroit, MI

Lindsay Maier, M.D. / Detroit, MI

William Hakeos, M.D. / Detroit, MI

OBJECTIVE: Patients have been utilizing the internet as a source of medical and surgical information at an increasing rate¹. Prior literature has cautioned on the quality and readability of medical information encountered online. Recent advancements in artificial intelligence and large language models such as ChatGPT (version 3.5, OpenAI), caused patients to utilize this software for medical information. The purpose of this study was to investigate the quality and readability of ChatGPT responses to common patient questions in orthopedic trauma compared to current reputable online information.

METHODS: A series of 20 common patient questions and responses (control) were taken from the Orthopaedic Trauma Association (OTA) patient frequently asked questions (FAQs) website. These questions were asked to ChatGPT on November 13, 2023, and responses were recorded (AI). The original questions, the blinded control responses, and the blinded ChatGPT responses were provided to 4 fellowship-trained orthopedic trauma surgeons to grade for 3 components: preference, medical accuracy, and appropriateness. Accuracy and appropriateness were graded using a Likert scale. Additionally, each response (AI and control) was graded for readability using the Flesch-Kincaid Grade Level.

RESULTS: Surgeons identified no significant preference between AI and control responses ($p > 0.05$). ChatGPT responses had a significantly greater mean accuracy than control responses (18.0 ± 2.0 vs. 15.6 ± 2.58 , respectively; $p < 0.05$). Additionally, ChatGPT more appropriately answered questions compared to control responses (17.6 ± 2.1 vs. 15.2 ± 3.8 , respectively; $p < 0.05$). ChatGPT provided answers at a higher reading level (AI: 13.9 years \pm 2.2, control: 8.3 years \pm 1.4; $p < 0.05$) and with significantly more words than the control response (AI: 179.15 words \pm 66.4, control: 119.6 words \pm 63; $p < 0.05$).

CONCLUSION: ChatGPT is a suitable option for patients looking online to learn answers to common questions in orthopedic trauma. Responses by ChatGPT were found to be accurate and appropriate when compared to a reputable control, offering a valuable alternative to information available online. ChatGPT responses were written at a significantly higher reading level. As with online searches, patients should express caution with information presented and defer to surgeon counseling when making treatment decisions.

Comparison of Postoperative Complications and Reoperations of Humeral Shaft Fractures Treated with Intramedullary Nail vs. Plate Fixation

Poster 114

Bhargavi Maheshwer, M.D. / Cleveland, OH

Co-Authors:

Andrew J. Moyal, M.D. / Cleveland, OH

Bhargavi Maheshwer, M.D. / Cleveland, OH

Jeremy M. Adelstein, M.D. / Cleveland, OH

Robert J. Burkhart, M.D. / Cleveland, OH

Raymond W. Liu, M.D. / Cleveland, OH

Joshua K. Napora, M.D. / Cleveland, OH

INTRODUCTION: Surgical management of humeral shaft fracture is complex with growing use of intramedullary nail (IMN) fixation compared to the traditional plate fixation. The purpose of this study was to compare postoperative complications and reoperation rates between humeral shaft fractures treated with plate fixation vs IMN. We hypothesized that plate fixation would be associated with increased risk of re-operation and wound complications compared to IMN.

METHODS: Patients undergoing fixation of humeral shaft fractures were identified across 113 million patients within the United States, utilizing the TriNetX database using Current Procedural Terminology (CPT) and International Classification of Disease (ICD-10) codes. Two cohorts were created based on fixation via plate or IMN. Cohorts were matched to 10 demographic and comorbidity variables. Outcomes included emergency department (ED) utilization, intensive care unit (ICU) admissions, readmissions, transfusions, surgical site infections (SSI), reoperations, radial nerve palsy and venous thromboembolism (VTE) within 30-days, 90-days, 1-year, and 2-years postoperatively. Significance was set at $p < 0.05$.

RESULTS: Following propensity matching, 2,961 patients met criteria for IMN and ORIF cohorts. Acutely, ORIF had lower rates of ED visits ($p < .01$, within 90-days) and VTE ($p = .048$ within 30-days, and $p = .04$ within 90-days), but higher rates of radial nerve palsy ($p < .01$, day of surgery) and wound dehiscence ($p = .048$ within 30-days, $p = .04$ within 90-days). ORIF had lower rates of non-infectious hardware complications between 90-days and 1-year post-op ($p = .02$), but higher rates of radial-nerve palsy ($p < .01$ 90-days through 1-year, $p = .048$ 1-year through 2-years). The total number of reoperations did not differ at 2-year follow up.

CONCLUSION: This large, matched cohort analysis demonstrates higher rates of radial nerve palsy and wound dehiscence, but lower rates of ED visits and VTE in the IMN cohort in the acute postoperative period. Total rates of reoperation did not differ long-term, although plate fixation continued to exhibit higher rates of RNP, likely due to future reoperations. Counseling patients and educating them of the risk of radial nerve deficits and future reoperation with plate fixation are imperative for the operative surgeon during the preoperative setting. Future studies with comparative clinical outcomes are needed to further compare both fixation techniques and to further assess rates and impact of re-operations within 2-years follow-up.

The Impact of Diabetic Neuropathy on Trimalleolar Fracture Outcomes

Poster 115

Blaire Peterson, B.S. / San Antonio, TX

Co-Authors:

Blaire Peterson, B.S. / San Antonio, TX

Travis Kotzur, B.S. / San Antonio, TX

Aaron Singh, BA / San Antonio, TX

Stephanie Jones, M.D. / San Antonio, TX

Travis Bullock, M.D. / San Antonio, TX

Case Martin, M.D. / San Antonio, TX

INTRODUCTION: Diabetic neuropathy is prevalent amongst orthopedic patients, yet there isn't a clear consensus in the literature about if neuropathy itself affects outcomes, or if negative outcomes associated with neuropathy are attributable to other manifestations of diabetes. The aim of this study was to investigate the impact of diabetic neuropathy on trimalleolar fracture outcomes when compared with both non-diabetic and diabetic patients without neuropathy.

METHODS: This retrospective cohort study utilized the National Readmissions Database from 2016 to 2020. Patients undergoing surgery for trimalleolar fractures were identified using ICD-10 codes, including those with diabetes and diabetic neuropathy. Regression models were employed to compare postoperative outcomes between non-diabetic to neuropathic patients and diabetic to neuropathic patients. Gamma regression assessed total charges and length of stay (LOS). Demographics and comorbidities, measured via the Elixhauser comorbidity index, were controlled for in our analysis.

RESULTS: This study included 78,189 trimalleolar fracture patients; 59,783 (76.5%) patients without diabetes, 13,486 (17.2%) patients with diabetes but without diabetic neuropathy, and 4,920 (6.2%) patients with diabetic neuropathy. When compared to patients without diabetes, patients with diabetic neuropathy had increased odds of medical (Odds ratio (OR) 1.86; $p < 0.001$) and surgical (OR 2.16; $p < 0.001$) complications, including osteomyelitis (OR 3.63; $p < 0.001$) and malunion (OR 4.12; $p < 0.001$). When compared to patients with diabetes, but without neuropathy, patients with diabetic neuropathy again had significantly higher odds of osteomyelitis (OR 2.11; $p < 0.001$) and malunion (OR 2.51; $p < 0.001$).

DISCUSSION: This study found that patients with diabetic neuropathy had higher odds of postoperative complications, such as osteomyelitis and malunion, following surgical fixation of trimalleolar fractures than non-diabetic patients and diabetic patients without neuropathy. Orthopedic surgeons should be aware of the added surgical risk associated with diabetic neuropathy, outside of the impact of diabetes alone.

Address-Derived Social Determinants of Health Metrics are a Predictor for No-Show in Orthopedic Trauma Clinic

Poster 116

Michelle Hertzberg, M.D. / Detroit, MI

Co-Authors:

Michelle Hertzberg, M.D. / Detroit, MI

Hamza M Raja, B.S. / Detroit, MI

Alexa Bernard, B.S. / Detroit, MI

Christian Freitag, B.S. / Detroit, MI

Husain Rasheed, B.S. / Detroit, MI

Eric Jiang, M.D. / Detroit, MI

Lindsay Maier, M.D. / Detroit, MI

Joseph Hoegler, M.D. / Detroit, MI

S. Trent Guthrie, M.D. / Detroit, MI

William Hakeos, M.D. / Detroit, MI

OBJECTIVE: Non-adherence with postoperative follow-up visits, “no-shows”, have been associated with poorer outcomes and increased costs to the patient and provider. Identifying patients at risk for no-show is the first step in minimizing these risks. This study investigates the role of a patient’s address and their correlation with no-show to postoperative clinic visits in orthopedic trauma.

METHODS: A retrospective case control study at a level I trauma center analyzed patients that failed to present to follow-up clinic within 1 year of surgery over a 2-year period. Patients who attended all postoperative clinic visits within 1 year of surgery over the same period were identified as controls. Patient address and publicly available 2022 United States Census data were correlated with no-show to postoperative clinic visits in orthopedic trauma. Logistic regression analyses were used with statistical significance maintained at $p < 0.05$.

RESULTS: There were 449 no-show patients and 369 controls identified. Address-derived US Census metrics were significant predictors to no-show status in orthopedic trauma clinic. Median census tract income was a significant negative predictor to no-show status, where for every \$10,000 increase in median income, the odds ratio of no-show was 0.88 (no-show \$37,300 [29,800-59,500]; control \$57,500 [35,900-92,300]; $p < 0.05$). Additionally, the percent of houses in a census tract without vehicle access, a US Census metric, was a predictor of no-show (no-show: 17% [8-24]; control: 9% [3-17]; OR: 1.41; $p < 0.05$). Median distance to clinic was a negative predictor to no-show status (no-show: 7.8 miles [4.6-14.2]; control: 14.3 miles [7.8-24.4]; OR: 0.94; $p < 0.05$).

CONCLUSION: A patient’s address can be utilized to identify patients at risk for poor postoperative follow-up. Address-derived census data like median tract income and lack of vehicle access are positive predictors of no-show to postoperative trauma clinic. Patients living further away from clinic were not more likely to no-show.

Management of Ballistic Metacarpal Fractures: A Retrospective Cohort Study

Poster 117

Jordan C. Serotte, M.D. / Chicago, IL

Co-Authors:

Jordan C. Serotte, M.D. / Chicago, IL

Hussein Abdul-Rassoul, M.D. / Chicago, IL

Jeffrey Stepan, M.D. / Chicago, IL

Jennifer Wolf, M.D., Ph.D. / Chicago, IL

Jason A. Strelzow, M.D. / St. Louis, MO

OBJECTIVE: Ballistic metacarpal fractures are becoming increasingly common due to both the rising prevalence of gun violence. Treatment options become more difficult when dealing with extensively comminuted metacarpal fractures with soft tissue destruction frequently seen in ballistic trauma. This study evaluated treatment options for ballistic metacarpal fractures with the hopes of adding to paucity of literature regarding this challenging clinical problem. Furthermore, we reviewed the complications associated with these fractures such as infection, union rates, and postoperative morbidity. We hypothesize that outcomes are poor following treatment of civilian firearm-related metacarpal fractures.

METHODS: An internal trauma database at our Level 1 urban trauma center was used to find all patients with ballistic metacarpal fractures over a 3-year period. Charts were reviewed for initial and associated fractures, location of the metacarpal fracture, and physical exam characteristics at initial presentation as well as surgical treatments and postoperative complications and outcomes.

RESULTS: 67 patients sustained a total of 91 firearm-related metacarpal fractures. Of these, 14 patients were lost to follow-up. 77 metacarpal fractures were analyzed. 59 underwent surgical treatment (76.6%): 37 underwent percutaneous pinning (62.7%), 1 underwent MCPJ fusion (1.7%), 5 underwent external fixation (8.5%), 8 underwent open reduction internal fixation (13.6%), 5 underwent intramedullary screws (8.5%), and 3 underwent temporary dorsal bridge plating (5%). Among the 59 metacarpal fractures that underwent surgical treatment, 10 (17%) went on to nonunion, 2 (3.4%) went on to delayed union, 5 (8.5%) went on to malunion, 5 (8.5%) had an extensor lag, and 2 (3.4%) were documented to have a deep infection. Globally, the most common complication was stiffness, with patients reporting stiffness in 45 (76%) operative metacarpals. Interestingly, 47% of patients reported decreased sensation at the time of injury; of these patients, 64% had return of normal subjective sensation at final follow-up without intervention.

CONCLUSIONS: In our series, the majority of patients (76.6%) underwent operative intervention (most commonly percutaneous pinning [62.7%]) after metacarpal fracture due to gunshot injury. Despite surgical intervention, a majority of patients (76%) experienced complications, including joint stiffness, nonunion, delayed union, and malunion. We had a nonunion rate of 17%, which is higher than previously reported in literature. 7 of 8 of the nonunion patients underwent pinning. Of note, all of the fractures that had nonunion had extensive bone loss, making union less predictable. Stiffness was the main complaint in this cohort (76%). Overall, we report a low infection rate (3.4%). Nearly 50% of patients initially presented with decreased sensation in the affected digit; the majority of these patients (64%) reported normal subjective sensation by final follow-up without intervention.

Complications Associated with Placement of Traction Pins with Unsterile Drills

Poster 118

Joshua A. Ungar, M.D. / Saint Louis, MO

Co-Authors:

Joshua A. Ungar, M.D. / St. Louis, MO

Sahand Fallahi, B.S. / St. Louis, MO

James R. Roe, B.S. / St. Louis, MO

Thomas J. Revak, D.O. / St. Louis, MO

OBJECTIVE: Traction pins are commonly used for temporary stabilization of pelvic ring injuries as well as acetabular and femur fractures. Typically these procedures are performed in the trauma bay/emergency room within a sterile field. At our institution, unsterile drills have been used for ease of access and not to burden central sterilization. Concerns have arisen with this practice as it pertains to risk of infection after traction pin placement. The aim of this study was to determine incidence of complications, namely deep infections, and need for surgical debridement after placement of traction pins using unsterile drills. Our hypothesis was that the incidence of deep infections will be low despite placement with unsterile drills.

METHODS: This study retrospectively identified patients from January 2016-January 2023 at a level 1 trauma center who sustained injuries that required temporary stabilization using traction pins with unsterile drills. Demographic data was recorded along with pin location and duration of time pin was in place. Charts were reviewed for documentation of superficial infection treatment or the need for surgical debridement for deep infection at pin site.

RESULTS: 201 patients met inclusion criteria with 119 distal femoral traction pins and 82 proximal tibial traction pins placed. Pins were placed for management of 87 femoral shaft/subtrochanteric fractures and 114 acetabular fractures/pelvic ring injuries. Traction pins were placed for an average of 2 days prior to removal and a median of 1 day prior to removal. Patients included were followed up outpatient for an average of 33 weeks. No secondary procedures were performed for surgical debridement at the previous pin site. There were no superficial pin site infections that occurred.

CONCLUSION: This study suggests that lower extremity traction pins can be safely placed with unsterile drills within a sterile field using a sterile pin with low risk of deep or superficial infection.

Evaluating the Impact of Upright Clavicle Radiographs on Decisions for Operative Management: A Retrospective Study

Poster 119

Joshua A. Ungar, M.D. / Saint Louis, MO

Co-Authors:

Joshua A. Ungar, M.D. / St. Louis, MO

Sahand Fallahi, B.S. / St. Louis, MO

Andrew J. Schlager, B.S. / St. Louis, MO

Beau D Chandler, M.S. / St. Louis, MO

Thomas J. Revak, D.O. / St. Louis, MO

OBJECTIVE: Clavicle fractures are commonly identified following trauma and typically first on the supine chest radiograph (SCR) during the primary survey. Upright clavicle radiographs (UCR) are commonly obtained to evaluate further vertical displacement or instability for necessity of surgery. Additional radiographs lead to increased radiation exposure, resource consumption, and patient discomfort. Our goal was to evaluate the frequency by which inpatient UCR change clavicle fracture management and retrospectively compare the increase in vertical displacement between SCR and UCR for patients managed conservatively vs. with open reduction internal fixation (ORIF). We hypothesized that decisions for ORIF is rarely impacted by review of UCR.

METHODS: A retrospective review was performed on patients presenting to a level 1 trauma center July 2021-November 2023 who sustained a clavicle fracture. Patients were included if their fracture was initially discovered on SCR with subsequent UCR. We analyzed the incidence of decision for ORIF based on the UCR and retrospectively compared the increase in vertical displacement between SCR and UCR for those who underwent ORIF vs. conservative management. Surgical indications were determined by review of electronic medical records. Student's T-test was used to compare increases in vertical displacement between patient's managed conservatively vs. with ORIF. A P value of $<.05$ was used to determine statistical significance.

RESULTS: There were 160 patients included. Eight (5%) underwent inpatient ORIF and 8 (5%) underwent delayed outpatient ORIF. All patients who underwent outpatient ORIF had persistent pain as the primary indication. Amongst all patients managed with inpatient ORIF, 6 (75%) had indications other than changes in vertical displacement, including scapulothoracic dissociation, impending open fracture, and polytrauma requiring upper extremities for mobility. Of all patients included, only 2 (1.3%) underwent ORIF indicated by changes seen in UCR. Average increase in vertical displacement for patients managed conservatively and with ORIF was 4.4mm and 5.6mm, respectively. There was no statistically significant difference for increase in vertical displacement from SCR to UCR between patients managed conservatively ($M=4.4$, $SD=6.5$) vs. with ORIF ($M=5.6$, $SD=4.4$), $t(158) = .73$, $p = .47$.

CONCLUSIONS: UCR rarely lead to decisions for ORIF. Between patients who underwent conservative management vs. ORIF, the change in vertical displacement was not statistically significant. This study supports that it may be reasonable to consider more judicious use of UCR during evaluation of clavicle fractures