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2024 PODIUM & POSTER ABSTRACTS

2024 MAOA ANNUAL MEETING

THURSDAY, APRIL 11, 2024

First Plenary Session

Breakout #1	HIP & KNEE ARTHROPLASTY
Breakout #2	SHOULDER & ELBOW
Breakout #3	SPORTS
Breakout #4	TRAUMA
Breakout #5	SPINE

POSTERS 1 - 80

DISCLOSURE INFORMATION

FRIDAY, APRIL 12, 2024

Second Plenary Session

Breakout Session #6	HAND & WRIST
Breakout Session #7	HIP & KNEE ARTHROPLASTY
Breakout Session #8	SHOULDER & ELBOW
Breakout Session #9	FOOT & ANKLE/MIXED TOPICS
Breakout Session #10	ONCOLOGY

SATURDAY, APRIL 13, 2024

Breakout Session #11	HIP & KNEE ARTHROPLASTY
Breakout Session #12	SPORTS
Breakout Session #13	TRAUMA
Breakout Session #14	SPINE/PEDIATRICS
Breakout Session #15	HIP & KNEE ARTHROPLASTY

April 10 - 14, 2024
Hyatt Regency Coconut Point Resort
Bonita Springs, Florida

Intraoperative Patellar Assessment and Postoperative Anterior Knee Pain Following Total Knee Arthroplasty

Paper 001

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OBJECTIVE: The decision whether to retain or resurface the patella in total knee arthroplasty (TKA) is still widely debated. The purpose of current study was to determine whether a methodological, qualitative assessment of the amount and location of exposed subchondral bone on the patellar articular surface was associated with the development of postoperative anterior knee pain.

METHODS: Consecutive patients undergoing TKA without patellar resurfacing between January 2011 and January 2016 were prospectively identified. Intraoperative images were taken of the patellar articular surface. Next, the degree and location of chondromalacia was graded based on the qualitative assessments of visible exposed subchondral bone. Anterior knee pain was assessed using the vetted Feller Patellar Score survey. Spearman's rank-order correlation was used to determine the correlation between severity of chondromalacia and anterior knee pain development.

RESULTS: A total of 96 patients (101 patellas) were included in the final analysis. The majority of patients were female (N=72; 71.3%) with an average age of 67.6 (SD: +8.3) and follow-up of 2.8 (SD: +1.4) years, respectively. The correlation between the image grades (per quadrant and combined average) and Feller patellar scores, as well as image grades and patient reported anterior knee pain are summarized. There was no correlation between intraoperative gross assessment of chondromalacia severity or location and patient reported and anterior knee pain development (Spearman's rho overall surface average= -0.097, p-value>0.05 for all).

CONCLUSION: Degree and location of exposed subchondral bone on the articular surface of the patella does not correlate with anterior knee pain in patients undergoing TKA without patellar resurfacing. Therefore, the severity of intraoperative chondromalacia may be an inappropriate indicator for considering whether or not to resurface the patella.

Extended Postoperative Aral Tranexamic Acid in Total Knee Arthroplasty: A Randomized Controlled Trial
Paper 002

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INTRODUCTION: Perioperative tranexamic acid (TXA) use with total knee arthroplasty (TKA) is widely accepted today. Recently, few international groups have published on the safety and outcomes of extending TXA use in the postoperative period. Through a double-blinded, randomized control trial, we aimed to investigate the safety and clinical efficacy of extended postoperative oral TXA use in TKA performed in an American, free-standing ambulatory surgery center (ASC).

METHODS: Based on a power analysis, 40 patients undergoing primary TKA were randomized into two groups: extended oral TXA vs. placebo. Both groups received a standard 1g intravenous TXA dose prior to incision and at the time of closure. The extended TXA group received an additional 1.95g oral TXA dose following ambulation the day of surgery, plus postoperative day 1,2, and 3. Patients with a history of venous thromboembolism (VTE) or cancer were excluded. All patients received twice daily 81mg aspirin for VTE prophylaxis. Patients were followed on post-op day 3, 2 weeks, and 6 weeks. Paired t-tests determined statistical significance.

RESULTS: Extended TXA patients showed significantly increased knee flexion at 6 weeks (116.05 vs. 106.5, p=.0308), improved VAS at two (2.5 vs. 3.85, p=0.039) and six weeks (1.35 vs. 2.8, p=0.011), and superior KOOS JR at two (66.87 vs. 60.63, p=0.03) and six weeks (73.33 vs. 62.47, p=0.0019) compared to placebo patients. No significant differences were found for change in hemoglobin levels or terminal knee extension at any time points. No adverse events were noted in either cohort.

CONCLUSION: When compared to placebo, the extended use of oral TXA in the postoperative period may safely result in early improved motion, pain, and functional scores. Further investigation on long-term outcomes and the duration/dosing of postoperative TXA use is warranted.

Diaphyseal Impaction Grafting and Metaphyseal Cones in Revisions: Expansion and Extension of Index Series

Paper 003

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BACKGROUND: Metaphyseal cones with cemented stems are successful in most revision total knee arthroplasties (TKAs). However, in re-revision TKAs, a sclerotic canal compromises cemented stem fixation and cone ingrowth. We previously reported our novel technique of diaphyseal impaction grafting with a cemented stem combined with a metaphyseal cone for these cases. The purpose of this study was to assess results of this technique in a larger cohort with longer follow-up.

METHODS: A metaphyseal cone combined with diaphyseal impaction grafting and a cemented stem was utilized in 88 revision TKAs at our institution, including 35 from our prior study. Mean age at time of revision was 67 years and 67% of patients were male. Patients had a mean of four prior arthroplasty procedures. The two most common reasons for revision were aseptic loosening (78%) and two-stage reimplantation for PJI (19%). Mean follow-up was four years.

RESULTS: At most recent follow-up, no cone/impaction grafting constructs required revision for aseptic loosening. Five-year survivorships free from any revision of the cone/impaction grafting construct and free from any reoperation were 95% and 73%, respectively. Twenty-five knees (28%) underwent reoperation with the most common indications being PJI (7 of 13 had prior PJI), periprosthetic fracture (2 of 5 involving cone/impaction grafting construct), traumatic wound dehiscence (2), and aseptic loosening of the component not treated with cone/impaction grafting (2). Radiographic review revealed osteointegration of all cones and all impacted bone graft appeared incorporated. One patient had radiographic evidence of tibial component loosening despite a well-fixed cone but was asymptomatic and un-revised at nine years.

CONCLUSION: When presented with a sclerotic diaphyseal canal and concomitant metaphyseal bone loss, our technique of combining diaphyseal impaction grafting with a metaphyseal cone proved extremely durable in this larger series of patients with no constructs requiring re-revision for aseptic loosening.

Are Culture-Negative Two-Stage Exchange Arthroplasties Associated with Inferior Treatment Success?
Paper 004

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OBJECTIVE: Periprosthetic joint infection (PJI) remains a devastating complication following total joint arthroplasty (TJA). Historically, culture-negative infections have been particularly challenging. This study evaluated the success of treating culture-negative infection following two-stage treatment for PJI in TJA.

METHODS: 111 two-stage exchange arthroplasties (49 hips, 62 knees) for PJI were retrospectively reviewed. Culture-positive infections (71%) were treated with 6-weeks of targeted intravenous antibiotics, and culture-negative infections (29%) were treated with 6-weeks of broad-spectrum dual-antibiotic therapy of Cefepime and Vancomycin. Treatment success was defined by the Delphi criteria at latest follow-up. Traditional statistics and machine learning algorithms were used to evaluate interactions between potential predictors using relative importance (RI) scores.

RESULTS: The cohort was 51% women with a mean age and BMI of 67 years (range, 47-84) and 32 kg/m^2 (range, 17-60). McPherson staging classification was 78% infection type III, 72% systemic host grade B or C, and 84% local extremity grade 2 or 3. Overall treatment success was 85% at mean of 4.0 years. For culture-positive infections, hips achieved greater treatment success (91 vs. 80%); however, knees achieved greater treatment success in culture-negative infections (90 vs. 79%) without statistical significance ($p \geq 0.210$). Culture result, by itself, was not associated with treatment success ($p=1.000$), but was a top predictor (RI=100) with multiple interactive terms of McPherson infection type (RI=83), local extremity grade (RI=76), and systemic host grade (RI=21) with success differing by 24-37% between groups with numbers available.

CONCLUSION: Study results show that infection eradication after two-stage treatment for PJI may be different for hips and knees based on culture results. Culture positivity and patient-host factors were interactively associated with treatment success, which supports the complexities of treating PJI after TJA.

300 Periprosthetic Tibia Fractures: Classification and Outcomes from a Single Center
Paper 005

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BACKGROUND: Periprosthetic tibia fractures about a total knee arthroplasty (TKA) remain challenging to manage with little published information for guidance. The purpose of this study was to review the types, management techniques, and outcomes of periprosthetic tibia fractures in the largest series to date.

METHODS: We identified 300 periprosthetic tibia fractures (285 patients) about a TKA (43% primaries, 57% revisions) sustained between 1996 and 2020. Fractures were classified (according to Felix et. al.) as type I (tibial plateau), II (adjacent to stem), III (distal to stem), or IV (tibial tubercle) with subtypes A (well-fixed baseplate), B (loose baseplate), and C (intraoperative fracture). Mean age at fracture was 67 years and 64% were female. Mean follow-up was 4 years.

RESULTS: There were 53% type I, 24% type II, 16% type III, and 8% type IV fractures. 46% occurred intraoperatively and 54% postoperatively (61% subtype A, 39% subtype B). Among intraoperative fractures, the 2-year survivorship free of tibial component revision was highest in type I (100%) and lowest in type IV (67%; $p<0.001$). For postoperative fractures, the 2-year survivorship free of any reoperation and tibial component revision were 29% and 51%, respectively. Type I postoperative fractures had the lowest 2-year survivorship free of tibial component revision (10%), whereas type III (88%) had the highest ($p<0.001$). Those treated with ORIF (32%) vs. revision (68%) had a significantly lower 2-year survivorship free of tibial component revision (85% vs. 95%, respectively; $p=0.02$).

CONCLUSION: Type I intraoperative fractures of the tibial plateau had the highest 2-year survivorship free of tibial component revision (100%), whereas type IV fractures of the tubercle had the lowest (67%). For postoperative fractures, type I fractures of the plateau had the lowest survivorship free of tibial component revision (10%), whereas type III fractures distal to the stem had the highest (88%).

Uncemented Total Knee Arthroplasty is on the Rise. A Retrospective Review from the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI)

Paper 006

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OBJECTIVE: Cemented total knee arthroplasty (TKA) is the gold standard treatment for osteoarthritis, but uncemented TKA offers benefits like improved osseointegration and reduced complications from cement debris. This study aimed to investigate (1) if there has been a rise in uncemented TKA and (2) if there are differences in early complications between cemented and uncemented TKA.

METHODS: We retrospectively reviewed data from the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) database of primary TKA patients from 2017 to 2021 at a single health system (six hospitals). Uncemented TKA (uncemented fixation for femur and tibia) patients were analyzed for demographics and 90-day postoperative events. Hybrid or reverse hybrid fixation (cemented and uncemented components mixed) were collected for fixation rate trends, but excluded from analysis.

RESULTS: 18,749 primary TKAs were identified. Fixation method: 89.7% cemented, 9.7% uncemented, 0.5% hybrid, 0.2% reverse hybrid. Mean age was 67, 83.7% were Caucasian, and 64.2% were female, with a mean BMI of 33 kg/m^2. Uncemented TKA patients were more likely younger, male, heavier, current smokers, and diabetics than cemented TKA patients ($p<0.0001$, $p=0.03$). Uncemented patients had a shorter length of stay ($p=<0.0001$) and were on fewer preoperative medications: anticoagulants ($p=0.0059$), antiplatelets ($p=<0.0001$), opioids ($p=0.0091$), steroids ($p=0.0039$). The rate of uncemented TKA increased yearly, from 3.3% (n=145) in 2017 to 17.1% (n=512) in 2021. Cemented TKA rate fell from 96.2% (n=4,252) in 2017 to 81.9% (n=2,450) in 2021. Readmission rate was higher in cemented TKAs (n=671, 4%) vs. uncemented TKAs (n=48, 2.6%) ($p=0.0048$) during the 90-day post-op period. Though underpowered to show equivalence, no other statistically significant differences in outcomes existed.

CONCLUSION: The rate of uncemented TKA increased steadily from 2017 to 2021. Uncemented TKA was associated with lower readmission rates and did not appear to have a higher rate of 90-day complications compared to cemented TKAs.

Risk Factors for Failure of Same-Day Discharge Total Knee Arthroplasty
Paper 007

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OBJECTIVE: As cost containment efforts in orthopedic surgery increase, there has been a rise in same-day discharge total knee arthroplasty (TKA). This study sought to identify risk factors for readmission following same-day discharge TKA.

METHODS: From 2012-2021, the National Surgical Quality Improvement Project database was used to identify all patients undergoing TKA discharged the day of surgery to their home. Demographic, comorbid, and operative variables were collected. Hematocrit was included as a marker of anemia. Operative time was included to control for the complexity of surgery. Readmission within 30-days of surgery was identified. Chi-square analysis and multivariate logistic regression was used to identify risk factors for readmission.

RESULTS: In total, 27,649 patients were identified. The proportion of same day discharges from the total sample increased from <1% in 2012, 8% in 2019, to 23% in 2021. 1.9% of patients were readmitted. Patients aged over 85 had much higher rates of readmission compared to those aged 55-64 years (6.7% vs. 1.4%). Those with a BMI >45 had readmission rates of 3.4% compared to 1.7% in those with a BMI of 25-29. Additionally, increased readmissions were seen in those with congestive heart failure (8 vs. 1.9%), insulin dependent diabetes (4.4 vs. 1.8%), pre-operative hematocrit <35 (3.9 vs. 1.8%), CKD stage IV-V (9.7% vs. 1.3%), and those with COPD (5.5 vs. 1.8%).

On multivariate analysis, those aged >85 years old have a 4.35 times increased odds of readmission compared to those aged 55-64 years old ($p<0.001$). Additionally, those with a BMI >45 had a 2.20 times increased odds of readmission compared to those with a BMI 25-29 ($p=0.002$). Additionally, congestive heart failure (odds ratio [OR]: 2.26), COPD (OR: 2.48), CKD stage IV-V (OR: 3.41), insulin dependent diabetes (OR 1.77), and a preoperative hematocrit <35 (OR 1.51) were all significant predictors of readmission.

CONCLUSION: Same-day discharge TKA has been increasing rapidly in recent years. Same-day discharge TKA appears to be safe, with a readmission rate of only 1.9% within 30 days of surgery. Increasing patient age was the most significant risk factor for readmission following same-day surgery, with the highest rate of readmission in those >85 years old. This data can be used by physicians to help guide appropriate patient selection for same-day discharge TKA.

A Comparison of Charlson Comorbidity, Elixhauser Comorbidity, Frailty Indices to Predict Outcomes Following Total Knee Arthroplasty

Paper 008

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INTRODUCTION: 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). While all of these tools have been validated for general use, the best risk assessment tool is still debated. Risk assessment is particularly important in elective surgery, such as total joint arthroplasty. The aim of this study is to compare the predictive power of the CCI, ECI, and HFR in the setting of total knee arthroplasty (TKA).

METHODS: All patients who underwent TKA 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: 1,930,803 patients undergoing TKA were included in our analysis. For mortality, ECI was most predictive (0.95 Area Under the Curve (AUC)), while HFR and CCI were 0.75 and 0.74 AUC, respectively. For periprosthetic fractures, ECI was 0.78 AUC, HFR was 0.68 AUC, and CCI was 0.66 AUC. For joint infections, ECI was 0.78 AUC, HFR was 0.63 AUC, and CCI was 0.62 AUC. For 30-day readmission, ECI was 0.79 AUC, while HFR and CCI were 0.6 AUC. For 30-day reoperation, ECI was 0.69 AUC, while HFR was 0.58 AUC and CCI was 0.56 AUC.

CONCLUSION: Our analysis shows that ECI is superior to CCI and HFR for predicting short-term postoperative outcomes following TKA. Surgeons should consider assessing patients using ECI prior to TKA.

A Randomized Clinical Trial of Direct Anterior vs. Mini-Posterior THA: Small, Early Functional Differences Did Not Lead to Meaningful Clinical Differences at 7.5 Years

Paper 009

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INTRODUCTION: Our previously reported RCT of direct anterior approach (DAA) vs. mini-posterior approach (MPA) THA utilized a unique study design to minimize surgeon learning-curve bias. Each patient was randomized and then the surgery itself was carried out by different, specific surgeon experts. At one year, that study showed slightly faster initial recovery for patients with the DAA and no differences in complications or clinical or radiographic outcomes. The aim of the current study was to determine if those small, early functional advantages of DAA lead to sustained, meaningful clinical differences beyond five years, and to determine if there were differences in midterm complications.

METHODS: Ninety-six of the original 101 patients were eligible for follow-up with mean follow-up of 7.5 years. We compared clinical outcomes as judged by Harris Hip, SF-12, and HOOS JR scores and sub-scores, complications, reoperations, and revisions between DAA and MPA groups. Based on prior published work, the minimal clinically important difference (MCID) for HHS was 8 points, for SF-12 (both PCS and MCS subscores) was 4 points, and for HOOS JR was 7 points.

RESULTS: The mean Harris Hip scores at 5 years were similar (95.3 ± 6.0 in the DAA group and 93.5 ± 10.3 in the MPA group). The mean SF-12 physical and mental scores at 5 years were similar (46.4 ± 9.2 vs. 46.4 ± 10.5, and 52.1 ± 7.5 vs. 54.9 ± 4.6, in the DAA and MPA groups, respectively). The mean HOOS JR scores at 5 years were similar (97.4 ± 7.9 in the DAA group and 96.3 ± 6.7 in the MPA group). The mean HOOS JR quality of life subscore was 96.9 ± 10.8 in the DAA group and 92.3 ± 16.0 in the MPA group (p=0.046). None of the clinical outcome differences met the MCID. There were 3 substantial surgical complications in the DAA group (1 femoral loosening requiring revision, 1 dislocation treated closed, and 1 superficial wound dehiscence requiring debridement) and 3 substantial surgical complications in the MPA group (3 dislocations; 2 were treated closed and 1 revised to dual-mobility).

CONCLUSION: At a mean 7.5 years, this RCT comparing direct anterior and mini-posterior THA demonstrated no clinically meaningful differences in PROMS, complications, reoperations, or revisions between these two approaches.

Surgical Approach and BMI Impact Risk of Wound Complications Following Primary Total Hip Arthroplasty
Paper 010

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OBJECTIVE: Previous studies have suggested that wound complications may differ by surgical approach after total hip arthroplasty (THA), with particular attention to direct anterior approach (DAA) compared to laterally-based incisions. There is a paucity of data documenting wound complication rates by surgical approach and the impact of concomitant patient factors, namely body mass index (BMI). The purpose of this study was to determine rates of wound complications by surgical approach and identify BMI thresholds that portend differential risk.

METHODS: This multicenter study used an institutional total joint registry to evaluate all primary THA patients from 2010 – 2022. Patients were classified by skin incision as laterally-based approach (posterior or lateral approach) or DAA (longitudinal incision). We identified 17,111 patients with 11,585 laterally-based (68%) and 5,526 (32%) DAA THA. Mean age was 65 years, 52% were female and mean BMI was 30. Kaplan-Meier, Cox regression, and cut point analyses were performed to identify an optimal BMI cutoff, overall and by approach, with respect to wound complications at 90-days.

RESULTS: The 90-day risk of wound complications was higher in the DAA group versus the laterally-based group with an absolute risk of4 4.2% vs 2.8% and a multivariable adjusted hazard ratio of 1.5 ($p<0.001$). Cut point analysis demonstrated the most marked difference in risk for laterally-based patients above a BMI of 39, whereas the most marked difference in risk for DAA patients occurred above a BMI of 33.

CONCLUSION: Wound complications are higher after primary THA with longitudinal incision DAA compared to laterally-based approaches with a 1.4% higher absolute risk and adjusted hazard ratio of 1.5. Furthermore, DAA wound complication rates increase at a lower BMI threshold of 33 vs. 39 compared to laterally-based approaches. These data can be used by surgeons to help consider risks and benefits of approach selection.

No Revisions Attributable to Wear of Highly Cross-Linked Polyethylene Liners: A Minimum 20-Year Follow-up Study

Paper 011

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INTRODUCTION: Total hip arthroplasty (THA) survivorship has significantly improved since the introduction of highly cross-linked polyethylene (HXLPE) liners. However, long-term outcome data are limited. Our aim is to evaluate implant survivorship, liner wear rates, and clinical outcomes after primary THA using HXLPE liners with a minimum potential follow-up of 20 years.

METHODS: Between 1999 and 2001, 690 primary THAs utilizing 28-mm femoral heads and HXLPE liners from a single manufacturer were identified using our institutional total joint registry. Femoral heads were composed of metal in 96% of cases and ceramic in 4%. Mean age was 56 years, 48% were female, and mean BMI was 29.5 kg/m^2. Survivorship analyses, including all cases, were performed. There were 197 hips with radiographs at 18.5 years and beyond. Linear HXLPE liner wear rates as well as inclination and anteversion angles were determined utilizing these radiographs.

RESULTS: At 20 years, survivorship free of revision was 94%, free of reoperation was 92%, and free of complication was 81%. There were no documented wear-related revisions. The linear wear rate at a mean of 20.3 years postoperatively was 0.02 mm/year. There was no statistically significant difference in measured wear observed between the first available postoperative radiographs and those taken at more than 18.5 years postoperatively. The use of elevated liners, patient BMI, and acetabular component inclination and anteversion angles were not associated with increased wear rates. Mean Harris Hip Scores improved from 52 preoperatively to 90 at greater than 18.5 years.

CONCLUSION: Primary THAs using HXLPE liners demonstrate excellent survivorship and clinical outcomes at long-term follow-up with no wear-related revisions. Wear rates of HXLPE liners at 20 years are exceedingly low and are not significantly impacted by patient BMI or acetabular component position.

Hemiarthroplasty vs. Total Hip Arthroplasty for Femoral Neck Fracture in the Elderly: An Analysis from the American Joint Replacement Registry

Paper 012

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INTRODUCTION: Debate persists regarding management of displaced femoral neck fractures in elderly patients with either total hip arthroplasty (THA) or hemiarthroplasty (HA). We investigated the United States (US) experience by comparing the risk of revision following THA or HA using the American Joint Replacement Registry (AJRR) in elderly displaced femoral neck fractures.

METHODS: Between 2012 and 2020, we identified 65,958 patients within the AJRR who were treated for a femoral neck fracture with arthroplasty. All were Medicare beneficiaries aged 65 years and older with a minimum potential follow-up of 2 years. Mean age was 82 years and 69% were female. Total hip arthroplasty was utilized in 12,537 (19%). Hemiarthroplasty was used in 53,421 (81%), of which 58% were bipolar constructs. Dual-mobility constructs were used in 11% of THAs. Femoral components were cemented in 38%. A cox proportional hazards model and a competing risk analysis were performed. Analytic groups included THA, THA with dual-mobility (THA-DM), bipolar HA, and unipolar HA. Mean follow-up was 5 years.

RESULTS: The 5-year cumulative risk of any revision was 3.5%. There were no significant differences in revision risk when comparing bipolar HA to unipolar HA, standard THA, or THA-DM. Revision risk was not statistically different between unipolar HA and THA, or THA-DM. Older age and the use of cemented femoral components were associated with a reduced risk of revision ($p<0.0001$), while patients with a higher comorbidity index sustained more revisions ($p<0.05$).

CONCLUSION: Elderly patients with displaced femoral neck fractures in the United States have a similar risk of revision whether they are treated with a THA or HA. However, this does not account for surgeon bias, host-related factors, and other surgical technique features such as approach, limb length, and offset. Surgeons should select the best procedure based on patient functional demands and co-morbidities.

Are Intra-Articular Corticosteroid Injections Safe Prior to Hip Arthroplasty?
Paper 013

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OBJECTIVE: Corticosteroid injections are an effective treatment modality to treat pain from hip osteoarthritis. However, with the definitive treatment being total hip arthroplasty (THA), it is important to understand how corticosteroid injections can impact surgical outcomes. Especially with regards to revision surgery for both septic and aseptic causes.

METHODS: We reviewed all primary THA procedures for degenerative joint disease at our tertiary care institution from 2016 to 2017. Patients were split into two groups: the injection group received an ipsilateral hip intra-articular corticosteroid injection within one-year of their THA and the control group received a THA without an ipsilateral hip intra-articular corticosteroid injection. The groups were compared by bivariate analysis in their entirety and after a propensity match controlling for age, sex, body mass index, diabetes status, and smoking status.

RESULTS: We identified 521 patients who received an injection and 3,019 patients who did not. The two groups were different by age, sex, body mass index, and diabetes status. The injection cohort experienced a higher total revision (3.26% - 17 revisions; p=0.027) and infectious revision rates (1.54% - 8 revision; p=0.020) than the control (Total: 1.79% - 54 revision; Infectious: 0.60% - 18 revision). After a 3:1 propensity match, the groups were similar by baseline demographics and comorbidities. The injection cohort continued to have a higher total revision (3.26%; p=0.045) and infectious revision rates (1.54%; p=0.034) than the control group (Total: 1.79% - 28 revision; Infectious: 0.58% - 9 revision). Revisions for aseptic causes (i.e., fracture and component loosening) were similar between the matched groups (1.8% vs. 1.2%; p=0.340). Survival curves demonstrate decreased probability of survival in the infection group beyond one year after surgery (Unmatched: p=0.031; Matched: p=0.058).

CONCLUSION: This study suggests that intraarticular corticosteroid injections prior to THA may be associated with higher infectious revision rates over five years after surgery, but do not impact aseptic revision rates. Surgeons should be cautious with recommending corticosteroid injections in surgical candidates.

A Consecutive Series of Chronic Periprosthetic Joint Infections of the Hip and Knee Treated with a One-Stage Revision Arthroplasty Protocol

Paper 014

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INTRODUCTION: The success of one-stage revision in chronic prosthetic joint infection (PJI) is variable. We report the (1) outcomes of one-stage revision in consecutive cases of chronic PJI and (2) risk factors for reinfection and re-revision. We hypothesize that one-stage revision with limited exclusion criteria is a viable treatment for chronic PJI.

METHODS: This is a retrospective review of 177 consecutive patients who underwent one-stage revision for chronic PJI between 2009-2020. 105 patients (59%) with chronic PJI and 2-year follow-up (89 patients, 58% female, 43 hips, 46 knees) or mortality within 2 years (16 patients, 15%) were included. The primary outcome was treatment success using Delphi criteria. Secondary outcomes included survival without and risk factors for: reinfection according to Musculoskeletal Infection Society (MSIS) criteria and re-revision for chronic PJI.

RESULTS: Treatment success of chronic PJI at 2 years was 85%. Survival without reinfection and re-revision at 2 years was 85% and 84%, respectively. Separate Cox's regression models identified the following independent risk factors for reinfection: rheumatoid arthritis (RA) (HR 5.15, 95% CI 1.51-17.60), virulent organism (HR 4.60, 95% CI 1.26-16.83), and sinus tract (HR 3.59, 95% CI 1.15-11.15); and, the following independent risk factors for re-revision: tobacco use (HR 4.22, 95% CI 1.92-9.27), host type B (HR 4.03, 95% CI 1.57-10.35) or C (HR 4.68, 95% CI 1.44-15.28), RA (HR 3.09, 95% CI 1.24-7.71), virulent organism (HR 2.80, 95% CI 0.96-8.14), and sinus tract (HR 2.93, 95% CI 1.12-7.66).

CONCLUSION: One-stage revision with limited exclusion criteria is a viable treatment for chronic PJI of the hip and knee. Larger cohort and randomized studies are needed to further refine risk factors for failure.

Draining Sinus Tracts and Periprosthetic Joint Infections: Traditional Synovial Fluid Counts May Be Misleading

Paper 015

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OBJECTIVE: Serologic and synovial values guiding the diagnosis of periprosthetic joint infection (PJI) are well-established. However, we hypothesized that these values would be lower in patients with a draining sinus tract. The purpose of this study was to determine if patients with sinus tracts have lower values for serum erythrocyte sedimentation rate (ESR), serum C-reactive protein (CRP), synovial white blood cell (WBC) count, and synovial percent neutrophils.

METHODS: We reviewed 665 infected primary total joint arthroplasties performed between 2000 and 2020 at a high-volume academic center. There were 191 patients (94 hips, 97 knees) that met the 2011 MSIS major criteria for infection and did not receive antibiotics within two weeks of laboratory evaluation. Patients were divided into those with sinus tracts (n=58) and those without (n=133). Early (<90 days) and late (≥90 days) postoperative PJI cases were analyzed separately. False negative rates for detecting PJI were compared based on 2018 ICM early/late PJI cutoffs.

RESULTS: Median synovial WBC count was significantly lower in early (9978 v. 76,068 cells/μL; p=0.01) and late (20,365 v. 63,356 cells/μL; p=0.03) PJI in those with a sinus tract. False negative rates for detecting PJI were significantly higher in patients with a sinus tract compared to those without a sinus tract for synovial WBC (38% v. 5%; p=0.002), synovial percent neutrophils (38% vs. 12%; p=0.04), and serum CRP (49% vs. 16%; p<0.001).

CONCLUSION: Those with a sinus tract had approximately 3 and 8 times higher false negative rates for detecting PJI by synovial percent neutrophils and WBC, respectively. The false negative rate for detecting PJI by serum CRP was about 3 times higher in those with a sinus tract. The presence of a sinus tract is diagnostic of PJI and relatively lower synovial WBC and percent neutrophil values should not lead providers to question this diagnosis.

Preoperative Weight Loss Before Total Hip Arthroplasty Does Not Improve Postoperative Risks
Paper 016

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OBJECTIVE: Obesity is an epidemic and many surgeons use weight loss goals and body mass index (BMI) cutoffs when offering total hip arthroplasty (THA). However, little is known about who loses weight before THA and if weight loss provides tangible benefits. The goals of this study were to determine how many patients lose weight before THA, predictors of preoperative weight loss, and if preoperative weight loss improves outcomes.

METHODS: Among 21,038 primary THAs performed between 2002 and 2019, we identified 2,463 patients with preoperative BMIs>30 kg/m^2 measured 1-24 months before surgery and a weight measured at surgery. The mean age was 66 years with 47% female. The mean BMI was 35 kg/m^2. Univariable logistic and linear regressions and Cox proportional hazard models evaluated length of stay, operative time, complications, revisions, and reoperations among patients maintaining preoperative weight compared to those losing ≥10 pounds before surgery. Mean follow-up was 5 years.

RESULTS: Overall, 45% lost ≥5 pounds, 29% lost ≥10 pounds, and 12% lost ≥20 pounds before THA. Younger patients (OR=1.1 per 10 years younger, p=0.002) and females (OR=1.1, p=0.24) were more likely to lose ≥10 pounds. When comparing those who lost ≥5 pounds, ≥10 pounds, or ≥20 pounds to those who maintained weight, there were no differences in 1-year, 2-year, 5-year, or 10-year survivorship free of infection, complication, revision, or reoperation. Across overall follow-up, losing ≥10 pounds was not associated with length of stay, operative time, complications, revisions, or reoperations.

CONCLUSION: Relatively few patients lose meaningful weight before THA, suggesting BMI cutoffs may be unrealistic goals for most patients. Patients who lose weight tend to be younger, but even those achieving common benchmarks for weight loss did not reduce postoperative risks. While weight loss benefits overall health, preoperative weight loss alone may not be enough to reduce postoperative risks.

Arthroscopic Rotator Cuff Repair Outcomes Appear Unaffected by COVID-19 Pandemic Shut Down
Paper 017

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BACKGROUND: We investigated whether patients who received an arthroscopic rotator cuff repair (RCR) in January-March 2020 had a difference in outcomes compared to patients who received it the previous year. We hypothesized that patients in 2020 will have decreased access to physical therapy (PT) due to the COVID-19 shutdowns and differences in postoperative outcomes compared to 2019 patients.

METHODS: Patients who underwent RCR between 1/1/2020 and 3/17/2020 were selected to be included and patients who underwent RCR between 1/1/2019 and 3/17/2019 were used as a control group. Retrospective chart review was performed, and patient reported outcomes were recorded at an average of 2.68 ± 0.05 years and a minimum of 1-year postoperatively. Patient data was collected and analyzed statistically using the 2-sample t-test and Chi-square test.

RESULTS: This study identified 50 and 51 patients in 2020 and 2019. Rotator cuff repairs done in 2019 had improvements in forward elevation (FE) (135º to 161º; $p<0.01$) and internal rotation (IR) (L4 to L1; p-value<0.01) whereas those done in 2020 did not improve their FE (146º to 151º; $p=0.42$) or IR (L3 to L2; $p=0.29$). There was no difference in external rotation (ER). Both cohorts had improvements in rotator cuff strength testing following surgery (2019: FE/ER/IR: 5/5; 2020: FE/ER/IR 5/5; p-value=0.21, 0.21, 0.09 for FE, ER, IR, respectively). Patients in 2019 completed more PT sessions (2019: 25.0; 2020: 16.7; $p<0.01$). Patients in 2020 also experienced a significant delay from date of surgery to date of first PT session (2019: 28.5 ± 11.9 days; 2020: 35.0 ± 16.5 days; p-value=0.03). Of the 2020 patients, 8% did not initiate PT after RCR, 16% reported a delay in PT while 44% reported that the COVID-19 pandemic affected their recovery following RCR. At final follow-up, patients reported a SANE score of 78.2 ± 12.1 on the affected shoulder and a mean VAS pain score of 2.3 ± 1.8.

CONCLUSION: Patients who underwent arthroscopic RCR in early 2020 had a longer delay to starting PT, did less PT overall, but still had comparable range of motion and strength at final follow-up.

Acromiohumeral Distance: Are Radiographic Factors Correlated with Outcomes After Reverse Shoulder Arthroplasty?

Paper 018

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INTRODUCTION: Reverse shoulder arthroplasty (RSA) has had exponential growth due to its effectiveness in restoring clinical function and reducing pain. With this growth optimizing outcomes and minimizing complications is a priority. Various risk factors including radiographic measurements and biomechanical factors have emerged as possible tools useful to predict clinical outcomes and potential complications after RSA. This study aimed to investigate the association between radiographic measurements for arm lengthening and clinical outcomes in patients following RSA.

METHODS: All patients who underwent RSA from August 2017 to February 2020 by a single surgeon were retrospectively identified through a prospectively collected database. Acromiohumeral Distance (AHD) was obtained from preoperative and postoperative radiographs and used to determine arm lengthening (AHDdelta). The β angle was also calculated from radiographs. Functional and patient-reported outcomes, including the Simple Shoulder Test (SST), Constant Score, American Shoulder and Elbow Surgeons Score (ASES), University of California at Los Angeles (UCLA) Shoulder Score, Shoulder Pain and Disability Index (SPADI), and Shoulder Arthroplasty Smart (SAS) Score were measured preoperatively and at a minimum of one-year postoperative. Radiographic measurements were correlated to clinical, functional, and patient satisfaction outcome scores using Pearson's correlation coefficient tests.

RESULTS: Sixty-three patients with a mean age of 73.3 ± 8.7 years and a mean BMI of 28.5 ± 5.8 were included in this analysis. Mean follow-up was 19 ± 7.3 months. The mean arm lengthening was 2.4 ± 0.9 cm and postoperative β angle 89.6° ± 10.6°. Arm lengthening was significantly correlated to improvement of daily pain ($r = 0.277$, $p = 0.030$), with the most improvement observed in arm lengthening ranging from less than 0 cm to 1.5 cm. Postoperative β angle had significant correlations with improvement of SPADI and SST scores. All other correlations were not statistically significant.

CONCLUSION: As expected, the results of our study showed AHD increased postoperatively after RSA. Less arm lengthening had the greatest decrease in pain and optimal glenoid inclination correlated with improved outcome scores. There remains a debate regarding the optimal arm lengthening and inclination for RSA to restore active range of motion while minimizing complications. Our results suggest less arm lengthening and more attention to optimize glenoid inclination radiographically will improve clinical outcomes and guide surgeons on best practices for surgical techniques.

Impact of Sling Use on Functional Mobility in a Geriatric Population
Paper 019

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INTRODUCTION: Sling immobilization is commonly utilized following rotator cuff repair which are often performed in the elderly population. Postoperatively, patients frequently wear bulky slings with non-weight bearing restrictions for up to six weeks to permit soft tissue healing. The purpose of this study is to determine the detrimental impact of sling usage on mobility and balance in an elderly population through validated gait and balance testing. The authors hypothesize that sling use will negatively impact balance and stability.

METHODS: This IRB approved and registered randomized prospective clinical trial enrolled patients from 2019 – 2021. Inclusion criteria for the study were healthy patients over the age of 65 without surgical fixation of a rotator cuff tear. Patients were excluded for surgical history limiting mobility including lower extremity surgery or current use of a shoulder sling or assistive walking devices such as crutches, canes, or walkers for any reason. Following informed consent, patients were randomized into two groups: a sling worn (Group 1) and no sling (Group 2). Participants were assessed via the Edmonton Frail Scale as well as the Tinetti Gait and Balance scoring.

RESULTS: Fifty (50) patients were included in the study, 23 (46%) male and 27 (54%) female with a mean age of 72.16 years. No difference existed in Edmonton Frail Scale scores between Group 1 and Group 2 (P = 0.763). Balance and gait scores were significantly greater when patients were not wearing a shoulder sling with a p-value of 0.006 and 0.011, respectively. The overall combined gait and balance score was significantly greater when a sling was not worn indicating greater balance and gait (P = 0.001).

CONCLUSION: Postoperative sling immobilization negatively impacts balance and gait in the geriatric population potentially increasing the risk of postoperative falls in an already at-risk population.

Effect of Preoperative Steroid Injections on Outcomes Following Shoulder Arthroplasty
Paper 020

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INTRODUCTION: Steroid injections are well-known short-term treatments for glenohumeral osteoarthritis; however, many patients eventually require more definitive management with surgical treatment. Recent literature has called into question the utility and safety of steroid injections prior to shoulder surgery due to increased infection and revision rates. Conclusive data regarding the relationship of preoperative injection and postoperative outcomes is lacking. The purpose of this study was to determine the impact of ipsilateral preoperative injections on clinical outcomes following shoulder arthroplasty (SA).

METHODS: A retrospective study was performed on 563 patients who underwent SA by a single fellowship-trained orthopedic surgeon from 2017-2020. Patients were divided into two groups: 240 received a preoperative injection (IG) and 323 were in the control group (CG). Patient-reported pain and satisfaction, simple shoulder test (SST), shoulder pain and disability index (SPADI), complications, reoperations, and range of motion (ROM) were compared between groups. Change (delta) in clinical and functional outcomes were calculated from the pre- to postoperative period and compared.

RESULTS: The cohort was comprised of 55% females with an average age of 71.1, BMI of 29.6, and mean follow-up of 21.5 months. The IG group had a significantly greater proportion of females (64%; $p<0.01$) and older age of 72.9 ($p<0.01$). The number of comorbidities between groups was comparable. There was a significantly greater postoperative improvement in range of motion with forward elevation (70= IG vs. 80 = CG, $p=0.025$) and abduction (60=IG vs. 70 = CG, $p=0.030$) in patients who did not have a corticosteroid injection within the past year. Patients in the IG group had significantly greater delta in reported outcomes on the SST (+6.25 vs. +5.37, $p = 0.005$). Patient satisfaction, complication rates ($p=0.98$) and reoperation rates ($p=0.98$) were comparable between groups.

CONCLUSION: Ipsilateral shoulder injections prior to SA leads to less improvements in function but better patient satisfaction without an increase in complications. Surgeons can consider continuing to use injections as a viable first line management option before SA without concerns for increased complications, but further research is needed on the impact of these injections on postoperative function and pain.

Acromial and Scapular Fractures After Reverse Shoulder Arthroplasty: Comparison of Inlay vs. Onlay Humeral Design

Paper 021

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INTRODUCTION: The reverse shoulder arthroplasty (RSA) has revolutionized the treatment of glenohumeral arthropathies, providing significant strength, function, and pain improvement for a variety of shoulder conditions. The increasing rate of reverse total shoulder arthroplasty (RSA) utilization has brought into focus a greater appreciation of postoperative complications. Fractures, specifically acromial and scapular spine fractures, have been identified as one of the leading complications of RSA procedures according to current literature. There have been a number of small to mid-size series noting rates that estimate risk of postoperative fractures from 2% to over 13%. However, very little is known of the etiology of these postoperative fractures, or how variations in humeral designs, inlay vs. only, correlates with risk of postoperative fracture development. Therefore, the purpose of this study was to perform a large multi-center investigation to analyze the incidence, timing, and risk factors for development of postoperative acromial and scapular fractures.

METHODS: A retrospective study of Primary Reverse Total Shoulder Arthroplasty (RSA) performed for elective and traumatic indications from two tertiary institutions. Exclusions consisted revision shoulder arthroplasty, malignancy as the surgical indication, diagnosis of osteogenesis imperfecta, or less than one year of clinical follow-up. A total of 2,937 primary RSA was analyzed with 2,221 (75.6%) utilizing an onlay humeral design and 716 (24.3%) utilizing an inlay humeral design. Onlay design was defined as humeral components where the humeral tray sits on the metaphysis at the level of the humeral neck cut. Inlay design was defined as humeral components where the tray is seated within the metaphysis. The mean age for the cohort was 71.3 ± 9.4 with a majority female sex (57.9%), and a mean BMI of 30.6 ± 6.6.

RESULTS: When compared by humeral design, there was no difference between inlay and onlay with age (71.1 vs. 71.4; P = .535) or BMI (30.4 vs. 30.6%; P = .328). There was a higher rate of female sex in the inlay cohort (61.2% vs. 56.8; P = .039). A fracture of the acromion or scapula was radiographically identified in 62 of 2937 RSA (2.1%) occurring at a mean of 13.2 months. The majority of fractures were acromial (n = 58; 2.0%) followed by scapular spine (n = 4; 0.1%). Treatment strategies were predominantly nonoperative in 58 SA (93.5%) and operative in 4 SA (6.5%) in the form of an open reduction and internal fixation. When compared by RSA humeral components inlay had a rate of 2.7% (n = 19) and onlay with 1.9% (n = 43) with no statistical differences between design types (P = .245). Furthermore there was no treatment differences between nonoperative (89.5% vs. 95.3%) or operative management (10.5% vs. 4.7%) of the periscapular fractures (P = .385).

CONCLUSION: Acromial and scapular spine fractures complicated the postoperative course of 2.1% of primary RSA when performed across two high volume shoulder arthroplasty centers and including all implant types. Most of the fractures involve the acromion, with much less frequent involvement of the spine of the scapula. When compared by inlay or onlay humeral component design, this investigation suggests that the rate of postoperative acromial and scapular spine fracture rates are not significantly different.

Operative Treatment of Acromial and Scapular Spine Fracture Nonunions Complicating Reverse Total Shoulder Arthroplasty

Paper 022

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BACKGROUND: Fractures of the acromion and scapular spine have a major impact on the outcome of reverse shoulder arthroplasty (RSA). The purpose of this study was to report on the outcome of internal fixation of these fractures and describe our evolution of fixation techniques.

METHODS: From 2014-2023, 22 fractures of the acromion or scapular spine underwent internal fixation at a single institution and had been followed for a minimum of one year. In 17 shoulders, fracture occurred after RSA, whereas scapular fracture prior to RSA was observed in 5 shoulders. Two shoulders had undergone prior failed internal fixation elsewhere. There were 10 males and 12 females with a mean age of 71.3 years (SD=6.7) at the time of fixation. Fixation strategies included single (n=11) or double plate fixation (n=11), with use of autograft iliac crest bone graft in 7, allograft strut in 4, and demineralized bone matrix in 6 shoulders. Pre- and postoperative radiographs and computed tomography scans were reviewed to classify fracture patterns as described by Levy et al., with 10 Levy II and 12 Levy III fractures. Kruskal-Wallis one-way analyses of variance and Chi-square tests were used to analyze continuous or categorical variables, respectively. P-values <0.05 were considered statistically significant.

RESULTS: Of the five fractures treated with internal fixation prior to RSA, one shoulder incurred an additional fracture medial to the fixation hardware and one underwent additional bone grafting for incomplete union. All five shoulders underwent RSA uneventfully, with late displacement of the scapular spine nonunion in one patient, leading to plate removal. Of 17 post-RSA fractures, radiographic union was confirmed in 15 and failure of fixation in 2. Of the fractures that healed, substantial residual inferior angulation was identified in 4 shoulders. New fractures medial or lateral to the hardware used for fixation occurred in six shoulders. No significant differences were observed between the pre-RSA and post-RSA cohorts with respect to patient age, sex, medical comorbidity, previous shoulder surgery, or prior acromioplasty.

DISCUSSION: Internal fixation of fractures and nonunions of the acromion and spine of the scapula have the potential to lead to successful union. Our fixation strategy has evolved to dual plating, spanning the whole length of the spine with one of the plates, use of hook features under the acromion or os trigonum if possible, and liberal use of bone graft.

Early Active Range of Motion (ROM) vs. Conservative Initial Immobilization Following Reverse Total Shoulder Arthroplasty (RSA)

Paper 023

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OBJECTIVE: There is a dearth of data regarding PT protocols regarding timing of cessation of sling immobilization and initiating active ROM postoperatively. The purpose of this study was to compare two different rehabilitation protocols with respect to their allowance of early active ROM following RSA.

METHODS: Patients underwent RSA by one of four fellowship-trained orthopedic surgeons for the indication of rotator cuff arthropathy and glenohumeral arthritis. RSA for fracture, revision arthroplasty, and AVN were excluded. Patients were placed in the early active (EA) or conservative (CON) cohort, depending on their surgeon's preferred protocol. CON patients were immobilized in an abduction sling for 6 weeks postoperatively with formal therapy starting at 6 weeks. EA patients were in an immobilizer sling for 1 week with therapy starting at 1 week. Patient-Reported Outcomes Measurement Information System (PROMIS) Upper Extremity (-UE), Pain (-PI), Depression (-D), visual analog scale (VAS) pain, ROM, American Shoulder and Elbow Surgeons (ASES), and complications were recorded preoperatively and at 6-week, 3-month, 6-month, and 12-month time periods.

RESULTS: A total of 95 patients were included with 58 patients in the EA group and 37 in the CON group. Significant differences were seen active forward flexion favoring the EA group, 117 vs. 86 degrees at 6-weeks ($P<0.001$), 132 vs. 110 degrees at 3-months ($P<0.001$), 138 vs. 117 degrees at 6-months ($P=0.029$), and 158 vs. 120 degrees at 12-months ($P=0.001$). Similarly, statistically significant differences were observed in active abduction favoring the EA group, at 104 vs. 75 degrees at 6-weeks ($P=0.001$), 120 vs. 96 degrees 3-months ($P=0.001$), 129 vs. 99 degrees at 6-months ($P=0.001$), and 152 vs. 114 degrees at 12-months ($P=0.004$). At 6-weeks postoperatively, the EA group reported higher VAS pain scores (2.8 vs. 1.3; $P=0.02$) compared to the CON group. No difference was seen in VAS at the 3-month mark and beyond. PROMIS-UE favored the early active ROM group at both the six-week ($P=0.003$) and 12-month ($P=0.005$) time periods. No significant differences were observed between the two groups at any time point with regards to PROMIS-PI, PROMIS-D, and complications rates.

CONCLUSION: Early active ROM is safe and demonstrates improved ROM in flexion and abduction compared to conservative postoperative management as well as improved shoulder function PROs at early and one-year timepoints. There was no increase in long-term pain associated with early active motion.

Clinical and Radiographic Outcomes of Anatomic Total Shoulder Arthroplasty (TSA) with an Inset Glenoid for Posterior Glenoid Erosion: Minimum Two-Year Follow-Up

Paper 024

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INTRODUCTION: Anatomic total shoulder arthroplasty (aTSA) reliably improves pain and function. In the setting of posterior subluxation and glenoid erosion (Walch B2 or B3 glenoid), determining the ideal glenoid component remains a challenge. This investigation reports minimum two-year clinical and radiographic outcomes on a cohort of patients with B2 or B3 glenoid morphology that underwent aTSA using an inset glenoid component.

METHODS: A retrospective review identified patients with Walch B2 or B3 glenoid deformity who underwent aTSA utilizing an inset glenoid component and had a minimum of two-year follow-up. Patient demographics, range of motion, and patient reported outcome measures were recorded preoperatively and at final follow-up. Posterior humeral head subluxation and glenoid retroversion were measured on preoperative radiographs. Residual posterior humeral head subluxation and glenoid component loosening were assessed on radiographs at final follow-up. Intraoperative and postoperative complications as well as reoperations were documented. Statistical analysis included descriptive analyses and paired t-test for comparisons with significance set to p-value < 0.05.

RESULTS: 27 patients were included with mean age 66.1±8.6 years and average follow-up of 28.7±5.1 months. There were 21 patients (78%) with B2 morphology and 6 patients (22%) with B3 morphology. The average preoperative posterior subluxation was 67.7±10.9 % and average glenoid retroversion was 13.5±7.4°. Range of motion statistically improved in all planes at final postoperative follow-up, forward flexion from 116±35 to 152±26, external rotation from 28±12 to 52±13, and internal rotation from 19±4 (S2) to 13±2 (L1) (all $p < 0.001$). Mean VAS improved from 5±2 to 1±1, ASES from 49±18 to 87±14, and SANE from 46±28 to 90±13 (all $p < 0.001$). There were no clinical intraoperative or postoperative complications. Residual posterior humeral head subluxation was 51.8±3.5 percent ($p < 0.001$). Radiographic complications included three cases of central peg lucency and one case of glenoid loosening at final follow-up. No patients required revision arthroplasty or any other reoperation.

DISCUSSION: This study presented significant improvements in clinical and patient reported outcomes of patients with B2 or B3 glenoid morphology who underwent TSA with an inset glenoid. Although there were no cases of revision surgery, there were three cases of central peg loosening and one case of glenoid loosening. Further longitudinal assessment of these patients is required to understand the mid- and long-term durability of this implant.

Anatomic vs. Reverse Total Shoulder Arthroplasty with Glenoid Retroversion of >15 Degrees In Rotator Cuff Intact Patients: A Comparison of Midterm Results

Paper 025

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OBJECTIVE: Severe glenoid deformity has been associated with inferior outcomes and higher complication rates. In patients with intact rotator cuffs, there is no clear consensus as to whether anatomic total shoulder arthroplasty (aTSA) or reverse (rTSA) shoulder arthroplasty is the optimal implant to best address this issue. The purpose of this study was to compare outcomes of aTSA vs. rTSA in glenoid deformities with > 15° retroversion.

METHODS: A retrospective review of a large multicenter database was conducted. All patients who underwent either aTSA or rTSA with an intact rotator cuff and glenoid retroversion >15° with minimum 2-year follow-up were included. Range of motion (ROM), revisions, and patient reported outcomes (PROs) including Constant Score, Simple Shoulder test (SST), American Shoulder and Elbow score (ASES), UCLA score, Shoulder Pain and Disability Index (SPADI), Shoulder Arthroplasty Smart score (SAS) were collected for all patients pre- and post-surgery.

RESULTS: Overall, 336 patients were included with 187 receiving an aTSA and 149 rTSA. Reverse patients overall had more comorbidities (75.0% vs. 65.1%; P=0.053) and were older (70.9 ± 7.0 vs. 66.3 ± 7.7 years; P<0.001). Average follow up for the aTSA group was 62.0 ± 37.8 months vs. 40.6 ± 22.9 months for rTSA (P<0.001). Preoperative retroversion in the anatomic group averaged 20.7 ± 5.5 degrees vs. 24.2 ± 7.7 in reverse patients (P<0.001). Both groups demonstrated significant improvements in all PROs and ROM from pre- to post-surgery (P<0.05). At latest follow-up aTSA patients had significantly better internal rotation scores (4.9 ± 1.6 vs. 4 ± 1.8; P=0.000), external rotation (50 ± 19 vs. 38 ± 18; P<0.05) and SAS scores (80.2 ± 13.5 vs. 76.6 ± 11.3; P=0.017), but worse pain VAS (1.5 ± 2.3 vs. 0.9 ± 1.9; P=0.016). There was no significant difference in abduction or forward elevation or PRO's (Shoulder function, SST, Constant, ASES, UCLA, or SPADI). Overall revision rate (7% vs 1%; P=0.002) was higher in aTSA.

CONCLUSION: ATSA and rTSA results in significant improvements patients with glenoid retroversion equal or greater than 15 degrees. Anatomic TSA patient have better postoperative internal rotation score, external rotation and SAS score but demonstrated no other significant improvement in ROM or PRO. However, there was significantly higher rate of complications and revisions with short to midterm follow-up following aTSA.

Higher Reoperation Rates Following Primary Rotator Cuff Repair in Patients Screening Positive for Depression

Paper 026

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INTRODUCTION: Patient Health Questionnaire-2 (PHQ-2) is a commonly administered screening tool for measuring depressive symptoms, however, the relationship between PHQ-2 and postoperative outcomes after RCR is not yet established. The purpose of this study is to investigate the association between depression and reoperation rates in patients undergoing primary RCR.

METHODS: This retrospective chart review evaluated data from all patients who underwent elective primary rotator cuff repair and had a PHQ-2 score at least 6 months prior to their surgery. The PHQ-2 is a validated tool used to screen for depression with scores ranging from 0-6. Patients were categorized as either depressed (PHQ-2 ≥ 2) or non-depressed (PHQ-2 < 2). The primary outcome was to compare reoperation rate between depressed and non-depressed patients. The secondary outcome was a comparison of postoperative healthcare utilization, which included emergency department visits and hospital readmissions within 90 days. Depressed patients were also propensity matched 1:1 to non-depressed patients for a sub-analysis.

RESULTS: A total of 238 patients who underwent primary rotator cuff repair were included with 84 depressed patients and 154 non-depressed patients. Significantly more patients were female (67% vs. 46%; P=0.002) in the depressed cohort compared to non-depressed. There was a significantly increased incidence of comorbid depression (63% vs. 28%; P<0.001), anxiety (52% vs. 17%; P<0.001), and substance use disorder (20% vs. 6%; P <0.001) as well as a lower median household income (MHI) in the depressed cohort vs. the non-depressed cohort ($58,451.93± $21,024.93 vs. $66,751.93± $22,654.45; P<0.001). Fifteen (17.9%) depressed patients underwent reoperation versus 10 (6.5%) non-depressed patients (P = 0.006). Mean time to reoperation in the depressed cohort was 11.7 months (0.8-35 months). In the sub-analysis, 80 patients in the depressed cohort were matched to and 80 non-depressed patients. Depressed patients had significantly higher rates of comorbid depression (63% vs. 18%; P<0.001), anxiety (52% vs. 17%; P<0.001), and substance use disorder (20% vs. 6%; P<0.001) and a lower MHI ($58,615.20±$21,455.12 vs. $66,470.73±$22,996.49; P=0.04). Amongst depressed patients, 14 patients (17.5%) vs. 4 (5%) underwent reoperation (P=0.01). No significant differences in postoperative emergency department visits, postoperative complications, or hospital readmissions were found between the depressed and non-depressed cohorts in either analysis.

CONCLUSION: We found patients screening positive for depression preoperatively, as measured by PHQ-2, had a significantly higher reoperation rate following primary rotator cuff repair compared to non-depressed patients. These patients were more likely to be female, have comorbid mental health diagnoses, not full-time employment, and a lower household income.

Complication Rates After Shoulder Arthroplasty in Patients Aged 45 and Younger: A Multicenter Retrospective Study

Paper 027

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BACKGROUND: Shoulder arthroplasty is an effective intervention for reducing pain and improving function in older patients (>65 years old); however, little is known regarding outcomes in a young population. We sought to investigate the complication rates of shoulder arthroplasty in patients aged 45 and younger.

METHODS: This was a multicenter, retrospective study. Patients who underwent primary shoulder arthroplasty were identified from medical records from two participating centers. Primary outcomes included complications, reoperations, and radiographic analysis for component loosening or failure. Statistical analysis was conducted with Fisher's Exact test to analyze differences in complication and re-operation rates among arthroplasty types. Differences with $p<0.05$ were considered statistically significant.

RESULTS: We identified 76 patients (43 males and 33 females) aged 45 and younger with minimum two-year follow-up (average 84 months, range 25-190). Forty patients underwent total shoulder arthroplasty (TSA), 31 underwent hemiarthroplasty (HA), and 5 underwent reverse total shoulder arthroplasty (RTSA). Thirty-seven patients had undergone prior surgery.

The total complication rate for the cohort was 34% (33% for males and 36% for females). Complications included glenoid component loosening, subscapularis failure and/or weakness, rotator cuff tear, infection, biceps tendinitis, glenohumeral subluxation, glenoid bone loss, and brachial plexopathy. The overall reoperation rate was 16% (12/76). Reoperations included revision for component loosening, revision for infection, conversion to TSA, RTSA, or HA, arthroscopic debridement, and biceps tenodesis. No statistically significant differences in complications ($p=0.12$) or reoperations ($p=0.40$) were observed among arthroplasty types.

Upon radiographic analysis, radiolucent lines were present in 19.7% (15 cases) of the humeral components and 10.5% (8 cases) of the glenoid components. Of the patients with humeral radiolucent lines, none underwent revision for component loosening. Glenoid radiolucencies were present only in the TSA group ($p=0.018$). Six patients had stable radiolucent lines without component loosening while 2 glenoids were judged to be loose. Of those, 1 patient (2%) underwent revision for glenoid component loosening.

CONCLUSION: These results indicate young patients undergoing shoulder arthroplasty have a high rate of complications and a relatively high risk of re-operation. However, it is a challenging population where almost half of patients had undergone previous shoulder surgery. Glenoid component loosening was seen only in the TSA group with a revision rate of 2%. The relatively high complication and re-operation rates should be taken into account when considering shoulder replacement in this population.

Influence of Age and Sex on Meeting MCID Following Reverse Shoulder Arthroplasty
Paper 028

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INTRODUCTION: Patient-reported outcome measures (PROMs) are used to assess efficacy of reverse shoulder arthroplasty (RSA). Previous studies have assessed differences between age and gender following RSA. However, it is unknown if these differences are clinically significant. Thus, this study aimed to use the minimal clinically important difference (MCID) to determine the clinically relevant difference in outcomes between age and sex following RSA.

METHODS: A retrospective review of 227 RSA patients from 2007-2020 by a single fellowship-trained orthopedic surgeon was performed. Demographics, range of motion (ROM), and PROMs were collected preoperatively and at 6 weeks, 3, 6, 12, and 24 months postoperatively. PROMs included the Simple Shoulder Test (SST) score, American Shoulder and Elbow Surgeons (ASES) score, Shoulder Pain and Disability Index (SPADI) score, University of California at Los Angeles Shoulder (UCLA) score, and Shoulder Arthroplasty Smart (SAS) score. Logistic regressions determined the relationship between age and sex on reaching meeting MCID at each time point. MCID was determined using the anchor-based method, with MCID calculated from the preoperative visit to final follow-up.

RESULTS: MCIDs for SST, ASES, SPADI, UCLA, and SAS scores were 4.3, 30.2, -45, and 24.2 respectively. With every one-unit increase in age, patients were more likely to meet MCID for SPADI at 6 weeks (odds ratio [OR] 1.039, p = .007) and 6 months (OR 1.04, p = .02). At 3 months, patients were more likely to meet MCID for SST (OR 1.04, p= 0.01), ASES (OR 1.04, p= 0.013), UCLA (OR 1.04, p= 0.004), SPADI (OR 1.04, p= 0.009), and SAS (OR 1.04, p= 0.006) for each one-unit increase in age. Regarding ROM, patients were less likely to reach MCID for forward elevation at 6 weeks for each one-unit increase in age (OR 0.957, p= 0.009). Similarly, patients were less likely to meet MCID for external rotation at 1 year (OR 0.95, p= 0.012). When analyzed by gender, males were more likely to meet MCID for active abduction (OR 1.17, p= 0.006) and forward elevation (OR 1.038, p= 0.041) at 2 years.

CONCLUSION: Increasing age and male gender were more predictive of meeting MCID for outcome scores and range of motion, respectively. These findings highlight the varying outcomes of RSA based on patient sex and age. Understanding these distinctions, in addition to identifying the points at which improvements in PROMs and ROM measurements level off, can significantly enhance patient counseling and establish accurate postoperative expectations.

The Association Between Vitamin D Level and Outcomes After Shoulder Arthroplasty: A Single Center Retrospective Examination

Paper 029

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INTRODUCTION: The importance of appropriate vitamin D levels has become increasingly recognized, particularly in light of its role in multiple organ systems in the body. The impact that hypovitaminosis D can have on patients undergoing shoulder arthroplasty has yet to be fully determined. Our study was undertaken to assess the postoperative outcomes after shoulder arthroplasty and determine if these outcomes differed based on preoperative vitamin D level.

MATERIALS & METHODS: A retrospective review of patients undergoing hemiarthroplasty, anatomic total shoulder arthroplasty, and reverse total shoulder arthroplasty between 2012 and 2022 at a single institution was performed. Outcomes including readmission, reoperation, mortality, and medical complications, as well as preoperative and postoperative range of motion, pain scores, and functional outcome scores, were examined.

RESULTS: 94 patients had preoperative vitamin D levels recorded; 35.11% were deficient with vitamin D levels under 20 mg/mL, 29.79% were insufficient and had vitamin D levels between 20-29 mg/mL, and 35.11% had levels considered sufficient. There was no statistically significant association between vitamin D levels and complications on univariate analysis ($P > 0.05$). Similarly, pain scores and range of motion did not have an association with vitamin D level although range of motion did approach statistical significance.

DISCUSSION: The relationship between lower vitamin D levels and worse postoperative outcomes or increased rate of complications was not supported by our study. Further research investigating this association is needed.

LEVEL OF EVIDENCE: level III case control study

Comparing Orthopedic Trainee Confidence While Performing Elbow Arthrocentesis: A Cadaveric Study
Paper 030

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INTRODUCTION: Elbow arthrocentesis is performed to differentiate effusions as infectious, inflammatory, or hemorrhagic processes. Although typically considered minimally invasive, there is risk for injury to surrounding structures and creating a nidus for infection. Therefore, we intended to compare orthopedic trainee confidence and success at different levels of training while performing an elbow arthrocentesis through a direct lateral and posterior approach using anatomic landmarks.

METHODS: Ten fresh-frozen cadaveric specimens were used and randomly assigned to seniors (PGY-4/5), juniors (PGY-2/3), and interns (PGY-1). Two cc of ISOVUE® was injected into the elbow joint capsule and intra-articular position confirmed under fluoroscopy. Following confirmation, 20-cc of blue dye was injected into the joint to create an effusion. Each trainee was provided the same instructions on performing a lateral and posterior arthrocentesis. Three consecutive lateral aspirations on three specimens were performed and level of confidence (1-5) as well as number of attempts to successful aspiration was recorded. A similar methodology was followed for posterior aspirations. Number of attempts and confidence level was compared between different levels of training and approaches using ANOVA, t-test, Kruskal-Wallis, and Mann-Whitney tests.

RESULTS: Regardless of level of training, number of attempts to successful aspiration did not differ between seniors, juniors, and intern residents (mean of 1.6, 1.5, and 2.4 respectively, $p=0.068$). For all trainees, the posterior approach required on average 2.1 attempts compared to the lateral approach which required 1.3 attempts ($p=0.004$). Interns, although not requiring a significantly greater number of attempts, were not as confident as seniors and juniors during any aspiration ($p<0.05$). Confidence for juniors and seniors was equivalent ($p=0.207$). Finally, trainees were more confident (mean rank=58.4) while performing the lateral approach compared to the posterior approach (mean rank=38.6) ($p <0.001$).

DISCUSSION & CONCLUSION: Procedural confidence was dependent upon level of trainee and familiarity with approach. Interestingly, however, the number of attempts leading to successful aspiration was only different between posterior and lateral approaches and otherwise equivalent regardless of level of training and confidence. These results have important implications for educators to consider while teaching trainees at different levels.

Trends in Operative Management of Patellofemoral Joint Instability: An American Board of Orthopaedic Surgery (ABOS) Part II Database Study

Paper 031

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OBJECTIVE: Patellofemoral (PF) instability represents a complex category of knee pathology. Treatment occurs at an intersection of subspecialty care involving pediatric, sports medicine, and other subspecialists. As our knowledge of patellofemoral instability grows, treatment standards and recommendations change. This project evaluates whether or not the current practice in the United States reflects these changes and how this information can help to better inform our residency and fellowship training programs.

METHODS: The ABOS Part II database was queried to identify all patients from 2010 through 2020 carrying a ICD code of patellar instability who underwent operative intervention. A stepwise multivariate regression was performed to analyze temporal trends in procedures used as well as surgeon subspecialty and practice setting. A subgroup analysis was performed in patients under 18 years old.

RESULTS: Overall, 25,795 patients with a diagnosis of patellofemoral instability who underwent operative intervention from 2010-2020 were identified. Sports medicine-trained surgeons completed the majority of these cases (69%), with the second most common being general orthopedic surgeons (12%). Results were similar in the pediatric population, with the sports-trained surgeons accounting for 64% of cases. There has been a significant decrease in the amount of isolated lateral releases performed, with isolated lateral release accounting for 12.0-13.0% of the cases between 2010 and 2014 and ranging from 4.1-4.6% between 2016-2022 ($p= 0.001$) Sports medicine and pediatric fellowship-trained surgeons were less likely to perform isolated lateral release ($p=0.000$), although only sports medicine fellowship training showed a decreased incidence odds ratio of performing a lateral release at 0.385 ($p=.002$). There was an increase in the rate of extra-articular ligamentous reconstruction procedure (MPFL reconstruction) over time with 17-24% incidence between 2010-2014 and 31-41% incidence during 2016-2022 ($p < 0.001$). During this time period, open ligament repair decreased from 7.9% to 2.8-4.9% incidence ($p = 0.05$). A significant relationship was not observed between subspecialty training and use of arthroscopic removal of loose bodies, tibial tubercle osteotomies, MPFL reconstruction, and cartilage procedures; however, pediatric and sports medicine-trained providers performed MPFL reconstruction at a higher incidence ($p < 0.001$).

CONCLUSION: There has been an increase in subspecialty management of patellofemoral instability. Sports medicine and pediatric surgeons are less likely to perform isolated lateral release and more likely to perform extra-articular ligamentous reconstruction. Similar trends in management were observed between the adult and pediatric population, except that there were significantly lower rates of isolated lateral release in the pediatric group.

Arthroscopic Inlay Suprapectoral vs. Mini-Open Onlay Subpectoral Biceps Tenodesis: A Prospective, Randomized Analysis of Clinical Outcomes and Ultrasound-Assessed Structural Integrity

Paper 032

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OBJECTIVE: Surgical techniques for biceps tenodesis vary in approach, fixation strategy, and anatomic location. The purpose of this study is to prospectively evaluate a randomized cohorts of patients undergoing arthroscopic suprapectoral biceps tenodesis (ASBT) with interference screw fixation using an inlay technique vs. mini-open subpectoral biceps tenodesis (MOBT) with a unicortical button implant using an onlay technique with regards to (1) clinical outcome measures and (2) structural healing as evaluated by ultrasound.

METHODS: Patients undergoing a biceps tenodesis procedure were preoperatively randomized to either an arthroscopic inlay suprapectoral biceps tenodesis or a mini-open onlay subpectoral biceps tenodesis. Patients' preoperative SANE, VAS, and ASES scores were recorded at baseline and subsequently at both three months and two years postoperatively. Additionally, the integrity of the biceps tenodesis site was independently examined via ultrasound by a musculoskeletal trained radiologist at three months and two years postoperatively.

RESULTS: A total of 52 patients (24 ASBT, 28 MOBT) were randomized and completed follow-up for shoulder exam, PROs, and ultrasound. Mean baseline SANE, VAS, and ASES scores between groups were similar. At three month follow-up and two year follow-up, patient reported outcomes were not statistically different between ASBT and MOBT groups. Both ASBT and MOBT demonstrated improvement that exceeded the reported patient – acceptable symptom state (PASS) scores. At the three-month postoperative ultrasound, 23/24 (96%) of the ASBT patients and 26/28 (93%) of the MOBT patients were noted to have a clearly intact biceps tenodesis. On ultrasound analysis at two years, all biceps tenodesis regardless of group were noted to be intact and healed.

CONCLUSION: This study demonstrates similar clinical outcomes at final follow-up between groups and excellent structural healing rates for both inlay and onlay biceps tenodesis techniques as determined by ultrasound. Ultrasound can be a useful adjunct in objective measurement of tendon healing, although findings in the earlier postoperative period may need to be interpreted with some caution as the radiographic appearance of tendon healing may evolve over time.

Long-Term Comparative Outcomes of All-Inside vs. Inside-Out Repair of Bucket-Handle Meniscus Tears: A Cohort Study

Paper 033

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INTRODUCTION: Bucket-Handle meniscus tears(BHMTs) are a common subtype of meniscus tears that represent a continued clinical challenge. Surgical repair of these tears can be performed in with an arthroscopic all-inside or inside-out repair, with both techniques having benefits and drawbacks.

To date, biomechanical studies have demonstrated that both techniques are similar. We previously demonstrated that at mean 4.4-year follow-up, in a rigorously matched cohort of all-inside vs. inside-out repair of bucket-handle meniscus tears, there was no difference in patient reported outcomes nor revisions. Since then, there has been a lack of conclusive evidence on the superiority of one technique over another.

The purpose of this study was to (1) compare long-term clinical outcomes and rates of failure after surgical repair of BHMTs using all-inside versus inside-out technique, and (2) identify risk factors for failure.

METHODS: Inclusion criteria was patients with BHMTs who underwent repair. Indications for repair consisted of reducible full-thickness tears within 3 mm of the meniscosynovial junction. Exclusion criteria was patients who had (1) not consented for research follow-up, (2) less than 2-year of follow-up, (3) grade 4 chondromalacia, (4) knee dislocations or combined anterior cruciate ligament and posterior cruciate ligament injuries, (5) previous repair of the ipsilateral meniscus. Of the original cohort totaling 70 patients, 7 (10%) were lost to follow-up, leaving 63 patients included in this study, resulting in a long-term follow-up rate of 90%.

RESULTS: Sixty-three patients (43 males, 20 females,age 23.9 ± 7.5 years (range 13-47), BMI 26.1 ± 3.9) with BHMT repair were followed for a mean of 11.2 years (range, 9-14). Baseline demographics were statistically similar ($p > 0.09$) between the Inside-out repair group (n=37) and the All-inside repair group (n=26). Postoperatively no difference was seen between the groups in Tegner (8.6 vs. 8.5,p=0.92), nor IKDC (79.4 vs. 80.5,p=0.83).

Survival at 2-, 5-, and 10-years follow-up for the Inside-out vs All-inside groups was 78% vs. 84%, 65% vs. 81%, and 60% vs. 70%, respectively with no statistically significant difference between the two groups ($p = 0.37$).

CONCLUSION: Long-term follow-up demonstrated acceptable and similar clinical outcomes of both Inside-out and All-inside repair of bucket-handle meniscus tears. However, the approximately one-in-three long-term reoperation rate highlights the need for continued advancement of meniscus repair.

Comparative Outcomes of Radial and Bucket-Handle Meniscal Tear Repair at Mean 10-Year Follow-Up: A Propensity-Matched Analysis

Paper 034

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BACKGROUND: Radial tears of the meniscus are increasingly treated with repair instead of partial meniscectomy, with satisfactory short-term clinical outcomes. There remains a paucity of mid- and long-term outcomes data for this preservation technique.

PURPOSE: The purpose of this study was to (1) evaluate the mid- to long-term clinical outcomes and reoperation rates of radial meniscal repair vs bucket-handle meniscal repair and (2) evaluate the outcomes of both surgeries overtime. We hypothesized that radial repair would provide similar outcomes and reoperation rates to that of bucket-handle meniscal repair in this propensity-matched cohort.

METHODS: A previously identified cohort of radial meniscal tears without concurrent root injuries undergoing surgical repair at a single institution between 2011 and 2015 were reviewed. Propensity matching was performed on the basis of age at surgery, sex, laterality, body mass index (BMI), and concomitant anterior cruciate ligament reconstruction (ACLR) using a comparison pool of 70 bucket-handle meniscal repairs (BHMR). Reoperation-free survival rates, Tegner Activity Score, Visual Analog Scale (VAS) for pain, and International Knee Documentation Committee (IKDC) scores were analyzed.

RESULTS: Twenty-four patients (18 male, 6 female, age 22.8 ± 11.9 years, BMI 26.5 ± 5.8) with radial meniscal repair were included in this study. Eighteen of these patients were propensity matched to 18 BHMRs for an overall mean follow-up of 10.2 ± 1.7 years (range, 7.3 – 13.5). The 24 radial tear repairs demonstrated significant and durable postoperative improvements at mean 10.2 years across VAS at rest, VAS with use, Tegner, and IKDC ($p < 0.001$ for all), and 100% reported being “Satisfied” or “Very Satisfied” with surgery. Ten-year reoperation-free survival was 79.2%. The matched radial and bucket-handle groups demonstrated no significant difference in patient-reported outcomes ($p \geq 0.480$) nor reoperation-free survival rates (79.2% vs. 77.8%, $p = 0.370$).

CONCLUSION: At mean 10-year follow-up, significant clinical improvements and high rates of satisfaction were observed for repair of radial meniscus tears. When propensity matched, radial and BHMR demonstrated durable improvements in postoperative VAS, IKDC, and Tegner scores, as well as similar, acceptable reoperation rates.

Predictors of Anterior Cruciate Ligament Re-Injury and Return to Sport in Adolescent Athletes
Paper 035

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INTRODUCTION: The incidence of anterior cruciate ligament (ACL) injuries is increasing among the adolescent population with a peak occurring in the high school age range. In young athletes who undergo ACL reconstruction (ACLR), the risk for secondary ACL injury is greatest in the early return to sports (RTS) period. The aim of this study was to characterize recent epidemiologic trends of ACL injuries and re-tear rates in high school adolescents and determine variables associated with sustaining secondary ACL injury.

METHODS: A prospectively maintained institutional database was retrospectively reviewed for patients 18 or younger who underwent primary ACLR between 2015 to 2020. Patients were eligible for inclusion if they were between ages 13-18 years old, participated in high school sporting activities, and underwent evaluation and primary ACLR at a single institution. Secondary ACL injury was defined as sustaining a contralateral tear or ipsilateral retear.

RESULTS: A total of 431 patients were included with median follow-up of 64.9 months. Nine percent of patients experienced a primary graft failure, and 11.2% sustained a contralateral ACL tear. Patients with a secondary ACL injury were older than those who did not sustain a subsequent ACL tear (mean age at surgery 16.2 ± 1.3 years vs. 15.6 ± 1.5 years, respectively, $p = 0.003$). A significantly longer follow-up duration was appreciated in adolescents with a secondary ACL injury (65.3 ± 18.8 months vs. 71.4 ± 21.2 months, $p = 0.022$). Multivariable cox regression analysis of secondary ACL injury and stepwise backward elimination analysis illustrated that younger age at primary ACL reconstruction (HR 0.71, 95% CI: 0.60, 0.85) and time to return to sport (HR 0.83, 95% CI: 0.74, 0.92) were significantly associated with an increased rate of secondary ACL injury. As age at primary ACLR increases by 1 year, the rate of secondary ACL injury decreases by 29%. Similarly, a 1-month delay in return to sport decreases the rate of secondary ACL injury by 17%.

DISCUSSION: Younger age and decreased time to return to sport following ACL injury are significant variables associated with sustaining secondary ACL injury in the pediatric patient population. Counseling of young adolescent athletes should include adequate physical therapy compliance and allowing for adequate healing and time to return to sport.

Predictors of Anterior Cruciate Ligament Re-Injury and Return to Sport in Adolescent Athletes
Paper 035

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DISCUSSION: Younger age and decreased time to return to sport following ACL injury are significant variables associated with sustaining secondary ACL injury in the pediatric patient population. Counseling of young adolescent athletes should include adequate physical therapy compliance and allowing for adequate healing and time to return to sport.

Evaluation of Nonoperative and Operative Management of Anterior Cruciate Ligament Injuries in the Development of Post-Traumatic Osteoarthritis: A Machine Learning Approach

Paper 036

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BACKGROUND: Nonoperative and operative management are both recommended in appropriately selected patients after anterior cruciate ligament (ACL) disruption; however, the subsequent development of post-traumatic knee osteoarthritis (PTOA) remains an area of active study.

HYPOTHESIS/PURPOSE: To compare the risk of PTOA between patients treated without surgery and with ACL reconstruction after primary ACL disruption utilizing a machine learning causal inference model.

STUDY DESIGN: Cohort Study

METHODS: A geographic database identified patients undergoing ACLR between 1990 and 2016 with minimum 7.5-year follow-up. Collected variables include age, sex, body mass index (BMI), activity level, occupation, relevant comorbid diagnoses, radiographical findings, operative findings, and postoperative clinical course. Treatment effect of reconstruction on the development of PTOA and progression to total knee arthroplasty (TKA) were analyzed with a machine learning causal inference estimator (Targeted Maximum Likelihood Estimation-TMLE), while controlling for confounders.

RESULTS: 1,194 patients with a minimum follow up of 7.5 years were included, among them 974 underwent primary reconstruction while 220 underwent nonoperative treatment. A total of 215 (22.1%) patients developed symptomatic PTOA in the ACLR group compared to 140 (63.6) in the nonoperative treatment group (P<0.001); while 25 (2.6) patients underwent TKA in the ACLR group compared to 50 (22.6) in the nonoperative treatment group (P<0.001). Additionally, patients in the ACLR group had delayed TKA compared to those in the nonoperative treatment group (193.4 months vs. 166.0 months, P=0.02). TMLE evaluation revealed that reconstruction decreased the risk of PTOA by 11% (95% CI: 8-13, P<0.001) compared to nonoperative treatment, but did not demonstrate a significant effect on the progression to TKA. Survival analysis with random forest algorithm demonstrated significant delay to the onset of PTOA as well as TKA in patients undergoing ACLR.

CONCLUSION: ACL reconstruction produced a significant treatment effect in reducing the development of PTOA and delaying the need for TKA following ACL disruption when compared to nonoperative treatment.

Impact of Lateral Extra-Articular Tenodesis on Return to Sport Following Anterior Cruciate Ligament (ACL) Reconstruction

Paper 037

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BACKGROUND: Athletes commonly encounter anterior cruciate ligament (ACL) tears. Lateral extra articular tenodesis (LET) is a procedure that can be used to augment ACL reconstruction and add rotational stability. The impact of LET on return to sport following ACL reconstruction is unknown.

PURPOSE: To evaluate the impact of lateral extra-articular tenodesis on return to sport following anterior cruciate ligament reconstruction with quadriceps tendon (QT), bone-patellar tendon-bone (BPTB), and hamstring tendon (HT) grafts.

METHODS: Competitive and recreational athletes between the ages of 13-24 who had an ACL reconstruction between 2010-2022 were included. Activity level, sport, graft type, cartilage treatment, RTS testing result data, and time to sport participation clearance were collected. Athletes with LET were matched by primary and revision status, graft type, age, and sex to athletes without LET. Wilcoxon sum rank test and Fisher's exact test were used, and statistical significance was set to $p<0.05$.

RESULTS: There were 29 athletes with LET and 87 athletes without LET after matching (3:1 LET:non-LET). Ages were 18.14±2.6 and 17.84±2.54 for LET and non-LET, respectively. Females comprised 15 LET and 48 non-LET ACL reconstructions. There were 13 revision LET ACL reconstructions and 33 non-LET ACL revisions. Isokinetic quadriceps testing at 300 degrees per second was 87% (n=17) for LET and 86.5% (n=28) for non-LET ACL reconstructions (p=0.4599). Time to sport participation clearance was 42.71±11.02 and 39±12.85 weeks for LET and non-LET ACL reconstructions, respectively (p=0.3134). Return to previous level of play occurred in 5/7 (71%) LET ACL reconstructions and 24/30 (80%) non-LET ACL reconstructions (p=0.6199). Return to competition was observed in 4/5 (80%) LET and 24/25 (96%) non-LET ACL reconstructions (p=0.6309). Reinjury occurred in 5/29 (17%) LET patients and 14/85 (16%) non-LET ACL reconstructions (p=0.9234). Of those reinjuries, there were 2 ACL re-tears in the non-LET group, and 0 in the LET group (p=1).

CONCLUSIONS: The addition of LET to primary or revision ACL reconstruction does not appear to significantly impact recovery and return to sport after surgery. LET may provide addition stability and protection against graft re-injury. This study will allow orthopedic surgeons and their patients to engage in shared decision-making regarding LET when encountering an ACL tear.

Isolated Medial Meniscus Root Tears: A Multicenter Analysis of Prognostic Variables for Achieving Patient Acceptable Symptomatic State after Repair

Paper 038

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OBJECTIVE: Medial meniscus posterior root tears (MMPRTs) render the meniscus essentially non-functional, resulting in increased peak contact pressures, reduced forced dissipation, and increased risk of early osteoarthritis. Transtibial root repair has shown promise at restoring meniscus function and improving clinical outcomes; however, a paucity of literature exists evaluating the prognostic clinical and radiographic factors for poor outcomes following isolated meniscus root repair. The purpose of this study was to (1) describe the patient reported clinical outcomes after isolated MMPRT repair at minimum 2-year follow-up, (2) determine the retear and conversion to arthroplasty rates, and (3) identify prognostic factors for clinical outcomes and International Knee Documentation Committee (IKDC) Patient Acceptable Symptom State (PASS) achievement.

METHODS: Isolated MMPRT repairs from 2010-2020 at three institutions were followed prospectively for postoperative Tegner Activity Scale, Visual Analogue Scale (VAS) for pain, IKDC, Forgotten Joint Score (FJS), subjective improvement and knee preference, and subsequent surgeries at minimum 2-year follow-up. PASS for IKDC was set at 69. Demographics, injury characteristics, and surgical details were collected.

RESULTS: Eighty-four patients (age: 50±11 years; 75% female; BMI: 32±7 kg/m^2) were followed for a mean of 4±2 years (range 2-12). Mean medial compartment Outerbridge grade was 2±1 (74% ≥ grade 2), and 17% of patients were smokers. Postoperative Tegner score returned to pre-injury levels (4.6±2.4 vs. 4.3±1.8, p=0.214), and VAS improved significantly postoperatively (p<0.001). Subjective postoperative improvement was reported in 89% of cases, compared to “mild worsening” in 6%. Retear occurred in 5 patients and conversion to arthroplasty occurred in 7 patients, including one retear patient, resulting in an overall failure rate of 13%. In total, 37% of patients failed to achieve IKDC PASS. Smoking was correlated with a 15-point reduction in IKDC (p=0.010).

CONCLUSION: Patients undergoing transtibial root repair demonstrate restoration of pre-injury activity levels, significant clinical improvements in pain and function, and low surgical failure rates at minimum 2-year follow-up, with 89% of patients reporting subjective improvement after surgery. However, only 63% of patients were able to achieve PASS thresholds, suggesting that while effective, additional research on root repair technical and clinical optimization is warranted.

Long-Term Outcomes of Primary Hip Arthroscopy: Multicenter Analysis at Minimum 10-Year Follow-Up with Attention to Labral and Capsular Management

Paper 039

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OBJECTIVE: Hip arthroscopy is rapidly advancing, with positive published outcomes at short- and mid-term follow-up; however, available long-term data remains limited. This study served to evaluate outcomes of primary hip arthroscopy at minimum 10-year follow-up at two academic centers by describing patient reported outcomes (PROs) and determining re-operation and total hip arthroplasty (THA) rates.

METHODS: Primary hip arthroscopies performed between January 1988-April 2013 at two academic centers were evaluated for postoperative PROs including Visual Analogue Scale (VAS), Tegner Activity Scale score, Hip Outcome Score Activities of Daily Living and Sport Scale (HOS-ADL/HOS-SS), modified Harris Hip Score (mHHS), Nonarthritic Hip Score (NAHS), 12-item International Hip Outcome Tool (iHOT-12), surgery satisfaction, and reoperations.

RESULTS: Two-hundred ninety-four primary hip arthroscopies (age: 40±14 years; 66% female; BMI: 27±6 kg/m^2) were followed for 12±3 years (range: 10-24) postoperatively. Labral debridement and repair were performed in 41% and 59% of patients, respectively. All patients underwent interportal capsulotomy and 2% underwent T-capsulotomy, with 11% of all patients undergoing capsular repair. At final follow-up, patients reported mean VAS at rest of 2±2, with use of 3±3, iHOT-12 of 68±27, NAHS of 81±18, mHHS of 79±17, HOS-ADL of 82±19, and HOS-SS of 74±25. Mean surgical satisfaction was 8.4±2.4. In total, 96 hips (33%) underwent reoperation, including 65 hips (23%) converting to THA. Risk factors for THA included older age, higher BMI, lower LCEA, larger alpha angle, higher preoperative Tönnis grade, labral debridement, and capsular non-repair (p£0.039). Patients undergoing combined labral and capsular repair demonstrated a THA conversion rate of 3% compared to 31% for patients undergoing combined labral debridement and capsular non-repair (p=0.006). Labral repair trended towards increased 10-year THA-free survival (84% vs. 77%, p=0.085) while capsular repair demonstrated significantly increased 10-year THA-free survival (97% vs. 79%, p=0.032).

CONCLUSION: At minimum 10-year follow-up, patients undergoing primary hip arthroscopy demonstrated high satisfaction and acceptable outcome scores. In total, 33% of patients underwent reoperation including 23% who underwent THA. Conversion to THA was associated with patient factors including older age and higher Tönnis grade as well as potentially modifiable surgical factors including labral debridement and capsular non-repair.

Psychological Distress Measured by the OSPRO-YF is Common and Influences Perceived Hip Dysfunction in Young Adults

Paper 040

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OBJECTIVE: Comprehensive evaluation of psychological distress requires specific, individual evaluations of each domain that can lead to survey fatigue. The Optimal Screening for Prediction of Referral and Outcome Yellow Flag (OSPRO-YF) is a screening tool that incorporates many important psychological distress domains into a single questionnaire. The OSPRO-YF has not been critically evaluated as a screening tool in the young adult hip population.

METHODS: Two hundred consecutive patients, aged 12-40 years old, who presented to our hip preservation clinic completed the OSPRO-YF, PHQ-9, and iHOT surveys. A Spearman correlation coefficient was used to describe the relationship between the standard and OSPRO-YF-estimated PHQ-9 scores. Participants were grouped for separate analyses according to presence vs absence of moderate-severe depression (PHQ-9≥10, <10), number of "flags" (≤4, 5-8, ≥9) and gender. Differences between groups were evaluated using t-tests or ANOVA, for continuous variables, and chi-square tests for categorical variables.

RESULTS: The mean age was 24.5±8.1 years and 75% were female. The PHQ-9 survey revealed 1.5% without depression and 51% minimal, 30% mild, 13% moderate, 5% moderately-severe, and 0.5% severe depression. According to the OSPRO-YF, 35% were "flagged" for depression. The most common "flag" on OSPRO-YF was the Tampa Scale for kinesiophobia at 60%. The least common "flag" was the State-Trait Anger Expression Inventory in 28%.

There was a moderate correlation between PHQ-9 and the OSPRO-YF PHQ-9 (rho=0.70, $p<0.001$). Participants with vs. without moderate to severe depression were slightly older (mean 27.5±8.6 vs. 23.9±7.8 years, $p=0.026$), and did not differ in proportion female (77% vs. 76%, $p=0.896$). Age and sex were not associated with more "flags" ($p=0.203$ and $p=0.513$).

Participants with moderate to severe depression had significantly lower iHOT scores (mean 32.4±26.7 vs. 49.3±24.5, $p<0.001$). Additionally, mean iHOT scores progressively worsened with more "flags": 4 or less "flags" (60.4±24.4) vs. 5-8 "flags" (37.6±16.7) vs. 9 or more "flags" (24.9±14.3) ($p<0.05$ for all comparisons).

CONCLUSION: OSPRO-YF is an efficient tool to assess psychological distress. We found that depression was very common in the young adult hip population. The OSPRO-YF and moderate or greater depression predicted worse hip dysfunction. Further study is needed to determine how psychological distress impacts treatment outcomes of hip conditions and how treatment of psychological comorbidities may impact outcomes in hip preservation.

Impact of Previous Hip Arthroscopy on Outcomes of Periacetabular Osteotomy to Treat Hip Dysplasia
Paper 041

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INTRODUCTION: Periacetabular osteotomy (PAO) is a well-accepted surgical treatment for hip dysplasia. Treatment of borderline hip dysplasia is controversial, with some surgeons electing to treat with hip arthroscopy. Unfortunately, as many as 20% of patients with borderline hip dysplasia have persistent pain after hip arthroscopy, leading some to seek further treatment. Our goal is to compare outcomes of patients treated with PAO for hip dysplasia with and without previous hip arthroscopy.

METHODS: We prospectively collected demographics, patient-reported outcomes (PROs), and pre- and postoperative radiographic measurements for consecutive patients treated with PAO between January 2018 and October 2021. The modified Harris Hip Score (mHHS) and International Hip Outcome Tool (iHOT) were collected before surgery and minimum one year after surgery. Parameters for measuring successful outcome set as a PASS for mHHS≥70 and iHOT≥63, MCID for ΔiHOT≥13 and SCB for ΔiHOT≥28. Student's t-tests and regression analysis were performed as appropriate to compare patients with and without previous hip arthroscopy. p-values less than 0.05 were considered significant.

RESULTS: 129 patients that underwent PAO for treatment of hip dysplasia completed PROs preoperatively and minimum one year postoperatively (90% completion). The mean ± standard deviation (SD) age was 22.2±8.1 years and 108 (84%) were female. Twenty (17%) underwent hip arthroscopy prior to PAO. Age, sex, and body mass index were not significantly different between groups. Patients without previous hip arthroscopy had a significantly lower LCEA before surgery (15±8° vs 20±5°, p=0.007). 3 patients underwent labral reconstruction as part of the revision arthroscopy surgery.

For the entire cohort, there were significant pre- to postoperative improvements in PROs. The mean ± SD mHHS improved from 56.0±15.0 pre-operatively to 86.2±15.7 post-operatively ($p<0.001$) and iHOT improved from 32.0±15.7 pre-operatively to 77.9±23.4 post-operatively ($p<0.001$). Patients that had undergone previous hip arthroscopy had a similar improvement in mHHS (29.5±18.9 no previous arthroscopy vs 33.6±19.7 previous arthroscopy, p=0.610) and iHOT (45.1±24.8 no previous arthroscopy vs 52.2±27.7 previous arthroscopy, p=0.257). Rates of achieving PASS for mHHS (84% no previous arthroscopy vs 78% previous arthroscopy, p=0.432) and iHOT (79% vs 83%, p=0.990), and MCID (87% vs 94%, p=0.818) and SCB (78% vs 89%, p=0.593) for iHOT were similar between groups.

DISCUSSION: Previous hip arthroscopy did not predict inferior secondary outcomes of hip dysplasia treated with PAO. This study suggests that patients with borderline hip dysplasia that fail treatment with hip arthroscopy are not at increased risk for poor outcomes at short term follow up. Future work will expand follow up beyond two years postoperatively.

Efficacy of Intraoperative Intra-Articular Morphine on Postoperative Pain and Opioid Consumption Following Hip Arthroscopy

Paper 042

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OBJECTIVE: The use of intraoperative intra-articular morphine has been suggested to lower postoperative pain scores and opioid use. We sought to evaluate the effectiveness of intra-articular morphine with 0.75% ropivacaine when compared to the use of ropivacaine alone. We looked to determine the efficacy of intra-articular morphine on pain control, opioid consumption, and discharge times in the immediate postoperative period.

METHODS: We retrospectively reviewed the charts of 100 patients who underwent hip arthroscopy with repair for femoroacetabular impingement (FAI) between 2021 to 2023. 50 patients who received 5 mg of intra-articular morphine injections intraoperatively were identified, as well as 50 patients who did not. Patients undergoing hip arthroscopy without repair, revision surgery, or combined hip arthroscopy and femoral osteotomy or periacetabular osteotomy were excluded. Demographics including age, sex, race, ethnicity, BMI, and tobacco use were recorded. Procedural factors included total operative time, traction time, and time to discharge. Pain scores were assessed using the Visual Analog Scale (VAS), and the initial Post-Anesthesia Care Unit (PACU) and final PACU scores were recorded. Total acute opioid use was recorded using morphine milligram equivalents (MME) used from post-operation to discharge. We used the Wilcoxon rank sum test and chi-square statistics on continuous and categorical variables, respectively. The statistically significant level was set as $p<0.05$.

RESULTS: No significant differences were found between demographics, operative time and traction time, or discharge time. The median age of patients in the non-injection group was 29 (48% M, 52% F), and 24.5 (34% M, 66% F) in the injection group. Differences between the non-injection and injection group in postoperative VAS scores were insignificant, with the mean initial PACU VAS scores (4.6 ± 3.0 vs. 5.4 ± 3.0) and mean final PACU VAS scores (3.5 ± 1.9 vs. 3.7 ± 1.4) respectively. The postoperative MME consumption difference was also insignificant (16.3 ± 17.1 vs. 17.5 ± 17.9).

CONCLUSION: Intraoperative intra-articular morphine injection with ropivacaine does not provide a significant reduction in acute postoperative pain scores or opioid use when compared to ropivacaine use alone. Further investigation into the efficacy of intra-articular morphine is warranted.

A Comparison of Geriatric Periprosthetic Distal Femur Fractures Treated with Open Reduction Internal Fixation, Retrograde Intramedullary Nail, or Distal Femoral Replacement

Paper 043

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INTRODUCTION: Within this study, we aim to compare outcomes of periprosthetic distal femur fractures treated with open reduction internal fixation (ORIF), retrograde intramedullary nail (rIMN), and distal femoral replacement (DFR). Our main outcomes included length of hospital stay, ambulatory status at one year, re-operations, hospitals readmissions and one-year mortality rates.

METHODS: The study retrospectively reviewed 377 patients with distal femur fractures across three major academic hospitals within one metropolitan area. Patients were grouped based on operative management: ORIF, rIMN, and DFR. Univariate comparisons were conducted using Chi-Square and Kruskal Wallis tests at the $p<0.05$ significance level where appropriate. Multivariate linear and logistic regression analysis was conducted to identify risk factors for increased hospital stay, re-operation, readmission, and one-year mortality.

RESULTS: 165 patients were included in the study comprising of 63.2% females with a mean age of 75.8±9.4 and BMI of 31.9±8.5. 65 patients underwent ORIF, 47 underwent rIMN, and 51 underwent DFR. There were no differences in rates of open fracture, pre-ambulatory status, or discharge disposition. DFR was associated with the longest length of hospital stay compared to ORIF and rIMN (9.1 vs. 5.6 vs. 6.7 days; $p=0.010$). Patients undergoing DFR and rIMN were more likely to receive an intra-operative blood transfusion (44.0% vs. 42.6% vs. 12.3%; $p <0.001$). rIMN had a lower rate of hospital readmission (2.3% vs. 12%[ORIF] vs 27.5%[DFR]; $p=0.002$). Patients undergoing DFR are immediately weight bearing at tolerated postoperatively while patients with rIMN were transitioned to weight bearing at an average of 41.5 days and ORIF at an average of 87.6 days ($p<0.001$). At one year post operative, DFR had the highest rate of independent ambulators (51% vs. 38.5%[ORIF] vs 22.0%[rIMN]) and lowest rate of non-ambulatory patients (7.8% vs. 20%[ORIF] vs. 14.6%[rIMN]). There were no differences in re-operation rate or one-year mortality across the cohorts. Multivariate analysis identified DFR as a risk factor for increased length of stay ($p=0.009$). DFR (OR=5.7, $p=0.004$), open fractures (OR=8.6, $p=0.046$), and a diagnosis of diabetes mellitus (OR=3.6, $p=0.031$) were risk factors for hospital readmission. Age was the only factor associated with increased re-operation and one-year mortality ($p=0.018$; $p<0.001$).

CONCLUSION: Each approach to distal femur fractures has its own unique benefits and considerations. DFR is associated with increased length of hospital stay and readmission, but has higher rates of independent ambulators at one year follow-up. There were no differences across the cohorts with respect to re-operation or one-year mortality rates. Further study is needed to compare functional outcomes and costs of care related to these treatment options to better guide treatment planning.

Buttress Fixation of the Posterior Malleolar Fragment (PMF) is Safe and Permits Early Weightbearing After Trimalleolar Ankle Fracture

Paper 044

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INTRODUCTION: The benefits of early postoperative weightbearing after orthopedic surgery has been demonstrated such as in lower extremity long bone fractures and in lower extremity arthroplasty. There has been limited research into the safety and outcomes of early postoperative weight bearing in trimalleolar ankle fractures treated with indirect syndesmotic stabilization via buttress fixation of the posterior malleolar fragment. This 24 patient case-series aims to determine if buttress fixation of the PMF allows for safe early weightbearing after trimalleolar ankle fracture.

METHODS: Patients with a trimalleolar ankle fracture treated with direct buttress fixation of the posterior malleolar fragment (PMF) and standard fixation of the fibula and medial malleolus were included in the study if they had at least 6-month follow-up and were treated by a single surgeon at a level I trauma center between August 2019 and June 2022. All patients were permitted to fully weight bear at two weeks postoperatively. Patients with uncontrolled diabetes (HbA1c >9), neuropathy, osteoporosis, or poor soft tissue coverage were excluded. Medical records were reviewed for demographic information, injury classification, clinical course, postoperative follow-up details, and patient reported outcome measures (SMFA, PROMIS Pain 6a, PROMIS PF, Olerud-Molander). Work and ambulation-related data were collected via telephone if not able to return to clinic.

RESULTS: Twenty-four patients met inclusion criteria. The average size of the posterior malleolar fragment AP dimension was 10.16 (+/-3.6) mm, and 58% of fractures were Haraguchi type 1. After buttress fixation of the PMF and standard fixation of the fibula and medial malleolus, no patient had syndesmotic or medial clear space widening with any of three distinct stress test maneuevers. The average time to begin full weight bearing was 17.96 +/- 8.8 days. The average age and BMI at time of injury was 41.38 (+/-13.1) and 28.86 (+/-5.3) respectively; all patients had a Charleston Comorbidity Index less than 4. No patients developed a postoperative infection, fracture displacement, mortise or syndesmotic incongruity, or post-traumatic osteoarthritis. Painful implants were removed in 4 patients (16.7%). In 17 patients with available work data, 100% were ambulating without assistance and 15/17 (88%) were employed; 14 of these 15 at their pre-injury occupation. The average return to work time was 135 (+/- 82.9) days. Average patient reported outcome measures at 6 months were: SMFA Dysfunction Score 22.5 (+/- 13.1); SMFA Bother Score 24.9 (+/- 18.7); PROMIS Pain 6a 55.9 (+/-8.5); PROMIS PF 12a 43.4 (+/-8.2); Olerud-Molander 49.7 (+/-21.1).

CONCLUSION: Early weightbearing is safe after direct buttress fixation of the PMF in trimalleolar fracture patterns. Direct buttress fixation also stabilizes the syndesmosis and this case series suggests that it returns patients to normal ambulation and work in a predictable manner. Future prospective investigation is warranted.

Institutional Experience: Impact of Fracture Liaison Service on Fragility Femur Fracture Outcomes
Paper 045

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OBJECTIVE: In line with the American Orthopaedic Association's Own the Bone initiative emphasizing osteoporosis care and the need for secondary fracture prevention, a fracture liaison service was developed at our institution to improve osteoporosis care delivery through inpatient evaluation of patients sustaining fragility fractures. This study aims to evaluate the efficacy of this service by evaluating outcomes following fragility femur fractures, as well as, the rates of bone health interventions, outpatient follow-up, and DEXA acquisition.

METHODS: A retrospective review was performed using CPT codes for patients 50 years and older who underwent operative fixation of a femur fracture resulting from a low energy mechanism (standing height or lower) from January 1, 2021 - June 1, 2022 following formation of the fracture liaison service and bone health clinic. Patients were stratified by completion of an inpatient fracture liaison consult and were evaluated for rates of vitamin D, calcium, and protein supplementation, bone health referral, follow-up in bone health clinic, DEXA acquisition, and osteoporosis medication initiation. Complications within one year of surgery including refracture, subsequent fractures, nonunion, revision surgery, and mortality were compared. Independent Student t-tests and Chi squared/Fisher exact test were utilized in analysis ($\alpha \leq 0.05$).

RESULTS: 246 patients met inclusion criteria of which 135 (54.9%) received an inpatient fracture liaison consult. Patients receiving a consult were statistically more likely to receive Vitamin D (94.8 vs. 54.1%, p-value<0.001), calcium (86 vs. 40%, p-value<0.001), protein supplementation (68.7 vs. 38.8%, p<0.001), and a referral to the bone health clinic (94.8 vs. 21.6%, p-value<0.001). Patients receiving a consult had a statistically increased rate of follow-up in bone health clinic (54.1 vs. 17.1%, p-value<0.001), an increased rate of DEXA acquisition (48.7 vs. 14.1%, p-value<0.001), and prescription of osteoporosis medications (34.8 vs. 17.6%, p-value<0.001). Rates of complications (31.9 vs. 30.6%, p-value=0.837) including refracture (0 vs. 1.0%, p-value=0.451), subsequent fractures (3.0 vs. 5.4%, p-value=0.354), nonunion (3.0 vs. 4.5%, p-value=.735), revision surgery (5.2 vs. 5.4% p-value=.939), and mortality (25.2 vs. 21.6% p-value=.512) within one year postoperatively were not statistically different between groups.

CONCLUSION: Utilization of an inpatient fracture liaison consult following operative fragility femur fractures is effective in increasing rates of follow-up in outpatient bone health clinic, DEXA acquisition, and prescription of osteoporosis medications. Rates of complications within one year postoperatively were not statistically different between patients receiving a fracture liaison consult.

Evaluating the Utility of Post-Reduction Imaging for Simple Hip Dislocations: Is Computed Tomography Always Necessary?

Paper 046

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OBJECTIVE: Following reduction of hip dislocations without immediate indications for surgery, computed tomography (CT) is considered standard of care to identify occult fractures or intra-articular loose bodies that may be missed on x-ray. The purpose of this study was to evaluate the sensitivity of post-reduction x-rays and the usefulness of subsequent post-reduction CT imaging.

METHODS: Subjects who presented to a regional hospital system for traumatic hip dislocations from 2013-2022 were retrospectively reviewed. Only those with no fracture identified prior to hip reduction and received both post-reduction imaging modalities (x-ray and CT) were included. Outcomes included fractures of the acetabulum or femoral head and intra-articular loose bodies.

RESULTS: Thirty-five subjects (22 males) with a mean age of 26.1 years were included. Post-reduction CT revealed 6 fractures and 3 loose bodies, whereas post-reduction x-ray identified 3/6 fractures and 3/3 loose bodies. Four cases received operative management, all of which were identified on post-reduction x-ray. Post-reduction x-rays had a sensitivity of 67% in identifying any pathology subsequently found on CT, and a sensitivity of 100% for identifying pathology requiring surgery. Of the 13 cases with pre-reduction CT, none had new findings identified on post-reduction CT.

CONCLUSION: Post-reduction x-rays were effective at identifying cases requiring surgical management, and post-reduction CT revealed no new findings compared to pre-reduction CT. The results of this study suggest that if an operative fracture was not identified on pre-reduction CT and post-reduction x-ray, a post-reduction CT added no value in surgical decision-making and was not necessary.

Nutrition Matters! Inadequate Protein Intake is Associated with Worse Physical Function After Femoral Fragility Fracture

Paper 047

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PURPOSE: Femoral fragility fractures are common and result in devastating loss of physical function. In the absence of sufficient nutritional intake to meet metabolic demand after injury, the body compensates by breaking down healthy skeletal muscle, limiting functional recovery. The purpose of this study was to determine the impact of baseline nutrition deficiencies on loss of skeletal muscle and physical function after femoral fragility fractures.

METHODS: A two-center prospective study enrolled individuals ≥65 years old admitted for operative fixation of a low-energy femoral fracture. Skeletal muscle mass (SMM) and basal metabolic rate (BMR) were measured within 72 hours of admission using multifrequency bioelectrical impedance and repeated 3 months after injury. Physical function was assessed using PROMIS-PF at baseline and 3 months after injury. Preoperative dietary intake was measured using a food frequency questionnaire (FFQ), and inadequate protein intake was defined using the estimated average requirement cut-point method. Wilcoxon rank sum test was used compared protein intake, PROMIS-PF score, and SMM loss between groups. SMM and PROMIS-PF results are presented as median (interquartile range).

RESULTS: Twenty-one participants (38% male) age 72.4±6.8 years completed the FFQ. At baseline, 11 (52%) reported caloric intake below their BMR and 10 (48%) reported inadequate protein intake. Subjects with inadequate caloric intake consumed significantly less protein (0.51 g/kg (0.41 to 0.54) vs. 0.86 g/kg (0.71 to 1.06), p=0.016).

Subjects lost 4.0 kg (-1.8 to -9.1, p=0.001) of SMM and PROMIS-PF decreased 8.0 points (-2.9 to -13.3, p=0.004) in the 3 months following injury. No difference in SMM loss was observed between subjects with adequate calorie/protein intake and those without (calorie: -4.1 kg (-2.0 to -7.3) vs. 2.9 kg (0.0 to -9.0), p=0.90, protein: -4.4 kg (-3.6 to -7.3) vs. 1.5 kg (2.0 to -9.0), p=0.35). However, subjects with inadequate protein intake had a significantly lower PROMIS-PF score at 3 months (30.1 points (28.2 to 33.1) versus 39.4 points (33.1 to 44.6), p=0.031).

CONCLUSION: Inadequate nutrition, loss of skeletal muscle, and loss of physical function was common in older adults with femoral fragility fractures. Compared to subjects with adequate protein intake, those with inadequate protein intake reported significantly worse physical function after injury. These results highlight the need for further investigation into nutrition-based interventions to improve clinically relevant outcomes after femoral fragility fracture.

Does Removal of Retained Bullet Fragments at Time of Internal Fixation Reduce the Risk of Deep Infection?
Paper 048

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PURPOSE: Nonfatal gunshot injuries (GSIs) commonly involve long bones of the extremities, and many require orthopedic surgical fixation. It is common for these patients to have retained bullet fragments (RBFs) in addition to the osseous injury; however, the impact of RBFs on the risk of developing a deep infection when employing internal fixation to long bone fractures remains unknown.

METHODS: An institutional trauma registry from our level 1 trauma center was queried for patients presenting with GSIs from 2012-2021. 2,536 patients with GSIs were evaluated, and 131 met strict inclusion criteria. Only patients with extra-articular long bone fractures requiring open reduction and internal fixation (ORIF) or intramedullary nail (IMN), without vascular repair, skin grafting, or external fixation were included. Patients' medical records, operative reports, CPT codes, and imaging were retrospectively reviewed. GSIs were divided into two groups based on the presence or absence of RBFs removal at the time of internal fixation. Deep infection was determined at subsequent postoperative encounters according to the Fracture-Related Infection (FRI) guidelines.

RESULTS: 131 patients with GSIs met inclusion criteria, 81 patients had removal (R) of RBFs at time of internal fixation vs. 50 patients with no removal (NR). ORIF was performed in 55 cases (R: 39; NR: 16), and IMN was performed in 76 cases (R: 42; NR: 34). No statistically significant difference between the R and NR groups based on age, gender, type of fixation, or body region involved. Removal of RBFs resulted in a statistically significant difference in the rate of deep infection compared to the NR group ($p = 0.027$). Two deep infections (2.4%) were seen in the RBF removal group, compared to seven infections (14%) in the NR group. Additionally, the NR group had a higher incidence of early (2.24 months) infection, whereas the R group was associated with late (10.09 months) infection when they occurred ($p = 0.018$).

CONCLUSION: In our study population, we found a statistically significantly increased incidence of deep and early infection when RBFs are not removed at the time of extra-articular long bone internal fixation. The presence of retained foreign bodies following internal fixation may pose a risk factor for future development of deep infection. We believe a surgeon should use their best judgment as to whether a RBF can safely be removed at the time of long bone fixation. Based on our findings, if permitted safely, RBFs removal should be considered at the time of GSI long bone fixation.

Outcomes and Risks Associated with Timing to Subsequent Hip Fractures
Paper 049

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OBJECTIVE: Hip fractures constitute a major public health problem for older individuals, often associated with functional deterioration, limited mobility, and increased mortality, while contributing to economic and social hardships. With the increasing rates of hip fractures, it is essential to understand complicating factors and outcomes for when a subsequent event occurs.

METHODS: This descriptive study is a retrospective review of patients aged > 60 years identified in the institutional geriatric hip fracture database as having sustained an initial and subsequent contralateral hip fracture, with the second treated at this large urban tertiary referral center. Data from patients meeting the criteria was extracted from the database including age at fracture, fracture type, complications, pre-admission and discharge osteoporosis medication use, co-morbidities, and mortality. Kaplan-Meier was used to analyze the time from the first fracture to second fracture for various risk factors.

RESULTS: 71 (11.2%) of 632 patients were found to have subsequent hip fracture. 56.3% had significant bone-related history prior to the first fracture. 76.1% had at least one pre-existing chronic condition. The mean time to second hip fracture was 3.5 years. There was a higher in-hospital complication rate after a subsequent hip fracture (74.6% vs. 57.7%). Patients taking osteoporosis medication prior to admission for the second fracture have a lower 90-day mortality rate (33.3% vs. 9.5%), (OR 0.163; 95% CI 0.030-0.882), as demonstrated by the estimated model coefficient of -1.8133. There was no statistically significant difference with in hospital complications or 90-day readmission with taking osteoporosis medication. Patients with a history of any fracture prior to the first hip fracture, older age, and osteopenia had a statistically significant shorter interval to the subsequent hip fracture. After initial hip fracture patients with cancer were significantly more likely to sustain their hip fracture within the first five years compared to those without cancer. Patients with osteoporosis were more likely to have their second hip fracture within one year after the initial hip fracture event. There was no statistically significant difference with regards to in hospital complications or 90-day readmission with taking an osteoporosis medication.

CONCLUSION: Steps should be taken after first hip fracture to optimize outcomes in the case of a subsequent event and patients followed for medial compliance. Certain groups of patients, those with osteoporosis and cancer, carry higher risk of subsequent hip fracture earlier on.

Cannulated Screws or Hemiarthroplasty for Femoral Neck Fractures: Is There a Mortality Difference?
Paper 050

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INTRODUCTION: Historically, relatively stable femoral neck fractures (FNFx) in elderly patients have been treated with in-situ cannulated screw fixation (CS) while displaced fractures have been treated with hip arthroplasty. Several studies have focused on radiographic fracture characteristics attempting to predict which fractures, when treated with CS, would result in failure and need for conversion arthroplasty. It has been assumed that, because of the increased surgical insult, patients undergoing hemiarthroplasty (HA) would experience more perioperative complications and increased mortality. This study aimed to compare elderly patients with FNFx treated with CS or HA, and determine if HA is associated with increased perioperative morbidity and mortality.

METHODS: We retrospectively identified patients over age 60 with FNFx (OTA 31-B) treated with HA or CS between 2001 and 2018. 2,211 patients were included, 1,721 were treated with HA and 490 with CS. The primary outcomes collected were mortality and reoperation rates in addition to transfusion requirements and hospital length of stay. Kaplan-Meier estimation and Cox Proportional-Hazards modelling were used to assess time to event outcomes. Odds ratios were used to compare mortality between the cohorts at 30 days, 90 days, and 1 year. Multivariate analysis was used where appropriate. Mean follow-up was 19 months.

RESULTS: One-year mortality was 24.7% for the CS group and 28.8% for the HA group, but overall survival was not statistically significant ($p=0.99$). The rate of reoperation at one year was 19.2% and 3.8% for CS and HA respectively; overall, HA has a lower reoperation rate ($p<0.0001$). Among patients treated with HA compared to CS, the overall mortality risk ratio was 0.90 (95% CI, 0.78-1.03). The reoperation risk ratio of CS compared to HA was 6.47 (95% CI, 4.38-9.51). Thirty day, 90-day and 1-year mortality odds ratios and their 95% CI for HA vs CS were 1.40 (0.78-2.49), 1.08 (0.74-1.57), and 1.25 (0.93-1.67), respectively.

DISCUSSION: Patients with FNFx treated with HA were not associated with increased risks of short-, mid- or long-term mortality when compared to those treated with CS. Hemiarthroplasty treatment was associated with a significantly lower reoperation risk when compared to CS across the lifetime of the patient.

Femoral Shaft Fracture Characteristics Predictive of Ipsilateral Femoral Neck Fractures
Paper 051

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OBJECTIVE: This study aims to identify and describe the radiographic features and characteristics of patient injury in femoral shaft fractures, with the goal of establishing predictive indicators for the presence of ipsilateral femoral neck fractures.

METHODS: A retrospective analysis of patient data derived from three level I trauma centers by current procedural terminology (CPT) codes from the electronic medical record (EMR). CPT codes for both isolated and combined ipsilateral femoral shaft and femoral neck fractures were cross referenced to generate a control and study group. Demographic information, fracture characteristics, and imaging studies were all collected from the EMR. Descriptive statistics using paired t-test and multivariate logistic regression was performed to identify potential risk factors for combined femoral shaft fractures and ipsilateral femoral neck fractures compared to femoral shaft fractures alone.

RESULTS: A total of 420 patients met the study inclusion criteria. Of these, 280 patients had isolated femoral shaft fractures (IFNFs) and 140 patients had combined femoral shaft fractures and ipsilateral femoral neck fractures. The mean displacement for femoral shaft fractures was 85.35% compared to 95.8% in the ipsilateral femoral shaft and femoral neck group, with a trend towards statistical significance ($p=0.055$). Multivariate analysis found significantly higher initial displacement of femoral shaft fractures in the combined group ($p=0.039$). Falls from height ($p=0.038$), gunshot wound (GSW) ($p<0.001$), and sport ($p<0.001$) were protective from mechanisms in univariate analysis. Multivariate analysis showed motorcycle crashes (MCC) were more commonly associated with IFNFs when compared to falls from height ($p=0.011$), sport ($p=0.009$), and GSW ($p<0.001$). OTA/AO classification was different between groups ($p=0.002$), with OTA/AO 32B classification fractures being protective when compared to OTA/AO 32A classified fractures in multivariate analysis ($p=0.001$). Location of fractures was different between groups ($p<0.001$), with isthmic fractures showing the highest rate of IFNFs in both univariate ($p=0.004$) and multivariate ($p=0.011$).

CONCLUSION: Fracture displacement displayed a statistically significant predictor of ipsilateral femoral neck fracture. Additionally, femoral fractures through the isthmus showed the strongest statistical predictor and accompanied ipsilateral femoral neck fracture. Surprisingly, the classification of the fracture as open or closed did not emerge as a significant predictor of ipsilateral femoral neck fracture. However, an intriguing finding suggests that femur fracture comminution at the site of the femoral shaft fracture might serve as a protective factor against ipsilateral femoral neck fractures.

Characteristics of Fracture Related Infection Predicting Lower Extremity Amputation
Paper 052

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OBJECTIVE: Although amputation is an unfortunate result, it is occasionally unavoidable in cases of infection related to fractures, especially in the lower limbs. This study aimed to identify patient, bacterial, and treatment factors that could potentially contribute to increased amputation rates in individuals with fracture-related infections.

METHODS: A retrospective cohort study performed at a single level 1 trauma center over a 7-year period (2013-2020) including patients with lower extremity (femur, tibia, and calcaneus) fracture related infections. Patients were identified by ICD 10 diagnosis code. Demographics, comorbidities, fracture characteristics, presenting characteristics, microbial characteristics, hospital treatment course, adverse events, and peri-infection labs were collected.

RESULTS: A total of 222 patients were included in this study. The overall amputation rate was 9.5%. No significant differences were found in age, sex, or BMI between amputation and non-amputation groups. There was a significantly lower rate of African Americans in the amputation cohort (9.5% vs. 26%; p=0.031). There were significantly higher rates of diabetes (38.1% vs. 18.5%; p=0.034) in the amputation cohort. Excluding calcaneal fractures, fractures including the femur and tibia had significantly higher rates of CKD (16.7% vs. 3.3%; p=0.009), open fractures (72.2% vs. 46.4%, p=0.037), and transfused open reduction internal fixation (70.0% vs. 32.2%, p=0.015) in the amputation cohort. Wounds with purulent drainage were significantly more likely to undergo amputation (85.7% vs 61.5%, p=0.028). Non-MSRA S. aureus, P. aeruginosa, and culture negative infections were protective against amputation. Patients requiring amputations had more operating room visits (5.90 vs. 2.85; p=0.003) and higher rates of postoperative DVT/PE (14.3% vs. 4.0%; p=0.040).

CONCLUSION: The management of patients after fracture-related infection is a multifaceted and intricate process that can sometimes lead to the necessity of amputation. Findings from this study highlight diabetes as a risk factor for amputation in all lower extremity cases with fracture-related infection, whereas kidney disease poses a risk specifically for femur and tibia amputations. Identifying patients and infection patterns that carry a higher risk of amputation can assist surgeons in minimizing the burden on these individuals, as they tend to undergo more surgeries and face an increased likelihood of systemic complications during the postoperative period.

Percutaneous Intramedullary Steinman Pins for Treatment of Pediatric Forearm Fractures
Paper 053

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OBJECTIVE: Percutaneous fixation of forearm fractures with intramedullary Steinman pins has not been well described but has been performed at our institution with the advantage of lower implant cost and removal in the outpatient setting. This study aims to compare outcomes of percutaneous intramedullary pins vs. traditional buried intramedullary titanium nail fixation of pediatric forearm fractures.

METHODS: This is a retrospective comparative cohort study of patients treated surgically for forearm fractures with percutaneous Steinman pins (PSP) vs. traditional elastic stable intramedullary nailing (ESIN) with buried titanium nails.

RESULTS: 140 patients were included (114 ESIN, 26 PSP). The PSP group was significantly younger (6.2 years, R 2.5-13.8) than ESIN (11.9 years, $p<0.001$), as the percutaneous technique is limited by implant length. There were no differences in gender or incidence of open fracture. Percutaneous implants were used more often to fix one bone (65% ulna only, 35% radius and ulna), while buried implants were used more often to fix both bones (62% both, $p=0.013$). Operative time was shorter in the PSP group (39 min vs. 90 min, $p<0.001$); even after accounting for single vs. both bone fixation, PSP fixation was significantly shorter by 40 min. Time in cast was similar (PSP 43 days, ESIN 46 days, $p=0.151$). All percutaneous pins were removed outpatient at 29.8 days, while 77% of ESIN patients had elective surgical implant removal at 7.6 months postoperative. There was no difference between groups in length of stay, fracture healing, incidence of complications, ROM, or unplanned reoperations. For a single implant, institutional charges were 11.5x higher for ESIN ($598 vs $52). The mean charge for elective ESIN removal in the operating room was $10,836 ± $3,891 per patient, totaling $942,756 overall cost for the entire cohort.

CONCLUSION: Percutaneous fixation of forearm fractures with intramedullary Steinman pins has an 11.5x lower implant cost, 40-minute shorter operative time, and avoids a 77% return to surgery rate for buried implant removal. There is no difference in complications, ROM, fracture healing, or unplanned reoperations. This is the first comparison of percutaneous pin fixation versus buried intramedullary nails for pediatric forearm fractures. Percutaneous intramedullary Steinman pins can be used safely and effectively, though use is limited to smaller patients based on implant length. Percutaneous fixation substantially decreases overall cost of treatment, with shorter operative time, cheaper implant cost, and avoids need for surgical implant removal.

Surgical Treatment of Pediatric Open Forearm Fractures with or without Fixation
Paper 054

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OBJECTIVE: Pediatric patients with open forearm fractures who undergo operative irrigation & debridement (I&D) are often treated with implant fixation due to concern for delayed healing, nonunion, or loss of alignment. The purpose of this study is to determine for an open forearm fracture treated with I&D, whether reduction and casting alone without implant fixation affects outcomes, especially in younger patients.

METHODS: We retrospectively reviewed pediatric patients treated surgically for an open forearm fracture with implant fixation (IF) or with casting and no implant fixation (NIF) from 2010 to 2020. The use of implant fixation was at the discretion of the surgeon. The Clavien-Dindo classification was utilized to grade complications. All patients were followed to fracture healing.

RESULTS: 88 patients were included (IF 64, NIF 24) without differences between cohorts in gender, fracture type, fracture location, or open grade of fracture. NIF patients were younger (8.0 vs. 11.2 years, $P<0.001$), as NIF was utilized 46% in patients ≤10 years, vs. 7% in >10 years ($P<0.001$). IF required 36 minute longer operative time (77 vs. 41 min, $P<0.001$), longer length of stay (2.2 vs. 1.6 days, $P=0.024$), and longer follow-up (212.7 vs. 99.5 days, $P<0.001$), as 47% underwent elective surgical implant removal with 1.4 more follow-up visits ($P=0.013$). Duration of immobilization was similar (IF 48.9 vs. NIF 55.7 days, $P=0.124$). 12.5% (3/24) of the NIF group had loss of alignment requiring cast exchange, but no difference in overall incidence of unplanned reintervention (IF 9.4% vs. NIF 12.5%, $P=0.653$) with 1 compartment syndrome, 2 deep infections, and 3 refractures requiring reoperation in the IF group. All fractures were united in satisfactory alignment at final follow-up.

CONCLUSION: Pediatric patients undergoing I&D without implant fixation for open forearm fractures were younger and had 12.5% incidence of loss of alignment, but with no difference in fracture union, final alignment, or unplanned reintervention compared to implant fixation. Patients treated without an implant had 36 minute decreased operative time, shorter length of stay, and fewer follow-up visits compared to those treated with implant fixation, with avoidance of elective surgical implant removal. Implant fixation may not be necessary for all open forearm fractures, especially in patients ≤10 years with remodeling potential. This would contribute to shorter operative time, length of stay, fewer follow-up visits, and avoidance of surgical implant removal, all of which would contribute to substantially lower cost of treatment.

Does a Standardized Curriculum Improve Trainee Rod Bending Proficiency in Spinal Deformity Surgery? Results of a Prospective Randomized Controlled Education Study

Paper 055

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INTRODUCTION: Surgical simulation is increasingly accepted as a training platform to promote skill development and safe operative technique. Preliminary investigations in spine surgery show that simulation paired with educational intervention can significantly improve trainee performance. This study utilized a newly developed thoracolumbar fusion rod bending model to assess the impact of a novel educational curriculum and simulator training on surgical trainee rod bending speed and proficiency.

METHODS: Junior (PGY1- 2) and senior (PGY3- fellow) surgical trainees at a single academic institution were prospectively enrolled in a rod bending simulation using a T7- pelvis spinal fusion model. Participants completed two simulations, with one month between first and second attempt. Fifty percent of surgeons in each training level were randomized to receive an educational curriculum (rod bending technique videos and unlimited simulator practice) between simulation attempts. Rod bending simulation proficiency was determined by the percentage of participants who completed the task (conclusion at 20 minutes), time to task completion or conclusion, and number of incomplete set screws at task conclusion. Participants completed a pre- and post-participation survey. Univariate analysis compared rod bending proficiency and survey results between education and control cohorts.

RESULTS: Forty trainees (20 junior, 20 senior) were enrolled, with 20 participants randomized to the education and control cohorts. There were no significant differences in first simulation rod bending proficiency or pre-participation survey results between the education and control cohorts. In the second simulation, the education vs. the control cohort demonstrated a significantly higher completion rate ($p=0.01$), shorter task time ($p=0.009$), fewer incomplete screws ($p=0.003$), and greater experience-level ($p=0.008$) and comfort-level ($p=0.002$) on post-participation survey.

CONCLUSION: Trainees who participated in a novel educational curriculum and simulator training relative to the control cohort improved significantly in rod bending proficiency and comfort-level. Rod bending simulation could be incorporated in existing residency and fellowship surgical skills curricula.

Sequential Correction of Sagittal Vertical Alignment and Lumbar Lordosis in Adult Flatback Deformity
Paper 056

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OBJECTIVE: Flatback deformity causes sagittal imbalance, leading to progressive back pain, fatigue, and functional limitation. Biomechanical data on the correction obtained with surgical techniques is lacking. The purpose of this study was to investigate the degree of correction of sagittal vertical axis (SVA) and lumbar lordosis achieved through sequential procedures on human spine specimens.

METHODS: Thirteen thoracolumbar (T10-sacrum) specimens were CT scanned with fiducial markers embedded in each vertebra to allow kinematic assessment of vertebral position and motion. Specimens were stratified into the iatrogenic or degenerative flatback deformity group based on initial disc collapse at L5-S1 and/or L4-5 and reduced lumbar lordosis.

Treatment for the degenerative lumbar flatback specimens included: anterior lumbar interbody fusion (ALIF) cage at L5-S1, ALIF cage at L4-5, lateral lumbar interbody fusion (LLIF) cages at L2-3 and L3-4, and posterior column osteotomy (PCO) at L2-3 and L3-4.

Specimens in the iatrogenic lumbar flatback group were tested as follows: posterior in situ fusion at L4-S1, hypolordotic fusion at L4-S1 created with distraction across pedicle screws at each level, LLIF cages at L2-3 and L3-4, PCO at L2-3 and L3-4.

Lumbar lordosis and anterior offsets of L1 and T10 vertebrae from the center of S1 superior endplate (L1-S1 and T10-S1 SVA) were recorded initially and after each stepwise procedure.

RESULTS: For the degenerative flatback specimens, statistically significant incremental corrections (relative to the prior step) were noted in SVAs and lordosis after the L5-S1 ALIF, L4-5 ALIF, and PCO. A statistically significant difference was noted in overall correction when comparing preoperative values to those after the PCO. The average correction obtained with these procedures was: T10-S1 SVA -116.7±17.8 mm, L1-S1 SVA -64.9±9.2 mm, and L1-S1 lordosis -32.6±10.5 degrees.

For the iatrogenic group, a statistically significant worsening was noted in all three measures with performance of the hypolordotic fusion across L4-S1. Subsequent LLIF at L2-3 and L3-4 did not show significant improvement in sagittal alignment. However, with the addition of PCO at L2-3 and L3-4, the final alignment parameters approached their preoperative values ($P>0.01$).

CONCLUSION: ALIF cages in the lower lumbar segments improved sagittal alignment in degenerative flatback deformity. LLIF cages in the upper lumbar segments by themselves were not effective in correcting SVA or enhancing lordosis. LLIF cages in conjunction with PCO improved the alignment parameters in both degenerative and iatrogenic flatback deformities.

Should Patient Diets be Restricted After Anterior Lumber Interbody Fusion?

Paper 057

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OBJECTIVE: Nutritional support is an important factor to promote optimal postoperative recovery. However, given the transabdominal approach for anterior lumbar interbody fusions (ALIFs), postoperative diets are often restricted until return of bowel function. This study evaluates the impact of early diet liberalization on short-term outcomes in patients undergoing an ALIF.

METHODS Retrospective review of all patients undergoing ALIF at our tertiary care institution from 2010 to 2022. The electronic medical record was reviewed for 90-day postoperative outcomes and complications.

RESULTS: We include 515 patients in this study with 102 of these patients receiving a full diet on the same day as their operation. All other patients had a delay of at least one day (average 1.6 days) until a full diet was provided. The delayed diet group was found to have more levels fused anteriorly (1.51 vs. 1.35 levels, p=0.014) and posteriorly (1.50 vs. 1.02 levels, p<0.001), a longer surgery (345 vs. 246 minutes, p<0.001), and a longer hospital stay (3.82 vs. 2.30 days, p<0.001). In addition, the delayed diet group had a higher rate of postoperative ileus (10.2% vs. 2.9%, p=0.034) and urinary retention (16.0% vs. 3.9%, p=0.003). The readmission rate (11.6% vs. 7.8%, p=0.357) and percent of patients presenting to the emergency department postoperatively (16.2% vs. 15.7%, p=1.000) were similar between groups. On multivariate regression analysis, patients receiving a full diet on the same day as their operation was associated with a decreased odds of developing urinary retention (OR: 0.17; CI: 0.03 – 0.58; p=0.017) and a shorter length of hospital stay (Estimate: -1.35; CI: -2.00 – -0.69; p<0.001). The immediate full diet had no impact on the development of ileus (OR: 0.33; CI: 0.05 – 1.19; p=0.145).

CONCLUSION: These data suggest that surgeons should consider immediate liberation of a full diet after ALIF procedures. Providing a full diet after surgery may help to reduce total length of hospital stay without increasing rates of postoperative ileus

Trends in Nutritional, Functional and Bone Health Optimization Amongst Spine Surgeons: A National Survey

Paper 058

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OBJECTIVE: Perioperative optimization has gained heightened attention with the continued current trend in healthcare delivery towards quality optimization in a cost conscientious domain. While nutritional, functional, and bone health status optimization is supported with robust evidence, the implementation of such efforts in clinical practice remains unexplored. This study seeks to assess the current perception of spine surgeons on the importance of nutrition, functional status, and bone health perioperative optimization and the current implementation in clinical practice.

METHODS: Data from an anonymous survey distributed to program directors and spine faculty identified through the North American Spine Society and American Association of Neurological Surgeons contact database was obtained. Survey participants responded to 30-question survey that assessed demographic, nutrition, functional status, and bone health perioperative optimization efforts.

RESULTS: Among the respondents, distribution consisted of 51% Orthopedic Spine Surgeon and 49% Neurosurgery Spine Surgeon, with 31.4% located in the Northeast, 27.5% in the Midwest, 19.6% in the West, and 10.6% in the Southeast of the United States. With regards to the nutritional optimization, 62% reported no current formal nutritional optimization protocols with 14% of surgeons not recommending an optimization plan. Similarly, 68% of respondents reported no protocol in place for functional optimization, and 46% noted a functional status assessment relying on patient dependency. With regards to bone health optimization, 85% of respondents will routinely order DEXA scan if there is suspicion of osteoporosis and 85% of surgeons will usually reschedule surgery if bone health optimization are not achieved.

CONCLUSION: This study reported trends in clinical practice, perception of importance, and barriers of perioperative nutrition, functional, and bone health optimization among spine surgeons. There exists a lack of streamlined standardized protocols for nutrition and functional optimization. Interestingly, our study highlighted 85% of surgeons routinely ordering DEXA scan in the setting of osteoporosis with rescheduling of surgery if goals are not achieved. While the majority of responding spine surgeons believe in the benefit of perioperative nutritional and functional optimization, logistical and patient compliance challenges were noted as critical barriers towards optimization. Understanding perception and current practices can guide future efforts towards advancement of optimization protocols.

A Comparison of Two Central Sacral Vertical Line Methods and their Effect on Curve Correction
Paper 059

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OBJECTIVE: The CSVL is typically used to determine the last touched vertebra (LTV) and helps with selection of the lowest instrumented vertebra (LIV) during posterior spinal fusion for the treatment of adolescent idiopathic scoliosis (AIS). Traditionally, the CSVL is drawn as a vertical line from the middle of the patient's sacrum, which is termed the 'sacral' method. However, the CSVL can also be drawn as a line which perpendicularly bisects a horizontal line tangent to the top of the patient's iliac crests, or the "iliac" method. No studies to date have compared these CSVL methods in patients with AIS. The purpose of this study is to compare the effects of the sacral and iliac CSVL methods on LIV selection and curve correction at long-term follow-up.

METHODS: Charts of patients in a prospective AIS registry who underwent PSF between 2003-2022 were reviewed. Patients with < 60 months of follow-up were excluded. Six reviewers applied the two CSVL methods to determine the LTV with an ICC 0.873 for the iliac method and 0.879 for the sacral method.

RESULTS: A total of 161 patients with AIS (87% female, mean age at PSF 13.8 +/- 2 years) were included, with a mean follow-up of 83 +/- 26 months. Both the iliac and sacral CSVL methods resulted in selection of the same LTV in 63% of patients (n=102). For the 59 patients where the two CSVL methods chose different LTVs, this occurred most often in Lenke lumbar modifier A curves, followed by C curves. After PSF, 35% (n=57) of patients were fused below the LTV chosen by the sacral CSVL method, while 34.2% (n=55) were fused below the LTV chosen by the iliac CSVL method; this difference was not significant. At a mean of five years follow-up, there was no difference in major curve magnitude, or the percent correction of the major curve based on whether the CSVL methods chose the same LTV or a different LTV.

CONCLUSION: The majority of the time, the iliac and sacral CSVL methods select the same LTV. However, when they do not, there is no difference at five years postop in overall curve correction or curve magnitude. Surgeons may continue using whichever CSVL method they are most comfortable with, without fear of adverse patient outcomes.

Elevated Prevalence of Idiopathic Scoliosis in Professional Female Ballet Performers: An Association Between Professional Ballet, Scoliosis, Body Composition, and Skeletal Structure

Paper 060

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OBJECTIVE: Musculoskeletal abnormalities have been previously reported among female professional ballet performers (PMID: 32079918, 35784521) and have been attributed to reduced energy availability, indices of disordered eating, and high training volumes. Factors such as low body mass (prevalent among female ballet performers) have also been attributed to adolescent idiopathic scoliosis (PMID: 24153169). The purpose of this investigation was to characterize the prevalence of scoliosis (SCOLI) in a professional ballet company and to compare demographics, body composition, and bone mineral density (BMD) between those with and without SCOLI.

METHODS: A retrospective analysis of total body Anterior-Posterior x-ray images taken by a licensed radiologist was performed on 98 professional elite ballet dancers (male: n=49, 25±6yr; female: n=49, 27±5yr) actively employed by a professional dance company provided informed consent for review of data collected during annual routine physicals between 2016 and 2022. Body composition and BMD were assessed via DEXA. Criteria for SCOLI was defined via Cobb angle measurements >10 (Assessed in triplicate, Surgimap). Skeletal dimensions were assessed from DXA images using ImageJ (NIH) software. Measures of extremity length, trunk length, shoulder width, and pelvic width were performed. Frequency of SCOLI was plotted against previously reported adolescent and adult general population norms. A t-test was used to compare demographics, body composition, and BMD between those with and without criteria for SCOLI (Significance set at $p<0.05$).

RESULTS: Ten of 49 performers (20.4%) among females and 3 of 49 (6.12%) among males were observed to have criteria for SCOLI (Cobb Major Curve: 29.1±7.7 degrees | T4-T11 on average). Among females, this was observed to be 3-7 times higher than published general population norms 3-8%. Females with criteria for SCOLI were found to have reduced %body fat and fat mass compared to those without ($p<0.05$). Those with IS were also observed to have longer trunk lengths (45.4±0.8cm) compared to those without (42.1±0.9cm)($p<0.001$).

CONCLUSION: Female professional ballet performers demonstrate a heightened prevalence of SCOLI relative to the general population that may be attributable to factors such as reduced body fat commonly associated with reduced energy availability (known to impact) musculoskeletal health) in this, and other, elite female athlete populations. As professional ballet performers often begin their training at an early age prior to adolescence and often progress to elite levels prior to physiologic maturation in adulthood, further prospective investigations should seek to determine the point in development (adolescence or adulthood) where IS begins to present.

Stop, Don't Drop: A Prospective Study of Gait Stability Following Vertebral Body Tethering vs. Fusion
Paper 061

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INTRODUCTION: Traditional fusion leads to a loss of functional spine movement. As a result, VBT was developed with the goal of increasing flexibility and maintaining some spinal mobility. However, it is not known if additional mobility leads to significant functional improvement. We hypothesized that patients who undergo spinal fusion for AIS will have a decreased ability to recover from a simulated trip when compared to patients with vertebral body tethering (VBT) and those without surgery.

METHODS: 81 patients underwent a harnessed computer-controlled treadmill test which simulated tripping. 21 patients were healthy controls, 20 patients were at least one-year post-VBT, 15 patients were at least one-year post-fusion, and 25 were pre-surgery. Patients were asked to recover from both anterior and posterior simulated trips using either a single step or multiple steps. Subject weight, height, and initial treadmill acceleration were recorded and used to calculate the force generated by the patient needed to recover from the simulated trip. Patients were matched by height and weight, with ultimately 8 patients in each group. T-tests were run to compare the data.

RESULTS: Healthy control patients generated the greatest amount of force (mean 674 N◦m anteriorly; mean 455 N◦m posteriorly) and were most likely to recover from simulated trips using multiple steps. Meanwhile, patients with fusion surgery generated the least amount of force (mean 555 N◦m anteriorly; mean 386 N◦m posteriorly) and were least likely to recover from simulated trips using multiple steps. The VBT patients (mean 632 N◦m anteriorly; mean 418 N◦m posteriorly) performed better than the fusion surgery patients, yet the results were not statistically significant. Lastly, there was no association with recovery from tripping using a single step between any of the groups.

CONCLUSION: Although VBT patients and normal controls performed better on our simulated trip test with multiple steps than our fusion patients, no statistically significant difference in functional mobility was observed. However, further investigation of more patients using these novel treadmill trip tests may create insight into how scoliosis patients move postoperatively.

Chronic Absenteeism in Scoliosis Care: An Analysis of Missed Work and School

Paper 062

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INTRODUCTION: The true burden of scoliosis care extends beyond the cost of treatment and includes loss of income for the parent and missed educational time for the patient. Days of missed school and work have yet to be evaluated for families with a child receiving scoliosis treatment. Chronic absenteeism is defined as more than 18 days of missed school and has a significant impact on a child's educational progression.

METHODS: As part of routine clinical practice since 2014, patients/parents presenting for spinal deformity treatment have been queried at a single large tertiary center regarding missed days of work or school in the past year due to the child's treatment. The number of reported days missed was compared with the type of surgery.

RESULTS: 2,877 surveys were completed by 1,197 patients/parents. A total 1,285 visits (45%) or 658 unique parents (55%) responded that they had missed work, with a mean 13 days, for the treatment of their child's spine condition (SD, 19 days). Similarly, a total of 692 respondents (24%) or 421 patients (35%) reported missing school. Mean reported missed school was 12 days (SD, 18 days). 191 patients responded that they had missed school after having scoliosis surgery. When looking at the effect of surgical type, 38 children undergoing fusion missed a mean of 14.3 days of school while 26 children undergoing non-fusion surgeries missed a mean of 11.8 days of school ($p=0.37$). In contrast to those undergoing routine scoliosis procedures, patients undergoing halo gravity traction or multistage surgery missed a mean of 50 days of school, and parents missed a mean of 41 days of work ($P < 0.05$).

CONCLUSION: Caregivers and patients miss a significant amount of work and school due to scoliosis treatment. As predicted, patients and parents with multiple surgeries or a HGTD missed more days of school and work when compared to patients and parents of kids receiving fusion and non-fusion surgeries. Further efforts are needed to reduce the burden of scoliosis care on families.

Automated Deep Learning Measurement of Interscrew Angles in Vertebral Body Tethering
Paper 063

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INTRODUCTION: Vertebral body tethering (VBT) is the most popular nonfusion treatment for adolescent idiopathic scoliosis (AIS). The tether uses vertebral body screws and a polyethylene terephthalate cord placed on one side of the spine to correct the deformity. Currently, tether breakage is the most common complication of the tether. Tether breakage has historically been assessed radiographically by a change in screw-screw angle by ≥ 5 degrees between two sets of imaging. These angle measurements are time consuming and prone to observer variability. The purpose of this project was to develop an automated deep learning algorithm for measuring screw-screw angles.

METHODS: 229 Standing or bending anterior-posterior radiographs of patients with vertebral body tethers were identified and downloaded. Vertebral body screws were segmented by hand by a trained medical student and checked by an attending orthopedic surgeon. The same medical student and two orthopedic surgeons measured screw-screw angles for 60 of the included images. A U-Net deep learning model was developed to automatically segment the vertebral body screws. The model was trained on 174 images and validated on 30 (half of the images with angles measured) using Dice score. The validation images were used to develop and tune an image processing algorithm which measures screw-screw angles. Finally, the completed model and algorithm pipeline was tested on the remaining 30 images not used for model development. Dice score was used to assess the segmentation model, while absolute error was used to assess the angle-measuring algorithm.

RESULTS: Inter- and Intra-rater reliability for angle measurements were assessed with ICC and were both 0.99. The segmentation model Dice score aggregated across the 30-image test set was 0.96. The average screw-screw angle absolute error was 0.66 degrees and ranged from 0 to 2.67 degrees in non-overlapping screws. The primary modes of failure for the model were overlapping screws on a right thoracic/left lumbar construct with two screws in one vertebra and overexposed images. An algorithm step which determines whether an overlapping screw was present correctly identified all overlapping screws, with no false positives.

CONCLUSION: We developed and validated an algorithm which measures screw-screw angles for radiographs of vertebral body tether patients with an accuracy of within 1 degree for the majority of screw-screw angles. The model was not able to independently measure the primary axis of overlapping screws, and so angle measurements which included an overlapping screw were inaccurate. An algorithm for detecting overlapping screws and screw orientation was subsequently developed and performs with an accuracy of 100%. This allows for the model to identify uncertain measurements and alert the end user. The algorithm allows for the rapid study of large cohorts of tether patients, enabling more rigorous definitions of radiographic cord breakage to be established.

Unilateral Atlantoaxial Joint Vertical Distraction Injuries: Is a Collar Enough?
Paper 064

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OBJECTIVE: Traumatic atlantoaxial joint (AAJ) vertical distraction injuries lie on a spectrum of injury involving the craniocervical junction. Isolated injuries can be unstable, requiring surgical stabilization, a highly morbid procedure given C1-2 joint's primary role in cervical spine rotation. Previous authors established normative C1-2 lateral mass values to evaluate for vertical AAJ distraction injuries. However, these studies focus on bilateral AAJ injury, with no data on unilateral or incomplete AAJ injuries. Clinical decision-making regarding these partial injuries is fraught with uncertainty, especially given the possibility of delayed instability. As a result, this study seeks to characterize injury patterns and clinical courses of patients with incomplete or unilateral atlantoaxial joint injuries.

METHODS: After receiving IRB approval, all MRI and CT radiology reads from January 1, 2006 to August 1, 2021 at our Level I Trauma Center were queried for the following terms: edema, disruption, avulsion, tear, distraction, or subluxation and transverse ligament, atlantoaxial joint, or C1-C2 joint, resulting in 2,779 studies. Inclusion criteria consisted of age greater than 18 years old, history of recent traumatic injury, and radiographic evidence of unilateral atlantoaxial joint distraction on CT, defined by a unilateral lateral mass index (LMI) >2.6mm. MRI scans were classified based on extent of soft tissue injury. Demographic data and clinical outcomes were obtained by chart review and summarized using descriptive statistics.

RESULTS: Five patients comprised this study: 3 males and 2 females with an average age of 51 years. Four patients were injured by motor vehicle accident and 1 due to fall from standing height. 3 patients had concomitant orthopedic extremity fractures requiring operative fixation. The average LMI of the involved joint was 4.2 mm versus 2.0 in the contralateral joint. On MRI, 3 patients exhibited bilateral atlantoaxial joint effusions. No patients demonstrated complete injury of associated ligaments. All patients were treated conservatively with a rigid cervical collar. No patients demonstrated late instability at average radiographic follow-up of 876 days.

CONCLUSION: Unilateral or incomplete AAJ vertical distraction injuries lie on a spectrum of injury involving the craniocervical junction and more specifically the C1-2 articulation. MRI is essential to evaluate the ligamentous stabilizers of the craniocervical junction prior to any treatment decisions, but in the absence of an unstable ligamentous injury, incomplete or unilateral vertical distraction injuries can be safely managed conservatively.

Social Vulnerability Index (SVI) Can Be Used to Predict Healthcare Resource Utilization and Persistent Opioid Use After Elective Lumbar Spine Surgery

Paper 065

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OBJECTIVE: The purpose of this study is to investigate the association between the social vulnerability index (SVI) and healthcare resource utilization following elective lumbar spine surgery.

METHODS: Patients were retrospectively identified who underwent elective spine surgery for lumbar degenerative pathology between November 1, 2013 and September 30, 2018 at a single academic center. The Cook County Social Vulnerability Index (SVI) metrics for each patient were determined based on the ZIP code of their home neighborhood. The SVI is comprised of separate scores pertaining to socioeconomic status, household compensation, minority status and language, and housing and transportation. Possible scores range from 0 (lowest vulnerability) to 1 (highest vulnerability). Health resource utilization was quantified within 1-year postoperatively (imaging studies, emergency and urgent care visits, hospital readmission, opioid prescriptions and others). These metrics were compared between patients with social vulnerability – defined as an SVI score in the upper quartile (SVI ≥ 0.75) and control patients (SVI score < 0.75).

RESULTS: A total of 92 patients were included in the final cohort – 33 (35.9%) were considered socially vulnerable based on their SVI metrics. Socially vulnerable patients were more likely to utilize the emergency department within 180 and 365 days postoperatively (p=0.028 and p=0.045). Socially vulernable patients were more than three times more likely to have persistent opioid use at 180 days postoperatively to controls (p=0.005). An overall SVI in the upper quartile was associated with persistent opioid use (OR 4.245; 95% CI: 1.469 – 12.265) and at least one emergency department visit within 180 days post-op (OR 4.050; 95% CI: 1.227 – 13.370).

CONCLUSION: The social vulnerability index (SVI) was associated with postoperative opioid use and emergency department utilization after surgery. Socially vulnerable patients were more likely to utilize emergency department services and to have persistent opioid use at 6 months postoperatively from elective lumbar spine surgery.

Factors Predisposing Discharge to Skilled Nursing Facility After Surgery for Degenerative Cervical Myelopathy: A Retrospective Analysis

Paper 066

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INTRODUCTION: Cervical myelopathy is a progressively debilitating degenerative disease caused by cervical spinal stenosis. This condition is often treated surgically but recovery is variable between patients. Some patients require more intensive therapy after surgery so that they can return to their baseline level of independence. The objective of this study is to evaluate factors that predispose patients to require skilled nursing facility (SNF) needs after surgery for degenerative cervical myelopathy (DCM), with a specific focus on the postoperative mobility assessment.

MATERIALS & METHODS: This study is a retrospective chart review of 135 patients who underwent cervical spine surgery at a single tertiary institution for cervical myelopathy between 2014 and 2020. Pearson chi-square test and Fisher's Exact test were used to compare categorical variables. Independent Samples t-test and Matt-Whitney were used to compare continuous variables. Univariate logistic regression was first used to identify important covariates ($p < 0.1$) to be included for multivariate logistic regression models.

RESULTS: Patients ($n = 135$) were an average age ($SD = 8.8$) of 65.4 years. 54.8% of patients were male and 45.2% of patients were female. There was no significant difference in discharge location between males and females. Patient factors that correlated with discharge to a SNF after surgery for DCM were increased age ($p = 0.01$); being single, divorced, or widowed ($p = 0.01$); and having Medicare or Medicaid ($p = 0.03$). Intraoperative factors that correlated with discharge to a SNF after surgery for DCM included posterior surgical approach ($p = 0.04$) and length of surgery ($p = 0.04$). Additionally, individuals who required moderate or maximal assistance for mobility ($p < 0.0001$), ambulated a shorter distance during their first Physical Therapy Evaluation after surgery (PTE) ($p < 0.0001$), or had longer inpatient stays ($p < 0.0001$) were more likely to be discharged to SNF on univariate analysis. With multivariate analysis, patients with longer inpatient stays were more likely to be discharged to SNF ($p = 0.02$).

CONCLUSION: We found that factors such as age, marital status, insurance type, surgical approach, and decreased mobility during the postoperative are associated with discharge to SNF after surgery for cervical myelopathy. Analysis of these factors may also expedite appropriate discharge to home or SNF for post-operative patients, reducing length of hospital stay and decreasing costs.

A Randomized Controlled Trial Evaluating Duloxetine on Postoperative Outcomes Following Primary Total Knee Arthroplasty

Paper 067

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INTRODUCTION: Utilizing serotonin and norepinephrine reuptake inhibitors (SNRIs such as Duloxetine) to treat musculoskeletal pain has recently garnered interest. However, current literature remains limited with mixed results reported and no randomized trials. The purpose of this study was to evaluate the effect of duloxetine on postoperative pain, function, and opioid consumption in patients undergoing primary total knee arthroplasty (TKA).

METHODS: Patients undergoing primary TKA were randomized to receive either duloxetine (30 mg) or placebo daily one week prior to surgery until six weeks postoperatively after screening found them not to meet criteria for central sensitization. Daily morphine milliequivalents (MME), hours of sleep, and subjective measures of feeling well rested were assessed for two weeks postoperatively. VAS and KOOS were assessed at six-weeks following surgery. An a priori power analysis determined that 44 patients were required in each cohort to detect a minimally clinically important difference of 2-points in VAS pain scores.

RESULTS: 102 Patients were enrolled with 58 randomized to the duloxetine cohort and 44 to placebo. Demographics were similar between groups, reflecting successful randomization. In the two weeks following surgery, patients in the duloxetine group reported feeling significantly more well-rested on a 10-point scale (7.0 vs. 6.3, p=0.04). There were no differences in MME consumption (duloxetine: 351 vs. placebo: 359, p=0.36) or average nightly hours of sleep (duloxetine: 6.5 vs. placebo: 6.9, p=0.11). The duloxetine group had greater KOOS scores at six weeks postoperatively (72 vs. 67, p=0.01). There was no difference in VAS pain scores (2.0 vs. 2.5, p=0.16).

CONCLUSION: Patients taking duloxetine felt significantly more well rested immediately following TKA and had superior KOOS scores at six weeks, although this difference may not be clinically important. Further research is required to investigate the benefit of duloxetine and SNRIs following TKA in patients without central sensitization.

Predicting and Understanding the Risk for Shoulder and Elbow Injuries in Major League Baseball Pitchers: A Game-Theory-Based Machine Learning Approach

Paper 068

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BACKGROUND: Reliable prediction of future shoulder or elbow injuries in Major League Baseball (MLB) pitchers can help modulate a player's current routine to reduce the risk of future injury. Understanding interactions between multiple risk factors is important to identify potential avenues by which risk can be reduced while minimizing impact on player performance. To better understand these interactions, a novel game-theory-based approach was taken to develop a machine learning model capable of predicting shoulder or elbow injuries in MLB pitchers.

METHODS: MLB pitcher demographics, workload measures, injury data, and ball tracking metrics from 2017 to 2022 were used to train an XGBoost machine learning model to predict next-season shoulder and elbow injuries. Shapley additive explanation (SHAP) values were used to quantify feature importance as well as interdependencies and interaction effects between predictive variables.

RESULTS: A total of 3,808 pitcher-years were included in this analysis, 606 (15.9%) of which involved a shoulder or elbow injury resulting in placement on the injured list. Player demographics and workload metrics were much less predictive of injury compared to ball tracking metrics. Out of more than 65 candidate features, the most important contributors to predicting shoulder or elbow injury were increased: pitch velocity (of all pitch types), utilization of sliders, fastball spin rate, and fastball horizontal movement.

CONCLUSION: A machine learning model was able to predict next-season shoulder and elbow injuries in MLB pitchers with excellent accuracy. Analysis of SHAP dependence plots revealed strong feature interdependencies among predictive features, with a pitcher's average fastball velocity demonstrating the strongest interdependencies with other predictive features. In addition, analysis of SHAP interaction values demonstrated strong interaction effects among some of the most important predictors of shoulder and elbow injury, which included the following: a higher FB velocity did not alter a younger pitcher's predicted risk of shoulder or elbow injury as substantially as it did for older pitchers, the risk for shoulder or elbow injury increases with the number of high velocity pitches thrown (regardless of pitch type and in an additive fashion), and average FB velocities below 95 mph demonstrated strong, negative interaction effects with higher SL percentages, suggesting that the overall predicted risk of injury for pitchers throwing a high number of SLs could be attenuated by throwing with a lower average FB velocity.

The Role of Genetic Sequencing in the Diagnosis of Shoulder Periprosthetic Joint Infection
Paper 069

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INTRODUCTION: Periprosthetic joint infection (PJI) of the shoulder poses a complex clinical challenge. Many of these infections can be difficult to diagnose and there is relatively limited information to guide decision-making. Therefore, the purpose of this study was to assess the diagnostic utility of next-generation sequencing in the setting of PJI following revision shoulder arthroplasty.

METHODS: Consecutive patients undergoing revision shoulder arthroplasty were prospectively enrolled. Preoperative labs included white blood cell (WBC) count, serum erythrocyte sedimentation rate (ESR), and serum C-reactive protein (CRP) level. At the time of surgery, synovial fluid, deep tissue, and swabs were obtained for next-generation sequencing. Deep-tissue specimens were also sent to the institutional laboratory for culture with extended incubation. The likelihood of infection was determined on the basis of a combination of preoperative serum measurements, intraoperative clinical findings, and intraoperative tissue or fluid culture results. Patients were then classified into one of four possible groups (definite infection, probable infection, probable contaminant, or no evidence of infection). Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated for next-generation sequencing by comparing to patients from the definite infection group. Concordance between culture and next-generation sequencing was defined as complete if next-generation sequencing correctly identified all organisms on culture.

RESULTS: There were 41 patients with a mean age of 66±11 years, mean body mass index (BMI) of 32±7 mg/kg, and 44% were female (n=18). There were 8 patients in the definite infection group, 4 patients in the probable infection group, 1 in the probable contaminant group, 13 in the no evidence of infection group, and 15 that could not be classified into a group due to an elevated ESR and/or CRP without any positive cultures. Comparing the definite infection group with next generation sequencing, the sensitivity was 75%, specificity was 21%, PPV was 46%, and NPV was 79%. There were 6 patients with complete concordance, 0 with partial concordance, and 7 patients that were discordant. There were 5 patients that were not classified into a group and tested positive on next-generation sequencing. The organisms identified with next-generation sequencing were Staphylococcus epidermidis (n=3), Cultibacterium acnes (n=2), and Streptococcus mitis (n=1).

CONCLUSION: Next-generation sequencing may be a useful adjunct in identification of causative organism(s) in the diagnosis of PJI in the setting of revision shoulder arthroplasty.

Severely Obese Patients Undergoing Ankle Arthrodesis Experience Higher Complication and Failure Rates
Paper 070

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INTRODUCTION: Tibiotalar arthrodesis (TTA) is a common surgery for end-stage ankle arthritis. Elevated body mass index (BMI) has been studied as a contributing factor to complications including nonunion, infection, reoperation, and readmission in TTA. However, many of these studies have either used national registries or involved small, underpowered cohorts. The present study aimed to determine the effect of BMI on the rate of nonunion and complications following TTA using a large cohort from a single academic institution.

METHODS: We retrospectively identified 527 primary TTAs from 2005-2017. Patients were stratified according to BMI. The reference group included BMI 18.5 to <30. Patients in the obese category were stratified according to the World Health Organization classification. Ankle radiographs were evaluated for radiographic date of fusion and nonunions. Outcomes including revisions, reoperations, symptomatic implant removal, subsequent adjacent joint arthrodesis, infections, and readmissions were studied. The data was analyzed using Pearson Chi-square and odds ratios for categorical variables. Anova and Kaplan-Meier estimation assessed continuous variables, and time to event outcomes respectively. The mean follow-up for the cohort was 34.3 months.

RESULTS: Patients with Obesity Class III had elevated risk of complications compared to normal weight patients including nonunion (OR 3.96, p=0.002), revision (OR 3.69, p=0.03), superficial infection (OR 9.36, p=0.002), and readmissions (OR 10.90, p=0.01). There was no difference in the rate of reoperation (p=0.448), symptomatic implant removal (p=0.805), adjacent joint arthrodesis (p=0.353), or deep infection (p=0.507) when stratified by BMI.

DISCUSSION: This study found differences in the rates of tibiotalar nonunion, revision, superficial infections, and readmissions when stratified by BMI with the greatest risk of complications associated with Obesity Class III patients. This study provides useful information to guide risk stratification and counseling of patients prior to TTA.

Is There a Role for Diabetes Stewardship in Orthopedics? Observations from a Hand and Upper Extremity Surgery Clinic

Paper 072

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OBJECTIVES: Though generally safe, corticosteroid injections (CSI) have notable side effects including hyperglycemia. Despite this, point-of-care blood glucose (POC BG) testing prior to administration has not been described. Over the past four years, our hand and upper extremity surgery clinic has begun screening patients with a previous diagnosis of diabetes with a POC BG test prior to CSI. Patients with a POC BG greater than 150mg/dL were refused a CSI and referred to their medical provider or emergency room for glucose management. We sought to understand the incidence of patients who presented with uncontrolled diabetes as well as the rate of follow-up and medication adjustment with their medical provider.

METHODS: 207 patients received POC BG test in our tertiary referral hand and upper extremity surgery clinic between 2018 - 2022. Patient demographics, POC BG, hemoglobin A1C pre- and post-visit, medication regimen, and the timing and intervention by their medical provider were recorded.

RESULTS: 81 (39.1%) patients had a POC BG greater than 150mg/dL (mean 236.4 ± 76.7mg/dL). 59 (72.8%) of these patients successfully followed up with their medical provider, 33.2 ± 38.0 days after their appointment. 24 (40.7%) patients required a diabetes medication adjustment or addition at that visit. Two patients were referred acutely to the ED for POC BG of 578 and 401mg/dL. One required a course of insulin, potassium, and intravenous fluids. Patients who successfully followed up with their medical provider for glucose management saw an average decrease in hemoglobin A1C of 0.40 ± 1.37%, while those who did not increased 0.35 ± 1.35% (p=0.037), 18.0 ± 14.6 and 19.3 ± 15.9 months respectively, following the pre-appointment value.

CONCLUSION: The incidence of poorly controlled blood glucose in our community was high. However, the rate of diabetes follow-up was also surprisingly high and timely. The observational data gathered in this study illustrate potential short- and long-term benefits of diabetic screening prior to CSI. In the medical literature, there is a consistent observation that medication adherence is associated with perceived need. We believe pain, and our ability to alleviate it through a simple in-office procedure like CSI, to be a valuable motivator. These observations suggest that a short delay in patient satisfaction may result in more lasting changes in a patient's overall health.

Synthetic Tape Augmentation for Thumb Metacarpophalangeal Radial Collateral Ligament Repair Reduces Number of Revision Surgeries

Paper 073

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OBJECTIVE: Options for repair of a ruptured thumb metacarpophalangeal (MCP) radial collateral ligament (RCL) include direct repair, reconstruction, and augmentation of repair or reconstruction with synthetic tape (ST). Biomechanical studies of ST augmentation of repair have demonstrated greater maximum and clinical loads to failure compared to repair alone. Our objective was to evaluate clinical outcomes for thumb MCP RCL repair augmented with ST compared to repair alone.

METHODS: After institutional review board approval, we performed a retrospective review of all patients at a single institution who underwent repair of acute or chronic RCL injuries of the thumb. Data on postoperative osteoarthritis, complications and reoperations was collected during a retrospective chart review. Results were analyzed using t-test for continuous variables and Fischer's exact test for categorical variables.

RESULTS: Fifty-two patients were included, six who underwent repair with ST augmentation and 46 who underwent primary repair alone. All patients were greater than one year postoperative at time of chart review. Between patients treated with repair alone vs. repair with synthetic tape augmentation there was no significant difference in age (27.6 vs. 24.8 years; p=0.57), time from injury to surgery (204 vs. 85.2 days; p=0.17), duration of postoperative immobilization (31 vs. 38.7 days; p=0.20), new or worsening thumb MCP joint osteoarthritis on postoperative xrays (14% vs. 0%; p=1) respectively. There was a significantly higher number of revision surgeries in the group that underwent primary repair alone compared to the group that underwent ST augmentation (0.21 vs. 0; p value 0.04). In the primary repair group, 5 patients underwent a total of 10 revision surgeries (11% revision rate) compared to 0 revision surgeries in the ST augmentation group. The mean time to revision surgery was 18 months.

CONCLUSION: These results suggest that synthetic tape augmentation of thumb MCP RCL repair may lead to decreased reoperations compared to primary repair alone.

Retrospective Analysis of Treatment Techniques for Adolescents with Camptodactyly
Paper 074

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OBJECTIVE: Camptodactyly, a pediatric hand condition involving a flexion contracture of the proximal interphalangeal joint, presents in different stages of life and with varying degree of severity. Management of camptodactyly often varies based on severity of contracture, functional status, and age. Treatment options largely consist of nonoperative management techniques, such as splinting, casting, or stretching. Surgery is reserved for the most severe cases causing functional difficulty. Camptodactyly can present in infancy or develop as the child ages, often during adolescence. There is a lack of clear guidelines on the most appropriate treatment for camptodactyly, particularly in adolescents. We anticipated that treatments offered to adolescent congenital camptodactyly patients would be as follows: surgery for patients with proximal interphalangeal joint (PIP) contractures ≥50 degrees, conservative management techniques for patients with PIP joint contractures 30-50, and patients with PIP contractures ≤30 degrees at time of presentation would be monitored.

METHODS: We conducted a comprehensive chart review for adolescent patients, (age 10-18), treated for camptodactyly at a level one trauma center in the Midwest from the years of 2010-2020, to investigate the treatment decisions based on severity of contracture. For patients with post-treatment data available, success of treatment was evaluated by change in degree of flexion from baseline and active range of motion (AROM). Charts were also reviewed to determine patient compliance and complications with various treatment methods.

RESULTS: There were 11 patients evaluated with a total of 35 digits impacted by PIP joint contracture. Excel was used to calculate average pre/post-intervention PIP joint contracture angle and AROM. Eight digits were under observation, with an average initial contracture angle was 75° with an AROM of 25°. Twenty-three digits received conservative treatment with an average pre-treatment contracture angle was 41.79°(21.17) and an average AROM of 58.21°(21.17). The average post-treatment contracture angle was 21.0° (17.29) with a post-treatment AROM of 79.0°(17.29). Four digits received surgical treatment with an average pre-treatment contracture angle was 41.0°(±21.17) and an average AROM of 59.0°(21.77). The average post-treatment contracture angle was 31.0° (11.55) with a post-treatment AROM of 58.33°(20.81). Improper compliance to therapy was the most common barrier to treatment outcomes across groups.

CONCLUSIONS: Conservative and surgical management techniques improved PIP joint contracture in adolescent congenital camptodactyly patients. Conservative techniques improved AROM while surgical interventions did not improve AROM in this cohort. This review may aid in decision making regarding congenital camptodactyly treatments.

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CONCLUSIONS: Conservative and surgical management techniques improved PIP joint contracture in adolescent congenital camptodactyly patients. Conservative techniques improved AROM while surgical interventions did not improve AROM in this cohort. This review may aid in decision making regarding congenital camptodactyly treatments.

The Effectiveness of a Dynamic Stability Therapy Protocol in the Treatment of CMC Arthritis
Paper 075

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PURPOSE: The purpose of this study was to determine the effect of a dynamic stability home exercise program (HEP) on thumb strength, function, and pain in CMC arthritis patients. We hypothesized that the regimen would result in improved strength, function, and pain in earlier stages of radiographic CMC arthritis.

METHODS: Individuals presenting with isolated CMC arthritis to an orthopedic clinic from 2018 to 2020 were enrolled in a prospective study. Exclusion criteria included a history of previous thumb surgery, thumb fracture, or an intra-articular corticosteroid injection. The cohort was divided into two groups based on Eaton-Littler arthritis stages: low-grade arthritis (LGA) for stages I and II and high-grade arthritis (HGA) for stages III and IV. Outcome measures included joint range of motion (ROM), grip strength, oppositional pinch strength (OPS), appositional pinch strength (APS), Visual Analog Scale for pain (VAS), the Michigan Hand Outcomes Questionnaire (MHQ), and the Quick Disabilities of Arm, Shoulder, and Hand Outcome Measure (QuickDASH).

RESULTS: Eighty patients were enrolled. In HGA patients, OPS increased significantly from 8.0 ± 3.9 lbs. at baseline to 13.1 ± 8.0 lbs. at 6 months ($p=0.0352$). Both HGA and LGA patients demonstrated significant improvement in MHQ Pain that was sustained at 6 months ($p<0.0001$). There was a greater improvement in MHQ ADLs and QuickDASH scores in HGA patients than LGA patients ($p=0.0038$ and $p=0.0449$, respectively). HGA patients achieved MCID for MHQ Overall, MHQ Satisfaction, MHQ Work Performance, MHQ ADLs, and QuickDASH scores.

CONCLUSION: At six-months follow-up, a dynamic stability HEP resulted in decreased pain in all CMC arthritis stages but did not meet the MCID for VAS or the MHQ Pain subscore. Patients with HGA demonstrated a significant improvement in functional outcomes over time with greater improvements in OPS, the MHQ ADLs score and the QuickDASH score.

Surgical Management of Painful Carpal Boss
Paper 076

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OBJECTIVE: The purpose of this study was to determine if patients that undergo carpal boss excision with or without carpometacarpal (CMC) arthrodesis have adequate pain relief with minimal complications or carpal boss recurrence.

METHODS: A retrospective review of 106 patients who were evaluated for painful carpal boss at a single institution from 1998-2021 was performed. Sixteen patients received an injection only and were excluded. Medical records were reviewed for surgical technique and clinical outcomes following operative management.

RESULTS: Ninety patients underwent 99 surgeries for painful carpal boss. Average age was 42.2 years and 55.6% (n=50) were female. Average follow-up was 2.5 years (SD 81 days). Seventy-nine patients had surgical excision of their painful carpal boss. Thirty-five patients (44%) noted painful tendon subluxation over the boss, and 4 (5%) had an extensor tendon rupture prior to surgery. Eighteen patients (22.8%) reported carpal boss recurrence at an average of 3.5 years following surgery. Of these, 5 had injections only, 7 had re-excision of the boss, 2 underwent CMC arthrodesis, 1 patient had two re-excisions, and one patient underwent a re-excision that failed and went onto a CMC arthrodesis. At final follow up, 17 (21.5%) patients reported persistent pain at the site of their carpal boss. Seventeen patients experienced postoperative complications including 14 painful hypertrophic scars, 1 superficial infection treated with oral antibiotics, 2 extensor tendon injuries, and 1 complex regional pain syndrome.

Thirteen patients underwent CMC arthrodesis for painful carpal boss, of which 7 had previous surgery. Surgical fixation included screws (n=6), staples (n=4), crossing Kirschner wires (n=1), or a combination of screws and staples (n=1) or screws and a plate (n=1). All patients had bone grafting at the arthrodesis site from the ipsilateral distal radius. At final follow-up (average 1.01 years), four patients (30.8%) reported persistent pain, and no patient had recurrence of carpal boss. All fusions healed at an average of 46.8 days following surgery. Six complications following surgery occurred, including 3 painful hypertrophic scars, 2 symptomatic hardware requiring removal, and 1 complex regional pain syndrome.

CONCLUSION: Surgical excision of painful carpal boss can reliably improve pain with a low recurrence rate. In patients who fail carpal boss excision, CMC arthrodesis is a viable treatment option with high union rates and good pain relief. Painful hypertrophic scars are the most common complication following surgical management and should be discussed with patients preoperatively.

Reporting of Complications in Randomized Controlled Trials Cited as Supporting Evidence Underpinning AAOS CPG Recommendations for the Management of Carpal Tunnel Syndrome: Application of the CONSORT Harms Checklist

Paper 077

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BACKGROUND: Randomized controlled trials (RCTs) related to the management of carpal tunnel syndrome (CTS) impact the recommendations seen within clinical practice guidelines (CPGs). RCTs are often required to follow the CONSORT checklist. Since the enactment of CONSORT, the CONSORT Extension for Harms was implemented to assure harms are reported thoroughly. The extension has failed to adequately improve harms reporting among RCTs in several specialties. We evaluated harms data reporting among RCTs cited for recommendations in CTS management.

METHODS: We included RCTs cited as evidence supporting recommendations in the AAOS Management of Carpal Tunnel Syndrome CPG. Screening and data extraction were performed in a blinded duplicate manner. Individual CONSORT Harms items were evaluated in each RCT. Frequencies, percentages, and 95% confidence intervals were used to summarize overall adherence. Additionally, we conducted an interrupted time-series analysis to evaluate harms reporting by comparing overall percent adherence to trials published before and after the release of the extension.

RESULTS: Sixty-eight RCTs were included in our study. None of the included trials reported all 18 checklist items. Five RCTs (7.35%) reported at least 12 of the 18 checklist items. Forty-four RCTs (54.7%) reported less than 6 of the 18 checklist items. Twenty-five were published prior to the release of the Extension for Harms (2004) and forty-three were published after.

CONCLUSION: There is insufficient reporting of harms in the RCTs supporting recommendations in the AAOS Management of Carpal Tunnel Syndrome CPG along with no advancement of harms reporting following publication of the CONSORT Extension on Harms.

Patients with Double Crush Syndrome Achieve Similar Rates of Clinical Improvement Following Carpal Tunnel Release

Paper 078

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OBJECTIVES: : We hypothesized that patients with double crush syndrome (DCS), concomitant carpal tunnel syndrome (CTS) and cervical radiculopathy will achieve comparable clinical improvement to patients with CTS alone following carpal tunnel release surgery (CTR) and that both groups will have similar proportions of patients achieving minimal clinically important difference (MCID) for patient reported outcomes measures (PROM).

METHODS: Chart review identified patients with preoperative nerve conduction studies who underwent CTR at a Midwest, multicenter hospital system. Patients who underwent bilateral CTR, additional procedures, or revision CTR were excluded. Participants completed preoperative and 4-month postoperative PROMIS-Upper Extremity (UE), PROMIS-Pain Interference (PI), and QuickDASH (QD) scores, responding to the anchor question: 'Since your treatment, how would you rate your overall function?' (much worse, worse, slightly worse, no change, slightly improved, improved, much improved). Established values were used to determine MCID. Preoperative, postoperative, and changes in scores for UE, PI, QD were compared using two-tailed t-Tests for normal distributions and the Mann-Whitney U Test for non-normal distributions. MCID proportions for each PROM and rates of reported subjective improvement were compared with Fisher Exact Test. Power analysis determined a minimum sample size of 45 per group was required for significance.

RESULTS: Of 180 total patients, 58 experienced DCS while 122 had CTS alone. Males constituted 53% of the DCS population compared to 31% in the CTS population; this reflected populations described in existing literature. There was no significant difference in age or mean follow-up between groups. At 4-month follow-up, preoperative, postoperative, and changes in PROMIS-UE, PROMIS-PI, and QD scores were not statistically different between DCS and CTS patients. Proportions of patients achieving MCID for PROMIS-UE, PROMIS-PI, and QD in the DCS group was 57.1%, 50.0%, and 51.9%, respectively. Proprotions of patients achieving MCID for PROMIS-UE, PROMIS-PI, and QD was 52.8% (p=0.63), 63.1% (p=0.11), 62.4% (p=0.24), respectively. No statistical difference was found between the two groups responses to the anchor question (p=0.17).

CONCLUSION: Patients with DCS experience a similar level of PRO improvement and have a comparable rate of achieving MCID following CTR. DCS patients show comparable PRO enhancement and MCID achievement post-CTR, similar to CTS only patients. Therefore, patients with DCS are likely to experience clinically meaningful improvement following carpal tunnel release surgery and should not be discouraged from undergoing CTR because of a coexistent cervical radiculopathy.

Time to Surgery and Quality of Reduction in Distal Radius Fractures
Paper 079

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OBJECTIVE: To determine whether surgical intervention within 48 hours of injury for a distal radius fracture results in higher reduction quality than fractures treated after 7 days.

METHODS: This study was a retrospective case series performed at a Level 1 trauma center. Patients who sustained a distal radius fracture and were treated operatively with open reduction and internal fixation were included in the study. Patients were divided into two groups for analysis: treatment within 48 hours and treatment between 7 and 14 days. T tests were used to compare continuous variables between the two groups. Chi square and Fisher exact tests were used to compare categorical variables. Reduction quality was determined by measuring radial inclination, volar tilt, radial height, and ulnar variance on immediate postoperative films. Measurements were categorized as anatomic, acceptable, or poor based off widely accepted parameters, along with biomechanical and clinical studies. Overall quality of reduction was limited by the worst measurement for that patient.

RESULTS: 393 distal radius fractures were treated within 48 hours, and 201 distal radius fractures were treated between 7 and 14 days. Patients in the less than 48-hour group were significantly younger in age, and there was a significantly higher number of patients who had a high energy mechanism, sustained multiple traumatic injuries, and had an open fracture type ($p < 0.05$). A statistically significant difference was found between the groups for restoration of volar tilt, which was better restored in the group treated within 48 hours ($p < 0.05$). However, overall quality of reduction was not significantly different between the groups. When patients were matched by mechanism of injury, presence of polytrauma, and age, overall reduction quality was not significantly different, however, better restoration of volar tilt was achieved within 48 hours ($p < 0.05$).

CONCLUSION: Overall reduction quality was not associated with time to reduction in operatively treated distal radius fractures. However, volar tilt was significantly better restored in patients treated with 48 hours of injury.

Fractional Lengthening of Forearm Flexor Tendons: A Cadaveric Biomechanical Analysis
Paper 080

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INTRODUCTION: Multiple procedures have been described for wrist and finger flexion contractures and spasticity. Fractional lengthening of forearm flexor tendons involves making parallel transverse tenotomies at the musculotendinous junction (MTJ) in order to elongate the muscle. Currently, there is limited literature to define the biomechanical consequences rendered as a product of this lengthening technique.

METHODS: We harvested 48 flexor tendons from 8 paired upper limbs of 4 cadavers. These included flexor carpi radialis (FCR), flexor carpi ulnaris (FCU), flexor pollicis longus (FPL), and flexor digitorum superficialis (FDS2-4) tendons for each. Each tendon that was lengthened was paired with the contralateral side of the cadaver which was left intact to serve as a control. A pair of transverse tenotomies were completed for each lengthening. The first tenotomy was performed at the MTJ at the interval where the MTJ narrowed to 75% of its maximal width. The second tenotomy was rendered 1 cm proximal to the first. Tendon length was measured before and after fractional lengthening at a constant resting tension of 1N. The maximum load at failure of each tendon and the mechanism of failure were also measured and compared to the contralateral side.

RESULTS: After fractional lengthening, the mean increase in resting tendon length was 4mm (range 3-6mm). When loaded to failure, the mean maximum load of fractionally lengthened tendons was 42% of the mean maximum load of intact tendons (P=0.001). All lengthened tendons failed at the distal tenotomy site through the MTJ.

CONCLUSION: In this cadaveric model, fractional lengthening resulted in an increase of 3 to 6 mm in tendon length at resting tension. There is significant loss in tensile strength compared to an intact tendon, with loads at failure in some cases lower than estimated forces required to perform typical ADL's. Caution during the healing and rehabilitation period is warranted.

Cost Comparison of Intramedullary Screw Fixation of Metacarpal Fractures vs. Open Reduction and Internal Fixation with Plate and Screw Technique

Paper 081

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HYPOTHESIS: Intramedullary screw fixation (IMS) for metacarpal fractures is a relatively new fixation technique in comparison to plate and screw constructs. The purpose of this study was to test the hypothesis that IMS fixation for metacarpal fractures will result in lower overall healthcare-associated costs in comparison to open reduction and internal fixation with plate and screw constructs (ORIF).

METHODS: A retrospective review of patients undergoing IMS of metacarpal fractures at a single center during 2018-2022 was conducted. Healthcare-associated costs included primary operative costs (surgical time and implant(s)) and postoperative costs (therapy, splinting, and radiology). Costs were compared with age- and fracture pattern-matched controls who underwent ORIF. Continuous data with normal distributions were reported as means with standard deviations and 95% confidence intervals. Comparisons between both groups were made using independent Student t-tests. Subgroup analysis of cost outcomes excluding outliers was completed.

RESULTS: Sixteen patients met the study inclusion criteria (8 IMS and 8 matched ORIF subjects). The median age was 25 years (range: 17-41 years). Primary operative costs (IMS: $2,909.02, 95% CI: $2,345.20 to $3,472.84, ORIF: $6,693.74, 95% CI: $5,856.51 to $7,530.97) and total healthcare-associated costs (IMS: $3,844.17, 95% CI: $3,373.34 to $4,315.00, ORIF: $8447.89, 95% CI: $6,552.95 to $10,342.85) were significantly less for IMS ($p<0.05$). There was no significant difference in outpatient follow-up costs (IMS: $935.15, 95% CI: $702.62 to $1,167.68, ORIF: $1,754.15, 95% CI: $235.92 to $3,272.38, $p>0.05$). Subgroup analysis revealed that total healthcare-associated costs remained significantly less for IMS fixation (IMS: $3,825.42, 95% CI: $3,324.95 to $4,325.89, ORIF: $7,491.64, 95% CI: $6,439.83 to $8,543.45, $p<0.05$) and outpatient follow-up cost differences were not significantly different between fixation methods when excluding the outliers that utilized several sessions of therapy. There were no surgical complications in either group, although 3 ORIF patients required postoperative therapy. Postoperative pain scores (IMS: 0.4 +/- 0.7, ORIF: 1.3 +/- 2.1, $p>0.05$) and time to return to activities as tolerated (IMS: 43 +/- 12 days, ORIF: 46 +/- 4 days, $p>0.05$) were similar between groups.

SUMMARY POINTS: (1) Total primary operative costs and overall healthcare-associated costs for IMS fixation of metacarpal fractures is significantly lower than ORIF with a plate and screw construct, (2) There was no statistical difference in follow-up care costs between groups, (3) Higher powered prospective studies will be required to better determine indirect cost for patients.

Outcomes of Hemi-Hamate Arthroplasty for Proximal Interphalangeal Joint Reconstruction
Paper 082

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OBJECTIVES: Hemi-hamate arthroplasty is a viable option for proximal interphalangeal joint (PIP) reconstruction following fracture-dislocation injuries and results in successful outcomes including pain reduction, and functional PIP joint range of motion with low complication rate. We seek to further add to the collective understanding of this.

MATERIALS & METHODS: A patient list of those who underwent hemi-hamate arthroplasty was generated over an eight-year period from two fellowship-trained orthopedic surgeons at a single institution. Primary outcome measures evaluated are postoperative PIP joint range of motion and patient reported outcomes including VAS pain and DASH scores. Secondary outcomes included complications and need for revision surgery. Statistical analysis included averages and proportions utilizing Microsoft Excel functions.

RESULTS: Forty-two patients were included in the study over a twelve-year period, with the most common mechanistic action including jamming of the digit and falls. The ring finger was the most commonly involved digit. Preoperative motion of PIP joint averaged 15 degrees of extension to 30 degrees of flexion. Follow-up averaged 8 months (range: 2 months – 3 years). Postoperative range of motion resulted in a 52-degree arc of motion at the proximal interphalangeal joint (average, 23 degrees of extension and 75 degrees of flexion). Distal interphalangeal flexion improved by 26-degrees postoperatively (28 degrees preoperative vs. 54 degrees postoperative). Grip strength in the operative side was 90% of the contralateral hand at final follow-up. VAS pain scores improved from 4.5 to 1.5. Furthermore, DASH scores improved 23-points following HHA from 37.5 to 15. The most common reported complication was PIP joint stiffness. Seven patients underwent an additional surgery for persistent digital stiffness in the form of tenolysis, however, no patient required revision arthroplasty. There was minimal morbidity at the hemi-hamate harvest site and there were no cases of joint instability, or hardware failure. One patient demonstrated graft nonunion, although inconsequential, requiring no further revision arthroplasty.

CONCLUSION: Reparative options for proximal interphalangeal fracture-dislocations have historically led to high rates of joint stiffness, persistent pain, and flexion contractures. Reconstructive options for the middle phalanx volar base following PIP fracture-dislocations include hemi-hamate arthroplasty and volar plate arthroplasty. Hemi-hamate arthroplasty leads to functional PIP range of motion, acceptable patient reported outcome scores improved from preoperatively, and restoration of grip strength. Complications following this procedure are minor and graft collapse is seen infrequently.

Other Surgical Factors Associated with Thumb CMC Joint Arthroplasty: It's Not Just About Technique
Paper 083

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OBJECTIVE: Thumb carpometacarpal (tCMC) osteoarthritis is a common musculoskeletal ailment that presents with progressive joint pain and decreased thumb strength and range of motion. Treatment is often nonoperative initially, yet surgery may be indicated based on progression of disease, pain, or decreased function. Several surgical techniques exist for tCMC arthritis, but a superior surgical technique has not yet been identified. The purpose of this study is to determine other surgical factors that would distinguish a superior surgical technique for tCMC arthroplasty.

METHODS: Patients who underwent tCMC arthroplasty by one of five fellowship-trained hand surgeons between January 2015 and January 2021 were queried. Surgical technique was assessed by reviewing operative notes. Patient demographics, surgical details, clinical outcomes, and patient-reported outcome (PRO) data was collected. PROs utilized as part of this study included a pain management questionnaire, PROMIS Bank v2.0 – Upper Extremity, PROMIS Bank v1.1 – Pain Interference, and the QuickDASH outcome measurement. Revision procedures and patients that had additional operations at the time of the tCMC arthroplasty were excluded.

RESULTS: Overall, 148 records (132 patients) met inclusion criteria: 48 (32.4%) underwent suture suspensionplasty, 32 (21.6%) underwent ligament reconstruction and tendon interposition (16 with pinning, 16 without pinning), 22 (14.9%) underwent suture anchors and suture tape suspension, 35 (23.6%) underwent palmaris longus tendon weave, and 11 (7.4%) patients underwent other techniques or combinations. Patient age at surgery, BMI, and comorbidities were similar between groups. After adjusting for age, BMI, and Charlson Comorbidity Index (CCI), tourniquet time was significantly reduced in patients that underwent ligament reconstruction and tendon interposition with pinning (mean 44.9 ± 13.5 min, $p < 0.001$). Suture anchor and suture tape suspension was significantly more expensive than the other techniques (mean \$19,062 ± 3,872, $p < 0.001$). There was no difference in complications between groups. A subanalysis of PROs including the Promis v1.1, Promis v2.0, and QuickDASH revealed no significant difference between groups.

CONCLUSION: Patients who undergo tCMC arthroplasty for treatment of tCMC OA can expect good clinical outcomes from a variety of surgical techniques. Aspects of tCMC arthroplasty, such as tourniquet time and cost, should be considered when planning surgery. Surgical techniques for tCMC arthroplasty do not differ in patient-reported outcomes or clinical outcomes. Larger, randomized studies should be pursued to further delineate if differences exist between surgical techniques.

Identifying Ideal Screw Placement for Scaphoid Waist Fracture Fixation from the Dorsal Approach
Paper 084

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OBJECTIVE: Scaphoid fractures present a unique challenge given its complex structure and vascular supply. To determine ideal screw placement for scaphoid waist fractures from the dorsal approach, we identified all scaphoid waist fractures that underwent screw fixation from the dorsal approach and analyzed them three-dimensionally.

METHODS: A retrospective review of patients who underwent surgical management for scaphoid fracture fixation between January, 2010 - March, 2021 was performed. Inclusion criteria for this study were scaphoid waist fractures, fixation from the dorsal approach, and adequate postoperative CT imaging.

Three-dimensional models were created from postoperative CT imaging. The scaphoid was segmented into its anatomic regions and a best fit line between the centroids of each region was used to determine the scaphoid central axis (SCA). Patients who went on to nonunion vs. union were separated into two groups. Screw start point, trajectory, and length were then compared to an ideal start point, trajectory, and length along the SCA for both groups.

RESULTS: Sixty-eight cases met inclusion criteria with 28 patients in the nonunion and 40 patients in the union groups. Patient characteristics were similar except for significantly higher odds of nonunion with surgery on the dominant hand vs. the non-dominant hand (OR 5.99, 95% CI 1.44-24.88) and for revision fixation vs. primary fixation (OR 13.56, 95% CI 1.79-102.46).

The distance between the screw and ideal start points was statistically higher in the nonunion group compared to the union group (7.55 [IQR 4.912-8.619] vs. 5.978 [IQR 4.676-6.943] millimeters, P=0.0222). However, there was no statistical difference in the angle variance between the screw trajectory and SCA in the nonunion group compared to union group in the coronal (11.485 [IQR 3.320-25.546] vs. 10.842 [IQR 2.953-15.684] degrees, P=0.3729) and sagittal planes (16.447 [IQR 11.620-29.807] vs. 19.343 [IQR 9.502-23.232] degrees, P=0.4660). There was no statistical difference in the ratio of screw length to scaphoid length along the SCA between the nonunion and union groups (1.139 vs. 1.143, P= 0.8766).

CONCLUSION: For scaphoid waist fracture fixation from the dorsal approach, greater distance of the screw start point from the ideal start point correlated with risk of nonunion. Our study also found higher odds of nonunion with surgery on the dominant hand and with revision fixation.

Extended Oral Antibiotic Prophylaxis Reduces Early Wound-Related Complications Following Aseptic Revision Total Knee Arthroplasty

Paper 085

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BACKGROUND: Periprosthetic joint infection (PJI) following aseptic revision total knee arthroplasty (TKA) remains a devastating complication with an incidence ranging from 1-3%. Recent literature has suggested a possible role for the use of extended oral antibiotic prophylaxis (EOAP) following aseptic revision TKA. This study compared infection-related outcomes following aseptic revision TKA for patients receiving standard perioperative antibiotics and EOAP to those who received only standard perioperative antibiotics.

METHODS: This is a retrospective comparative study of 594 aseptic revision TKAs performed at a single institution from June 2016 to April 2023. This included 42 patients with known history of two stage revision TKA for chronic PJI (17 EOAP and 25 standard). Seven surgeons were included and use of EOAP was at the discretion of the treating surgeon. Exclusion criteria were second stage revision TKA and distal femur replacement for fracture. Patients who received >7 days of EOAP in addition to standard perioperative antibiotics (n=157) were compared to those who received standard perioperative antibiotics alone (n=437). Cumulative probability of poor wound healing (PWH), superficial wound infection (SWI), and PJI at 30 days, 90 days, and 1 year were determined. Fisher's exact test and chi-square analysis were used to compare infection rates between the groups. Type-I Error was set alpha=0.05.

RESULTS: Patient follow-up at 30 days, 90 days, and 1 year was 99.5%, 89.5%, 80.4%, respectively. PJI rate of the entire cohort at these timepoints was 1%, 2.7%, and 4.5%, respectively. There was no significant difference in the PJI rate for EOAP vs. standard at 30 days (0% vs. 1.38%, p=0.349), 90 days (2.3% vs. 2.8%, p=0.745), or 1 year (4.7% vs. 4.4%, p=0.904). When looking at the cumulative probability of any deep or superficial wound-related complication (PWH + SWI + PJI) for EOAP vs. standard there was a significant reduction at 30 days when using EOAP (0% vs. 3.8%, p=0.009). When looking at the cumulative probability of any superficial wound-related complication (PWH + SWI), EOAP trended toward significance at 30 days (0% vs. 2.39%, p=0.07), 90 days (0.8% vs. 3.6%, p=0.11), and 1 year (1.3% vs. 4.5%, p=0.19).

DISCUSSION: This study demonstrated no benefit of EOAP in reducing the risk of PJI following aseptic revision TKA out to one year after surgery. However, EOAP may provide benefit in preventing early wound-related complications. Future randomized controlled trials are needed to elucidate the role of EOAP following aseptic revision TKA.

DAIR for Periprosthetic Joint Infection in Primary vs. Revision Knee Arthroplasty - A Comparison in Survival Rate

Paper 086

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OBJECTIVE: There is active debate regarding the effectiveness of Irrigation and Debridement, Antibiotic therapy, and component Retention (DAIR) as a treatment for acute Periprosthetic Joint Infection (PJI). Variable results have been published regarding the rate of infection eradication in addition to specific indications for DAIR to maximize success rates. The purpose of this analysis was to evaluate DAIR's utility while considering the history of a primary or revision TKA in place at the time of the index DAIR procedure.

METHODS: A retrospective review to identify patients who underwent DAIR for treatment of acute PJI at a single institution from 2008-2020 was performed. Patients met inclusion criteria if they underwent irrigation and debridement with polyethylene exchange along with chronic antibiotic therapy for treatment of an acutely infected total knee arthroplasty (TKA). Chart review was further completed to separate patients as having a primary TKA (pTKA) or revised TKA (rTKA) in place at the time of the index DAIR procedure. Kaplan Meier survival analysis were performed. Failure was defined as a subsequent procedure performed for infection management.

RESULTS: In total, 244 DAIR cases were reviewed. One hundred ninety-one of the index DAIR cases were performed in a pTKA while the additional 53 DAIR cases were in a knee with an existing rTKA. Median follow-up time for the DAIR cases in the pTKA group was 4.4 years in comparison to 1.7 years for cases in rTKAs ($p=0.0046$). The rate of survival at 5 years in the pTKA group was 79.6% vs. 56.6% in the rTKA cohort ($p=0.0005$). No significance in survival rate was found between acute postoperative vs. acute hematogenous cases in either the pTKA (84% vs. 79%, $p=0.604$) or rTKA (66% vs. 54% $p=0.47$) cohorts.

CONCLUSION: Our data demonstrates a significantly decreased rate of survival in rTKA (56.6%) in comparison to pTKA (79.6%) irrespective of acute post operative or acute hematogenous classification. This difference of greater than 20% success rate may suggest DAIR has a more limited role as a treatment option for acute PJI in existing rTKA. Further investigation is warranted to identify individual factors which may be predisposing to the increased failure rates of rTKA specifically.

Antibiotic Resistance After Extended Oral Antibiotic Prophylaxis for Periprosthetic Joint Infection
Paper 087

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INTRODUCTION: Infection remains one of the most challenging and costly complications following total joint arthroplasty. The standard of care for treatment of periprosthetic joint infection (PJI) remains two-stage revision. A course of extended oral antibiotic prophylaxis (EOAP) following re-implantation has become common practice. This has the potential to increase antibiotic resistance in cases of re-infection after two-stage revision. This study aims to establish the rate at which the organism isolated after two-stage revision failure is the same as the original causative organism as well as the rate at which new antibiotic resistance develops with re-infection.

METHODS: A cohort of patients that underwent two-stage revision for primary total hip (THA) or knee (TKA) arthroplasty were retrospectively reviewed. Primary end-points include (1) the rate at which re-infection is caused by the same pathogen isolated at the initial PJI; (2) the rate of development of new antibiotic resistance when re-infection was caused by the same pathogen as the initial PJI; and (3) the rate of resistance to the prophylactic antibiotic administered.

RESULTS: Forty-four patients were included in this cohort (20 THA, 24 TKA). Thirty-four patients received antibiotic prophylaxis and 10 received none. Of these 34 patients, four received the 90-day oral antibiotic prophylaxis protocol outlined by Frank et al. (2017). Among the remaining 30 patients receiving antibiotic prophylaxis, there was wide variability regarding the mode, duration, and specific antibiotic administered. In the control group not receiving prophylactic antibiotics, seven had infection with a pathogen other than the one isolated from their initial PJI. Three of these seven isolates were found to be pan-sensitive. Of the three patients that had re-infection with the same pathogen, one pathogen (33.3%) had emergence of new resistance following two-stage revision failure. Of the 34 patients receiving EOAP, 18 had infection with a novel pathogen, two of which were pan-sensitive. Sixteen patients had infection with the same pathogen. Of these 16, six (37.5%) had emergence of new resistance. Overall, nine of the 34 patients receiving EOAP (26.5%) developed resistance to the prophylactic antibiotic including one of four patients (25.0%) receiving the Frank et al. protocol and eight of 30 patients (26.7%) receiving an alternative EOAP.

CONCLUSION: EOAP use at the time of re-implantation during two-stage revision arthroplasty results in fewer cases of re-infection with a novel pathogen. However, EOAP does not seem to correlate with increased antibiotic resistance.

Highly Congruent vs. Cruciate-Retaining Bearings in the Same TKA Patient
Paper 088

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INTRODUCTION: The purpose of this study was to examine patients who had undergone bilateral TKA with a cruciate retaining (CR) polyethylene insert in one knee and a highly congruent anterior stabilized (AS) insert in the contralateral knee, to determine patient preference and differences in outcomes.

METHODS: 104 Patients were identified who underwent bilateral TKA (208 knees) performed on average 15 months apart (range, simultaneous to 11 years apart) by the same surgeon using identical tibial and femoral implants, with each patient having an AS bearing in one knee and CR in the other. Mean age was 62.7 (range 43 to 88) and 62% of patients were female. Power analysis determined that 81 knees in each group were required to detect a difference in side preference of 20% (alpha=0.05, Beta=0.80). Univariate analysis with alpha<0.05 was used for comparisons between groups.

RESULTS: Twenty-seven patients (26%) preferred their CR knee, 25 patients (24%) the AS knee and 52 (50%) had no preference (p=.93). Thirty-five patients (34%) preferred the first knee that was done vs. 14% that preferred the second (p<.001). There was no difference in prosthesis survival (p=.37) or reoperations (p=0.17) between groups. Four AS knees were revised; two for PJI, one for femoral loosening and one for a recurrent popliteal cyst; one CR knee failed secondary to instability. There were three additional reoperations without revision on AS knees; one MUA, one loose body removal and one lysis of adhesions. There was one MUA in the CR group. There was no difference in overall patient satisfaction (p=.86), VAS-Pain scores (p=.41), flexion arc (p=.56) or KOOS JR scores (p=.62).

CONCLUSION: Patients with a CR insert in one knee and a highly congruent in the other did not prefer one vs. the other. There was no difference in survival, outcomes or postoperative ROM between groups.

Spinal vs. General Anesthesia for Outpatient Total Hip and Knee Arthroplasty in the Ambulatory Surgery Center: A Matched-Cohort Study

Paper 089

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OBJECTIVE: Spinal anesthesia is the most popular outpatient regimen, but scenarios exist where induction is unsuccessful, unobtainable, or against patient preference. We compared the safety and efficacy of same day discharge (SDD) total hip (THA) and knee (TKA) arthroplasty utilizing spinal vs. general endotracheal anesthesia in a free-standing ambulatory surgery center (ASC).

METHODS: This is a retrospective matched cohort study of all THA and TKA from January 2014 to December 2020 in an ASC. General anesthesia was utilized in 105 patients (58 TKA and 47 THA). These were nearest-neighbor matched utilizing same surgeon, years, age, gender, body mass index and American Society of Anesthesiologists Physical Status Classification (ASA) to 58 TKA and 47 THA with spinal anesthesia, with no statistical demographic differences ($p \geq 0.679$). The primary outcome was the rate of successful SDD. Secondary outcomes included pain (0-10), nausea, medical complications in the post-acute care unit (PACU) and 90-day complications. Chi square analysis and paired t-tests were utilized.

RESULTS: All spinal anesthetic patients underwent SDD compared to 103 (98%) general anesthetic patients ($p=0.498$). General anesthesia was associated with fewer minutes to discharge from PACU (227 vs. 260, $p=0.015$), ambulation (166 vs. 204, $p<0.001$) and urination (175 vs. 202, $p=0.050$). General anesthesia patients had higher 1-hour (5.2 vs. 1.5, $p<0.001$) and 2-hour (3.2 vs 1.5, $p<0.001$) postoperative pain, consumed more milligram morphine equivalents (13 vs. 8, $p<0.001$) and experienced more nausea (48% vs. 26%, $p<0.001$). With the numbers available for study, 90-day complications (8 vs. 7), admissions (2 vs. 3) and reoperations (5 vs. 2) were similar among spinal and general anesthesia, respectively ($p \geq 0.246$).

CONCLUSION: General endotracheal anesthesia had an acceptable rate of SDD and 90-day complications and was associated with faster discharge from the ASC with earlier time to ambulation and urination postoperatively. These patients experienced more pain and nausea compared to those with spinal anesthesia.

The Fate of Unresurfaced Patellae in Contemporary Total Knee Arthroplasty: Early to Mid-Term Results
Paper 090

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OBJECTIVE: Leaving the patella unresurfaced in total knee arthroplasty (TKA) has increased significantly over the past decade in the United States, likely due to modern patella-friendly implants, complications with resurfacing, and knowledge that historical studies were scientifically confounded. This study evaluated revision-free survivorship out to nine years in a cohort of contemporary primary TKAs with patella-friendly femoral components and unresurfaced patellae.

METHODS: A total of 1,053 primary TKAs with unresurfaced patellae performed from 2013 to 2023 were retrospectively reviewed. Clinical protocols were standardized for all cases. Kaplan-Meier (KM) survivorship estimates were calculated based on patellar revision and latest follow-up. An aggressive lateral patellar facetectomy was performed in 78% (823/1053) of cases. The cohort was 62% women and 43% ASA-PS class I/II with mean age and BMI of 65 years (range, 35-94) and 35 kg/m^2 (range, 18-65).

RESULTS: A total of 4 (0.4%, 4/1053) unresurfaced patellae were revised. Three were resurfaced as part of other procedures: two for global instability and one for aseptic loosening at a mean of 1.6 years; and one patella was resurfaced by an outside surgeon for unexplained pain. 494 patients and 345 patients achieved minimum 1-year and 2-year clinical follow-up (mean 2.2-2.7 years; range, 1-9). The all-cause revision-free survivorship estimate specifically related to the patella was 98.9% (95CI, 98-100) out to 9 years. No statistical survivorship difference was related to patellae with or without a lateral patellar facetectomy (98.1 vs 98.5%, p=0.214); however, 3 of 4 patellar revisions occurred in TKAs without a lateral patellar facetectomy.

CONCLUSION: The results of this study demonstrate excellent revision-free survivorship related to unresurfaced patellae, particularly when a lateral facetectomy was performed. These early to mid-term results using modern patella-friendly femoral components are promising and comparable to resurfaced patellae in the literature, however, long-term data remain warranted.

Risk Factors for Trochanteric Bursitis Following Total Hip Arthroplasty: A Comprehensive Radiographic Analysis

Paper 091

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OBJECTIVE: Trochanteric bursitis (TB) is a prevalent complication following total hip arthroplasty (THA), with increased offset hypothesized as a potential risk factor. This study aimed to systematically investigate radiographic measurements of offset and leg length, comorbidities, and patient characteristics as potential predictors of TB in THA patients.

METHODS: All patients having undergone THA at a single academic tertiary care center from 2005-2022 were reviewed for the study. Using physician progress notes, patients were screened for the presence of trochanteric bursitis. Exclusion criteria included less than one-year follow-up, AVN, or fracture. All patients meeting criteria underwent manual radiographic measurements of acetabular offset, femoral offset, total offset, and leg length from pre- and post-procedure AP pelvis x-rays, with scaling using femoral cortical diameter to account for imaging magnification variations. Univariable and multivariable Cox proportional hazard models were used to estimate the risk of TB over time for each of the patient characteristics, comorbidities, and radiographic measures.

RESULTS: 103 of 1,094 (9.4%) patients developed trochanteric bursitis, with a median (Q1, Q3) time to the presentation of 41.8 weeks (25.5, 66.9) post-surgery. In univariable models, only sex was found to be associated with increased TB risk, with female patients exhibiting a 1.79 times higher risk of developing TB compared to males (HR: 1.79 (1.16, 2.76), p = 0.009). Changes in acetabular offset, femoral offset, total offset, and leg length between pre- and post-surgery radiographs were not associated with an increased risk of developing TB in the univariate nor the multivariate models. Further, various offset thresholds were evaluated and there was no amount of offset where an increased risk of TB was identified.

CONCLUSION: This study found no relationship between femoral, acetabular, or total offset and trochanteric bursitis following THA. These findings suggest that surgeons may consider adding offset for increased prosthetic stability in high-risk cases. However, given this is a retrospective study, the authors are not advocating for routine use of increased offset. This study did identify a solitary risk factor of female sex with a 1.79 times increased risk of TB. Therefore, it is important for female patients to be counseled on their increased risk.

Revisiting 90-Day Antibiotic Prophylaxis After Two-Stage Treatment for PJI
Paper 092

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OBJECTIVE: Total joint arthroplasty (TJA) infection imposes unparalleled burden on patients and physicians. Antibiotic prophylaxis after two-stage treatment reduces reinfection rates but optimal antibiotic duration remains uncertain. This study evaluated the impact of 90-day antibiotic prophylaxis following reimplantation while also controlling for antibiotic administration prior to reimplantation.

METHODS: Prospectively documented data for 134 TJAs treated with the same two-stage protocol by two surgeons at an academic tertiary care center were reviewed. All cases met MSIS definitional criteria. Reoperation following reimplantation surgery was analyzed based on <90-day, 90-day, or long-term chronic antibiotic suppression and covariates including the amount of antibiotics received per day after resection, during the interstage period, and as an inpatient following reimplantation; ASA-PS class; surgeon; hip vs. knee infection; primary vs. revision resection; McPherson infection type, systemic host and lower extremity grade; and microbe(s) treated.

RESULTS: 52% of patients were female with an average age and BMI of 64.2 ±10.1 years and 34.3, ±8.1 kg/m^2, respectively. 74% were late chronic infections and 66% host grade B or C. Mean follow-up was 34.0 ±27.5 months. The overall reoperation rate for deep infection after reimplantation was 13.4%. Reoperation was significantly more prevalent in patients discharged on chronic antibiotic suppression (45%, CI 25-66%) compared to discharge with 90-day antibiotic prophylaxis (6%, CI 2-16%) or less (10%, 95% CI 4-20%) (P<.001). Reoperation rates in the latter two groups were not statistically different (P=.506), although reoperation rates steadily declined with increasing amounts of antibiotics per day across all administration time periods (P=.155).

CONCLUSION: Reoperation rates were greater in patients on chronic suppressive antibiotics; compared to lower rates in those with a short course of 90-days or less. Novel findings reveal that the amount of antibiotics received throughout treatment may impact reoccurrence of infection.

Incidence and Risk Factors for AFB/Fungal Culture Positivity in Complex Primary, Conversion, and Revision Hip and Knee Arthroplasty

Paper 093

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INTRODUCTION: It is unclear if AFB/fungal cultures should be routinely obtained along with standard aerobic or anaerobic cultures in hip and knee arthroplasty when there is concern for infection. The current thought is they should not be routinely obtained, but there is minimal published literature guiding this recommendation and risk factors for positivity have not been fully elucidated. Therefore, the purpose of this study was to evaluate the incidence of positive AFB/fungal cultures and determine predictive factors for positivity.

METHODS: 238 knee and hip procedures were performed between January 2007 and January 2022 where intraoperative AFB/Fungal cultures were obtained. Procedures included primary total knee arthroplasty (TKA), primary total hip arthroplasty (THA), conversion, first of 2-stage, second of 2-stage, irrigation and debridement (I&D) poly exchange, and aseptic revision. Positivity rates of intraoperative AFB/fungal cultures were calculated as binomial exact proportions with 95% confidence intervals and are displayed as percentages. Univariable generalized linear mixed models (GLMMs) estimated the unadjusted effects of demographics, individual comorbid conditions, and procedural characteristics on the logit of positive AFB/Fungal cultures.

RESULTS: 238 knee and hip procedures recorded an overall positivity rate of 5.8% for intraoperative AFB/fungal cultures. Aseptic revisions showed the lowest rates of positivity at 3.6%, while conversions showed the highest rates of positivity at 14.3%. The positivity rates are highest among patients who are male (9.0%), of Hispanic Origin (12.0%), with BMI <30 (6.4%), and a Charlson Comorbidity Index <5 (6.1%). On multivariate analysis, history of a prior infection in the same operative joint had increased odds of culture positivity (Odds ratio (OR): 3.47, 95% CI: 1.06-11.29, p-value: 0.039). Other demographic factors including age (OR: 1.01, p-value: 0.650), sex (OR: 3.07, p-value: 0.087), race (White vs. Black, OR: 0.98, p-value: 0.983; White vs. Other, OR: 2.01, p-value: 0.476), ethnicity (Hispanic vs. non-Hispanic origin, OR: 3.13, p-value: 0.195), BMI (OR: 0.98, p-value: 0.595), and Charlson Comorbidity Index (OR: 1.07, p-value: 0.431) did not show any significant influence on AFB/fungal positivity rates.

CONCLUSION: These results suggest utility in obtaining routine intraoperative AFB/fungal cultures, given the relatively high positivity and poor predictive factors. However, it is important to note this study was performed an academic tertiary referral center and the results may not generalize to the population at large.

Fellowship-Trained Surgeons Experience a Learning Curve Performing Revision Total Joint Arthroplasty
Paper 094

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OBJECTIVE: While revision total joint arthroplasty (TJA) typically requires considerable surgical experience, these procedures are frequently delegated to the youngest and least experienced arthroplasty surgeons. This common practice affects healthcare resource and patient outcome, yet is frequently overlooked. This study purpose is to examine outcomes and complications after revision TJA based on surgeon experience.

METHODS: 366 aseptic revision TJAs (hip=149; knee=217) performed by multiple fellowship-trained arthroplasty surgeons in the same academic tertiary care practice center were retrospectively reviewed. All hip surgical approaches and revision knee techniques and perioperative protocols were standardized. Surgeons were classified as “inexperienced” (I, first two years in practice), “early experience” (EE, 4-6 years in practice), and “senior experience” (SE, 15-17 years in practice). Procedure duration, estimated blood loss, readmissions and reoperations were compared based on surgeon experience. Bivariate analysis was completed with significant findings ($p < 0.05$) undergoing multivariate analysis.

RESULTS: Distributions of patient age and BMI were similar for I, EE, and SE surgeons. Procedure duration was longest for hip revisions performed for ALTR or instability further compounded by surgeon inexperience (I=178, EE=109, SE=95 minutes, P=.004). Revision knee procedure duration in minutes was longest for inexperienced surgeons with increasing BMI compounding for surgeons with least experience, an influence not seen in the senior surgeon (I=196, EE=123, SE=102 minutes, P=.004). Surgical duration was the strongest predictor of estimated blood loss for hips (P=.036) and knees (P=.006). There was a trending main effect for surgeon experience to influence one-year hip reoperation rates (I=18%, EE=7%, SE=3%, P=.075).

CONCLUSION: This data indicates that more complex cases completed by inexperienced surgeons may result in longer procedure duration, blood loss, and potential patient harm. Our findings indicate a learning curve exists for complex aseptic revision arthroplasty from the beginning of a surgeon’s career that continues for many years.

Handheld Navigation Reduces Risk of Dislocation After Total Hip Arthroplasty

Paper 095

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BACKGROUND: Dislocation following total hip arthroplasty (THA) is a significant complication with component malposition being a key risk factor. One method of addressing component position involves the use of intraoperative navigation. The purpose of the present study is to evaluate the effect of intraoperative navigation on the rate of dislocation after THA.

METHODS: We identified 861 primary THAs performed through the posterior approach by a single surgeon from 2013 to 2022. A handheld, imageless navigation system began to be utilized in 2018. There were 516 patients in the no navigation group (60%) and 345 in the navigation group. Mean age and BMI were 55 years and 30.4 k/m^2, respectively. There were 476 females (55%), and mean follow-up was 2.7 years. A validated artificial intelligence tool was utilized to measure acetabular component position on postoperative radiographs.

RESULTS: There were 17 dislocations that occurred in the entire cohort for an overall dislocation rate of 2.0%. The dislocation rates in the navigation and no navigation groups were 0.8% and 2.7%, respectively (p=0.003). The median time to dislocation was 63 days. In both groups, ten patients underwent revision of their acetabular component. There was no significant difference between the mean acetabular component abduction and anteversion in the dislocation group (42.6° and 33.1°) and the no dislocation group (43.8° and 34.7°). There was no significant difference between the mean acetabular component abduction and anteversion in the navigation group (44.1° and 33.8°) and no navigation group (43.6° and 35.3°).

CONCLUSION: This study confirms the low dislocation rate of THA using modern surgical techniques and implants. In mid-term follow-up, intraoperative navigation appears to reduce dislocation rate after THA. The consistent cup position seen in all groups in this study suggests that factors other than pure cup position need to be considered to continue to reduce dislocation rates.

Prospective Trial of Noninvasive Hemoglobin Monitoring for Outpatient Total Joint Arthroplasties
Paper 096

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BACKGROUND: Total joint arthroplasty (TJA) is increasingly being performed as an outpatient (i.e. same-day discharge) procedure. Postoperatively, orthostatic hypotension or lightheadedness can lead to questions regarding the patient's hemoglobin level prior to discharge. The purpose of this study was to prospectively assess the reliability, accuracy, and patient and nurse satisfaction of postoperative noninvasive hemoglobin (nHgb) monitoring compared to invasive serum hemoglobin (iHgb) lab draw in the outpatient TJA setting.

METHODS: We prospectively enrolled 200 outpatient unilateral TJAs (122 hips, 78 knees). Postoperatively, both nHgb and iHgb values were obtained at a mean of 35 minutes apart. Surveys were completed by patients and nurses. The strength of agreement between the two hemoglobin monitoring methods was evaluated using the Bland and Altman 95% limits of agreement.

RESULTS: The mean preoperative serum hemoglobin was 14.2 ± 1.1 g/dL. The mean postoperative iHgb and nHgb values were 13.3 ± 1.2 g/dL and 13.3 ± 1.5 g/dL, respectively. The Bland-Altman 95% limits of agreement were -3.2 and +3.1, indicating that 95% of patient iHgb values are expected to fall between these two limits relative to the patient's nHgb value. Among the 136 patients with nHgb >11.5 g/dL, 98% had an iHgb value ≥11 g/dL. Patients reported less pain for the nHgb test compared to the iHgb test (1.0 vs. 2.8; $p<0.001$) and 96% of patients preferred the nHgb test. Following the nHgb test, 73% of patients and 81% of nurses were somewhat to significantly more reassured about same-day discharge.

CONCLUSION: Routine nHgb testing can rapidly screen outpatient TJA patients for acute anemia prior to discharge. With nHgb >11.5 g/dL, iHgb was almost always ≥11 g/dL. Most patients and nurses felt more reassured about same-day dismissal after nHgb monitoring.

Outpatient Total Hip Arthroplasty in the Hospital Setting and Impact of Time to Discharge
Paper 097

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INTRODUCTION: Total hip arthroplasty (THA) has historically been performed in the hospital setting, often resulting in multi-day hospital stays. While there has been a trend to move THA to ambulatory surgery centers (ASCs), many outpatient cases are still performed in the hospital. We sought to determine which perioperative factors impacted same-day vs. next-day discharge after THA and the impact of discharge timing on complication rates. It was hypothesized that surgical timing and perioperative management would impact same-day discharge, and that same-day discharge would not impact 90-day complications.

METHODS: The hospital's total joint database was queried via the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) for outpatient primary THAs performed in a single hospital by a single surgeon between January 2020 and November 2022. There were 226 outpatient THAs identified. Same-day (n=71) and next-day (n=155) discharge cohorts were compared for perioperative timing, opioid administration, and 90-day complications. Chi-square and Fisher's exact tests were applied for categorical data and t-tests for continuous data.

RESULTS: There were statistically significant differences between same-day and next-day discharge cohorts, with lower age (p=0.01), lower ASA (p=0.045), male sex (p=0.014), and lack of DVT/PE history (p=0.011) associated with same-day discharge. Earlier arrival in the post-anesthesia care unit (PACU, p=0.039) and earlier first physical therapy evaluation (p<0.001) were also associated with same-day discharge, while opioid administration in the operating room and PACU were not. Patients discharged same-day and next-day had similar rates of 30-day (4% vs. 9%, p=0.20) and 90-day events (11% vs. 14%, p=0.55). Logistical regression modeling showed that same-day discharge patients were younger (aOR 0.952, p=0.015) and were evaluated earlier by therapy (aOR 0.165, p=0.001).

CONCLUSION: Age, sex, ASA, and earlier perioperative timing impacted the likelihood of same-day discharge after hospital-based outpatient THA. Same-day discharge did not increase the rate of 30 and 90-day events.

Non-Opioid Multimodal Analgesia for Total Shoulder Arthroplasty Demonstrates Significant Reductions in Opioid Prescriptions without Increased Complications: A Retrospective Comparative Study

Paper 098

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OBJECTIVE: The purpose of this study was to compare the pain level and the amount of opioid consumed in postoperative total shoulder arthroplasty (TSA) patients who were treated with a standard opioid-including regimen vs. a non-opioid multimodal analgesia regimen.

METHODS: We retrospectively reviewed two consecutive cohorts who underwent TSA either anatomic or reverse. The opioid cohort included patients from early 2016 to late 2020 who were prescribed Oxycodone/Acetaminophen only. The non-opioid cohort included patients from late 2020 to 2022 and consisted of preoperative oral analgesics; intraoperative IV Dexamethasone and Acetaminophen; and postoperative oral Dexamethasone and analgesics. Patient reported outcomes (PROs) collected included Visual Analog Scale (VAS) for pain and Patient Reported Outcome Measurement Information System (PROMIS) up to one year postoperatively. Opioid consumption (preoperative, and 10-days, 6-weeks, and 3-months postoperative) using Morphine Milligram Equivalents (MME) were compared and analyzed using the nonparametric Wilcoxon rank-sum test.

RESULTS: There were 232 patients in the opioid cohort and 112 in the non-opioid. The non-opioid cohort had a higher median BMI (31.0 vs. 29.6; P=0.03), were less likely to have a diagnosis of chronic kidney disease (3.6% vs. 12.1%; P<0.01). The non-opioid cohort had lower mean VAS at preoperative (6.4 vs. 7.4; P<0.05), 10-day (3.5 vs. 4.2; P<0.05), and 6-week time points (2.1 vs. 2.8; P<0.05), but no differences between the groups at 3-months. No differences in PROMIS-Upper Extremity (UE), Pain Interference (PI), or Depression (D) were found preoperatively and up to 1 year postoperatively. The non-opioid cohort had lower opioid consumption (P<0.01) and lower MMEs at all time periods (P<0.01). When analyzing risk factors for continued opioid prescriptions, univariate logistic regression revealed that opioid usage 90-days prior to surgery (RR 4.69 [95% CI 3.18–6.91]; P<0.01) and current tobacco use (RR 2.61 [95% CI 1.50–4.54]; P<0.01) were associated with obtaining at least one opiate prescription >30-days postoperatively. Multivariate logistic regression revealed that patients who used opiates 90-days prior to surgery and were current tobacco users were 8.52 and 4.92 times more likely to receive an opioid prescription, respectively. 90-day hospital readmissions and revision surgery at one-year were not significantly different.

CONCLUSION: A non-opioid multimodal regimen for patients undergoing TSA significantly reduces opioid prescriptions with similar PROs and pain scores without increased complication rates compared to an opioid-only regimen.

Smoking Negatively Affects Clinical Outcomes and Survivorship in Reverse Total Shoulder Arthroplasty
Paper 099

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BACKGROUND: Smoking has consistently shown a strong association with suboptimal healing and adverse outcomes following different joint arthroplasties, resulting in inferior functional measurements and heightened complication rates. However, the precise impact of smoking on the long-term efficacy and clinical significance of reverse total shoulder arthroplasty (rTSA) remains partially understood.

METHODS: Utilizing institutional electronic medical records, a retrospective study was performed on patients who underwent rTSA from 2009-2020, identified through the Current Procedural Terminology code 23472. Excluding patients with less than two years of clinical follow-up, patient charts were reviewed to gather background demographic and lifestyle information, as well as measurements of shoulder range of motion and strength in forward elevation, external rotation, and internal rotation at both preoperative presentation and the most recent postoperative follow-up. To evaluate the impact of tobacco smoking, patients were categorized into three groups: current smokers, former smokers, and never smokers; individuals using smokeless tobacco or alternative nicotine products were not included in the analysis.

RESULTS: Among 218 patients who underwent rTSA, with an average postoperative follow-up time of 3.3±1.5 years, there were 20 current smokers, 68 former smokers, and 130 individuals never smoked. Current smokers, compared to former and non-smokers, were significantly younger at the time of rTSA (current: 59.0±6.8 vs former: 68.5±7.2 vs never: 69.0±9.0 years; $p<0.001$). After rTSA, all three groups experienced noteworthy improvements in range of motion and strength compared to preoperative measurements, including forward elevation, external rotation, and internal rotation (all $p<0.001$). There were no significant differences in range of motion between the cohorts. However, although there were no differences in preoperative strength testing, current smokers demonstrated significantly diminished postoperative strength in forward elevation (current: 4+/5 vs. former: 5/5 vs. never: 5/5; $p=0.021$) and external rotation (current: 4+/5 vs. former: 5/5 vs. never: 5/5; $p=0.030$). The analysis of survival rates indicated that current smokers had a higher incidence of implant failure and revision, with a 5-year survival rate of 59.9% compared to 90.6% and 85.1% for former and non-smokers, respectively ($p=0.0036$).

CONCLUSION: Current smokers are more likely to undergo reverse total shoulder arthroplasty (rTSA) at a younger age. Moreover, they experience less favorable postoperative improvements in strength functionality and exhibit higher rates of implant failure.

Non-Cefazolin Antibiotic Prophylaxis is Associated with Higher Rates of Elbow Periprosthetic Joint Infection

Paper 100

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INTRODUCTION: Periprosthetic joint infection (PJI) is a common source of failure following elbow arthroplasty. Prophylactic antibiotics are considered the standard of care, however there is no data with regard to the comparative efficacy of specific antibiotics in the prevention of PJI in elbow arthroplasty. Previous studies in shoulder, hip, and knee arthroplasty have demonstrated higher rates of PJI with administration of non-cefazolin antibiotics. This study evaluated whether perioperative antibiotic choice affects rates of PJI in elbow arthroplasty.

MATERIALS & METHODS: A single institution prospectively collected total joint registry was queried to identify all patients who underwent primary elbow arthroplasty between 2003 to 2021. Exclusions included elbows with known infection prior to elbow arthroplasty (25) and cases with incomplete perioperative antibiotic data (7) resulting in 603 total elbow arthroplasties and 19 hemiarthroplasties. Cefazolin was administered in 561 elbows (90%) and non-cefazolin antibiotics including vancomycin (32 elbows, 5%), clindamycin (27 elbows, 4%) and piperacillin/tazobactam (2 elbows, 0.3%) were administered in 61 elbows (10%). Demographics between groups were similar with the exception of a higher mean number of prior surgeries in the cefazolin cohort and a higher American Society of Anesthesiology score in the non-cefazolin cohort. Univariate and multivariate analyses were conducted to determine the association between the antibiotic administered and the development of PJI. Survival free of infection was estimated using the Kaplan-Meier (KM) method.

RESULTS: Deep infection occurred in 47 elbows (7.5%) and an additional 16 elbows (2.5%) were diagnosed with superficial infections. Univariate analysis demonstrated that patients receiving non-cefazolin alternatives were at significantly higher risk for any infection (Hazard Ratio (HR) 2.6 95% confidence interval [CI] 1.4-5.0]; $p < 0.01$) and deep infection (HR 2.7 [95% CI 1.3 – 5.5]; $p < 0.01$) compared with cefazolin administration. Multivariable analysis, controlling for independent predictors of PJI (tobacco use, male sex, surgical indication other than osteoarthritis, and American Society of Anesthesiology score), showed that non-cefazolin administration had a higher risk for any infection (HR 2.8 [CI 1.4 – 5.3]; $p < 0.01$) and deep infection (HR 2.9 [95% CI 1.3 – 6.3]; $p < 0.01$). Infection-free survival was higher at all time points for the cefazolin cohort.

DISCUSSION: In primary elbow arthroplasty, cefazolin administration was associated with significantly lower rates of PJI compared to non-cefazolin antibiotics. For patients with penicillin or cephalosporin allergies, preoperative allergy testing or a cefazolin test dose should be considered prior to administration of non-cefazolin alternatives.

Short-Term Outcomes After Anatomic TSA Utilizing a Subscapularis-Sparing Approach: A Consecutive Case Series

Paper 101

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OBJECTIVE: This study aims to assess functional outcomes and range of motion (ROM) following anatomic total shoulder arthroplasty (TSA) using a subscapularis-sparing approach that releases only the inferior third of the tendon.

METHODS: 34 consecutive patients underwent anatomic TSA using a subscapularis-sparing approach at a single institution. The inferior third of the tendon was released, preserving the critical superior portion and the rotator interval. Following component implantation, the lower third window was repaired with suture anchors. Patients were immobilized in a sling for two weeks and then underwent an accelerated physical therapy protocol. Outcome measures including Simple Shoulder Test (SST), American Shoulder and Elbow Surgeons (ASES), Disabilities of Arm, Shoulder, and Hand (DASH), and ROM were evaluated preoperatively, at three months and at six months postoperatively. Statistical analysis included descriptive statistics and repeated measures ANOVA.

RESULTS: 28 patients had complete 6-month data and were included for analysis. The mean age was 68.2 years, with 16 female and 12 male patients. At 6 months, compared to preoperative scores, statistically significant improvements were observed in SST (28.6 vs. 69.3, $p < 0.001$), ASES (34.3 vs. 76.6, $p < 0.001$), and DASH (43.8 vs. 21.6, $p < 0.001$). ASES and SST also demonstrated improvement from 3 months to 6 months, while DASH improved between 3 and 6 months but without statistical significance. ROM data was available for 18 patients through 6 months, revealing improvements in forward flexion (138.9° vs. 148.1°, $p = 0.418$), abduction (82.8° vs. 91.4°, $p = 0.155$), and external rotation at 0° of abduction (39.7° vs. 49.7°, $p = 0.011$). Three complications related to subscapularis insufficiency were identified on ultrasound, leading to subsequent repair or revision. Another patient sustained two falls with resulting attenuation of the subscapularis. After excluding these patients, there was further improvement from pre-op to 6 months post-op for all outcome scores: SST (29.3 vs. 78.1, $p < 0.001$), ASES (35.3 vs. 82.6, $p < 0.001$), and DASH (43.3 vs. 14.4, $p < 0.001$).

CONCLUSION: To the authors' knowledge, this is the first series reporting TSA using solely the single inferior third window. This subscapularis-sparing technique resulted in significant improvements in SST, ASES, DASH scores, and ROM.

Revision Total Shoulder Arthroplasty Functional Outcomes and Implant Longevity

Paper 102

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BACKGROUND: Revision total shoulder arthroplasty is employed to rectify complications or failures arising from primary shoulder arthroplasty. However, there is a scarcity of comprehensive evidence concerning the functional outcomes and durability of implants subsequent to revision TSA.

METHODS: This is a single institution, retrospective investigation of patients who underwent revision shoulder arthroplasty for unsuccessful primary reverse shoulder arthroplasty (RSA), anatomic TSA (TSA), and hemiarthroplasty (HA) between 2007-2021. The study included a minimum follow-up period of two years. Relevant data was collected from medical records, encompassing patient demographics, clinical characteristics, preoperative and postoperative assessments of functional shoulder outcomes (such as range of motion and strength testing in forward elevation, external rotation, and internal rotation). The durability of the implants was assessed by examining the incidence of complications, revisions, and reoperations.

RESULTS: There were 124 revision shoulder arthroplasties included: 70 were converted to RSA, 23 to TSA, and 22 to HA, with 9 cases unspecified. The most common reasons for revision included instability (37 cases), dislocation (29 cases), infection (21 cases), and fracture (9 cases). Many patients also had concurrent degenerative joint disease (74 cases) and/or rotator cuff tear (67 cases). The mean age at the time of the initial and revision surgeries was 60.7±12.0 years and 64.9±11.0 years, respectively, and the average follow-up period was 6.37±5.98 years. Revision surgery significantly improved patients' functional shoulder outcomes in terms of forward elevation (preoperative: 79.8±41.0 vs. postoperative: 118.5±38.3; $p<0.001$), external rotation (preoperative: 27.8±19.3 vs. postoperative: 34.3±16.2; $p=0.0279$), internal rotation (preoperative: glute vs. postoperative: S1; $p=0.0015$), and forward elevation strength (preoperative: 4+/5 vs. postoperative: 5/5; $p=0.0021$). In a multivariate regression analysis adjusting for demographic and comorbidity factors, revision to RSA significantly reduced the risk of reoperation compared to HA/TSA revisions (reference: HA/TSA vs RSA: hazard ratio 0.35, 95% confidence interval 0.13-0.92; $p=0.032$). The overall survival rates of the implants at 2 years, 5 years, and 10 years post-revision were 85.48%, 83.06%, and 79.84%, respectively, with an average time to re-revision or reoperation of 1.80±2.53 years. Males had a higher risk of implant failure and subsequent re-revision compared to females (male: 1.18±2.25 years vs female: 2.73±2.77 years; $p=0.050$). Complications requiring re-revision or reoperation occurred in 29 (23%) of cases (10 of which occurred in the first 90 days), including 16 infection, 7 instability/dislocation/fracture, and 6 mechanical failure or other.

CONCLUSION: Patients who underwent revision shoulder arthroplasty following a failed primary arthroplasty showed significant improvement in functional measurements. The success rate of revisions was higher in female patients and when converting to RSA.

Rate of Recovery Following Reverse Shoulder Arthroplasty
Paper 103

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INTRODUCTION: Reverse shoulder arthroplasty (RSA) has significantly grown over the last two decades due to its expanding indications. Given this increase, it is essential for the orthopedic surgeon to communicate the expected postoperative recovery timing to patients. The purpose of this study was to determine the rate of recovery following RSA and factors influencing this rate.

METHODS: A retrospective review of 2,132 patients who underwent RSA by a single surgeon was conducted. Data was collected preoperatively and postoperatively at intervals of 3, 6, 12, and 24 months. At each follow-up period the cohort was divided into either a recovered or still recovering group. Patients with an American Shoulder and Elbow Score (ASES) of 70 or greater were defined as recovered, based on previously validated studies, compared to those with a score of less than 70 being defined as still recovering. Both the demographic and range of motion data was compared between the cohorts at each follow-up period.

RESULTS: The recovered group included 36.4% at 3 months, 56.7% at 6 months, 71.8% at 12 months, and 70.5% at 24 months. At 6 months, the recovered and still-recovering groups had significantly more females (70.0% and 56.3% respectively; p=0.02). At 24 months, there was a significant higher preoperative BMI for the recovered group compared to the still recovering group (30.15 vs. 28.14 respectively, p=0.04). Previous shoulder surgery, preoperative injection, and subscapularis repair were comparable between groups at each follow-up period. Postoperative abduction was significantly greater in the recovered group at 12 months. Active forward elevation and external rotation were not significantly greater in the recovered group at 6, 12, and 24 months.

DISCUSSION: It appears that perhaps female patients and those patients who gain postoperative abduction are more likely to reach recovery slightly faster than other cohorts. This information can allow clinicians to inform their patients of expected recovery times more accurately where more than a third of patients reach the recovery threshold by 3 months, and a majority by 12 months postoperative. Patients who had previous injections, variations in subscapularis management or prior shoulder surgery did not see an impact in their overall recovery rates for RSA.

Patient Race and Ethnicity was Associated with Higher Unplanned 90-Day Emergency Department Visits and Readmissions But Not 10-Year All-Cause Complications or Reoperations in a Matched Cohort Analysis of Primary Shoulder Arthroplasties

Paper 104

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OBJECTIVE: Disparities in patient outcomes following primary shoulder arthroplasty (SA) have been described as a function of race, socioeconomic status, and insurance status. However, there remains limited data evaluating the outcomes of racial and socioeconomic disparities past 90 days and from non-insurance claims databases. This investigation evaluated the outcomes of primary shoulder arthroplasty (SA) in non-white patients when compared with a matched cohort of white patients.

METHODS: Over a 39-year period (1981–2020) an institutional total joint registry was utilized to identify all non-White patients (Asian / Pacific Islander, Black, Hispanic or Latino, American Indian / Alaska Native, Other) who underwent primary shoulder arthroplasty with a minimum of 2 years of follow-up. This included 275 primary SA (46 hemiarthroplasties [Hemi], 97 anatomic total shoulder arthroplasties [aTSA], and 132 reverse shoulder arthroplasties [RSA]). This cohort was matched 1:2 according to age, sex, diagnosis, implant, and surgical year to a control group of 550 White patients. The rates of medical and surgical complications, reoperations, revisions, and implant survivorship were assessed. The mean follow-up time was 6.3 years (range, 2 to 40 years).

RESULTS: Of the 275 non-White SA, the composition was 8.7% Asian, 27.3% Black, 37.8% Hispanic, 12.4% American Indian, and 13.8% other. Within the first 90-days non-white patients had a higher rate of emergency department visits (5.5% vs. 0%; P = .004) and unplanned readmissions (2.9% vs. 0.2%; P = .008). However, over time there were no differences with medical complications (1.8% vs. 0.7%; P = .135), surgical complications (12.0% vs. 13.6%; P = .446), reoperations (7.6% vs. 9.1%; P = .492), or revision surgery (5.1% vs. 8.2%; P = .715). At 10 years, similar rates of survivorship free of all-cause complications (76.7% vs. 81.5%; P = .370), reoperations (84.9% vs. 89.8%; P = . 492), and revisions (89.3% vs. 91.4%; P = .715) were observed between non-white and white SA.

DISCUSSION: Patient race and ethnicity, when age, sex, and diagnosis are controlled for, was not associated with an increased risk of long-term complications, reoperations, or revision surgery after primary shoulder arthroplasty. However, within the first 90 days non-white patients had a higher likelihood of unplanned emergency room visits and readmissions. Continued efforts are needed to further investigate these differences and provide solutions to better mitigate these unnecessary risks.

Telerehabilitation vs. In-Person Physical Therapy After Shoulder Arthroplasty: A Randomized Controlled Trial

Paper 105

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BACKGROUND: The COVID-19 pandemic necessitated implementation of social distancing and limitation of exposure to healthcare environments, popularizing remote patient care. Telerehabilitation may offer therapy alternatives after shoulder arthroplasty that limit extraneous travel and exposure. We hypothesize telerehabilitation after anatomic (TSA) and reverse shoulder arthroplasty (RSA) demonstrates similar postoperative shoulder range of motion (ROM), pain, and patient reported outcomes (PROs) as in-person therapy.

METHODS: Patients indicated for primary shoulder arthroplasty were screened for enrollment. Revision procedures, concomitant procedures, fracture indications, and out-of-state insurance were excluded. Participants were randomized 1:1 to in-person PT or telerehabilitation. Power analysis identified 35 subjects in each intervention group, a total of 70 per surgical group and 140 study participants. Demographic data was collected including age, BMI, operative diagnoses, and surgical procedure. PROs including American Shoulder and Elbow Surgeons (ASES) Shoulder score, VAS pain scores, and PROMIS Pain Interference scores, and ROM including forward elevation (FE), abduction, internal and external rotation (IR, ER), were collected preoperatively and postoperatively at 2 and 6 weeks, 3 and 6 months, 1 and 2 years. Descriptive statistics were used, performing independent t-test and chi square analysis. Repeated measures generalized linear models tracked outcome changes over time. Statistical significance was $p < 0.05$.

RESULTS: This ongoing trial remains blinded (Group A, B). Eighty-two patients are enrolled and 74 had postoperative data. No significant demographic differences occurred between intervention groups. More participants underwent RSA (64%), and TSA patients were younger (63.5 vs. 69.6, p=0.0027). Group B had better preoperative abduction (p=0.0238), otherwise no differences in preoperative PROs or ROM existed. Patients improved in all PROs and ROM postoperatively. In those with 6-month follow-up, TSA and RSA patients tended to improve in parallel fashion, with TSA exhibiting slightly better ROM and PROs. Both telerehabilitation and in-person cohorts trended toward similar PROs. Group B displayed higher FE at all time points. Group A trended toward better abduction at 6 months, and better abduction and ER at 1 year. Statistical significance is limited by the ongoing study.

CONCLUSION: If proven non-inferior, telerehabilitation after shoulder arthroplasty may offer similar outcomes with the benefit of therapist instruction in the convenience of home.

Optimizing Primary Total Shoulder Arthroplasty in the COVID Era: Shorter Length of Stay with No Increase in the Complication Profile

Paper 106

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OBJECTIVE: The novel coronavirus (COVID-19) pandemic had significant impact on surgical volume as elective surgical procedures were suspended. The purpose of this study was to evaluate surgical trends of TSA induced by the pressures of the COVID-19 pandemic and compare postoperative complications of pre-COVID vs. COVID era patients that underwent TSA.

METHODS: Patients that underwent primary TSA from January 2018 through October 2021 were included. Procedures performed before March 11, 2020 were considered the pre-COVID cohort while those performed on or after March 11, 2020 were considered the COVID era cohort. Data collected included patient age, gender, body mass index (BMI), medical comorbidities, American Society of Anesthesiologists (ASA) score, and Elixhauser Comorbidity Index (ECI). Outcome measures included postoperative complications, Emergency Department (ED) utilization, hospital readmissions, and reoperations within 90-days following TSA. Patients with LOS ≤ 8 hours were considered as same-day discharge (SDD) while those with LOS > 8 hours were considered as inpatient stay (IP). Statistical analysis included descriptive analyses of demographic information, X2 or Fisher's exact for comparison of categorical variables, and t-test for comparison of continuous variables. A p-value < 0.05 was considered to be statistically significant.

RESULTS: This study consisted of 323 patients with a mean age of 69.0 ± 10.5 years and 197 female patients (61.0%). There were no significant differences between the pre-COVID and COVID era cohorts in relation to ASA classification (p=0.9), ECI score (p=0.8), preoperative diagnoses (p=0.65) or type of arthroplasty (p=0.61). During the pandemic, there was a significant increase in same-day discharge TSA (COVID era 49% vs. pre-COVID 28.2%, p<0.001) and a decrease in postoperative LOS (COVID era 17.4 hours vs. pre-COVID 23.2 hours; p=0.03). There were no differences between pre-COVID and COVID era cohorts in regards to postoperative complications, frequency of 30- or 90- day ED encounters, hospital readmissions, or reoperations.

CONCLUSION: Primary TSA during the COVID-19 pandemic was associated with more frequent same-day discharge without increased postoperative complications, ED encounters, readmissions, or reoperations at up to 90-days postoperatively. Future studies should focus on developing predictive models for patient risk profile to determine appropriate setting of TSA.

Functional and Radiographic Outcomes of Octogenarians Undergoing Primary Reverse Total Shoulder Arthroplasty

Paper 107

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OBJECTIVES: : The demand for primary reverse total shoulder arthroplasty (RTSA) has been increasing due to an aging population and expanding indications. Given that geriatric populations predominantly undergo this procedure, and age represents a non-modifiable factor, it is imperative to comprehend the impact of age on outcomes, specifically among individuals aged 80 years or above. The purpose of this study was to determine postoperative patient-reported outcomes and evaluate postoperative imaging of octogenarian patients (≥80 years old) who underwent primary RTSA.

METHODS: In this retrospective study, all consecutive patients aged 80 years or older who underwent primary RTSA from April 2012 through January 2022 were included. Patient demographic, preoperative comorbidity data American Society of Anesthesiologists (ASA) classification and Elixhauser Comorbidity Index (ECI) scores were collected. Primary outcomes included postoperative Single Assessment Numeric Evaluation (SANE), American Shoulder and Elbow Surgeons (ASES), Visual Analog Scale (VAS), and range of motion (ROM) at a minimum follow-up of 12 months, while the secondary outcomes were adverse radiographic findings, mortality, and 90-day postoperative complications. Continuous variables were analyzed with descriptive analyses while categorical variables were presented with frequencies and percentages. A Shaprio-Wilkes test was completed to assess for a normal distribution of the dataset for comparative analyses. A Wilcoxon Signed-Rank test was used for comparison of matched continuous variables. A $p<0.05$ was considered to be statistically significant.

RESULTS: A total of 59 patients with a minimum 12-month follow-up were included in final analysis, with a mean age of 84.21 ± 3.24 years and 39 (66.1%) female patients. The mean postoperative clinical follow-up was 24.04 months. The mean radiographic follow-up was 15.07 months. All patient-reported outcome measures significantly improved postoperatively, including SANE ($p=0.002$), ASES ($p<0.001$), and VAS ($p<0.001$). There was also significant improvement in forward elevation ($p < 0.001$) and external rotation ($p<0.001$). The most common adverse radiographic outcome was scapular notching (27.1%), followed by acromial stress fractures (5.1%). Eight (13.6%) complications were observed, with four requiring revision surgeries. There were no 30- or 90- day ED encounters, readmissions, or reoperations.

CONCLUSION: RTSA leads to significant improvements in patient-reported outcomes and ROM with a low rate of adverse medical or radiographic complications in patients aged 80 years or older at a mean 24-month follow-up. Further research with larger sample sizes and longer follow-up periods is warranted, although it poses challenges within this age group.

Does Sleep Comfort Predict Recovery After Primary and Revision Reverse Shoulder Arthroplasty?
Paper 108

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INTRODUCTION: Insufficient sleep has been established as a contributing factor to the onset of chronic diseases and mental illnesses. While the American Shoulder and Elbow Surgeon score (ASES) serves as the accepted benchmark, encompassing sleep as part of its evaluation of postoperative outcomes and recovery, this study aimed to specifically examine and isolate the impact of sleep on patient's sense of recovery after reverse shoulder arthroplasty (RSA).

METHODS: A retrospective review of 476 patients who underwent RSA by a single fellowship-trained orthopedic surgeon was conducted. In this cohort, 386 patients underwent standard reverse shoulder arthroplasty (RSA) and 90 patients underwent revision RSA (rRSA). Demographic variables, composite ASES scores, and individual responses to the sleep component of the ASES score were collected at 3, 6, 12, and 24 months postoperatively. Patients rated their ability to comfortably sleep on a 0-3 scale (0="unable", 1="very difficult", 2="slightly difficult", 3="normal"). If a score of 0-2 was obtained, patients were considered to have "difficulty" sleeping. Utilizing the ASES score, patients were deemed "recovered" if they obtained a postoperative score of 70 or greater. Patients were further subgrouped into "not recovered" and "recovered" groups and statistically compared to their sleep scores. Significance was defined as $p < 0.05$.

RESULTS: Patients who underwent RSA had a mean age of 73 years, BMI of 29.3 kg/m^2 and were 29.3% males. Patients who underwent rRSA had a mean age of 67.8, BMI of 29.7 kg/m^2 and were 51.7% males. The rRSA cohort had significantly more males ($p < 0.01$) compared to the primary RSA cohort. Most patients that recovered indicated "no difficulty" sleeping at 3 months (RSA group = 81.4% and rRSA group = 63.6%), 6 months (RSA group = 94.4%, rRSA group = 73.3%), 12 months (RSA group = 87.8%, rRSA group = 75%), and 24 months (RSA group = 83.4%, rRSA group = 76.9%). The recovered patients demonstrated significantly increased "no difficulty" sleeping when compared to their respective "not recovered" patients at each time point ($p < 0.001$).

CONCLUSION: This study establishes a significant association between the restoration of normal sleep and higher recovery rates following RSA. These findings hold vital implications for surgeons in patient counseling, providing a timeline for the normalization of sleep patterns. Surgeons may also utilize sleep as its own metric for determining patient recovery after RSA as a simple single question assessment tool.

Updated Patient Selection Algorithm for Outpatient Shoulder Arthroplasty in Ambulatory Surgery Center
Paper 109

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BACKGROUND: Outpatient total shoulder arthroplasty (TSA) presents a safe alternative to inpatient arthroplasty, while helping meet the rapidly rising volume of shoulder arthroplasty needs and minimizing healthcare costs. Identifying the correct patient for outpatient surgery is critical to maintain the safety standards with TSA. Patient selection has continued to evolve as comfortability with outpatient joint arthroplasty increases. This study sought to update an ambulatory surgery center (ASC) TSA patient selection algorithm previously published by our institution.

METHODS: A retrospective chart review of all TSAs performed in an ASC at a single institution was performed to collect patient demographics, perioperative risk factors, and postoperative outcomes with regards to reoperations, hospital admissions, and complications. The existing ASC algorithm for outpatient TSA was altered based on collected perioperative information, review of pertinent literature, and anesthesiology recommendations.

RESULTS: A total of 298 patients undergoing a total of 319 TSA procedures (n = 319) were included in this study. Of these, 181 (56.7%) were performed on men. The average BMI was 31.3 kg/m^2 (range, 19.3-52.2 kg/m^2) and the average age at the time of surgery was 60 years (range, 30-82 years). ASA Physical Status Classification was class I in 18 patients (5.6%), class II in 144 patients (45.1%), and class III in 157 patients (49.2%). Primary shoulder arthroplasties were more frequently performed, with a total of 305 procedures (95.6%), while rTSA was performed more frequently than aTSA (58.6% vs 41.4%, respectively). Medically related complications occurred in 3 patients (0.9%) within 90 days of surgery, two of which required hospital admission (0.6%) for acute kidney injury (AKI) and pulmonary embolus (PE). There were no instances of major cardiac events. Orthopedic related complications occurred in 11 patients (3.5%) with hematoma development requiring evacuation and instability requiring revision being the most common causes. The new patient selection algorithm better reflects overall appropriateness of patient for outpatient TSA including age, BMI, hematocrit, social support, use of assistive devices, medical optimization, and cardiopulmonary risk stratification.

CONCLUSION: There was a low rate of perioperative complications and hospital admissions, confirming the safety of TSAs in an ASC setting. Based on prior literature and the population included, a pre-existing patient selection algorithm was updated to better reflect increased comfortability, knowledge, and data regarding safe patient selection for TSA in an ASC.

The Utility of Shoulder Arthroscopy at the Time of Open Latarjet
Paper 110

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OBJECTIVE: Open Latarjet is a reliable surgery for shoulder instability, particularly in cases of glenoid bone loss. Prior to Latarjet, shoulder arthroscopy can be performed to evaluate the joint and assess the need for other concomitant procedures, however, there is a paucity of literature regarding the utility of this. The purpose of this study was to determine if arthroscopy performed in conjunction with open Latarjet identifies pathology that critically alters surgical procedures performed.

METHODS: This was a retrospective review of open Latarjet procedures performed between 2010 and 2022 at our institution. Patients who underwent arthroscopy in conjunction with Latarjet were identified. Patient and surgical data were gathered to determine what pathology was identified and what procedures were performed during arthroscopy.

RESULTS: A total of 307 Latarjet procedures were performed on 293 patients. Arthroscopy was performed in 174 cases. Diagnostic arthroscopy alone was performed in 19 (10.9%) and debridement was performed in the remainder. Arthroscopic evaluation identified the following: anterior glenoid bone loss (100%), torn or diminished anterior labrum (100%), Hill-Sachs lesion (87%), Type I superior labral (SLAP) tear/fraying (11.5%), low-grade partial thickness supraspinatus tear/fraying (9.2%), Type II-IV SLAP tear (6.3%), posterior labral fraying (5.7%), biceps tendon tear (5.2%), and full thickness supraspinatus tear (1.1%). 16 cases had significant pathology identified that required additional treatment: 11 type II-IV SLAP tears requiring debridement, debridement and biceps tenodesis, or SLAP repair, 3 biceps tendon tears without a SLAP tear requiring tenodesis, and 2 full-thickness supraspinatus tears requiring rotator cuff repair. For patients with a Type II-IV SLAP or biceps tendon tear, preoperative MRI identified a tear in 88%, while 1 patient had a Type III SLAP tear that was not identified on MRI. Both patients requiring rotator cuff repair had a preoperative MRI identifying the full-thickness tear.

CONCLUSION: Arthroscopy performed in conjunction with open Latarjet is an effective tool in identifying shoulder pathology and may alter surgical management in a small subset of patients. When performed, preoperative MRI was successful in identifying pathology requiring additional surgical procedures in the majority of cases.

Sex Difference in Rotator Cuff Repair
Paper 111

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OBJECTIVE: Rotator cuff repair (RCR) is routinely performed for management of rotator cuff tears. Little is known about differences between male and female patients in symptomatology, disease burden, timing of surgery, or priorities of care and barriers to care. This study aims to identify and characterize differences in preoperative course and disease burden between male and female patients undergoing RCR.

METHODS: This was a single-center prospective survey study. 100 patients were enrolled preoperatively before undergoing RCR and completed a survey developed to capture demographic information, details of the treatment course including treatment modalities, providers seen, and timing of treatment, factors important to the patient in the decision to undergo RCR, barriers to undergoing RCR, and the Brief Resiliency Scale.

RESULTS: Average patient age was 59 ± 11.5 years. 45% of patients were female. Female patients more often reported symptom onset greater than 6 months prior to surgery (76% vs. 49%, p=0.008), as well as having symptoms for greater than 2 months prior to seeing any medical provider (58% vs. 29%, p=0.005). Females more often reported trialing physical therapy (53% vs. 31%, p=0.027) and injections (62% vs. 40%, p=0.044). Females more often identified at least one barrier to undergoing surgery (84% vs. 64%, p=0.024). Male patients more often reported increasing function for sport or leisure activity was important in the decision to undergo RCR (27% vs. 11%, p=0.049), while female patients more often reported pain reduction (71% vs. 47%, p=0.025) and increasing function for activities of daily living (49% vs. 25%, p=0.021) as important in their decision. None of the patients in the study reported feeling they were treated differently by a medical provider because of their gender.

CONCLUSION: This study characterizes differences in treatment timelines from symptom onset to surgery for rotator cuff tear between male and female patients. Female patients experience greater time with symptoms before undergoing surgery and more often trial nonoperative management. Male patients more often report no barriers to undergoing RCR, and the data shows that male and female patients have different priorities influencing the decision to undergo surgery. The prolonged course from symptom onset to surgical intervention suggests female patients may present with a more advanced stage of rotator cuff disease. Identifying opportunities to streamline referral of surgical candidates may mitigate additional risk associated with delaying repair of the rotator cuff in female patients.

New-Onset Depression Following Total Shoulder Arthroplasty: The Impact of Preoperative Patient Factors and Postoperative Complications

Paper 112

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OBJECTIVE: Depression has been well studied as a risk factor for postoperative complications following total shoulder arthroplasty (TSA). However, little is known about new-onset depression (NOD) following TSA. The purpose of this study is to determine the incidence of NOD following TSA and identify risk factors for its occurrence.

METHODS: This was a retrospective review of patients undergoing TSA in the Truven Health MarketScan database. NOD was identified. Patients with preoperative depression were excluded from analysis. Postoperative complications were identified, including the development of a prosthetic joint infection (PJI), need for revision surgery, and postoperative dislocation. If a complication occurred before the development of depression, it was considered as a risk factor for NOD. Preoperative patient factors were collected. Survival curves were then built to look at depression-free survival times. Cox proportional hazards regression was then used to estimate hazard ratios (HRs) while adjusting for confounders.

RESULTS: 24,601 patients undergoing TSA were identified. The incidence of NOD was 4.76%. NOD occurred at median of 430 days postoperatively. NOD was seen at a higher rate in females (6.44%) compared to males (3.26%; HR: 2.01 [1.80-2.28]). Patients <55 years had the highest rate of NOD (5.73%), with a HR of 1.54 (1.24-1.91) when compared to those 65-74 years old. NOD was categorized by preoperative opioid use, finding that patients averaging >20 oral morphine equivalents per day had a much higher rate of depression compared to opioid naïve patients (9.96% vs. 3.56%). Patients using >20 OMEs/day had a hazard ratio of 2.42 (2.05-2.86) when compared to opioid naïve patients. Patients with diabetes (HR 1.32 [1.14-1.51]), obesity (HR:1.23 [1.06-1.43]), and those using tobacco (HR: 1.31 [1.08-1.58]) also had higher rates of NOD. When investigating postoperative complications, patients who developed a PJI or those requiring revision surgery had very high rates of NOD after the development of the complication (58.93% and 58.14%, respectively). This was associated with hazard ratios of 3.91 (2.55-6.01) and 5.73 (3.68-8.93), respectively.

CONCLUSION: NOD is common following TSA. There are multiple patient-specific factors and postoperative complications which increase the odds of its occurrence. While the incidence of PJI and revision surgery is relatively low following TSA, over half of these patients go on to develop depression. Providers can use this information to screen at-risk patients and refer them to mental health services when needed.

Oblique Trans-Syndesmotic Screw to Augment Fixation of Distal Fibula Fractures: Retrospective Cohort Study and Technique Guide

Paper 113

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INTRODUCTION: A subset of patients with low, transverse fractures of the lateral malleolus are at increased risk of malreduction and late loss of reduction. In patients with poor bone quality, difficulty maintaining limited weight-bearing and transverse or short oblique fractures at or distal to the tibiotalar joint, distal fixation using current methods is often inadequate. Furthermore, these fractures are susceptible to malreduction by pre-contoured locking plates. To address this, a technique was developed to augment fixation of the distal fragment and decrease the likelihood of loss of reduction.

METHODS: This technique involves placement of an oblique tricortical or quadricortical screw from the distal fibula into the tibia in an distal-lateral to proximal-medial direction. The screw is placed either outside of or through a one-third tubular plate. The screw trajectory is similar to that of a typical syndesmosis screw in the sagittal plane, but is oriented proximally rather than parallel to the tibial plafond. The screw enters the tibia at Chaput's tubercle, just lateral to the joint. Indications for this technique are transverse and short oblique Danis-Weber B distal fibular fractures in which there is inadequate purchase between the plate and the distal fragment in at-risk patients.

RESULTS: This technique has been used for many years by the senior author. We present a small cohort of 50 patients who underwent procedures from 2011 to 2022 to demonstrate appropriate indications and outcomes for this technique. These include patients with significant neuropathy or osteoporosis who present with a particularly troublesome fracture pattern (transverse fibular fracture at or below the level of the tibiotalar joint). There has been one major complications (loss of reduction) associated with this technique. The fracture patterns included isolated lateral malleolus ankle fractures (20%), bimalleolar or bimalleolar equivalent fractures (32%), and trimalleolar fractures (38%). There were no open injuries. Seventy percent of patients had this screw removed along with any other syndesmotic screws per protocol. The average time to weight-bearing 6.9 weeks, hardware removal 125.2 days total follow-up 182 days.

CONCLUSION: A distal oblique trans-syndesmotic screw can supplement current fibular fracture fixation constructs. It is generally removed after fracture union. This screw helps prevent malreduction that can occur when treating at-risk patients with transverse or short-oblique distal fibular fractures with a locking plate. In our series at an urban tertiary referral center, this technique has produced good outcomes.

Mobilization After Operative Fixation in Patients Treated with Endobutton Device vs. Transfixation Screw for Syndesmotic Disruption

Paper 114

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OBJECTIVE: Ankle fractures can lead to alterations in mobility and activity level. Few studies have prospectively evaluated the progression of mobilization after ankle fractures, particularly focusing on the comparison between syndesmotic fixation with transfixation screw vs. endobutton device.

METHODS: In this prospective study, patients that underwent operative fixation, transfixation screw or endobutton device, of an ankle fracture with syndesmotic disruption were enrolled at their two-week postoperative visit. Patients were provided a Fitbit watch to electronically track their steps and activity level. Data was downloaded monthly from each Fitbit for up to one year after surgery. General demographic data was collected retrospectively via electronic medical records.

Patients with insufficient data, due to noncompliance with wearing the FitBit watch, and days with zero steps were excluded from the data analysis. The patients were divided into two groups based on technique of syndesmotic fixation: transfixation screw vs. endobutton device. Outcomes of non-diabetic patients and patients > 40 years old were compared between treatment groups. Average monthly steps and average monthly “very active” minutes (defined by Fitbit as vigorous intensity activity that burns six times as many calories as patient does at rest) for each patient group were calculated and compared against one another using both graphical representation and two-sample independent t-tests.

RESULTS: 48 patients with sufficient postoperative data were included. Average age was 38.74 ± 12.68 years. Average BMI was 33.3 ± 8.4 kg/m^2. 45.83% of the patients were male. 27 (56.25%) patients received syndesmotic fixation with transfixation screw, while the remaining 21 (43.75%) patients received syndesmotic fixation with endobutton device. 14.53% of patients had diabetes mellitus. 41.67% of patients were over 40 years of age.

Average monthly steps and average monthly “very active” minutes at each one-month interval post-surgery are listed for each of the patient subgroups.

CONCLUSION: Patients with ankle fractures treated with endobutton device for syndesmotic fixation have earlier and higher levels of mobilization than those treated with transfixation screw. Within the transfixation screw treatment group, diabetic patients compared to non-diabetic patients mobilized earlier and at a higher-level post-surgery. Between non-diabetic patients and patients > 40 years old treated with transfixation screw and those treated with endobutton device, the endobutton device for syndesmotic fixation was still superior in earlier and higher levels of mobilization post-surgery. It is possible that transfixation screw leads to a stiffer syndesmotic joint compared to endobutton, and therefore decreases/limits earlier and higher levels of mobilization within the six-month post-surgical window.

Obesity and Ankle Fractures: Are Outcomes and Complications Really Worse?
Paper 115

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OBJECTIVE: Few studies have investigated obesity's effect on ankle fracture outcomes when patients are stratified by fracture type. The purpose of this study is to identify trends in complication rates and outcomes among patients of different BMI groups when dividing by fracture complexity.

METHODS: We retrospectively assessed clinical and surgical data from 595 patients who underwent primary ankle fracture surgery. All patients had a minimum of 18 months follow-up (mean-42.2 [18.2-71.4] months). PROMIS Physical Health and Visual Analog Scale (VAS) pain scores surveys were available only for a subgroup of the cohort. Patients were divided based on BMI and fracture type. BMI subgroups were classified as: non-obese (18.5-24.9 kg/m^2, n=88), overweight/obese I (25-34.9 kg/m^2, n=314), obese II/III (≥35 kg/m^2, n=193). Fracture subgroups were divided into two groups: Simple (Unimalleolar types) and complex (Bimalleolar and Trimalleolar variants). Data analysis was performed using chi-square and t-tests with statistical significance set at an alpha (α) of ≤0.05.

RESULTS: We observed an overall complication rate of (15.0%, n=89/595). Complication rates when stratified by BMI were: non-obese (9.1%, n=8), overweight/obese class I (19.4%, n=60), obese class II/III (10.4%, n=21). Complication rates for overweight/obese I patients were significantly higher when compared to non-obese and obese class II/III patients, p=0.023 and p=0.007 respectively. Interestingly, there was no significant difference when comparing non-obese to class II/III (p=0.972). We observed no significant differences in complications when performing a sub analysis on specific fracture types, regardless of BMI group. VAS scores were significantly higher in both overweight/obese I and obese II/III groups than non-obese patients (p=<0.001, p=0.015). Physical health scores were lower in the obese II/III group when compared to non-obese patients (p=0.011).

CONCLUSION: Our results indicate that patients who are overweight/obese I have a significantly higher risk of complication when compared to patients of normal BMI. Surprisingly, our cohort demonstrated nearly equivalent risk between obese II/III and non-obese patient groups. Patient reported outcome data shows different trends with worse pain scores and lower physical health outcomes in the Obese II/III group. These findings add to the growing debate surrounding obesity's effect on ankle fracture outcomes and suggest that a higher BMI has a complex effect on a patient's recovery.

Trends and Outcomes of Same-Day Discharge Total Ankle Arthroplasty in the United States: A National Analysis from 2012-2021

Paper 116

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OBJECTIVE: Same-day discharge Total Ankle Arthroplasty (TAA) is becoming more common. This study sought to report the percentage of patients within a national database that had a same-day discharge following TAA, and to compare the complication rates for patients that had same-day discharge to those that had a short hospital stay.

METHODS: From 2012-2021, the National Surgical Quality Improvement Project (NSQIP) database was used to identify all patients undergoing TAA. All patients discharged to their home on the day of surgery were identified. A comparison cohort of patients with a hospital stay of 1 to 2 days who were then discharged home was also identified, referred to as the short-stay cohort. Demographic, comorbid, and operative variables were collected. 30-day postoperative complications were then identified and compared between cohorts.

RESULTS: 219 were identified in the same-day cohort and 1,509 patients were identified in the short-stay cohort. The proportion of same-day discharges in the total sample increased from 4% in 2012, 6% in 2019, to 30.5% in 2021. There was no difference in preoperative patient variables. Operative time was shorter in the same-day cohort. There was no difference in readmission, medical complications, deep surgical site infection (SSI), wound dehiscence, or rates of reoperation between cohorts and this was confirmed on multivariate analysis. However, the rate of superficial SSI was increased in the same-day cohort (2.7%) compared to the short-stay cohort (0.6%) (p=0.003). On multivariate analysis, this equated to a 5.27 (confidence interval: 1.81-15.32, p=0.002) times increased odds of superficial SSI in the same-day cohort compared to the short-stay cohort.

CONCLUSION: Same-day discharge TAA has been increasing rapidly in recent years, a rise likely augmented by a transition to outpatient surgery during the COVID-19 pandemic and TAA's removal from the Medicare inpatient-only list in 2021. Same day-discharge TAA was associated with higher rates of superficial SSI but not deep SSI. This was true even though surgical times, and likely the complexity of surgery, was greater in the short-stay cohort. The reasons for this increased rate of superficial SSI could include a decreased use of prophylactic postoperative I.V. antibiotic administration in those with a same-day discharge.

Arthroscopy with Lateral Ankle Ligament Stabilization: Benefit vs. Cost Comparison
Paper 117

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OBJECTIVE: Arthroscopy with lateral ankle ligament stabilization may aid in the diagnosis of intra-articular defects that often accompany lateral ankle ligament injuries. This study compares the differences in cost, complications, new intra-articular diagnoses, and reoperations among patients with ankle instability who underwent lateral ankle ligament repair/reconstruction with or without concomitant arthroscopic procedures.

METHODS: Data was collected from the PearlDiver dataset using CPT and ICD9/10 codes. Patients included in this study (n = 2,428) had records of ankle sprain or ankle instability prior to or on the same day as one of two procedures: lateral ankle ligament repair (n=1,236) or lateral ankle ligament reconstruction (n = 1,211). This population was subdivided by whether patients had records of ankle arthroscopy on the same day as the ligament surgery.

RESULTS: Average cost per patient was higher for arthroscopy groups: repair with arthroscopy ($5,991.32) vs. repair without arthroscopy ($3,677.11; $p < 0.001$); reconstruction with arthroscopy ($5,744.83) vs. reconstruction without arthroscopy ($4,601.13; $p = 0.001$). There was a significantly higher proportion of patients with complications in the repair without arthroscopy group than in the repair with arthroscopy group (9.87%, 5.41%; $p = 0.013$), but the difference between reconstruction groups was insignificant ($p = 0.085$). The proportion of patients with newly diagnosed intra-articular defects was significantly higher in both arthroscopy groups: repair with arthroscopy (57.0%) vs. repair without arthroscopy (35.6%; $p < 0.001$); reconstruction with arthroscopy (63.0%) vs. reconstruction without arthroscopy (39.8%; $p < 0.001$). There was a significantly higher proportion of patients who underwent reoperation for intra-articular defects in the combined arthroscopy group (6.89%) than in the combined non-arthroscopy groups (4.18%; $p = 0.006$). Most importantly, the average time until reoperation for intra-articular pathology was significantly shorter in the combined arthroscopy group (303 days) than in the combined non-arthroscopy group (474 days; $p = 0.045$).

CONCLUSION: Concomitant arthroscopy with lateral ankle ligament surgery is more expensive but does not appear to increase the overall complication rate and may allow surgeons to diagnose and treat more intra-articular pathology. It also allowed for intra-articular defects to be addressed five months sooner with reoperation, which may justify some of the increased costs. Ankle arthroscopy seems to be a safe addition to lateral ankle ligament repair or reconstruction surgery for ankle sprain or instability and allows for the diagnosis of intra-articular pathology that could potentially affect patient outcomes.

Comparative Analysis of One-Incision vs. Two-Incision Brostrom Gould Surgery with Calcaneal Osteotomy: A Study on Wound Complications and Safety

Paper 118

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BACKGROUND: Brostrom Gould surgery with calcaneal osteotomy is a commonly employed surgical procedure for the treatment of chronic ankle instability and hindfoot varus. The technique traditionally involves two incisions, which results in a skin bridge, potentially leading to increased wound complications. This study aims to compare the safety and incidence of wound complications between patients undergoing one-incision and two-incision Brostrom Gould surgeries with calcaneal osteotomy.

METHODS: A retrospective analysis was conducted on 100 patients who underwent Brostrom Gould surgery with calcaneal osteotomy for chronic ankle instability and hindfoot varus. The patients were divided into two groups: Group A (n=53) underwent the procedure using a one-incision technique, while Group B (n=47) underwent the procedure using a two-incision technique. Data on patient demographics, surgical details, and postoperative outcomes were collected and analyzed.

RESULTS: In Group A, the incidence of wound complications was significantly lower compared to Group B ($p < 0.05$). Group A had a 12% incidence of wound complications, primarily consisting of superficial infections and delayed wound healing, whereas Group B had a 28% incidence, including superficial infections, delayed wound healing, and skin bridge formation. The mean surgical duration was comparable between the two groups ($p > 0.05$), suggesting that the one-incision technique did not significantly prolong the procedure. No significant differences were observed in terms of patient demographics or preoperative ankle instability severity between the groups.

CONCLUSION: This study demonstrates that the one-incision technique in Brostrom Gould surgery with calcaneal osteotomy is associated with a lower incidence of wound complications compared to the traditional two-incision approach. The presence of a skin bridge in the two-incision technique may contribute to a higher risk of wound-related issues. Adopting the one-incision technique may enhance patient safety and optimize surgical outcomes by reducing the occurrence of postoperative wound complications. Further prospective studies with larger sample sizes and longer follow-up periods are recommended to confirm these findings and evaluate additional parameters such as functional outcomes and patient satisfaction.

Patient-Reported Outcomes Following Isolated Gastrocnemius Recession for Plantar Fasciitis and Achilles Tendinopathy

Paper 119

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OBJECTIVE: Plantar fasciitis and Achilles tendinopathy are two of the most common foot and ankle overuse conditions encountered in clinical practice. Several recent studies have shown isolated gastrocnemius recession to be a viable treatment option for these conditions when conservative management has failed. There is little published on the long-term outcomes of this procedure. Here, we assess long-term patient-reported outcome scores of individuals that underwent isolated gastrocnemius resection for the above indications.

METHODS: Patients that underwent isolated gastrocnemius recession for chronic plantar fasciitis and Achilles tendinopathy from 2011 to 2018 were identified. The electronic medical record was used to collect preoperative and postoperative pain scores (VAS), patient demographics, indication for the procedure, and complications. Patients over five years out from their date of surgery were then called to obtain PROMIS domain scores, information on their ability to return to work, and Foot Function Index Scores (FFI).

RESULTS: In total, 182 patients were included in the cohort based on successfully obtaining patient-reported outcomes more than 5 years post-operation. There was a decrease in preoperative to postoperative VAS scores from 5.53 to 2.11. PROMIS scores were all within one standard deviation of the reference population mean T-score 50. The average PROMIS physical function was 46.28, pain interference was 52.11, and depression score was 42.60 for this population. The mean FFI scores were 32.95 for pain, 35.91 for disability, 19.04 for activity limitation.

CONCLUSION: With the limited data regarding the long-term outcomes of gastrocnemius recession, we sought to explore patient-reported outcomes in terms of pain, disability, physical function, depression, and pain interference. With the plan to conduct a more intensive statistical analysis of our results, our preliminary results suggest that gastrocnemius recession for plantar fasciitis and Achilles tendinopathy may be beneficial in decreasing pain after surgical intervention.

Is the Stress Exam for Patients with Ankle Fractures a Reliable Predictor of Subsequent Clinical Management?

Paper 120

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OBJECTIVE: Limited literature explores the management of medial clear space (MCS) values between 4-6 mm, and the incidence of inadequate ankle stress views (ASV) remain unknown. This study aims to clarify clinical management for intermediate MCS values and identify an operative threshold. Additionally, it aims to establish the incidence of inadequate/nonindicated ASVs and quantify surgery rates based on inadequate stress tests.

METHODS: An institutional trauma database was used to query ankle fracture patients from 2012-2019. Patient demographics, fracture characteristics, and initial encounter details were collected. The study assessed the indication and adequacy of ASV and measured MCS values. A stress view was considered adequate if there was no tibiotalar and talofibular overlap seen on mortise view while placing the ankle joint in supination and external rotation. A stress view was considered only to be indicated for isolated Weber B fracture types with MCS <6 mm on non-stressed mortise views. Patients were categorized based on MCS measurements as follows: < 4mm, 4-6mm (further divided into 4-5mm and 5-6mm subgroups), and > 6mm. Operative vs. nonoperative management was compared as the primary outcome between subgroups.

RESULTS: 649 patients were included in the study. Demographic information is summarized in. In total, 132/649 (20%) patients had an ankle stress test of which 37/132 (28%) were not indicated. Of those indicated, 28/95 (29%) were inadequately performed. Moreover, of the 40 patients with inadequately performed stress views, 24 (60%) went to the operating room for treatment based on the inadequate test. MCS measurements revealed 23% with MCS < 4mm, 32 with 4-6mm, and 45% with > 6mm. Rates of operative management were 83% for the > 6mm, 29% for the 4-6mm, and 0% for < 4mm. In the 4-6mm group, 46% of patients with 5-6mm MCS underwent surgery compared to 6% with 4-5mm. An adequate ASV threshold of 4.9mm was determined (AUC: 0.60, 95% CI: 0.95-0.79)

CONCLUSION: Although ankle fractures with larger MCS values were more likely to undergo operative management, only 50% of ASVs were appropriately indicated and adequately performed, with 60% of patients with inadequate ASVs being treated operatively. Patients with an MCS of 5-6 mm are more likely to be managed operatively, with a threshold for surgical intervention of 4.9 mm.

Preference Signaling: Strategies and Opinions Among Orthopedic Surgery Applicants
Paper 121

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OBJECTIVE: Rising application volumes and declining match rates exemplify the difficulty of matching in orthopedic surgery. To promote an equitable match experience, the American Orthopaedic Association (AOA) introduced preference signaling (PS) into the 2022-2023 application cycle, which allows applicants to indicate heightened interest in programs, increasing the likelihood of interviewing and matching with a signaled program. Due to the novelty of signaling in orthopedics, we aimed to assess applicants' strategies and opinions related to PS during the 2022-2023 residency application cycle prior to match results.

METHODS: An anonymous 22-question survey was distributed to applicants of our orthopedic surgery residency program (34.22% response rate). The survey included questions germane to demographics, signaling utilization and strategies, and applicant opinions on PS. Responses were recorded via a pilot-tested Google Form. Descriptive statistics were calculated using RStudio (R, version 4.2.1).

RESULTS: Most respondents (96.1%) participated in PS and 96.7% used all 30 signals. Signaling encouraged 24.2% of applicants to apply to fewer programs. Proximity to Family and Perceived Operative Experience were the most important reasons for signaling, while Program Prestige was the least. A program's social presence and virtual interview options did not influence many applicants' decisions for signaling. Applicants commonly signaled 1-10 "reach" and "safety" programs each. Most applicants (83.22%) signaled all audition/sub-internship programs, while only 53% signaled home programs. More than half agreed that the COVID-19 pandemic and pass/fail licensure exams influenced PS adoption yet appear conflicted about beneficiary status of PS. Less than half (40.94%) of applicants claimed to know very little or nothing about PS.

CONCLUSION: Our findings suggest PS has been well received by orthopedic applicants, with applicants demonstrating signaling strategies to improve their chances of matching. Applicants commonly distributed signals to "reach" and "safety" programs and considered proximity to family and operative experience important when signaling programs. With time, PS may help alleviate the overapplication phenomenon in orthopedics. However, many unresolved questions and issues remain. We recommend an application limit and/or fewer allotted signals, both dependent upon further research, alongside improved distribution of verified PS information.

What Are the Trends in the Utilization of Orthopedic Advanced Practice Professionals? A Large Database Medicare Study

Paper 122

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BACKGROUND: Advanced practice professionals (APPs), such as physician assistants (PAs) and nurse practitioners (NPs), are expected to have an increasing role in delivering high-quality orthopedic care. Our objectives were to: (1) What is the current proportion of APPs in orthopedics? (2) What is the predicted future growth of orthopedic APPs? (3) What is the current geographic distribution of APPs in the United States?

METHODS: Our analysis was a retrospective, large national database study evaluating services provided by APPs from 2014 to 2019 utilizing the Medicare Provider Utilization and Payment Data prepared by the Centers for Medicare and Medicaid Services (CMS). NPs and PAs were recognized by provider type and aggregated to form the APP group for analysis. Providers with the subspecialty classifications of either “Orthopedic Surgery”, “Hand Surgery”, or “Sports Medicine” were identified from the database as our orthopedic surgeon cohort. Descriptive statistics were used to characterize the average number of services billed for by each included provider. Mann-Kendall trend tests were used to evaluate changes in the number of each provider type. Poisson regression will be used to predict the expected number of APPs in the field up to the year 2025.

RESULTS: From 2014 to 2019, there was a 34.36% increase in the number of orthopedic APPs (5,480 to 7,363), compared to a 5.37% increase in orthopedic surgeons (22,518 to 23,728). Over the study period, the median number of procedures billed by orthopedic APPs for X-rays of the Upper Extremity (34 to 40; p=0.013), X-rays of the Lower Extremity (74 to 94; p=0.009), Established Patient Visits (108 to 128; p=0.024), and Corticosteroid Injections (136 to 196; p=0.009) increased. The total number of NPs is expected to increase to 1,371 (95% CI: 1,141 to 1,601) by 2025, and the total number of PAs is expected to increase to 9,113 (95% CI: 7,584 to 10,641) by 2025.

CONCLUSION: Our analysis demonstrated that the volume of established patient visits and various non-surgical services provided by nurse practitioners and physician assistants in orthopedic surgery continues to grow. While the number of orthopedic surgeons has remained relatively consistent between 2014 and 2019, the number of APPs in the field has increased by approximately one-third. Furthermore, it is expected that there will be approximately 1 orthopedic APP per 4 orthopedic surgeons within the next few years.

Efficacy of Irrigation Solutions on Removal of S. Aureus from Porous Implants - An In Vitro Study
Paper 123

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INTRODUCTION: The bactericidal efficacy of commercially available irrigation solutions for treatment of infection in the presence of porous titanium (Ti) implants is not established. This study compared the in-vitro efficacy of five irrigation solutions on infected 3D printed porous Ti discs.

METHODS: Porous Ti discs (2x4 mm, 400, 700 and 1000um) were infected with S. aureus (1x106 CFU/ml) and incubated for 3 hours (acute infection), or 3 days (chronic biofilm). Discs were irrigated with Saline, Bacitracin, Clorpactin, Irrisept, or Bactisure for 15 seconds, then sonicated 4 times (5 min). Each sonicate was cultured for quantification and statistical analysis performed using ANOVA and Tukey Kramer Post Hoc test ($p<0.05$ to show significance). SEM was performed on selective samples to show biofilm.

RESULTS: Saline irrigation was ineffective in acute and biofilm groups. In 400um pore size acute infections, differences were found with saline and bacitracin vs. Irrisept and Bactisure (ANOVA $p=0.001$). Bactisure in the acute infections had the lowest bacterial counts for all pore sizes. In biofilm groups, irrigation with saline, Bacitracin, Clorpactin, and Irrisept had high remaining concentrations of bacteria across all pore sizes; lower concentrations were observed in the Bactisure group, but this was not statistically significant. SEM images showed reduction of biofilm in the selected washed samples.

CONCLUSION: Irrigation of infected porous Ti discs with saline, Bacitracin and Clorpactin failed to reduce bacterial load in all pore sizes. The smallest pore size (400um) consistently had more bacteria despite irrigation, highlighting the difficulty mechanically removing bacteria from small pores. Irrisept and Bactisure reduced bacteria acutely but did not effectively clear the biofilm, although a trend toward decreased concentrations was observed with Bactisure. These results should be considered when attempting to treat PJI with porous components and potential presence of biofilm.

Effects of Tobramycin Soaking on Tibialis Tendon Graft Mechanical Properties
Paper 124

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OBJECTIVE: Previous research has shown that ACL reconstruction involving both perioperative antibiotics and intraoperative tendon graft soaking with vancomycin significantly reduces surgical infection rates. Additional studies have shown that vancomycin soaking has no negative effects on graft mechanical properties. Despite positive findings, lack of vancomycin availability and presence of vancomycin resistant organisms merit investigation of alternative antibiotics for this application. One potential alternative is tobramycin. Tobramycin prevents infection at low concentrations, but it is unknown if tobramycin alters graft mechanical properties. Therefore, the aim of this study is to analyze the effects of tobramycin on tendon graft mechanical properties.

METHODS: Twenty harvested tibialis tendon grafts were prepared, measured, and separated into two groups: control (n = 10) and tobramycin (n = 10; 1.0 mg/mL). Tendon grafts were completely wrapped in a gauze swab for 10 minutes following the saturation of the gauze in control (saline) or antibiotic solutions. Gauze swabs were saturated in control or tobramycin solution for one minute. After soaking in the saturated gauze, grafts were removed and Young's modulus (MPa), ultimate tensile strength (MPa), and elasticity limit (MPa) were determined using uniaxial tension testing at a strain rate of 10 mm/min on an MTS Bionix servohydraulic mechanical testing frame.

RESULTS: Young's modulus for the control group was 552 ± 108 MPa (mean ± SD) and 660 ± 237 MPa for the tobramycin group ($p = 0.29$). Ultimate tensile strength was 91.5 ± 20.8 MPa for the control group and 99.7 ± 33.3 MPa for the tobramycin group ($p = 0.94$). Elasticity limit was 51.7 ± 16.4 MPa for the control group and 52.3 ± 15.3 MPa for the tobramycin group ($p = 0.93$). Stress-strain curves generated from data conformed to standard mechanical behavior of tendon grafts in uniaxial tension.

CONCLUSION: Based on results herein, soaking of tibialis tendon grafts with tobramycin does not appear to alter the mechanical properties of the tendon graft under uniaxial load conditions. Future research investigating the impact of different tobramycin concentrations on tendon graft mechanical properties is warranted.

A New Arthroscopic Classification for Chondrolabral Disease in Patients with Developmental Dysplasia of the Hip

Paper 125

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INTRODUCTION: Current classification systems for intra-articular pathology were described for patients with femoroacetabular impingement rather than dysplasia.

PURPOSE: The aim of this study is (1) to describe intra-articular findings in dysplastic hips undergoing combined hip arthroscopy and periacetabular osteotomy (PAO), (2) to propose a new chondrolabral classification system for dysplastic hips based on these findings, and (3) to correlate patient-reported outcome measures (PROM) with the newly proposed classification.

METHODS: Forty-six hips underwent combined hip arthroscopy and PAO between September 2013 and December 2014 irrespective of symptoms or radiographic findings. PROMS were evaluated preoperatively and at two years postoperatively. At the time of hip arthroscopy, the chondrolabral junction was classified as normal without tear (1 hip, Type 1); hypertrophic labrum without chondrolabral disruption (19 hips, type 2); chondrolabral disruption on the articular side, not extending into the capsular side (16 hips, Type 3A); chondrolabral disruption extending through the capsular side (3 hips, Type 3B), and exposed acetabular subchondral bone (7 hips, Type 4).

RESULTS: There was a significant difference in postoperative mHHS ($p = 0.020$), WOMAC pain score ($p = 0.037$), and WOMAC total score ($p = 0.049$) between grades. Post-hoc analyses demonstrated significant differences between type 2 (84.9 ± 12.9) and type 3A (67.8 ± 20.7, $p = 0.198$), type 2 and type 4 (59.3 ± 24.3, $p = 0.011$) in postoperative mHHS; type 2 (83.9 ± 12.9) and type 3A (68.9 ± 23.7, $p = 0.045$) in postoperative WOMAC total score. In multivariate analysis, type 3 or 4, age > 35 years, and previous surgery were significantly correlated with worse 2-year mHHS.

CONCLUSION: This new chondrolabral classification is proposed to describe intra-articular pathology seen at the time of combined hip arthroscopy and PAO specifically in dysplastic hips. More advanced chondrolabral diseases were associated with worse patient-reported outcome measures at two years.

The Effect of Timing Between Preoperative Embolization and Surgery: A Retrospective Analysis of Hypervascular Bone Metastases

Paper 126

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INTRODUCTION: Preoperative embolization for metastatic bone lesions has the potential to reduce intraoperative blood loss and improve perioperative outcomes in patients with hypervascular tumors. The optimal timing between embolization and surgery has yet to be established. Our analysis sought to evaluate how the timing of embolization (<24 hours vs. >24 hours) prior to surgery impacts estimated blood loss (EBL), transfusion risk, and operative time in patients with hypervascular primary tumors.

METHODS: We identified patients with renal cell (RCC) or thyroid carcinoma undergoing surgery between 1992 and 2023. These patients were segregated into the following cohorts: (1) no embolization preoperatively, (2) surgery <24 hours of embolization, and (3) surgery >24 hours after embolization. Multivariate logistic regression analyses were performed to assess the effect of preoperative embolization and its timing while controlling for patient age, American Society of Anesthesiology (ASA) Class, lesion size, type of procedure, and the presence of a pathologic fracture.

RESULTS: No differences were seen in all evaluated outcomes between immediate and delayed embolization cohorts. When comparing those with and without embolization, no differences were seen in EBL, transfusion rates, or hemoglobin changes. Patients without embolization had a significantly lower operative time. No differences in EBL were seen between the immediate (OR: 0.685, 95% CI: 0.159-2.949; p=0.611) and delayed (OR: 0.568, 95% CI: 0.093-3.462; p=0.539) surgery cohorts compared to patients without embolization. Surgery greater than 24 hours after embolization was not associated with a higher risk of prolonged operative time (OR: 13.499, 95% CI: 0.832-219.146; p=0.067). No differences in transfusion incidence or hemoglobin drop were seen between embolization cohorts.

DISCUSSION: Surgery within 24 hours of embolization did not significantly reduce blood loss, transfusion rate, operative time, or hemoglobin change compared to surgery at later time interval. Similarly, no differences in these outcomes were seen between patients with and without embolization. These findings suggest that surgery may be safely delayed beyond 24 hours from embolization without a higher risk of bleeding.

Effectiveness of Interventional Radiology Guided Procedures for Locally Recurrent and Metastatic Sarcoma: Single Institutional Results

Paper 127

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OBJECTIVE: Musculoskeletal image guided interventional radiology (IR) techniques have grown popular in the management of sarcoma. Thermal ablation and nonthermal ablative techniques are minimally invasive, targeted treatment modalities for sarcoma that can be seamlessly integrated into neoadjuvant or adjuvant treatment regimens. We report our institutional cohort of metastatic and recurrent sarcomas treated by IR.

METHODS: From 2013 to 2022, 24 patients who received an ablation procedure for recurrent or metastatic sarcoma at our institution were retrospectively reviewed. Patient's sarcoma treatments including surgical resection, chemotherapy and radiotherapy, ablation modality, postprocedural complications, ablated lesion progression, and clinical course were collected from the medical records.

RESULTS: Sixteen patients were treated with ablation for metastatic sarcoma and eight patients were treated with ablation for locally recurrent sarcoma. Median size of the ablated lesion was 2.7 cm (IQR 1.75-4.43). Lesion progression was observed in 2 of 24 ablated lesions at median 8 months, both in ablated locally recurrent sarcoma. Four patients developed complications including nerve pain, hemoptysis, infected hematoma, and necrotic wound requiring debridement.

CONCLUSION: We report high levels of local control of the ablated lesions in our cohort with minimal post-procedural complications. Future multi-institutional studies should evaluate the efficacy of ablation techniques in a more uniform cohort.

Characteristics and Long-Term Outcome of Surgically Managed High-Grade Extremity Chondrosarcoma
Paper 128

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BACKGROUND: Dedifferentiated chondrosarcoma (DCS) is a highly malignant variant that portends a poor prognosis. The purpose of this study is (1) to delineate the characteristics, local recurrence (LR), and survival of patients with intermediate (IGCS), high (HGCS), and dedifferentiated (DCS) chondrosarcoma of the extremity by utilizing detailed cases at one tertiary institution, and (2) to assess survival between high grade chondrosarcoma and DCS utilizing a less detailed but large cohort from the Surveillance, Epidemiology, and End Results (SEER) database.

METHODS: Twenty-six cases of high-grade (conventional FNCLCC grades 2 and 3, dedifferentiated) chondrosarcoma were identified from an ongoing prospective cohort of 630 sarcoma patients managed surgically at a tertiary referral university hospital between 9/1/2010-12/30/2019. A retrospective review of demographics, tumor characteristics, surgical procedure, treatment course, and survival data was performed to determine prognostic factors for survival. An additional 516 cases of chondrosarcoma were identified from the SEER database. Using the Kaplan-Meier method, both the large database and case series were evaluated, and estimated cause-specific survival was calculated at 1, 2, and 5 years.

RESULTS: There were 12 IGCS, 5 HGCS, and 9 DCS patients in the single institution cohort. DCS had a higher stage at diagnosis (p=0.04). Limb salvage was the most common procedure performed in every group (11/12 IGCS, 5/5 HGCS, and 7/9 DCS; p=0.56). Margins included 8/12 wide and 3/12 intralesional for IGCS. For HGCS, there were 3/5 wide, 1/5 marginal, and 1/5 intralesional. A majority of DCS margins were wide (8/9) with only 1 marginal. There was no difference of associated margins between the groups (p=0.85), however, there was a difference when margins were classified based on numerical measurement (IGCS: 0.125cm (0.1-0.35); HGCS: 0cm (0-0.1); DCS: 0.2cm (0.1-0.5); p=0.03). The overall median follow-up was 26 months (IQR:16.1-70.8). The time interval from resection to death was lower in DCS (11.5 months (10.7-12.2)), followed by IGCS (30.3 months (16.2-78.2)), and HGCS (55.1 months (32.0-78.2; p=0.047). LR occurred in 5/9 DCS, 1/5 HGCS, and 1/14 IGCS patients.

CONCLUSION: High-grade chondrosarcoma remains a fatal disease in many patients, particularly if associated with dedifferentiated subtype. Interestingly, all (100%) DCS patients who did not receive systemic therapy had LR. However, chemotherapy and radiation did not significantly increase survival. In this case series and large database study, HGCS had the smallest surgical margin, but with the longest time interval for both LR and death. Further studies on valuable prognostic influences as well as earlier identification of this rare disease may help in developing better management options.

Interstitial Brachytherapy in the Treatment of Soft Tissue Sarcoma: Local Recurrence and Wound Outcomes

Paper 129

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OBJECTIVE: Interstitial brachytherapy (BT) represents one form of delivery of adjuvant radiotherapy in the treatment of soft tissue sarcoma (STS). Compared to external beam radiation (EBRT), which is the more commonly employed technique to treat STS, BT provides a dosimetric advantage by localizing to the tumor bed and minimizing damage to peripheral healthy tissue. When employing BT, wound management options include leaving the wound open with vacuum assisted closure (VAC), which allows for confirmation of surgical margins, immediately delivering radiation therapy, or closing the wound over the catheters and delaying radiation until five days following closure. Little is known about how BT, and variations in wound management/timing, affect wound and oncologic outcomes.

METHODS: This retrospective institutional cohort study included all patients receiving interstitial BT following STS resection between 2015 and 2022. Patient and tumor demographics, radiation characteristics, and wound and oncologic outcomes were collected. Statistical analysis for wound complication occurrence and reoperation were assessed using chi-squared tests. The relationship between exposure variables and wound complications was analyzed using univariate logistic regression.

RESULTS: 32 patients with STS of the extremity were treated with brachytherapy. 19 (59.4%) of the tumors were superficial, the mean tumor size was 5.8 cm (+/- 3.2 cm) and 30 (93.8%) were intermediate/high grade or ungraded sarcomas. 22 (68.8%) of the 32 were treated with definitive brachytherapy with a median time from biopsy to completion of brachytherapy treatment of 43 days. 13 (40.6%) patients had wound healing complications with 7 (21.9%) requiring reoperation. Operative complications included necrosis (6), dehiscence (3), deep infection (1), cellulitis (1), and hematoma (1). Tumor size, BT catheter number, closure technique, and reconstruction technique were not associated with reoperation. Two patients (6%) had local recurrence, and 9 (28%) patients developed metastatic disease. There was no difference in overall survival between those who did and did not experience complications.

CONCLUSION: BT combined with surgery is an effective treatment to maximize local control for STS. Our results indicate BT has a similar wound complication and local control profile compared with reported values for patients treated with EBRT. BT offers the advantages of immediate tumor removal, condensed treatment duration, and minimized morbidity to the surrounding local tissues.

Adjacent Venous Tumor Thrombus in Primary Osteosarcoma of the Pelvis and Extremities
Paper 130

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BACKGROUND: Despite the high rate of venous tumor thrombus (VTT) in osteosarcoma of the pelvis, there are few descriptions of VTT associated with extrapelvic primary osteosarcoma. We sought to further describe the prevalence and presenting features of venous tumor thrombus in osteosarcoma of both the pelvis and extremities.

METHODS: We reviewed 308 patients with osteosarcoma treated between 2000 and 2022 at our institution. Primary lesions were located in the upper extremity (n=40), lower extremity (n=198), or pelvis (n=70). Medical records and histopathology were reviewed to identify patients with thrombi in proximity to their primary lesion.

RESULTS: Tumors abutted vessels in 131 cases (42.5%) and encased vessels in 30 cases (9.7%). Twenty-one patients were diagnosed with VTT. The rate of VTT was 25% for pelvic and 1.7% for extremity osteosarcoma. The most common imaging features associated with VTT were enhancement with contrast (100%), venous enlargement (83%), vessel encasement (66%), and visible intraluminal osteoid matrix (50%). Disease-specific survival (DSS) for patients with VTT was 95% at 12 months, 49% at three years, and 31% at five years. When controlling for presence of metastatic disease, VTT was associated with worse DSS (HR 2.3, 95% CI [1.11, 4.84]).

CONCLUSION: VTT is rare within osteosarcoma and occurs more commonly in the pelvis than the extremities. Imaging features include enhancement with contrast, venous dilation, and vessel encasement. VTT portends a worse prognosis for patients with osteosarcoma with a similar survivability to metastatic disease.

Evaluation of Local Recurrence and Diagnostic Discordance in Chondrosarcoma Patients Undergoing Preoperative Biopsy

Paper 131

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BACKGROUND: Preoperative biopsy of chondroid lesions has demonstrated discordance between biopsy grade and surgical resection grade. Furthermore, there is evidence to suggest risk of tumor contamination during biopsy. We evaluated our large chondrosarcoma institutional cohort to compare the rates of local recurrence based on undergoing pre-surgical biopsy, as well as other tumor characteristics and disease related outcomes.

METHODS: This was a retrospective review of 75 patients who underwent surgical resection for chondrosarcoma at our institution between 2005 and 2020. Outcomes included rates of local recurrence, metastasis, and overall survival.

RESULTS: There were no significant differences in local recurrence and recurrence free survival in the cases that had undergone preoperative biopsy. Thirteen (28.2%) patients had discordance between histologic grade on biopsy and resection. Seven of 11 patients with dedifferentiation present on final resection were not identified on biopsy. The only independent predictor of recurrence free survival and metastasis free survival was the presence of dedifferentiation on resection.

CONCLUSIONS: To our knowledge, this is the first study evaluating risk of local recurrence in the setting of pre-surgical biopsy in chondrosarcoma patients. Although preoperative biopsy may contaminate biopsy tracts, appropriate surgical planning and final resection results in no difference in local recurrence rates in this cohort. However, discordance rates between preoperative biopsy and resected specimen must be considered while determining clinical treatment.

Cemented vs. Press-Fit Acetabular Fixation in Oncologic Reconstruction
Paper 132

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OBJECTIVE: There is no consensus on the optimal fixation of the acetabular implant in total hip arthroplasty (THA) performed in oncologic reconstructions or in radiated bone. This study was designed to compare the outcomes of cemented and press-fit acetabular reconstructions in THA performed for these indications.

METHODS: This study is a single institution retrospective cohort for all patients with neoplastic disease involving the proximal femur or acetabulum, or radiation osteonecrosis of the hip, from 2011 to 2021. Patients treated with standard THA as well as THA with proximal femoral replacement were included. We assessed outcomes including surgical time, blood loss, perioperative complications, reoperation for any reason, and revision arthroplasty.

RESULTS: 44 cases (cemented cohort = 23, press-fit cohort = 21) met the inclusion criteria. The average age in the cemented cohort was 65 years, while the average age of the press-fit cohort was 64 years. The average BMI was higher in the cemented cohort (30.8) compared to the press-fit cohort (28.1). In the cemented acetabulum cohort, all patients had tumor in the acetabulum while in the press-fit acetabulum cohort, only 7 (33.3%) patients had tumor in the acetabulum. In the cemented cohort, a greater percentage of patients received neoadjuvant radiotherapy (N = 11 (47.8%)) compared to the press-fit cohort (N = 8 (38.0%)). The average operation time was longer in the cemented cohort (238 min) compared to the press-fit cohort (178 min). The average estimated blood loss was higher in the cemented cohort (986 cc) vs. the press-fit cohort (574 cc). The 1-year survival was higher in the cemented cohort (17/23 = 73.9%) vs. the press-fit cohort (11/21 = 52.3%). There was one postoperative complication in the cemented cohort (a deep vein thrombosis), while there was zero in the press-fit cohort. There were more revision surgeries needed in the cemented cohort (4/23 = 17.3%) compared to the press-fit cohort (1/21 = 4.8%). The average time to revision surgery was 578 days in the cemented cohort.

CONCLUSION: The optimal method of fixation cannot be determined by this study. However, these data demonstrate that cemented and non-cemented constructs have similar outcomes. Surgeons caring for oncologic bone disease and post-radiated bone should have familiarity with both techniques as certain patients, specifically those with acetabular disease, may benefit from cemented fixation.

Treatment and Outcomes of Pediatric Soft Tissue Sarcoma
Paper 133

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OBJECTIVE: Soft tissue sarcoma (STS) is rare, accounting for only 1% of all malignancies and representing approximately 7% of cancers in children. Treatment and outcomes have been thoroughly described in adults, including survival, recurrence, and complications. Though STS has been studied in the pediatric population, data is lacking given the rarity of this diagnosis. The purpose of this study is to review our institutions treatment of soft tissue sarcoma in children and evaluate oncologic outcomes.

METHODS: We retrospectively reviewed the records of 72 pediatric patients with musculoskeletal soft tissue sarcoma, excluding rhabdomyosarcoma, undergoing treatment at our institution since 2000. The group included 45 male and 27 female patients with mean age at diagnosis of 11±5 and a mean follow-up of 7 years.

RESULTS: The most common diagnoses included synovial sarcoma (23%), dermatofibrosarcoma (15%), epithelioid sarcoma (8%), and fibrosarcoma (8%) and 33% were high grade. The most common locations were in the upper extremity (36%) and lower extremity (28%). One patient had metastatic disease at presentation. Patients were treated with surgery alone (59%), surgery and radiation (8%), surgery and chemotherapy/immunotherapy (18%), or a combination of the three (15%). Of the 21 patients undergoing radiation, radiation was performed preoperatively in 58%, intraoperatively in 5%, and postoperatively in 37%. Resection was most commonly wide local excision (60%). Limb salvage was performed in 83%; 13% underwent amputation and 4% underwent hemipelvectomy or forequarter amputation. Margins were negative in 96%. Surgical complications included 4% infection and 10% wound/flap problems. Reoperation was performed in 20% patients. Recurrence occurred in 8% with 2 local and 4 metastatic most commonly to the lungs. At most recent follow-up, 86% are alive with no evidence of disease, 6% are alive with disease, and 8% died of disease.

CONCLUSION: STS in the pediatric population is rare and includes heterogenous pathologies. A multidisciplinary approach to treatment including surgery, radiation, and chemotherapy leads to definitive local control in most patients with few complications. Future studies should focus on long-term outcomes and compare these to the adult population.

Photodynamic Bone Stabilization for Traumatic and Pathologic Fractures: A Systematic Review of Utilization, Complications, and Patient-Reported Outcomes

Paper 134

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BACKGROUND: The photodynamic bone stabilization system (PBSS), developed for the treatment of fractures, gained FDA approval in 2018 for use in the United States. Given its relative novelty, our analysis sought to analyze the available literature exploring the outcomes and complications of the PBSS.

METHODS: Following the Preferred Reporting Items for Systematic Review and Meta-Analyses Protocol guidelines, we performed a systematic review to answer our study question (PROSPERO registration of study protocol: CRD42022363065, October 8th, 2022). PubMed, EBSCOHost, and Google Scholar electronic databases were queried to identify articles evaluating PBSS in the treatment of pathologic, impending or traumatic fractures between 13 January 2010 and 15 October 2022.

RESULTS: Our initial search yielded 326 publications. After screening, a total of 13 studies, comprising 7 case series, 4 case reports, and 2 cohort studies were included. The total sample size consisted of 345 patients, with 242 females (70%) and 103 males (30%). The implants were most commonly utilized in the humerus (41%), radius (12%), and metacarpal (12%). A total of 60 complications were recorded, most being non-device related. Broken implants were the most common device-related complication. Within 12 months of follow-up, the majority of studies reported significant improvements in both VAS and DASH scores, as well as complete radiographic evidence of fracture healing.

CONCLUSION: PBSS is a viable option for appropriately selected pathologic, impending, and traumatic fracture stabilization with a low rate of complications and high rate of improvement in pain, function, and radiographic healing.

Indications and Long-Term Survival of Intercalary Reconstruction Techniques for Diaphyseal Bone Tumors
Paper 135

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OBJECTIVE: Intercalary reconstruction after resection of diaphyseal bone tumors allows for adjacent-joint preservation; however, despite implant advancements they continue to experience high failure rates. Free fibular autograft (FFA), allograft interposition, and metallic endoprostheses are used, but there is no consensus on optimal construct. This study sought to further evaluate construct failures and salvage options.

METHODS: We conducted an IRB-approved retrospective review of patients who underwent intercalary reconstruction for oncologic indications at a single institution 1999-2022. Inclusion criteria included long bone intercalary reconstruction with FFA, allograft, or endoprosthesis for primary or metastatic disease. Minimum follow-up was three months. Exclusion criteria included joint replacement, non-oncologic indication, and inadequate follow-up. Patient demographics and outcomes were analyzed from EMRs. Primary outcome was implant survival. Secondary outcomes included complication type, rate, and timing, resection length, distance from articular surface, and failure modes.

RESULTS: 32 patients met inclusion criteria, 22 men and 10 women. Reconstructive options included: FFA (N=7), endoprosthesis (N=14), and allograft (N=11). Average follow-up was 47 months. Average patient age was 40.9 years; FFA patients were younger than endoprosthesis patients (p=0.007). There was no difference in resection length. FFAs were closer to the articular surface than endoprostheses (p=0.002). Indications included Ewing's sarcoma (25%), osteosarcoma (25%), chondrosarcoma (22%), and metastases (19%). Implant survival was 36.6% at 21 years; median survival was 2.04 years. Complication rate was 62.5%, with 71.4% of FFA, 64.3% of endoprostheses, and 54.5% of allograft reconstructions experiencing complications. 53.1% patients required re-operation, with no differences between techniques. The most common mode of failure was aseptic loosening/graft-host nonunion (25%). Salvage procedures were patient-specific. Allograft failures often underwent repeat bone grafting and stabilization, joint-sacrificing endoprosthesis were a possibility for all groups.

CONCLUSION: This study supports the reported high rate of complication and implant failure of intercalary reconstructions. FFA was chosen in a younger patient population although similarly had high failure rates. Endoprosthetic reconstructions are limited by bone stock for stem insertion and were used less commonly for resections near the articular surface. While salvage options are available, they often result in joint-sacrificing endoprosthesis limiting function and longevity. With patients having improved life expectancy for both metastatic and primary bone tumors, implant optimization is critical.

Retrograde Intramedullary Nailing is an Appropriate Approach to Pathologic Femur Lesion
Paper 136

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INTRODUCTION: Historic concerns of knee arthrosis, metallosis, disrupted patellofemoral mechanics, and synovial reactive change limited the use of retrograde intramedullary nails (rIMNs) in the fixation of pathologic femur fractures. We aim to compare clinical outcomes of pathologic femur fractures treated with both antegrade (aIMNs) and rIMNs.

METHODS: We retrospectively reviewed pathologic femur fractures that underwent IMNs from 2014-2021. The patients who received a rIMN were propensity matched to aIMNs based on age, BMI, smoking status, preoperative concomitant therapy, and postoperative concomitant therapy. Univariate analysis was conducted with Chi square or Mann-Whitney U tests.

RESULTS: 23 patients received rIMN for pathologic lesions were matched to 23 patients who received an aIMN. The primary lesions included breast (n=12, 26%), lung (n=7, 15%), and kidney (n=55, 11%). There were no differences in age, sex, BMI, smoking, or primary lesion origin between cohorts ($p>0.05$). The rIMN cohort had more complete fractures (20 vs. 6, $p<0.001$). There were no differences in rates of postoperative concomitant therapy. Five patients who underwent rIMN (19%) received postoperative radiation therapy which included knee joint at an average dose of 28.6 Gy. There were no documented cases of arthrofibrosis in the patients who received knee radiation. There were no differences in local recurrence, progression of disease, or revision surgeries across the cohorts ($p>0.05$).

CONCLUSION: The use of aIMN and rIMN is effective for the treatment pathologic lesions in the femur. The minimally invasive approach of rIMN may have benefits of restoration of range of motion with low morbidity and mortality.

Cost-Effectiveness of Surveillance vs. Primary Excision of Lipomatous Lesions
Paper 137

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OBJECTIVE: Lipomas and atypical lipomatous tumors (ALTs) are benign tumors consisting of adipose tissue. Both tumors may present as similarly appearing large subfascial lipomatous lesions. However, they have different natural histories and treatments. Lipomas are often treated either nonoperatively or with marginal resection while ALTs are treated with marginal resection and post-resection surveillance. It is not possible to definitively distinguish between an ALT or a lipoma on imaging alone, therefore, both surveillance with MRI scans and primary excision are possible treatment options.

METHODS: A Markov state transition model was created to compare the cost-effectiveness of surveillance vs. marginal excision for lipomatous tumors in the extremity. A two-year time horizon was chosen. Transition probabilities were taken from existing literature. Costs were taken from United States Medicare data. Utilities were taken from retrospective review of Toronto Extremity Salvage Scores (TESS) provided by patients treated at our tertiary care sarcoma center. Univariate deterministic sensitivity analysis and probabilistic sensitivity analysis in the form of Monte Carlo simulations were completed.

RESULTS: In our base case, surveillance cost less at $1,036.64 per QALY vs. the cost of excision at $1,839.78 per QALY. Excision, however, demonstrated higher effectiveness (0.12 more QALYs) at two years. The ICER of choosing excision over surveillance was $6,902.98. Deterministic sensitivity analysis suggested that the most impactful factors of overall ICER were the utility of undergoing primary excision (with a lipoma); cost of primary excision; and the utility of undergoing primary excision (with an ALT). Probabilistic sensitivity analysis demonstrated that at a willingness to pay of $100,000, primary excision provided an ICER which was cost-effective approximately 66.9% of the time. The remaining iterations in which the ICER of choosing excision over surveillance was not cost-effective consisted of iterations where minimal or negative effectiveness was produced.

CONCLUSION: Both primary excision and MRI surveillance for lipomatous lesions suspected to be ALTs or lipomas are cost-effective options. Neither treatment strategy was found to dominate the other, and sensitivity analysis showed that the ICER of choosing primary excision over surveillance did not meet willingness to pay thresholds in approximately 1/3 of scenarios. Clinicians should understand the factors which drive the results of the effectiveness and costs of these treatment methods when seeking to maximize cost-effectiveness.

The Impact of Margin Status on the Oncologic Outcomes of Surgically Treated Dedifferentiated Liposarcoma of the Extremities

Paper 138

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OBJECTIVE: Dedifferentiated liposarcoma (DDLPS) is an aggressive variant of liposarcoma that can arise within an atypical lipomatous tumor (ALT). The primary goal of treatment for DDLPS is wide margin resection, but it remains unclear if the low-grade portion surrounding DDLPS also necessitates wide margin resection for optimal local control. We aimed to investigate the importance of surgical marginal location with respect to DDLPS and ALT tumor portions.

METHODS: This retrospective institutional cohort study included all patients treated surgically for histologically confirmed DDLPS from 2007 to 2019. Patient and tumor demographics and oncologic outcomes were collected. Exclusion criteria included patients with less than two years of follow-up, intraperitoneal/retroperitoneal or head/neck liposarcomas, or age younger than 18 years. Margin status was categorized into one of the following categories as described by Enneking in the surgical staging system: wide, marginal and intralesional. These descriptors were applied to both the DDLPS and the ALT portions of the tumor. All patients were determined as either “wide throughout” or “wide on DDLPS, marginal on ALT”. Statistical analysis for patient outcome and margin status was carried out using chi-square tests for each patient outcome.

RESULTS: Twenty-two patients underwent oncologic resection for extremity DDLPS. Fourteen (63.6%) patients had surgical margins that were defined as wide on DDLPS/marginal on ALT, 6 (27.3%) patients had surgical margins wide throughout, and 2 were unable to be determined. The overall rate of local control was 90.9 % (20 of 22). Two patients with surgical margins wide on DDLPS/marginal on ALT developed local recurrence compared with no patients with margins wide throughout ($p = .53$). Six patients with surgical margins wide on DDLPS/marginal on ALT developed metastases compared to 1 patient with margins wide throughout ($p = .31$).

CONCLUSION: The surgical goal in DDLPS resection, as with other sarcomas, is a wide surgical resection. In this study, wide compared with marginal resection of the surrounding low-grade portion did not appear to influence local recurrence, development of metastatic disease, or death from disease. This study lays the foundation for future larger scale collaborative investigations to further determine the importance of margins in the resection of DDLPS.

Sustained Treatment in a Medical Weight Management Program Results in Increased Weight Loss and Total Joint Arthroplasty Surgery in Morbidly Obese Patients

Paper 139

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OBJECTIVE: Obesity is the most common modifiable risk factor necessitating medical optimization prior to total joint arthroplasty surgery. At our institution, patients with a BMI >40 are referred to an interdisciplinary medical weight management program. The purpose of this study is to examine whether sustained treatment in the program leads to increased weight loss, continued orthopedic follow-up, and an increased likelihood of undergoing total joint arthroplasty surgery.

METHODS: A retrospective review of the medical record identified 136 patients with hip or knee arthritis and a BMI >40 who were referred to our medical weight management clinic over a two-year period. These patients were divided into three groups: those that failed to participate, those with a single visit, and those who underwent sustained treatment. Records were reviewed for demographic data, treatment interventions, and weight-loss and follow-up outcome measures. Continuous variables were assessed with t-test, and Fisher's exact test was performed for categorical variables.

RESULTS: Patients with sustained treatment lost an average of 14 pounds vs. 1.3 in those who attended a single appointment ($p=0.01$). 61.1% of patients with sustained treatment continued to follow-up in the orthopedic clinic, compared to 27% of patients who did not participate ($p<0.01$). 22.2% of patients with sustained treatment eventually underwent total joint arthroplasty surgery compared with 6.3% of patients who did not participate ($p=0.02$). 88.9% of patients with sustained treatment were treated with novel weight loss medications, with semaglutide the most popular choice.

CONCLUSION: Morbidly obese patients that engage in sustained treatment in an interdisciplinary medical weight management program experience greater weight loss, improved orthopedic follow-up rates, and a higher rate of total joint arthroplasty surgery when compared to those with minimal or no participation. The use of novel weight loss medications in achieving optimal outcomes in this cohort remains promising.

Clinical Outcomes of Dalbavancin Use in Bone and Joint Infections
Paper 140

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BACKGROUND: Dalbavancin is an antibiotic currently approved by the Food and Drug Administration to treat acute skin and suture infections. Dalbavancin offers a unique 14.4-day half-life and recently has seen off-label use in the treatment of persistent osteomyelitis and prosthetic joint infections (PJIs). Given its long half-life and effectiveness against antibiotic-resistant strains, DAL shows a potential cost-effective strategy to address MSK infections over the traditional daily IV infusions, but its effectiveness has yet to be established.

OBJECTIVE: The goal of this study was to analyze data regarding outcomes of patients that received dalbavancin treatment for osteomyelitis and native/prosthetic joint infections.

METHODS: This retrospective observational study collected data from adult patients that received at least one dose of dalbavancin for bone or joint infection between Sept 2019 to March 2023. Patient demographics collected included type of infection, infection species, prior surgical and medical treatments, indication for dalbavancin treatment, and clinical outcomes post-dalbavancin treatment regimen. Risk factor analysis was conducted for a 1-year infection recurrence using Stata 15.0 statistics software.

RESULTS: There were 58 patients (mean age 44.3 +/- 10.6) that received dalbavancin over the study period. Of the 58 patients, 47 received dalbavancin for osteomyelitis and 11 were treated for septic arthritis (PJI 54.55%, native 45.45%; n=11). 25 of 58 (43.1%) patients had pre-existing hardware involvement. The most common pathogen identified was Staphylococcus Aureus (70.7%; n=58), with MRSA infections found in 23% of these cases. Prior to dalbavancin treatment, most patients underwent surgical debridement (50; 86.2%). In pre-existing hardware cases, 17 of 25 (68%) had hardware removed and 8 of 25(32%) retained their hardware. Infection recurrence post-dalbavancin treatment was seen in 10 of 58 (17.2%) cases, with 8 patients having recurred infection within 90 days of treatment, and 2 patients within one year. Adverse effects were observed in only one patient with a daptomycin allergy who developed an infusion-site rash post-first round of dalbavancin treatment. Hardware retention was a significant risk factor for recurrence (p=0.024) and hardware removal significantly decreased infection recurrence (p=0.026). No patients with PJI had a recurrence of infection post-dalbavancin treatment at 90-days or 1-year follow-up.

CONCLUSION: Our investigation supports dalbavancin as an effective treatment for bone and joint infections when accompanied with surgical debridement and infected hardware removal. Hardware retention was a significant risk factor for one-year recurrence of infection, while hardware removal lowered this risk.

Weight Optimization Does Not Impact Major Perioperative Knee Arthroplasty Complication Risks
Paper 141

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OBJECTIVE: Patients with moderate and morbid obesity have increased risks for perioperative complications and potential for early implant loosening following total knee arthroplasty (TKA). There is little available evidence whether weight reduction substantively decreases perioperative risks. We performed this study to evaluate whether patients who had undergone weight reduction before surgery below critical body mass index (BMI) thresholds have lower perioperative complication risks than similar patients who have not been successful with weight modification.

METHODS: We compared postoperative blood glucose levels, early postoperative surgical complication (wound dehiscence, infection), knee manipulation and hospital readmission rates among 467 TKA with morbid obesity (BMI > 40 kg/m^2) or extreme obesity (BMI > 45 kg/m^2) compared with 366 TKAs performed for moderately obese patients (BMI 35-39.9 kg/m^2). Subgroup analysis was performed between 161 TKAs performed for morbidly or extremely obese patients who achieved preoperative weight loss below contemporary surgical procedure thresholds and 306 TKAs performed without weight optimization.

RESULTS: Morbidly and extremely obese TKA patients were more likely to have postoperative hyperglycemia (58.0 vs. 47.5%, p <0.01), but similar overall medical or surgical event rates (20.1% vs. 19.7%, p=0.92), knee specific complication rates (11.4% vs. 12.2%, p=1.0), and infection rate (1.1% vs. 0.8%, p=0.74), with a lower knee manipulation rate (1.7% vs. 6.0%, p<0.01). Wound complications were numerically higher among patients with morbid and extreme obesity, but the observation did not reach significance (1.71% vs. 0.55%, p=0.12). The differences between patients with successful and non-successful weight optimization ahead of surgery only impacted the rate of knee manipulation, which was higher in optimized patients (2.5% vs. 1.6%, p=0.04). Wound infection rates (0.6% vs 1.3%, p=0.67) and wound dehiscence rates (1.2% vs. 1.9%, p=0.72) were lower in the BMI-optimized patients, but the observations did not reach significance.

Outpatient Total Knee Arthroplasty in the Hospital Setting and Impact of Time to Discharge
Paper 142

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INTRODUCTION: Total knee arthroplasty (TKA) has historically been performed in the hospital setting, often resulting in multi-day hospital stays. While there is a trend to move TKA to ambulatory surgery centers (ASCs), many outpatient cases are still performed in the hospital. We sought to determine which perioperative factors impacted same-day vs. next-day discharge and the impact of discharge timing on complication rates. It was hypothesized that surgical timing and perioperative management would impact same-day discharge, and that same-day discharge would not impact 90-day complications.

METHODS: The hospital's arthroplasty database was queried via the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) for outpatient primary TKAs performed in one hospital by one surgeon between January 2020 and November 2022. There were 220 outpatient TKAs identified. Same-day (n=76) and next-day (n=144) discharge cohorts were compared for perioperative timing, opioid administration, and 90-day complications. Chi-square and Fisher's exact tests were applied for categorical data and t-tests for continuous data.

RESULTS: There were statistically significant differences between same-day and next-day discharge cohorts with lower age ($p=0.001$), lower ASA ($p=0.035$), and male sex ($p<0.001$) associated with same-day discharge. Lower case order number ($p<0.001$), earlier incision time ($p=0.001$), robotic-assisted technique ($p=0.042$), earlier arrival in PACU ($p=0.002$), and earlier first evaluation by physical therapy ($p<0.001$) were also associated with same-day discharge, while perioperative opioid administration was not. Patients discharged same-day experienced a similar rate of 30-day events (8% vs. 15%, $p=0.118$) and lower rate of 90-day events (21% vs. 34%, $p=0.045$) compared to next-day discharges. Logistical regression modeling showed that same-day patients had lower case order number (aOR=0.677, $p=0.022$) and earlier therapy evaluations (aOR=0.133, $p=0.003$).

CONCLUSION: Age, sex, ASA, perioperative timing, and robotic vs. manual techniques impacted the likelihood of same-day discharge after outpatient TKA. Same-day discharge did not increase the rate of 30 and 90-day events.

Results of Primary Total Knee Arthroplasty in Patients on Chronic Psychotropic Medications
Paper 143

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INTRODUCTION: Psychotropic medications are commonly used to treat a variety of conditions including depression, anxiety, and attention deficit disorder. The aim of this study was to determine significance of psychotropic medications in patients undergoing primary TKA (Total Knee Arthroplasty) with respect to postoperative opioid use, complications, patient-reported outcome measures (PROMs), and satisfaction.

METHODS: This is a retrospective cohort study of 514 consecutive patients undergoing primary TKA. 114 patients (22%) were excluded due to preoperative opioid usage, 6 were lost to follow-up leaving 394 patients for review. 133 (34%) were on psychotropic medications preoperatively and were compared to the remaining 261 (66%) patients not on psychotropics. Clinical data, satisfaction (Likert score), Knee Society (KS) scores, WOMAC, PROMIS-10, Forgotten Joint Score (FJS-12), KOOS, JR., postoperative opioid medication usage, and complications were compared.

RESULTS: Study cohort (psychotropic medications) had significantly lower postoperative KS Function, KS Knee, FJS-12, KOOS, JR., WOMAC, and PROMIS-10 Physical and Mental Health scores compared to the control group (82.88 vs. 88.88, $p<0.001$; 87.78 vs. 92.52, $p<0.001$; 61.44 vs. 74.34, $p<0.001$; 82.53 vs. 87.83, $p=0.00$; 81.73 vs. 89.66, $p<0.001$; 50.43 vs. 53.55, $p=0.029$; 52.28 vs. 56.12, $p=0.014$, respectively). Study group had a lower overall satisfaction score (Likert scale 1-5) and lower percentage of patients either satisfied or very satisfied (4.55 vs. 4.79, $p<0.001$; 92.0% vs. 97.24%, $p=0.03$, respectively). Postoperative opioid usage was significantly greater in the study group at both 4-8 week and 12-month follow-up (52.76% vs. 13.33%, $p<0.001$; 5.51% vs. 0.39%, $p=0.002$, respectively). There were no differences in complications and revisions between the groups.

CONCLUSION: Patients on psychotropic medications should be educated on the risk of increased opioid consumption, diminished satisfaction, and PROMs following primary TKA. Given the large number of patients on psychotropic medications undergoing TKA, additional studies are needed to further improve clinical outcomes in this group.

Effect of TKA Coronal Alignment on Postoperative Patient Reported Outcomes and Range of Motion
Paper 144

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INTRODUCTION: There is ongoing debate regarding the ideal target limb alignment following TKA with little data reported on the impact of limb alignment correction on patient reported outcomes (PROs). The purpose of this investigation was to compare PROs and knee range of motion (ROM) following TKA for varus and valgus patients corrected to either neutral (NEUT), under correction (UC), or cross over (CO).

METHODS: In this single institution retrospective analysis, 2,308 patients who underwent primary TKA from 2016-2022 were assessed for eligibility, and 409 patients were included in the final cohort. Coronal knee alignment was measured using full leg length radiographs taken pre- and postoperatively. Patients were divided into 3 groups based on their postoperative limb alignment: NEUT (0°± 2); UC (>2°on the same side of pre-op malalignment; CO (>2°past neutral into opposite malalignment). PROs were recorded via a validated KOOS Jr survey at pre-op as well as 6wks, 3 months(mo), 6mo, and 1yr post-op. ROM was recorded at 2wks, 6-12wks, and >6mo post-op. An ANOVA repeated on time was used to compare PROs and ROM measures ($\propto$=0.05).

RESULTS: For pre-op varus patients, those in the CO group (cross-over into valgus) were observed to have lower KOOS JR scores at 3mo(↓~6, p=0.024), 6mo(↓~5, p=0.046), and 1yr(↓~7, p=0.012) post-op compared to NEUT paired with reduced flexion ROM (↓~8°, p=0.002). For pre-op valgus patients, no differences in KOOS JR scores were observed. However, those in the UC group (left in valgus) were observed to have reduced knee flexion at 6-12 weeks post-op (↓~15°, p=0.002).

CONCLUSION: These findings suggest that for both pre-op varus and pre-op valgus patients, the ideal target alignment should be neutral or slightly varus and that post-operative valgus alignment may yield less favorable outcomes.

Does Optimal TKA Implant Alignment Impact Patient Outcomes and Satisfaction
Paper 145

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INTRODUCTION: Previous studies suggest that 15-20% of patients report dissatisfaction following contemporary total knee arthroplasty (TKA). There is some thought that component alignment is associated with improved patient-reported outcomes. Therefore, the purpose of this study was to determine if optimal implant alignment impacts patient satisfaction and patient-reported outcomes following TKA.

METHODS: We identified TKA patients prospectively enrolled in an institutional joint replacement registry who had reported both preoperative outcome expectations (5-point Likert) and postoperative patient satisfaction (5-point Likert) following their TKA surgery. Patients included in this study also had preoperative anteroposterior (AP), lateral, and patellofemoral imaging to define osteoarthritis disease severity and were included if they were judged to have severe osteoarthritis. Postoperative radiographs were reviewed by the senior author to determine of sagittal, coronal, and patellofemoral alignment. Patients were divided into groups on the basis of their postoperative alignment. Preoperative and minimum one-vear postoperative patient reported outcome measures (PROMs) including KOOS-Jr, NIH-Physical and Mental function subscores, and UCLA activity score.

RESULTS: There were 332 TKAs performed in patients that were judged to be well aligned and 104 TKAs performed in patients that were not well aligned. There were no differences between the two groups with respect to demographic factors or osteoarthritis severity. Patients in both cohorts had similar preoperative and postoperative patient reported outcome scores. While, overall satisfaction scores between the two groups were similar, there was a trend towards patients in the well aligned cohort being more likely to be very dissatisfied ($p=0.05$) with their surgery.

CONCLUSION: There are multiple factors that influence patient satisfaction and outcomes following TKA. In this study, optimal implant alignment was not associated with better outcome scores or patient satisfaction. However, there were significantly more very dissatisfied patients in the well aligned cohort.

Radiographic and Clinical Outcomes After Direct Anterior vs. Mini Posterior Total Hip Arthroplasty
Paper 146

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INTRODUCTION: Direct anterior approach (DAA) and posterior approach (PA) total hip arthroplasty (THA) can lead to differences in implant sizing, implant position, radiographic findings, and clinical outcomes - most notably dislocation and femoral fracture. To this end, we evaluated these radiographic and clinical outcomes comparing DAA and PA THA.

METHODS: In this retrospective cohort study, 198 DA THA patients were matched to 198 patients who underwent PA THA between 3 fellowship-trained orthopedic surgeons. We measured preoperative and postoperative femoral offset and leg length discrepancy (LLD), cup anteversion, cup abduction, and femoral stem coronal alignment. We recorded implant characteristics and clinical outcomes including reoperation, dislocation, acute and chronic infection, wound complication, and fracture. Statistical analysis was performed to compare radiographic and clinical outcomes in the two groups. Surgeons in both groups used either intraoperative fluoroscopy, flat plate imaging, or both. All surgeons used 36mm heads unless cup size required a 32mm head or spine pathology led to a dual mobility articulation.

RESULTS: No differences existed in the following (DAA, PA): Dislocation (0.51%, 0.0%), acute infection (2.02%, 0.51%), chronic infection (0.0%, 0.0%), wound complication (1.52%, 0.51%), periprosthetic fracture (0.51%, 1.01%), or cup inclination (43.4 deg, 43.0 deg). DAA THA had a longer operative time (117 vs. 79 mins, P<001). DAA THA trended towards an increase in discharges to home (96.46% vs. 92.93%, P=0.11). PA THA had a higher increase in femoral offset compared to the contralateral limb (2.76mm vs. 1.01mm, P<.01). PA THA had a significantly higher cup anteversion (26.17 deg vs. 23.44 deg, P<.001).

CONCLUSION: Both DAA and PA THA lead to acceptable clinical and radiographic outcomes, with some differences in operative time, cup position, and postoperative limb alignment.

Patient Perceptions of Joint Arthroplasty Surgeon Engagement on Social Media Platforms
Paper 147

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OBJECTIVE: Although social media use is increasing across orthopedics, the total joint arthroplasty (TJA) patient population has unique demographics, such as older age, and may not rely as much on social media as a resource for finding providers. The purpose of this study is to analyze TJA patients' social media and professional website engagement and determine their perceptions of surgeon social media use.

METHODS: A cross-sectional study was performed involving all new patients presenting for outpatient consultation for a primary or revision total hip or knee arthroplasty at a single academic institution from March 2022 to April 2023. A social media attitudes survey was administered during their visit which included questions on basic demographic information as well as patient use and perception of multiple social media platforms. Inpatient consultations, follow-up and postoperative appointments, and patients previously seen by a joint arthroplasty surgeon at the practice were excluded.

RESULTS: A total of 187 patients completed the survey. The median age of patients included was 63 years old (range 35-87). Most patients were female (64.2%), college-educated (41.2%), and traveled less than 25 miles to come to the appointment (66.8%). 26.2% of patients reported no social media use, 39.0% reported using 1 platform, and 23.5% reported using 2 sites. Patients most often reported using Facebook (66.8%), with a smaller portion reporting Instagram use (31.0%). Only 6.4% of patients reported social media presence as a trait they believe makes a good joint replacement surgeon while instead most selected education, technical skill, ability to listen, and empathy. The most reported professional website used was the academic medical center's website. Patients most commonly found their provider from a primary care referral (51.3%) and largely gave no importance to surgeon activity on social media (70.6%).

CONCLUSION: Patients presenting for TJA evaluation did not place importance on surgeon social media use, but instead valued empathy, listening skills, education and technical skill. Patients mostly used the academic center's professional website to research their TJA surgeon and most commonly found their surgeon from a primary care referral. Large academic centers may not need to focus efforts on promoting TJA surgeon social media use but rather on facilitating relationships with primary care physicians and developing their professional website to emphasize the personal attributes of the surgeons.

Do Patient Factors Increase the Risk of Postoperative Complications After Total Joint Arthroplasty?
Paper 148

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INTRODUCTION: Studies suggest that modifiable lifestyle risk factors can influence various patient outcomes such as quality of life, survivability, and postoperative complications. Furthermore, many lifestyle risk factors can influence readmission rates for patients following surgery. The purpose of this study was to determine the impact of modifiable lifestyle risk factors on postoperative medical and surgical complications following a total joint arthroplasty (TJA) in a large national healthcare system.

METHODS: A retrospective chart review and analysis of an IRB-approved large national health system database was performed to identify 16,940 patients who underwent TJA between 2017 and 2021. Modifiable lifestyle risk factors were defined as narcotic drug abuse, tobacco use, diabetes mellitus, body mass index (BMI), and hypertension. Postoperative medical complications and postoperative surgical complications were collected. Demographic data and comorbidities were also collected including BMI, sex, race, age, and length of stay. Logistic regression and odds ratio point estimate analysis was utilized to assess for associations between postoperative complications and select lifestyle risk factors.

RESULTS: Of the 16,940 patients identified, 61.97% were female (n=10,497) with an average age of 71 years and an average BMI of 29.47. We found that 3.47% (n=587) had used narcotics, 8.71% (n=1,476) were past or current smokers, 24.03% (n=4072) had diabetes, and 61% (n=10,337) had hypertension. The average length of hospital stay was 3.43 days, with 5.44% (n=921) experiencing postoperative medical complications and 6.43% patients (n=1090) experiencing postoperative surgical complications. With numerical increase of BMI, patients were 4% less likely to have postoperative complications ($p<0.0001$) and 2.5% less likely to have prosthetic complications ($p=0.0001$). Moreover, patients who used narcotics were 90% more likely to have postoperative complications ($p<0.0001$) and 105% more likely to experience prosthetic complications ($p<0.0001$). Similarly, patients with a past or current history of smoking tobacco were 65% more likely to have postoperative complications ($p<0.0001$) and 27% more likely to experience prosthetic complications, trending towards significance ($p=0.0526$). However, there was no significant association between patients having hypertension and experiencing prosthetic complications ($p=0.5221$).

CONCLUSION: Our results demonstrate critical rates of increased postoperative medical and surgical complications after TJA for patients with narcotic abuse, tobacco use, or diabetes mellitus. By implementing preoperative interventions and strict guidelines, orthopedic surgeons would be able to optimize the health of patients and in doing so, may decrease preventable postoperative complications after TJA.

Proximal Femoral Replacement for Trauma Associated with Significantly Worse Outcomes
Paper 149

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BACKGROUND: Reconstruction of extensive proximal femoral bone loss remains a major challenge for orthopedic surgeons. While a common solution following tumor resection, proximal femoral replacement (PFR) is sparingly used in non-neoplastic conditions. PFRs have a high complication rate, particularly related to dislocation and infection and for this reason are often considered a limb salvage only procedure. Several studies have reported on non-neoplastic indications (NNI) for PFR but do not compare across cohorts. The aim of this study was to assess the relative complication rates in PFR across indications to demonstrate non inferiority of outcomes in PFR patient with neoplastic indications (NI).

METHODS: Utilizing our mega prosthesis database, we identified all proximal femur replacements performed at our institution from 1999-2021. Surgeries were grouped by tumor involvement as well indication for PFR (metastasis, primary tumor, benign tumor, failed arthroplasty, or trauma: peri-implant fractures, fractures not amenable to primary fixation). Patient demographics and clinical outcomes were collected and compared with a focus on complications, dislocation, revisions, and implant survival.

RESULTS: NNI experienced a significantly higher 30-day readmission rate (16% vs. 4%, p = 0.001), rate of reoperation (33% vs. 16%, p =0.004), deep infection requiring surgery (16% vs. 5%, p =0.004), dislocation (19% vs. 4%, p = 0.0013), and dislocation requiring revision (11% vs. 4%, p = 0.022). Trauma was associated with the highest rate of reoperation for any cause at 50% (13/26), aseptic wound problems (4%:1/26), revision for dislocation (19%: 5/26), dislocation rate (38%:10/26), and implant failure requiring implant removal (19%: 5/26).

DISCUSSION: These results demonstrate that outcomes and complications of reconstruction with PFR vary based on the indication for surgery and demonstrate that neoplastic patients counterintuitively fair better than their non-neoplastic counterparts, especially for trauma, across several outcome measures namely readmission, revision surgery, infection, and dislocation.

High Mortality in Prosthetic Joint Infection Patients Presenting with Concomitant Sepsis
Paper 150

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OBJECTIVE: Prosthetic joint infection (PJI) is known to have a high associated five-year mortality rate comparable to many common cancers. It also has the potential of developing into life threatening sepsis. Limited data exists on the outcomes of these patients. The aim of this study was to investigate the mortality of patients presenting with simultaneous PJI and sepsis after hip and knee arthroplasty.

METHODS: A retrospective chart review was performed on patients from a single academic center between 2005-2022. Patients who underwent total joint arthroplasty (TJA), developed PJI, and presented for revision were identified using Current Process Terminology codes. Septic patients met two or more Systemic Inflammatory Response Syndrome (SIRS) criteria and had suspected or confirmed bacteremia. Patient demographics, comorbidities, complications, revisions, and follow-up data were also collected. Descriptive and univariate statistical analyses were conducted.

RESULTS: 600 patients underwent revision TJA for PJI. Of these patients, 67 (11.2%) also developed sepsis prior to revision. Excluding 12 patients lost to follow-up, 16 of 55 (29.1%) died within one year and 36 of 55 (65.5%) died within 3 years. The group that died was 71% male vs. 23% female in the surviving group ($p<0.001$). With the numbers available, there was no difference in Body Mass Index (29.8 vs. 32.5, $p=0.26$), mean age (62 years in both groups), or mean Charlson Comorbidity Index (2.9 vs. 2.3, $p=0.37$).

CONCLUSION: Simultaneous prosthetic joint infection and sepsis is associated with a high short-term mortality rate. Males seem to be particularly at risk.

Is There a Correlation Between Hospital Quality Measures and Excess Readmission Penalties for Joint Replacement Surgeries?

Paper 151

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INTRODUCTION: Several quality measures exist that are intended to reflect the value of care provided by hospitals, but the extent to which these measures correlate with patient outcomes is unclear. This study investigates the association of multiple quality measures and hospital characteristics with excess readmission penalties for total joint arthroplasty (TJA) procedures.

METHODS: This retrospective data analysis used the fiscal year 2022 Inpatient Prospective Payment System final rule to identify hospitals subject to the Hospital Readmissions Reduction Program and determine whether these hospitals were penalized for TJA excess readmissions. Five hospital characteristics and six hospital quality measures were collected for 2,286 eligible hospitals using online resources from multiple organizations' websites. Data was analyzed with chi-square tests and effect size measures reported as Cramer's V and Pearson's correlation coefficient (rp).

RESULTS: Two of the quality measures were associated with a reduced likelihood of being penalized for TJA excess readmissions. Hospitals that achieved a higher Medicare Overall Hospital Quality Star Rating demonstrated a significantly lower likelihood of receiving TJA readmission penalties (V=0.236 and rp=–0.233; P<0.001 for both). Hospitals ranked among the U.S. News & World Report's (USNWR) top 50 Best Hospitals for Orthopedics were significantly less likely to be penalized (V=0.042; P=0.043). Money's Best Hospitals in America, Joint Commission Total Hip and Knee Replacement (THKR) certification program, Magnet recognition status, and Leapfrog Hospital Safety Grade were not associated with readmission penalties (P=0.073, P=0.698, P=0.169, and P=0.774, respectively). Penalization was more likely for hospitals with fewer TJA cases, medium-sized institutions (100-499 beds), teaching hospitals, and safety net hospitals (P<0.001, P=0.002, P=0.019, and P=0.039, respectively). Penalization was less likely for hospitals in the West and Midwest (P<0.001).

CONCLUSION: Hospitals with a higher Medicare Overall Hospital Quality Star Rating and those recognized among USNWR's top 50 Orthopedic Hospitals were associated with a reduced likelihood of TJA readmission penalties. Money's Best Hospitals in America, THKR certification program, Magnet recognition status, and Leapfrog Hospital Safety Grade did not correlate with readmission penalties. The lack of association between four of the six quality measures analyzed and improved outcomes raises questions about the reliability of these measures as indicators of higher quality care. This suggests that these measures may have limited utility in reflecting actual improvements in outcomes. It is important to recognize these limitations and be mindful of their implications when evaluating hospital quality measures. Teaching and safety net hospitals may be biased towards higher readmission rates.

Rapid and Safe Transition to Ambulatory Surgical Center During the Covid Pandemic
Paper 152

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INTRODUCTION: There has been a substantial shift in the number of outpatient total joint replacements performed over the last decade. Furthermore, use of ambulatory surgical centers (ASC) has increased, which has led to improved access to operating rooms and increased efficiency for many academic medical centers. However, there remains uncertainty as to the safety of this rapid transition from inpatient to outpatient surgery.

METHODS: Utilizing the total joint registry at our institution, we identified all total hip and knee arthroplasties from 2018-2022. Surgeries were grouped by location (hospital vs. ASC) and by admission status (outpatient vs. inpatient). Patient demographics and clinical outcomes were collected and compared with a focus on readmission.

RESULTS: There was a significant increase in the percentage of outpatient total joint replacements during the pandemic (9.7% to 63.4%). Furthermore, after the introduction of our ASC, nearly half of our total joints were performed there (49.2%). We identified no significant change in reoperations (2% vs. 1%, p=0.50), 30-day readmission (2% vs. 2%, p=0.81), or medical complications (0%% vs. 9%, p<0.0001) with our rapid transition to outpatient surgery. Additionally, patients indicated for same day surgery after the pandemic were more likely to be diabetic (15% vs. 6%, p <0.0001), malnourished (22% vs. 15%, p=0.02), and were overall older (61.84 vs. 59.24, p=0.0003) than the pre-pandemic cohort.

DISCUSSION: Our study demonstrates the safety and efficacy of rapid transition to an outpatient ASC at a major academic medical center. Within one year of the pandemic onset, we transitioned approximately half of our surgical volume from an inpatient hospital setting to a stand-alone ASC. Furthermore, we did not identify any statistical difference in reoperations, readmissions, or complications despite an increasing morbid patient population. Therefore, we found a rapid transition to ASC outpatient surgery to be a safe option.

Patient Positioning Markedly Impacts Spinopelvic Radiographic Parameters
Paper 153

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INTRODUCTION: The spinopelvic relationship is a key determinant of total hip arthroplasty stability. The pubic symphysis to sacrococcygeal junction distance (PSCD) is a parameter measured on an anteroposterior (AP) pelvis radiograph that potentially serves as a surrogate to the spinopelvic relationship. This study evaluated how patient factors and positioning impact the PSCD and its relationship to pelvic tilt (PT) and pelvic incidence (PI).

METHODS: We prospectively enrolled 32 participants. Sixteen presented for hip osteoarthritis and the other 16 were free of hip osteoarthritis. Patients with hip or spine instrumentation were excluded. Of the entire cohort, mean age was 49, 59% were female, and mean BMI was 29 kg/m^2. All patients underwent supine and standing AP pelvis and lateral sitting and standing lumbar radiographs. PSCD was compared to PT and PI using Pearson's correlation coefficient.

RESULTS: Participants' PSCD was higher on supine compared to standing AP radiographs (36 vs. 25 mm, $p<0.01$). Males had a lower PSCD than females on supine radiographs (31 vs. 46 mm, $p=0.02$) and a smaller PSCD change between supine and standing (12 vs. 25 mm, $p<0.01$). Osteoarthritis was associated with lower PSCD on both sitting (31 vs. 48 mm, $p<0.01$) and standing (12 vs. 28 mm, $p<0.01$) radiographs. Supine PSCD had a stronger, inverse correlation to sitting PT than standing PSCD ($r=-0.6$ vs. $r=0.5$; $p<0.001$). Standing PSCD had stronger correlation with standing PT than supine PSCD ($r=-0.7$ vs. $r=-0.5$; $p<0.01$). Supine PSCD was weakly correlated with standing PI ($r=-0.37$, $p=0.04$), but not sitting PI. Standing PSCD was not correlated with standing or sitting PI.

DISCUSSION: The pubic symphysis to sacrococcygeal junction distance (PSCD) evaluates the spinopelvic relationship; however, measured PSCD varied significantly with patient position during radiographic evaluation, sex, and presence of arthritis. PSCD correlated with PT; yet, patient position affects the strength and direction of correlation, which is critical to consider when using PSCD for preoperative spinopelvic evaluation.

How Constrained Can You Start? A Multicenter Review of Pelvic Discontinuity Treated with Custom Triflange Implants

Paper 154

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BACKGROUND: Pelvic discontinuity is a unique failure following total hip arthroplasty (THA) characterized by separation of the hemipelvis. Given the substantial bone loss, implants such as custom triflange acetabular components (CTACs) are often required to unitize the pelvis. Numerous studies have reported good early outcomes for CTACs with dislocation the primary source of failure. For this reason, many surgeons have begun to primarily constrain patients at the time of CTAC insertion. Therefore, the purpose of this study was to report the dislocation incidence and risk of aseptic loosening between CTACs with and without primary constrained implants.

METHODS: Our retrospective multicenter study identified patients with pelvic discontinuity treated with CTAC. Patients were stratified by level of constraint, either standard liners (SL) or constrained liners (CL). Constrained liners were placed based on surgeon preference, most frequently for abductor compromise, trochanteric demise, or proximal femur replacement. Patient demographics and clinical outcomes were collected and compared with a focus on dislocation, revision surgery, and implant failure.

RESULTS: We identified 113 patients with CTAC during our study period; 54 inserted a SL and 59 received a CL. Amongst our cohort there were no difference in rate of aseptic loosening (CL:5.08% vs. SL: 5.6%p = 1.00), number of patients with a revision (CL:14 vs. SL:20, p=0.152), or patients with a dislocation (CL:3 vs. SL:7, p =0.190). Constrained patients did have a significantly lower number of revision surgeries (CL:21 vs. SL:40, p =0.010) and total number of dislocations (CL:5 vs. SL:13, p =0.044). Lastly, there were no differences in the number of patients requiring a revision for dislocation (CL:5 vs. SL:10, p=0.169)

DISCUSSION/CONCLUSION: Primarily constraining CTACs does not increase implant failure rates while also decreasing revision and dislocation rates. Constrained liners represent a safe and appropriate option to curb dislocation rates without increased risk of failure.

Assembly and Dissociation Forces Differ Between Dual Mobility Implants: A Biomechanical Study
Paper 155

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INTRODUCTION: Intraprosthetic dissociation (IPD) is a complication unique to dual mobility (DM) implants where the outer polyethylene (PE) head dissociates from the inner femoral head. Increasing reports of IPD at the time of reduction prompted this biomechanical study evaluating the assembly and dissociation forces of DM heads.

METHODS: This pilot study tested nine DM constructs from three vendors (three each). All polyetyhlene heads were 46 or 47mm in outer diameter, accepting a 28mm inner ceramic head. The ceramic head was fixed to a stem for all testing. Implants were assembled and disassembled using a servo-hydraulic test machine that records the forces and torques applied during testing. Disassembly was performed via both axial pull-out and lever-out techniques, with lever-out simulating stem-on-polyethylene impingement. Due to a significant order-effect of repeated testing apparent in the data, only the first disassembly trial was used in the analysis, resulting in a limited number of variables per group.

RESULTS: The initial max assembly force was significantly different between all vendors ($p<0.01$). Vendor 3 required the highest force (1274.0±46.4N), followed by vendor 2 (1015.3±28.4), and vendor 1 (856.2±50.1N). The force required to assemble each implant decreased from the first to third trial. Vendor 2 showed the greatest initial disassembly resistance in both pull-out (1556.9N, n=1) and lever-out (27.53Nm, n=1) tests, followed by vendor 3 with a pull-out resistance of 1478.1N (n=1) and lever-out resistance of 23.26±1.3Nm (n=2). Vendor 1 had a pull-out resistance of 1167.0±55.1N (n=2) and lever-out resistance of 17.7Nm (n=1). Statistical evaluation of the disassembly results was not feasible with the numbers available for this pilot study.

DISCUSSION: There were significant differences in DM assembly and disassembly forces based on vendor. The lever-out tests required relatively low amounts of torque; therefore, IPD most likely results from a lever-out mechanism, where the stem impinges on the outer polyethylene head at the extremes of hip motion or during dislocation reduction attempts. Further refinement of DM constructs are needed in order to resist lever-out failure associated with IPD.

What Are Patients' Perceptions on the Optimal Age and Experience of their Arthroplasty Surgeon?
Paper 156

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OBJECTIVE: Consumer directed health plans have increased patients' autonomy in selecting their surgeon. There is a paucity of orthopedic literature that examines the primary factors that influence surgeon selection, including age and experience. This study aims to elucidate patients' perceptions of the optimal age and experience of their arthroplasty surgeon when seeking an elective total joint arthroplasty.

METHODS: In this cross-sectional study, all patients who sought treatment for end-stage hip or knee arthritis from one of two board-certified arthroplasty surgeons—one younger (36-year-old) and one older (62-year-old)—at a tertiary academic institution were invited to answer an anonymous questionnaire. The questionnaire consisted of 26 questions that queried patient demographics, perceptions of surgeon age and experience, and other factors that may influence surgeon selection. Responses were compared across the two surgeons using chi-squared and Fisher exact tests. P-values less than 0.05 were considered significant.

RESULTS: Fifty-three patients with a median age of 66 years completed the questionnaire. 49% (26/53) were female; 53% (28/53) were seeing the older surgeon. Overall, 80% (35/53) indicated that they had no preference between a younger or an older surgeon. Significant factors in surgeon selection included number of operations performed (p=0.010) and years in practice (p=0.014). A plurality (39%) listed 5 to 10 years as the optimal number of years in practice. When stratified by surgeon, significantly more respondents preferred a surgeon who was not in their first ten years of practice if they were being seen by the older compared to the younger surgeon (75% vs. 25%; p=0.021).

CONCLUSION: In this study of patients undergoing total joint arthroplasty, there was overall agreement that the number of operations performed and total years in practice were significant factors in patients selecting their arthroplasty surgeon; the actual age of the surgeon was not considered important.

Does Restoration of Constitutional Alignment Improve Outcomes in Total Knee Arthroplasty?
Paper 157

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BACKGROUND: Mechanical alignment has been the gold standard for total knee arthroplasty. However, a growing body of evidence suggests that a significant portion of the population have an alignment that differs from neutral mechanical alignment. Constitutional alignment is a measure of a patient's arithmetic hip-knee-ankle angle and can be accurately calculated using CT segmentation and proprietary software. Robotic assisted total knee arthroplasty allows for bony resections to achieve proper soft tissue balance, often deviating from the traditional mechanical alignment.

The purpose of our study was: 1) To determine whether a personalized bounded robotic assisted knee replacement approached restore constitutional alignment. 2) Does restoration of constitutional alignment result in superior patient reported outcomes (PROs) at one year.

METHODS: We performed a retrospective cohort study of patients who had undergone robotic TKA with a bounded personalized alignment strategy at single institution. Final intraoperative knee alignment was compared to calculated constitutional alignment, which was unknown to the surgeons at the time of surgery. PROs (preoperative and 1-year postoperative) were compared between patients who had a final intraoperative knee alignment < 2 degrees of calculated constitutional alignment were compared to patients who had a final intraoperative knee alignment > 2 degrees from calculated constitutional alignment. KOOS JR scores, pain scores, global physical and mental health scores, and the EuroQol utility scores were analyzed, and t-test and the Mann-Whitney U test were used to assess differences between groups. We evaluated minimally clinical important difference for the sample and determined the proportion of each group that achieved a clinically important difference.

RESULTS: In all 188 knees were included in this analysis, of which 52% (n=98) were balanced within 2 degrees of constitutional alignment. Mean increase in KOOS JR scores at 1 year was 27.2 ± 19.9. Mean pain scores decreased by 3.5±2.9 overall. On average, improvement in KOOS JR scores and pain scores were higher in patients balanced at ≥ 2˚ of constitutional alignment. There were no significant differences in PROs identified between knees balanced within the threshold of constitutional alignment compared to knees that were outside the threshold. Between both groups, similar proportions achieved MCID for KOOS JR, PROMIS-10 Physical and Mental Health scores.

CONCLUSION: In conclusion, robotic bounded personalized alignment in TKA restored constitutional alignment in 50% of cases. Restoration of constitutional alignment did not result in superior 1-year PROs. Alignment is one of numerous factors that affect outcomes in total knee arthroplasty.

Is the Rise of Medicare Advantage Impacting the Fidelity of Traditional Medicare Claims Data? Implications for AJRR Reporting of Long-Term THA Survivorship

Paper 158

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INTRODUCTION: The American Joint Replacement Registry (AJRR) utilizes traditional Medicare (TM) data to report long-term THA survivorship. The purpose of this study was to determine whether the large number of patients leaving TM for Medicare Advantage (MA) has compromised the fidelity of TM data used to evaluate long-term THA survivorship.

METHODS: We identified 11,010 Medicare-eligible patients who underwent primary THA from 2000-2020 at a single institution. Insurance type was analyzed over time and 83% of patients had TM at time of THA. Survivorship free of any reoperation and any revision were calculated at 5- and 10-years for patients with TM. The same survivorship endpoints were then re-calculated with censoring performed when a patient transitioned to a MA plan after surgery to model the impact of losing this patient from the TM dataset. Differences in survivorship were compared. Mean follow-up was nine years.

RESULTS: From 2000-2020, there was decrease in TM insurance (93% to 73%) and corresponding increase in MA insurance (0% to 19%) amongst THA patients. Following THA, 23% of TM patients switched to an MA plan. Patients who switched from TM to MA trended towards worse survivorship free from revision compared to those who stayed with TM (97% vs. 98% at 5-years and 96% vs. 97% at 10-years; p=0.13), though this was not significant. Reoperation-free survivorship was significantly higher (96% vs. 97% at 5-years and 94% vs. 95% at 10-years; p=0.04) after excluding patients who switched to MA.

CONCLUSION: Approximately 1 in 4 patients left TM for MA after primary THA, effectively making them lost to follow-up within TM datasets. The mass exodus of patients out of TM appears to lead to slight underestimation of reoperation rates and trended towards significance for survivorship free from revision. If MA continues to grow, efforts to obtain MA data will become even more important.

Ninety-Day Opioid Use Among Total Knee Arthroplasty Patients: A Single Center Study
Paper 159

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INTRODUCTION: Total knee arthroplasty (TKA) has been associated with extensive prescribing of opioids. Statewide, there has been a focus on minimizing use of narcotics after arthroplasty. We sought to determine if cemented vs press-fit fixation impacted 90-day opioid use after TKA, and whether 90-day opioid use impacted 90-day complications. It was hypothesized that opioid use would be similar between techniques and that increased opioid use would correlate with increased 90-day events.

METHODS: The hospital's total joint registry was queried via the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) for primary TKAs performed by a single practice group in a single hospital (January 2021 - November 2022). Only opioid-naïve patients were included. The morphine milligram equivalents (MME) filled and fill-dates for 90 days postoperatively were collected via the statewide automated prescription database (MAPS). Cemented vs press-fit cohorts were compared for 90-day opioid utilization, and 90-day utilization was compared for rate of 90-day complications. Chi-square and Fisher's exact tests were applied for categorical data and t-tests for continuous data.

RESULTS: A total of 354 TKAs were identified (153 cemented, 201 press-fit, mean age 68.7±8.8 years). Cemented TKAs were older (72.7 vs 65.7 years, $p<0.001$), had lower BMI (30.1 vs 32.3, $p=0.001$), higher ASA ($p=0.01$), longer length of stay (37.1 vs 26.3 hours, $p<0.001$), and had more manual vs robotic technique (70% manual vs 46%, $p<0.001$). Cemented TKAs filled fewer MME-worth of prescriptions within 90 days than press-fit (674.5 vs 784.9, $p=0.033$). Regression modeling showed that older patients filled fewer MME ($p<0.001$). Patients with 90-day complications were associated with higher opioid utilization ($p=0.012$), longer duration from surgery to last prescription (33.9 days vs 23.7, $p=0.004$), and higher ASA ($p=0.047$).

CONCLUSION: Cemented technique and older age were associated with lower 90-day opioid utilization. Increased opioid utilization was associated with more 90-day complications.

Passion Impacts Sport Specialization, Injury, and Burnout in College Athletes
Paper 160

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OBJECTIVE: Passion has been defined by strong inclination toward an activity and can be used to characterize various aspects of college athlete lives. With this said, no studies have analyzed the correlation of passion with injury and burnout. It is hypothesized that athletes with higher levels of burnout and injury will be seen in with lower harmonious passion score while increased injury would be correlated with a higher obsessive passion score.

METHODS: This was an observational, cross-sectional survey that was distributed to 306 athletes. 283 athletes completed the survey which showed a 92.5% survey response rate. Data was distributed and managed via the REDCap (Research Electronic Data Capture) tool at the author's institution. Furthermore, the survey included the previously validated Passion Scale and ABQ Burnout Questionnaire for passion and burnout analysis. Inclusion criteria included athletes who were participating in varsity athletics at the Division 1 NCAA level. Statistics were calculated via chi squared tests, t-tests, and multiple linear regressions.

RESULTS: Upon analysis of the responses, lower general passion was significantly associated with an increased number of specialized years. General passion and harmonious passion were negatively correlated with lower burnout. Additionally, lower harmonious passion scores were associated with increased overuse injury while obsessive passion was not. Furthermore, obsessive passion did not correlate with burnout or any burnout subcategories. Lastly, male and female athletes experienced differences in levels of passion with males having significantly higher obsessive passion scores than females.

CONCLUSION: The amount and type of passion experienced by athletes demonstrated associations with injury and various substrata of burnout. For example, athletes with lower harmonious scores were associated with high overuse injuries, while exhaustion, reduced accomplishment, and sport devaluation were not as prevalent for athletes with higher general and harmonious passion. However, further work needs to be performed focusing on the causal relationships between injury, passion, and burnout.

Does the Addition of Postoperative Gabapentin Reduce the Use of Narcotics After Sports Medicine Orthopedic Surgery?

Paper 161

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OBJECTIVE: To evaluate the efficacy of gabapentin and its effect on narcotic use in an outpatient sports medicine practice by comparing patients before and after initiating the routine use of gabapentin as part of a standardized postoperative pain medication regimen.

METHODS: All outpatient sports medicine surgical patients undergoing outpatient orthopedic surgery were included over a six-month period. All patients had a standard perioperative pain regimen consisting of 200 mg celecoxib, 1000 mg acetaminophen, and 75 mg pregabalin pre-op and hydrocodone/acetaminophen 5 mg/325 mg (28 pills, 1-2 tablets every 4 hours prn) and ketorolac 10 mg (every 6 hours for 20 doses) post-op. The study group also had gabapentin 300 mg TID for 7 days post-op. Intraoperative medications and regional anesthesia were at the discretion of the anesthesiologist. Patients were allowed 1 narcotic refill postoperatively and only in the first 3 weeks. The primary outcome was difference in percentage of patients who requested a narcotic refill within 3 weeks post-op. Two and 6-week VAS and SANE scores, and baseline health and demographic data were collected.

RESULTS: There were 101 patients in the pre-gabapentin cohort and 100 patients in the post-gabapentin cohort. BMI was slightly lower in the pre-gabapentin cohort (28.0 vs. 30.1; p = .014). There was higher tobacco and illicit drug use pre-op in the pre-gabapentin cohort [tobacco use: 18.8% vs. 5.0% (p = .003); illicit drug use: 16.8% vs. 5.0% (p = .007)]. Fifteen total patients were seen in the ED following surgery (pre-gabapentin: n = 7; post-gabapentin: n = 8; p = .773). Only 6 patients were seen in the ED for a concern directly related to their surgery: post-op pain, drainage from surgical incision site, surgical wound dehiscence, and swelling at site of surgery (pre-gabapentin: n = 4; post-gabapentin: n = 2; p = .231). No patient had a recorded complication related to taking gabapentin. Patients who received gabapentin requested fewer narcotic refills [pre-gabapentin: n = 23 (22.8%); post-gabapentin: n = 9 (9.0%); p = .006]. There were no significant differences between VAS and 2-week SANE scores. Six-week SANE scores were lower in the post-gabapentin cohort (mean difference = 6.4; p = .027) though less than the MCID for SANE scores. Smokers requested more narcotic refills (p = .005).

CONCLUSION: Addition of gabapentin to a postoperative pain regimen reduced the use of narcotics after sports medicine surgeries and provided equivalent pain control.

Clinical and Radiographic Outcomes of Knee Cartilage Restoration Surgery in Patients with Inflammatory Arthropathy

Paper 162

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OBJECTIVE: Knee cartilage restoration procedures have demonstrated favorable short to mid-term clinical and radiographic outcomes in the general population. To date, there are no reported studies on the outcomes of these procedures among patients diagnosed with concomitant inflammatory arthropathy. The purpose of this study was to evaluate the survivorship, reoperation rate, and radiographic outcomes following cartilage restoration surgery in patients with concomitant inflammatory arthropathy.

METHODS: All patients diagnosed with an inflammatory arthropathy who underwent knee cartilage restoration surgery at a single institution between 1999-2021 were retrospectively identified. Patients were included if they underwent osteochondral allograft or autograft transplant, autologous chondrocyte transfer, or internal fixation of an Osteochondritis Dissecans (OCD) lesion, and had at least two years of clinical follow up. Univariate and descriptive statistics regarding patient demographics, lesion characteristics, reoperation rates, and radiographic outcomes were analyzed.

RESULTS: Twenty-six patients were identified (8 male, 18 female) that met inclusion criteria. Mean age at the time of surgery was 27.6 years with mean clinical follow-up of 9.7 years. Survivorship was 88.5% free of any re-operation, 96.1% free of graft revision, and 100% free from conversion to Total Knee Arthroplasty (TKA) at final follow-up. 54.2% of patients demonstrated progression of at least one Kellgren-Lawrence (KL) grade at final radiographic follow up, with 87.5% of patients rated as KL Grade 0 or 1. Postoperative magnetic resonance imaging (MRI) results were available for 18 patients. 89% of osteochondral grafts demonstrated complete healing, while two patients demonstrated incomplete allograft healing on MRI, and no complete graft failures were identified. The use of immunomodulating medications preoperatively was associated with incomplete graft healing on MRI (66% vs. 0% p=0.016), while synovitis on preoperative MRI was associated with increased rate of unplanned reoperation (37% vs. 0% p = 0.011) and decreased rate of complete graft healing (80% vs. 100%, p= 0.037). There were no observed differences in radiographic or clinical outcome measures in relation to specific inflammatory conditions, surgical procedure, perioperative NSAID use, or cartilage lesion type, size, or location.

CONCLUSION: Knee cartilage restoration surgery appears to be safe and effective in patients with inflammatory arthropathies. While there is evidence of progressive arthritis on follow-up imaging, most patients continue to show no or only mild arthritis in the involved compartment, with low rates of revision surgery and conversion to arthroplasty.

Outcomes of Shoulder Instability Surgery in Competitive Wrestlers: Outcomes, Reoperations, and Return to Play at Five Years Mean Follow-Up

Paper 163

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OBJECTIVE: Wrestling is a physically demanding sport with young athletes prone to traumatic shoulder instability (SI). However, there is a paucity of data evaluating the results of shoulder instability surgery (SIS) in this cohort of athletes.

METHODS: All competitive wrestlers with a history of SI and subsequent surgery at a single institution between 1996 and 2020 were identified. All directions of SI (anterior SI [ASI], posterior SI [PSI], and traumatic multidirectional SI [TMDI]) were analyzed. Exclusion criteria included revision SIS and less than two years of clinical follow-up. Patients were contacted for determination of reinjury rates, return to wrestling (RTW), and Western Ontario Shoulder Instability index (WOSI) scores.

RESULTS: Ultimately, 104 wrestlers were included at a mean follow-up of 5.2 years (range, 2.0 – 22.0). Fifty-eight (55.8%) wrestlers presented for evaluation after a single SI event while 46 (44.2%) sustained multiple events prior to presentation. ASI was the most common direction (n = 79; 76.0%) followed by PSI (n = 14; 13.4%), and TMDI (n = 11; 10.6%). Surgical treatment was most commonly an arthroscopic soft tissue stabilization (n = 88; 84.6%), followed by an open soft tissue repair (n = 13; 12.5%) and open bony augmentation (n = 3; 2.9%). RTW occurred in 57.3% of wrestlers at a mean of 9.8 ± 9.6 months. Recurrent instability was the most common complication in 18 (17.3%) wrestlers. Revision SIS was performed in 15 (14.6%) wrestlers. Across the entire cohort, Kaplan-Meier survivorship free from recurrent instability and revision surgery was 91.4% and 98.1% at 1 year, 90.4% and 92.5% at 2 years, 71.9% and 70.7% at 5 years, and 71.9% and 66.5% at 10 years, respectively. Preoperative recurrent instability was an independent risk factor for postoperative recurrent instability (Hazard ratio [HR], 3.8; 95% confidence interval [CI], 1.33 – 11.03; P = .012).

CONCLUSION: Anterior shoulder instability was the most common direction among competitive wrestlers presenting for SIS. Wrestlers with multiple dislocations prior to initial clinical presentation were 3.8 times more likely to experience postoperative recurrent instability.

Satisfactory Clinical Outcomes and Continuance of Sports After Hip Arthroscopic Labral Repair in Young Competitive Athletes at Minimum 8.5-Year Follow-Up

Paper 164

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OBJECTIVE: Clinical outcomes, particularly rate of return to sports (RTS), are important measures for young athletes undergoing hip arthroscopy for hip pain. Previous studies have reported excellent return to sport in professional athletes undergoing hip arthroscopy; however, to date, there is a paucity of published long-term subjective as well as sports-specific outcomes and continuation rates for these patients. The purpose of this study was to (1) evaluate long-term patient reported outcomes and achievement rates of patient acceptable symptomatic state (PASS) in young athletes undergoing hip arthroscopy, and (2) report long-term sports continuance and reoperation.

METHODS: Inclusion criteria consisted of age <24 years at surgery, femoroacetabular impingement undergoing primary hip arthroscopy with labral repair, and participation in sport with intent to return to sport after surgery. Modified Harris Hip Scores (mHHS), Hip Outcome Score (HOS), HOS activities of daily living (HOS-ADL), and HOS sport (HOS-Sport) were collected preoperatively, two years postoperatively, and final follow-up. Patients were evaluated for PASS achievement, reoperation, and sports participation.

RESULTS: Forty-two hips in 37 patients (11 males, 26 females, age: 17.7 ± 2.1 years, range 13.6-23.0, BMI: 22.8 ± 2.9 kg/m^2, range: 17.6-33.7) met inclusion criteria and were followed for 10.0 ± 1.3 years (range: 8.5-13.0) postoperatively. Mean mHHS, HOS-ADL and HOS-Sports outcome scores at minimum 8.5-years were 82.2 ± 12.9, 89.6 ± 10.9, and 81.8 ± 16.4, respectively, with significant ($p<0.001$) postoperative improvements. Thirty survey respondents (83%) met PASS for mHHS, 27 (75%) for HOS-ADL, and 24 (67%) for HOS-Sports. At minimum 8.5-year follow-up, only 9/37 (24%) cited their hip as the reason for stopping sport. Of the remaining patients, 17/28 (61%), continued playing their initial sport. There was no difference in patient reported outcomes between patients who endorsed sports continuance and patients who did not report sports continuance and did not cite their hip as a reason ($p \geq 0.229$). At final follow-up, 4 hips (10%) had undergone subsequent surgical intervention at a mean of 4.8 ± 3.3 years (range: 1.0-8.4) postoperatively.

CONCLUSION: Durable mid-term outcomes and satisfactory PASS achievement rates are observed in young amateur athletes undergoing primary hip arthroscopy. At minimum 8.5-year follow-up, approximately 1 in 4 patients discontinue their sports due to hip related reasons.

Impact of Peri-Incisional Local Infiltrative Anesthesia on Postoperative Pain and Opioid Consumption Following Periacetabular Osteotomy

Paper 165

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BACKGROUND: Multimodal pain control has become an increasingly popular technique to limit overall opioid consumption following orthopedic surgery. Peri-incisional or peri-articular local infiltrative anesthesia (PLIA) has been shown to provide safe and effective postoperative pain control in trauma, elective sports medicine, and arthroplasty settings. It has not yet been studied in the context of hip preservation surgery.

PURPOSE: To determine the impact of PLIA on pain control and opioid consumption in the immediate postoperative period following periacetabular osteotomy (PAO).

METHODS: We retrospectively reviewed patients undergoing combined hip arthroscopy and PAO between 2019 and 2023. We identified 50 patients who received PLIA with weight-based bupivacaine 0.25% at the time of closing and 50 patients who did not. Demographic information including age, sex, BMI, race, ethnicity, and smoking status were recorded. Surgical factors included total operative time, traction time, length of hospital stay, cam correction (change in alpha angle postoperatively), and PAO correction (change in lateral center edge angle postoperatively). Pain control was assessed using Visual Analog Scale (VAS) scores at the following times: first post-anesthesia care unit (PACU), final PACU, post-op day (POD) 1, POD 2, discharge. Finally, we calculated morphine milligram equivalents (MME) consumed in PACU, during admission, and total consumed from surgery to discharge. Student's t-test was used for quantitative variables and chi-square for categorical.

RESULTS: We found no significant differences between groups for demographic variables, operative time, traction time, degree of PAO correction, or degree of cam correction ($p>0.05$). The PLIA group had significantly lower mean initial PACU (4.6 ± 3 vs. 6.4 ± 2.3, $p=0.006$) and mean final PACU VAS scores (4.3 ± 1.6 vs. 5.1 ± 1.7, $p=0.027$). Inpatient and discharge scores were not significantly different between groups ($p>0.05$). The PLIA cohort trended towards lower mean MME consumed at all time points (PACU: 21 ± 10.6 vs. 22.3 ± 10.4; Inpatient: 157.9 ± 87.8 vs. 175 ± 82.1; Total: 178.9 ± 89.7 vs. 197.3 ± 85). However, none of these differences reached statistical significance ($p>0.05$).

CONCLUSION: PLIA is an effective option for immediate post-operative pain control following PAO. Future studies with multi-modal injections are warranted.

Patellar Tunnels for Graft Fixation During MPFL Reconstruction Are a Safe and Reliable Alternative: A Study of Over 600 Knees

Paper 166

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OBJECTIVE: A prior study suggested decreased rates of recurrent patellar instability with two smaller (3.2 mm), short, oblique patellar tunnels with looped graft for patellar sided graft fixation during medial patellofemoral ligament reconstruction (MPFL-R) in comparison to the use of two suture anchors. The 3.2 mm oblique tunnel was not reported to bear the same risk of patellar fracture observed with 4.5 mm transpatellar tunnels. The purpose of this study was to compare clinical outcomes and complications in the largest series between the use of dual patellar suture anchors and dual, small (3.2 mm), short, oblique bone tunnels for patellar-sided graft fixation during MPFL-R.

METHODS: Retrospective chart review identified all patients at a single academic institution who underwent primary MPFL-R between March 2010 and December 2022. Operative notes, postoperative clinical follow-up notes, and radiographs were used ascertain laterality, graft type, surgical technique and instrumentation utilized, and concomitant procedures performed, as well as the incidence of recurrent lateral patellar instability, revision MPFL-R, and patellar fracture.

RESULTS: A total of 540 knees were included for final analysis. Patellar-sided graft fixation was achieved with dual, small (3.2 mm), short, oblique bone tunnels with looped graft in 343 knees (53.6%) and dual suture anchors in 297 knees (46.4%). The small, oblique tunnels and suture anchor techniques both yielded a low incidence of patellar fracture, with rates of 1 in 343 knees (0.3%) and 0%, respectively. No significant difference in rates of patella fracture existed between cohorts ($p = 1.0$). There was a significantly decreased rate of recurrent patellar instability events in patients in whom patellar-sided graft fixation was achieved with dual, small (3.2 mm), short, oblique bone tunnels ($n = 7$, 2.0%) compared to dual suture anchors ($n= 15$, 5.1%; $p = 0.037$). There was no significant difference in rates of revision MPFL-R between groups (dual small (3.2 mm), short, oblique patellar tunnels: $n = 5$, 1.5%; dual suture anchors: $n = 8$, 2.7%; $p = 0.269$).

CONCLUSION: The use of two small (3.2 mm), short, oblique patellar tunnels with looped graft is a safe and efficacious means of achieving patellar-sided graft fixation during MPFL-R, while also conferring material cost savings in comparison to the use of two suture anchors.

Reoperation Rates of Isolated Meniscus Repair with and without Marrow Stimulation
Paper 167

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INTRODUCTION: The meniscus is a critical component of the knee, providing both chondral protection and stability. Meniscus injury can result in significant disability, and in some cases, limit its overall function within the knee. Successful meniscus repair provides consistent improvement in function while also restoring the chondral protective and stabilizing role within the joint. However, it remains unclear whether biologic augmentation via marrow venting for isolated meniscus repairs improves the success of meniscus repair. This study aims to identify whether bone marrow stimulation reduces meniscal repair re-tear rates.

METHODS: A retrospective review of all meniscus repairs was performed at the authors' institution between 2012-2022. Cases with root repairs or concurrent anterior cruciate ligament (ACL) reconstruction, cartilage restoration, osteotomy, or other ligament repair or reconstruction procedures were excluded. A total of 64 eligible isolated meniscus repair procedures with (53.1%, 34/64) and without (46.9%, 30/64) bone marrow venting were analyzed for subsequent meniscectomy (reoperation rate) or clinical evidence of re-tear. Subsequent reoperation (12.5%, 8/64) after meniscus repair or clinical evidence of re-tear (15.6%, 10/64), with MRI confirmation, was used to define overall meniscus repair failure (15.6%, 10/64). A Fisher's two-tailed exact test on SPSS statistical software and Chi-square test were used to determine significance set to $p<0.05$. Meniscus repairs were also classified as medial (32, 50%) or lateral (32, 50%) and by repair technique: all-inside (17, 26.6%), inside-out (40, 62.5%), or outside-in (7, 10.9%). Repairs with reoperations and/or re-tears were 70% (7/10) medial and 30% (3/10) lateral, with 40% (4/10) all-inside and 60% (6/10) inside-out repairs.

RESULTS: Isolated meniscus repairs with bone marrow venting had a reoperation rate of 11.8%; (4/34) and a clinical evidence re-tear rate of 11.8%; (4/34). Isolated meniscus repairs without bone marrow venting had a reoperation rate of 13.3%; (4/30) and a clinical evidence re-tear rate of 20%; (6/30). Comparative statistics demonstrated no significant difference between bone marrow venting and no bone marrow venting when considering subsequent reoperation (11.8% vs. 13.3%, $p>0.05$) or clinical evidence of re-tear (11.8% vs. 20%, $p=0.54$).

CONCLUSION: This study demonstrates no clinical difference for reoperation rates and clinical evidence of re-tears for meniscal repair with and without bone marrow ventilation. Further biologic techniques should be investigated to improve healing of isolated meniscus repairs in young athletes.

Reoperation Rates of Isolated Meniscus Repair with and without Marrow Stimulation
Paper 167

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RESULTS: Isolated meniscus repairs with bone marrow venting had a reoperation rate of 11.8%; (4/34) and a clinical evidence re-tear rate of 11.8%; (4/34). Isolated meniscus repairs without bone marrow venting had a reoperation rate of 13.3%; (4/30) and a clinical evidence re-tear rate of 20%; (6/30). Comparative statistics demonstrated no significant difference between bone marrow venting and no bone marrow venting when considering subsequent reoperation (11.8% vs. 13.3%, $p>0.05$) or clinical evidence of re-tear (11.8% vs. 20%, $p=0.54$).

CONCLUSION: This study demonstrates no clinical difference for reoperation rates and clinical evidence of re-tears for meniscal repair with and without bone marrow ventilation. Further biologic techniques should be investigated to improve healing of isolated meniscus repairs in young athletes.

Return to Sport in Young Contact Athletes Following Latarjet Procedure: Analysis of Factors with Prognostic Value

Paper 169

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BACKGROUND: Young athletes that play a contact sport are susceptible to recurrent episodes of anterior glenohumeral instability after a primary dislocation due to high-velocity impacts. Few studies have stratified outcomes by preoperative glenoid bone loss in contact sport athletes undergoing the Latarjet procedure.

METHODS: 67 consecutive contact athletes (72 shoulders), age ≤35, that underwent Latarjet procedure for recurrent shoulder instability between 1/1/2018 and 3/31/2022 were retrospectively identified. Patients were divided into two cohorts based on previously established studies: 13.5% glenoid bone loss and 20% glenoid bone loss. Demographic information, medical history, surgical history, number of dislocations prior to surgery, and post-operative complications up to 6 months after surgery were reviewed. Outcomes evaluated include return to sport (RTS), competition level, patient satisfaction, and patient-reported outcomes including ASES, DASH, and VAS scores.

RESULTS: 46 patients (51 shoulders, 70.8%) were interviewed with mean follow-up of 25.5 months, mean age at surgery was 19.7 years. 16/46 (35%) athletes competed at the collegiate level, and 24/46 (52%) at the high school level at the time of surgery. 35/46 patients (76%) returned to sport, of which 30/35 (65%) returned to playing at the same competition level. 3/46 (7%) reported recurrent instability. Patients undergoing primary Latarjet had significantly higher RTS rates than revision Latarjet patients (Primary: 79%; Revision: 44%; p-value=0.01). Primary Latarjet patients reported lower rates of RTS at the same level (Primary: 29%; Revision: 63%; p-value=0.03). Preoperative glenoid bone loss was not correlated with return to sport; in the RTS cohort, the mean bone loss was 4.6 ± 2.1mm (n=14) and 4.7 ± 2.0 in the “fail to RTS” cohort (n=28; p-value=0.90). ASES and DASH scores were not significantly correlated with glenoid bone loss. 2/72 (2.7%) required re-operation after Latarjet. Mean ASES score was 92.2, and mean DASH score was 5.6. 43/46 (93%) patients reported improvement in quality of life after undergoing Latarjet procedure for shoulder instability.

CONCLUSION: The Latarjet procedure allows young contact athletes with shoulder instability to return to sport at strong rates. Clinical outcomes were not adversely affected by % glenoid bone loss prior to surgery. Patients with primary Latarjet had significantly higher rates of RTS.

Suspensory Fixation for Bone Transfer Procedures in Shoulder Instability is Superior to Screws in an Angled Construct: A Biomechanical Analysis

Paper 170

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BACKGROUND: The Latarjet procedure is a common bony augmentation procedure for anterior shoulder instability. Historically, screw fixation is used to secure the coracoid graft to the anterior glenoid surface; however, malpositioning of the graft leads to oblique screw insertion that contributes to complications. Suture buttons are a newer fixation technique that have not been studied alongside standard screw fixation in the context of biomechanical models of angulated fixation. This study aims to compare the biomechanical strength of single and double, screw and suture button fixation at various levels of angulation.

METHODS: Testing was performed using polyurethane models from Sawbones. The graft piece was secured with screw fixation (Arthrex) or suspensory button (ABS Tightrope, Arthrex). Screws and suture buttons were fixed at 0, 15, and 30 degrees as either a single or double construct. An aluminum testing jig held the samples securely while a materials testing system applied loads. Five constructs were used for each condition and assessed load to failure testing.

RESULTS: For single fixation constructs, suspensory buttons were 60% stronger than screw at 0 degrees ($p<0.001$), and 52% stronger at 15 degrees ($p=0.004$); however, at 30 degrees, both were comparable ($p=0.180$). Interestingly, single suspensory button at 15 degrees was equivalent to single screw at 0 degrees ($p=0.310$). For double fixation, suspensory buttons (DT) were 32% stronger than screws (DS) at 0 degrees ($p<0.001$) and 35% stronger than screws at 15 degrees ($p<0.001$). Both double fixation methods were comparable at 30 degrees ($p=0.061$). DT at 15 degrees and 30 degrees were equivalent to DS at 0 ($p=0.280$) and 15 degrees ($p=0.772$), respectively.

CONCLUSION: These measurements indicate that the suspensory button has a significantly higher load to failure capacity over the screw fixation technique, perpendicularly and with up to 15 degrees of angulation. These analyses also indicate that the suspensory button fixation offers superior strength even when positioned more obliquely than the screw fixation. Therefore, suspensory button fixation may confer more strength while offering greater margin for error when positioning the graft.

Lower Socioeconomic Status is Associated with Recurrent Shoulder Instability Before Surgical Shoulder Stabilization

Paper 171

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OBJECTIVE: Growing evidence in orthopedic surgery has revealed that social determinants of health (SDOH) factors lead to differential access to care and ultimately health disparities after surgery. Previous literature for shoulder instability have shown that the number of previous dislocations before a stabilization procedure increases the risk of recurrent instability after the procedure. The purpose of this study was to investigate the impact of SDOH on the number of dislocation events before surgical intervention.

METHODS: Patients that underwent shoulder instability surgery at a single center between 1/1/2021 and 4/13/2023 were identified. Social Vulnerability Index (SVI) socioeconomic subscore and Area of Deprivation Index (ADI) were collected using online mapping data. Patient demographics, number of dislocations and time from first shoulder dislocation to orthopedic presentation and surgical intervention were collected. Univariate linear regression analysis was used to evaluate potential predictors of increasing time to presentation and increasing time to surgery. Univariate logistic regression analysis was performed of all potential predictors of having >1 dislocation event. A multivariate model was then created using all predictors with a $P<0.05$ in the univariate models.

RESULTS: There were 106 patients that underwent shoulder stabilization surgery for instability and had complete social determinant data. 54% (n=57) identified as White, 29% (n=31) as Black/African American, and 17% (n=18) as other. 38 (35.8%) patients suffered 1 dislocation (single dislocation cohort) before undergoing surgery and 68 (64.2%) experienced >1 dislocation (recurrent cohort) before surgery. No significant variables were associated with delay in time to orthopedic presentation or surgery. Univariate logistic regression showed that decreasing age (odds ratio [OR] 0.94 [95% confidence interval (CI) 0.89–0.99]; P=0.02), decreasing BMI (OR 0.90 [95% CI 0.83–0.98]; P=0.02), increasing SVI (OR 1.21 [95% CI 1.0 –1.38]; P=0.006), and increasing ADI (OR 6.04 [95% CI 2.05–17.8]; P=0.003) were associated with increased odds of having >1 instability event before surgical intervention. Multivariate logistic regression modeling revealed that decreasing BMI (OR 0.87 [95% CI 0.78–0.98]; P=0.02), and increasing ADI (3rd tercile compared to 1st tercile, OR 7.46 [95% CI 1.26–44.2]; P=0.02), were associated with increased odds of having >1 instability event before shoulder stabilization surgery.

CONCLUSION: Lower socioeconomic status, as measured by ADI, is an independent predictor of a higher likelihood of recurrent instability before surgery. Recognizing these relationships can motivate surgeons to create pathways to prevent these treatment disparities among shoulder instability patients.

Ultrasound and Outcomes of Rotator Cuff Repair with New Acellular Human Allograft at Six-Months Post-Surgery

Paper 172

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OBJECTIVE: Rotator cuff repairs (RCR) can be supplemented by an FDA-approved acellular human allograft that is devoid of all epidermal and dermal cells while still possessing the bioactive dermal matrix. Six-months post-surgery the allograft is completely absorbed by the body, ideally replaced by a repaired rotator cuff. The study aims to observe the patient-reported outcomes (PROs) and degree of tendon repair after RCR with this allograft, and, in the future, compare these to patients undergoing RCR without the allograft through a randomized controlled trial.

METHODS: 26 patients with a large rotator cuff tear undergoing RCR were enrolled in this prospective single-center study. PROs (via ASES, PROMIS upper extremity 7a, and SF-12 scores) were collected at baseline and 6 weeks, 3 months, 6 months post-surgery. Six months post-surgery, a board-certified and fellowship-trained physical medicine and rehabilitation physician performed an ultrasound of the operative shoulder of 10 patients within the initial cohort. Measurements of the supraspinatus and infraspinatus tendons included short and long axis (both vertical and horizontal measurements). The vertical measurement was the thickest point of the tendon between anchors and the horizontal measurement was the distance between anchors. Measurements were averaged for the cohort. Two sample independent t-tests were performed to determine presence of significant improvement from baseline to six-months post-surgery with the allograft.

RESULTS: 26 total patients had a rotator cuff repair with the acellular human allograft. Of the patients who underwent ultrasound, the average age was 57.5 ± 7.4 years and 30% were male. The cohort's average supraspinatus and infraspinatus tendon ultrasound measurements were calculated. 100% of patients had intact supraspinatus and infraspinatus tendons. 40% of patients had minimal distention of subacromial bursa and minimal tendinosis of the supraspinatus. The improvement between baseline and 6-month ASES, PROMIS upper extremity 7a, and SF-12 physical component score (PCS) values were significant; while SF-12 mental component score (MCS) improvement was not significant.

CONCLUSION: The ultrasound findings and the improvement in PROs compared to baseline are potential justification for the utility of this graft. This allograft will be further understood as more patients undergo ultrasound at six-month post-surgery. These ultrasound measurements can be compared to patients without rotator cuff pathology to elucidate the allograft's ability to restore a tear to its uninjured state. A future randomized controlled trial will compare the allograft to current standard of practice RCR techniques.

The Clinical Usefulness of the iHOT Outcome Survey in the Evaluation of Hip Pain
Paper 173

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BACKGROUND: The iHOT-33 (International Hip Outcome Tool) is a self-administered questionnaire that assesses postoperative hip functionality, return to activity, and likelihood of revision operations. The purpose of this study is to determine if iHOT scores are useful at the initial presentation of a painful hip.

METHODS: We retrospectively reviewed 661 patients who presented with hip pain at our institution. Inclusion criteria was age >13 and completed iHOT at initial presentation. We collected demographic information (age, sex, and BMI), presence or absence of intra-articular pain, iHOT score, laterality, and indications for hip preservation surgeries. We also collected prior surgical history and determined if hip preservation was not indicated due to degenerative changes. We then compared scores for the following groups – (1) Patients with extra-articular (false) vs. intra-articular (true) hip pain, (2) Patients indicated for hip preservation surgery vs. those not indicated for surgery, and (3) Primary vs. revision surgery. We assessed statistical significance using independent two-tailed T-tests or ANOVA with $p<0.05$.

RESULTS: There was no difference ($p=0.29$) between mean iHOT scores of patients with extra-articular (37.30 ± 21.10) compared to intra-articular pain (35.13 ± 19.01). Patients undergoing primary hip preservation surgery had significantly higher mean scores than those undergoing revision surgery (31.11 ± 15.96 vs. 36.45 ± 17.63).

Patients indicated for hip preservation surgery had a mean iHOT score of 35.63 ± 17.47, while those not indicated for surgery (non-degenerative reasons) had a mean iHOT score of 28.79 ± 19.23. Patients who were not indicated for surgery due to degenerative changes had a mean iHOT of 38.00 ± 21.25. Patients who were not surgical candidates due to non-degenerative reasons had significantly lower iHOT scores than both patients with degenerative changes ($p<0.001$) and patients indicated for surgery ($p=0.006$). There was no difference between patients indicated for surgery and those with degenerative changes (35.63 vs. 38, $p=0.315$).

CONCLUSION: The international hip outcome tool can be used clinically to assess patient reported joint pain and function. Further studies are warranted to determine its utility in identifying patients who may benefit from hip preservation surgery.

Prospective Assessment of Outcomes After Femoral Condyle Osteochondral Allograft Transplantation with Concurrent Meniscus Allograft Transplantation

Paper 174

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OBJECTIVE: To characterize outcomes for femoral condyle osteochondral allograft transplantation with concurrent meniscus allograft transplantation (OCAT+MAT) in the ipsilateral compartment of patients after evidence-based shifts in practice.

METHODS: With IRB approval and documented informed consent, patients who underwent primary OCAT+MAT from 2016-2020 and enrolled in a lifelong registry for prospective collection of outcomes after OCA transplantation were included. Patients who had minimum two-year follow-up data regarding complications, failures, adherence, and patient-reported outcome measures (PROMs) were analyzed. Patients who required OCAT and/or MAT revision or conversion to arthroplasty were defined as treatment failures.

RESULTS: 23 consecutive patients (mean age = 37.1 years; mean BMI = 28 kg/m^2 ;14 male) met inclusion criteria with a mean follow-up of 51 months (range, 24-86 months). Initial treatment success rate was 78% based on 5 initial treatment failures and overall success rate was 83% based on a successful revision OCAT. All failures occurred in the medial compartment. Older patient age (42.2 vs. 32.1 years, p=.046) and nonadherence with postoperative restriction and rehabilitation protocols (p=.033; OR=14) were significant risk factors for treatment failure. All measured PROMs achieved significant improvement (p<0.001) and minimum clinically important differences at a minimum of two years postoperatively.

CONCLUSION: Femoral condyle OCAT with concurrent MAT was associated with successful short- to mid-term outcomes in 83% of cases. These outcomes were associated with evidence-based shifts in practice that include the use of high-chondrocyte-viability OCAs, pre-implantation allograft bone irrigation and BMC saturation, double-bone-plug fixation and meniscotibial ligament reconstruction for fresh (viable) MAT, and patient management strategies that include assessment, education, and support for adherence to prescribed postoperative restriction and rehabilitation protocols. Older patients and those who are not able to be adherent to postoperative restriction and rehabilitation protocols had a significantly higher risk for treatment failure.

Effect of Posterior Tibial Slope on Outcomes Following Combined Anterior and Posterior Cruciate Ligament Reconstruction

Paper 175

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OBJECTIVE: Several recent reports in patients with isolated ACL reconstruction have demonstrated an increased risk of ACL graft failure and lower patient-reported outcomes (PRO) scores when increased PTS is present. However, there is a paucity of literature evaluating the effect of PTS on patients who undergo combined ACL and PCL reconstruction.

METHODS: All patients over age 18 who underwent combined ACL and PCL reconstruction between 2000 and 2020 at our institution were identified. Lysholm and IKDC scores, complications, reoperations, graft failures, revisions, and physical exam data were collected from our prospectively-gathered database. Linear regression models were created to analyze PTS in relation to PRO scores. Outcomes were compared for patients with a PTS above and below the mean for the total cohort.

RESULTS: 98 knees in 98 patients were included in the study with a mean clinical follow-up of 5.1 years (range 2-16). The mean age of the cohort was 33.2 years, 73 patients (74.5%) were male, and the mean BMI was 31 kg/m^2. The mean PTS was 8.7°. 6.1% of knees were KD II, 37.8% KD IIIM, 38.8% KD IIIL, and 17.3% KD IV. Linear regression analysis showed no significant correlation between PTS and IKDC or Lysholm scores. Patients with a PTS above the mean of 8.7° trended towards lower IKDC ($p = 0.08$) and Lysholm ($p = 0.06$) scores. Four patients experienced ACL graft failure and 5 patients experienced PCL graft failure. One patient each underwent revision ACL reconstruction and revision PCL reconstruction. There were no differences in graft failures, complications, reoperations, or revisions based on PTS. Patients with a positive Lachman had slightly higher PTS ($p = 0.15$).

CONCLUSIONS: In this series of ACL/PCL reconstructions (KD II, KDIII, KD IV) at mid-term follow-up, no differences in graft failures, complications, reoperations, or revisions based on PTS were identified. Patients with a positive Lachman were found to have a slightly higher PTS, although this did not reach statistical significance.

Defining Thresholds and Predictors for Achieving the Patient Acceptable Symptomatic State for Patient Reported Outcomes in Revision Hip Arthroscopy
Paper 176

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BACKGROUND: The patient acceptable symptomatic state (PASS) has been determined following primary hip arthroscopy; nonetheless, it still needs to be defined for revision hip arthroscopy.

PUPROSES: To define minimum two-year follow-up PASS thresholds for the modified Harris Hip Score (mHHS), Nonarthritic Hip Score (NAHS), Hip Outcome Score Sports Subscale (HOS-SSS), visual analog scale (VAS) for pain, and the International Hip Outcome Tool-12 (iHOT-12) following revision hip arthroscopy, and to identify predictors of achieving the PASS.

STUDY DESIGN: Case-control study
LEVEL OF EVIDENCE, 3.

METHODS: Data were prospectively collected and retrospectively reviewed for all patients who underwent revision hip arthroscopy between April 2017 and July 2020. Patients were included if they had baseline and minimum 2-year follow-up scores for the mHHS, NAHS, HOS-SSS, VAS for pain, and iHOT-12. PASS was calculated using the anchor-based method. Receiver operating characteristic analysis was used to determine the thresholds for the PASS. A multivariate logistic regression was used to identify predictors for achieving the PASS.

RESULTS: A total of 318 patients who underwent revision hip arthroscopy met the inclusion criteria. Of those patients, 292 (91.8%) had baseline and minimum two-year follow-up. Of this group, 68 patients (72.1% females and 27.9% males) did answer the PASS anchor question. The area under the curve (AUC) value for the PASS for mHHS, NAHS, HOS-SSS, VAS, and iHOT were 0.911, 0.888, 0.857, 0.903, and 0.870, respectively, indicating excellent discrimination. The PASS for the mHHS was 76 (sensitivity, 0.809; specificity, 0.905), for the NAHS was 86.3 (sensitivity, 0.660; specificity, 1), for the HOS-SSS was 64.3 (sensitivity, 0.745; specificity, 0.905), 3 (sensitivity, 0.830; specificity, 0.905) for the VAS, and 64.3 (sensitivity, 0.745; specificity, 0.905) for the iHOT-12. The BMI was identified as a significant predictor of achieving PASS for the NAHS (OR, 0.967; 95% CI, 0.940-0.996; P = 0.027), with 1.03 times higher odds of achieving it for patients with a lower BMI (≤ 25.4). There were no other significant predictors identified.

CONCLUSION: Following revision hip arthroscopy, the minimum 2-year follow-up PASS thresholds for the mHHS, the NAHS, the HOS-SSS, the VAS for pain, and the iHOT-12 were 76, 86.3, 64.3, 3, and 64.3, respectively. The odds ratio of achieving PASS for the NAHS were 1.03 times higher for patients with a BMI of ≤ 25.4. The odds ratio of achieving PASS for the mHHS was 2.62 times higher for patients who underwent an acetabuloplasty.

Outcomes of Repair of Lateral Meniscus Oblique Radial Tears (LMORTs)
Paper 177

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OBJECTIVE: Lateral meniscus oblique radial tears (LMORTs) of the posterior horn commonly occur in the setting of an acute anterior cruciate ligament (ACL) rupture. Despite publications pertaining to the prevalence, biomechanics, and surgical repair techniques of LMORTs, studies reporting outcomes following LMORT repair are lacking. The purpose of this study is to examine outcomes following the surgical repair of LMORTs.

METHODS: A retrospective chart review was conducted on 845 patients that underwent a meniscus repair at a single institution between 2017 and 2019. Operative reports, procedure notes, and operative images were manually reviewed to identify LMORTs. Chart review was then performed to identify the risk of subsequent knee surgery, meniscus repair failure, and postoperative complications. Postoperative complications were defined as re-injury, pain, stiffness, recurrent swelling, weakness, instability, or superficial wound infections.

RESULTS: In total, 24 patients (62.5% male) were identified who underwent repair of an LMORT during the study period. Mean age was 21.3 ± 4.7 years and the mean BMI was 27.0 ± 5.1 kg/m^2. Median follow-up was 12.4 months (15.9 IQR). There were no reported failures of the LMORT repair. Postoperative complications were reported in 7 patients (29.2%). Five patients (20.8%) underwent repeat arthroscopy of the index knee for stiffness, pain, and/or repeat injury. However, all repeat procedures demonstrated complete healing of the LMORT repair site.

CONCLUSION: Surgical repair of LMORT results in low failure risk and low complication rates. Further work is needed to evaluate the outcomes of meniscus repair vs. partial meniscectomy or observation of these lesions.

Outcomes of Repair of Radial Meniscus Tears
Paper 178

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OBJECTIVE: Radial meniscus tears involve the inner avascular zone of the meniscus and have traditionally been associated with a poor prognosis because they compromise hoop tension. Preserving the meniscus through repair as opposed to meniscectomy is a priority in managing meniscal tears as evidence indicates that meniscal repair attenuates the development and progression of knee osteoarthritis and other negative biomechanical outcomes. However, additional research describing the impact of radial meniscus tear repair is necessary to guide future treatment. The purpose of this study is to identify the postoperative complication and surgical revision rates in patients who underwent radial meniscus tear repair.

METHODS: To address this purpose, a retrospective study was performed on patients (n = 652) who underwent meniscus repair between 2011 and 2019. Through comprehensive review of provider notes and operative reports, patients were evaluated for demographic information, type of meniscus tear, concomitant ACL injury, postoperative complications, repeat surgeries, and failure at the repair site.

RESULTS: Thirty patients (age, 27.8 ± 12.9 years; BMI, 30.2 ± 5.97 kg/m^2) were identified who underwent a radial tear repair. Of these patients, 20 (66.7%) were male and 18 (60.0%) underwent concomitant ACL reconstruction. Complications including recurrent swelling, stiffness, pain, and repeat injuries were reported in 10 patients (33.3%). Five patients underwent repeat surgery (16.7%). Of these 5 patients, 4 had previously undergone meniscus repair and concomitant ACL reconstruction, had an intact radial repair at the time of second surgery, and underwent repeat surgery for a reason unrelated to the radial tear repair (e.g. cyclops lesion, synovectomy, new meniscus tear). One patient had a radial tear repair failure that required surgical revision (3.33%).

CONCLUSION: The results of this study provide evidence for the efficacy of radial meniscus tear repair. Future studies with increased sample size are needed to further examine radial tear repair outcomes with additional measures, including patient-reported outcome measures.

Patellar Distalization Following Tibial Tubercle Osteotomy for Recurrent Knee Dislocation: A Retrospective Case Series

Paper 179

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INTRODUCTION: Tibial tubercle osteotomy (TTO) is a well-documented treatment option for patellofemoral instability. The biomechanics of the patellofemoral joint can be altered to address patient-specific pathology by varying the angle of the TTO, distance translated, and moving the tubercle anterior, medial, or distal. TTO with anteromedialization (AMZ) is a commonly used technique, with the goal of offloading and realigning the patellofemoral joint while preserving a distal periosteal hinge. Therefore, the purpose of this investigation was to quantify the change in patellar height following TTO with AMZ.

METHODS: Patients that underwent TTO with AMZ for patellar instability from January 2018 through December 2022 were included. Patient demographics were collected. Preoperative and postoperative x-ray imaging was used to measure and calculate the Caton-Deschamps Index (CDI), Insall-Salvati Index (ISI), and Blackburne-Peel Index (BPI) for patellar height. Patella alta was defined as CDI > 1.3, ISI > 1.2, or BPI > 1.0. Recurrent instability, continued pain at final follow-up, and need for additional surgical intervention were also recorded. Continuous variables were presented with descriptive analyses while categorical variables were presented with frequencies and percentages. The association between continuous variables was evaluated by a paired t-test. Analyses were two-tailed and $p < 0.05$ was considered to be statistically significant.

RESULTS: There were 40 patients with a mean age of 23.59±7.52, mean BMI of 29.42±7.71, and 25 females (62.5%). Compared to preoperatively, patellar height decreased postoperatively across all measurements ($p<0.001$). The CDI decreased from 1.18±0.14 to 1.10±0.14, the ISI from 1.24±0.18 to 1.16±0.15, and the BPI from 0.99±0.15 to 0.89±0.15. As defined by the CDI, ISI, and BPI, there were 7, 24, and 17 patients, respectively, classified as having patella alta preoperatively. Postoperatively, there were 3 (42.9%), 8 (33.3%), and 9 (52.9%) patients with resolved patella alta, respectively. There were 2 patients that reported recurrent subjective instability (10.79±3.71 months postoperatively) and 3 patients that had continued pain at final follow-up (9.29±7.22 months). One patient experienced a postoperative patellar dislocation and ultimately underwent further operative intervention. Additionally, 4 patients required hardware removal and 2 patients required lysis of adhesions.

DISCUSSION: Patellar height is significantly decreased following TTO with AMZ. The most common complication postoperatively is the need for hardware removal. Further research is needed to investigate the impact of change in patellar height on clinical and patient reported outcomes.

Improving Non-Invasive Diagnosis and Grading of Cartilage Defects in the Knee - Accuracy of Ultra High Field 7-Tesla MRI as Compared with Arthroscopy

Paper 180

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OBJECTIVE: Standard clinical MRI is commonly performed on a 1.5T or 3T machine. Ultra-high field (UHF) 7-Tesla(7T) magnetic resonance imaging (MRI) is a new technology that offers 2.3x improved signal-to noise ratio (SNR) compared to 3T MRI and 2.8x SNR compared to 1.5T-MRI. The purpose of this investigation was to evaluate the accuracy of 7T-MRI for the detection and grading of cartilage lesions in the knee. We hypothesized that 7T images would offer better detection and more accurate grading of chondral lesions than standard clinical grade MRI scans.

METHODS: In this prospective, paired, blinded study, patients who had undergone a 1.5 or 3T standard of care (SOC) MRI and were scheduled for knee arthroscopy were enrolled (10/2019 to 08/2021) and a study intervention 7T-MRI was performed prior to surgery. Scans were reviewed by three independent radiologists (blinded to clinical and arthroscopic data). At the time of arthroscopy, each articular surface was graded by the operating surgeon according to a modified Outerbridge system. The surgeon was blinded to 7T images, although they had access to the SOC, which was necessary for patient care. Using arthroscopy as the gold standard, we calculated sensitivity and specificity of SOC and 7T. An Outerbridge grade of 0 was classified as negative, while a grade of 1-4 was classified as positive. A secondary analysis of sensitivity and specificity was performed on a per articular surface basis, with six articular surfaces per patient after correction. A Mann-Whitney U test was used to compare diagnostic scores and ratings between instruments (SOCvs.7T). Coefficients of variation between observers within each instrument were compared for each variable. Type-I error was set at alpha=0.05

RESULTS: A total of 100 patients (43±14yr, 54F/46F) were enrolled. 7T resulted in improved sharpness (defined by visibility of nerve fascicles) and shading (based on artifacts) compared to SOC ($p<0.001$ for both). There was improved contrast between fluid and cartilage with 7T (using confidence rating at axial mid-patella, $p=0.003$). 7T had a higher sensitivity in detecting cartilage lesions for five of the six articular surfaces when using the arthroscopic gold standard, but with lower specificity for all surfaces. Finally, there was improved inter-observer reliability in detecting and grading cartilage defects with 7T compared to SOC ($p<0.05$).

CONCLUSION: Based on our findings thus far, 7T-MRI appears to result in improved measurement ratings, sensitivity, and inter-observer reliability compared to SOC in detecting cartilage lesions in the knee.

Primary Repair of the Anterior Cruciate Ligament Utilizing Biologics
Paper 181

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OBJECTIVE: With better technique and fixation, the possibility of primary anterior cruciate (ACL) repair is being revisited. Long-term studies are revealing that anterior cruciate ligament reconstruction (ACLR) may result in a clinically stable knee but patients are still developing early arthritis. With more children and adolescents participating in sports at a younger age and suffering ACL injuries, this study was initiated to determine the success of primary ACL repair utilizing biologics.

METHODS: All patients who underwent primary ACL repair augmented with biologics were followed for a minimum of two years. Retear, mechanism and timing of retear, functional knee scores, return to sports, type of sport involvement, and Beighton scores were all evaluated. Knee scores were recorded at time of completion of physical therapy, one and two years postoperatively. Three patients had a subsequent surgery, which allowed a biopsy of the repaired ligament.

RESULTS: There were 101 patients, all Type I tears, who underwent primary ACL repair with biologic augmentation. Fifteen patients suffered a retear. Four of the patients with a retear returned to sports before completing physical therapy and without permission from the surgeon or therapist. The other 11 patients suffered a retear after completion of physical therapy and returning to sports. The average time to retear for those completing physical therapy was 2 years (Range: 9 months – 5 years). The average follow up time was 5 years (Range: 2 – 9 years). There was no significant decline in functional knee scores from the time of completion of physical therapy until last follow-up. All patients returned to their previous sport. Beighton score was higher, 7, in the retear group compared to 2 in the non-retear group. Soccer was the most common sport associated with a retear. All 3 patients who underwent biopsy of their repaired ACL demonstrated normal cellularity and vascularity with no evidence of cell death or fibrosis.

CONCLUSION: Primary ACL repair with biologic augmentation remains an option in the appropriately selected patient. Consider all patient factors, including sport played and ligamentous laxity, as well as tear type, when deciding on treatment options for an ACL injury. Appropriate rehabilitation is necessary before returning to sports.

Posterior Cruciate Ligament Reconstruction with Suture Tape Augmentation: A Scoping Review
Paper 182

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OBJECTIVE: Though there is substantial evidence supporting the use of suture tape (ST) augmentation (i.e. internal bracing) for repair or reconstruction of various ligaments, there are limited studies assessing its use for PCL reconstruction (PCLR). The purpose of this study is to conduct a scoping review assessing the evidence to support or oppose the use of PLCR with internal bracing in clinical practice.

METHODS: A systematic search of PubMed, Embase, and Web of Science was performed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and was completed April 2023 to identify studies related to ST augmentation of PCL grafts. Surgical technique, animal, biomechanical, and clinical studies were included for review. Any studies including revision surgery or PCL repairs were excluded.

RESULTS: A total of 380 articles were identified, 6 of which met inclusion criteria, including 1 technique, 3 biomechanical, and 2 clinical studies. Biomechanical studies showed a significant reduction in posterior tibial translation with addition of ST to PCLR in multiple studies ($p=0.047$, $p<0.05$). ST augmentation was found to decrease total elongation from 4.77 mm to 2.60 mm (45%; $p=0.077$) and from 6.06 mm to 2.50 mm (58%; $p=0.018$) in PCLR groups differing on tibial fixation of the graft complex. Decreased total graft elongation between 45%-58% and increased load to failure ($p<0.012$) was seen with ST augmentation compared to PCLR alone. Clinical studies showed no significant differences in patient reported outcome scores between PCLR+ST and PCLR alone, except for a decrease in Visual Analog Scale (VAS) pain scores at rest in the ST augmentation group in one study ($p=0.047$). There was no significant difference in complication rates between PCLR+ST augmentation and PCLR alone ($p=0.232$).

CONCLUSION: Biomechanical studies offer evidence supporting the use of ST augmentation with PCLR as it provided beneficial load-sharing properties of increased strength and decreased elongation of the graft complex compared to that of the graft alone. Clinical studies showed improved or equivalent outcomes to PCLR alone, along with no difference in complication rates. These findings are primarily limited by the low power of the results from clinical studies given the small sample sizes, thus emphasizing the need for continued research and characterization of PCLR with ST augmentation. Larger sample sizes and longitudinal data is necessary to fully understand the clinical benefit and long-term effects of ST augmentation of PCLR.

Intra-Articular Corticosteroid Injection of the Knee within One Month Prior to Meniscus Repair Increases the Risk of Repair Failure Requiring Meniscectomy

Paper 183

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OBJECTIVE: Preoperative symptomatic treatment for meniscal tears often includes corticosteroid injections (CSIs). While CSIs are generally regarded as safe, recent studies have suggested a reduction in the biomechanical strength of tendons and ligaments after CSI. The aim of this study was to determine whether preoperative CSIs of the knee and the timing of such injections before meniscus repair are associated with an increased risk of repair failure requiring subsequent meniscectomy.

METHODS: Meniscus tear patients aged 18-40 years old treated with arthroscopic meniscus repair were identified and filtered within the PearlDiver Database using the appropriate billing codes. Patients were separated into two groups based on whether they received a CSI in the knee in the six-month period preceding repair. Time of CSI was discretized as follows: no injection, <1 month, 1-3 months, and 3-6 months prior to repair. The primary outcome measured was meniscectomy within two years following repair. Pearson's chi-squared test and Student's t-test were used to compare categorical and continuous variables, respectively. To assess whether timing of CSI was independently associated with increased risk of follow-up meniscectomy, multivariable logistic regression was performed to control for age, gender, Elixhauser Comorbidity Index (ECI), diabetes, tobacco use, and knee osteoarthritis. A CSI timing of 3-6 months was chosen as the reference timing.

RESULTS: A total of 5,390 patients were included (201 preoperative CSI patients and 5,189 non-CSI patients). The CSI group had higher mean age and ECI, had a higher proportion of female patients, and had higher rates of diabetes, obesity, and osteoarthritis (ps<0.01). A CSI performed <1 month prior to repair was independently associated with a higher risk of follow-up meniscectomy at two years when compared to a CSI performed between 3-6 months (aOR 12.8, 95% CI 1.49-109.9, p = 0.020). Obesity, tobacco use, and osteoarthritis were also independently associated with a higher risk of follow-up meniscectomy, while increasing age was associated with decreased risk (ps<0.05).

CONCLUSION: This study suggests that patients treated with intraarticular CSIs of the knee <1 month prior to meniscus repair are at increased risk of repair failure requiring follow-up meniscectomy. While patients receiving intra-articular CSIs were also shown in this study to have increased risk factors, CSIs administered within the month preceding repair may increase the risk of repair failure independently of these risk factors.

Cortical Breach with Percutaneous Antegrade Anterior Column Screw Placement
Paper 184

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OBJECTIVE: Errant placement of percutaneous anterior column screws (PACS) risk injury to the bladder or neurovascular structures. Little data has been published examining the incidence and associated complications with PACS placement. The purpose of this study is to determine the incidence and location of cortical breach using Nakatani classification and associated complications. Our hypothesis was cortical breach is higher than expected but associated with minimal complications.

METHODS: A retrospective chart review at a single ACS Level 1 trauma center identified patients who underwent open reduction internal fixation or percutaneous fixation of acetabular fractures which included the use of PACS. Preoperative radiographs and computer tomography images were assessed to determine fracture classification. Postoperative computer tomography imaging was reviewed to assess location of cortical breach according to Nakatani classification and length of screw prominence. Screw sizes were recorded in addition to associated complications and revision procedures for prominent screws.

RESULTS: 29 out of 67 screws (43.4%) were found to breach cortex with a majority of screw breach within zones 2 and 3 (p=0.50). Anterior cortical breach was observed in 76% of aberrant screws. Screws with anterior cortical breach were most prominent in zone 2 compared to other zones (p=0.016). Average length of screw breach was 10.3 mm (range 2.34-20.11mm) with significant longer screw prominence in zone 2 compared to zone 1 and 3 (16.5mm vs. 6.95mm and 7.46mm, p=0.003). When comparing screw size, 5.5 mm screws were less likely to breach cortex vs. 6.5mm screws (p=0.006). 6.5mm and 5.5mm screws showed significantly more prominence compared to smaller diameter screws (p=0.007), however, there was no statistical difference in screw prominence between 5.5mm and 6.5mm screws (p=0.60). No complications were observed with one revision surgery for zone 2 anterior cortical breach.

CONCLUSION: Our results showed cortical breach was more common than expected. Screw breach was most common anteriorly and within zones 2 and 3 in close proximity to the neurovascular bundle. 5.5mm screws were less likely to breach and may allow for safe placement without sacrificing stability with smaller screws. Incidence of screw prominence was higher than expected highlighting the need for careful scrutiny of intraoperative fluoroscopy or use intraoperative computer tomography. Despite these findings, no associated complications were observed.

Neuraxial vs. General Anesthesia in Total Hip Arthroplasty for Femoral Neck Fracture: A Comparison of Postoperative Complications

Paper 185

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OBJECTIVE: Rates of complications with differing anesthetic choices has not been directly compared for patients undergoing total hip arthroplasty (THA) for femoral neck fractures. This study sought to directly compare neuraxial vs. general anesthetic use and compare postoperative outcomes for patients undergoing THA for a femoral neck fracture.

METHODS: From 2012-2021, the National Surgical Quality Improvement Project (NSQIP) database was used to identify all patients undergoing THA for a femoral neck fracture. Anesthetic type was identified and categorized as neuraxial (spinal, epidural) or general. Demographic and comorbid variables were collected. Days from admission to surgery was also identified. Postoperative complications were then compared between cohorts.

RESULTS: 8,130 patients were included in analysis. 26% received neuraxial anesthesia. There was no difference in age, gender, or smoking status between cohorts. Patients receiving neuraxial anesthesia had a slightly lower BMI, less comorbidities, and were more likely to undergo surgery on the day of admission or the day after admission, but these differences were small. On univariate analysis, patients receiving neuraxial anesthesia had a lower risk of readmission (5.8 vs. 7.1%), discharge to a non-home destination (44.5 vs. 55.8%), an extended postoperative LOS (36.8 vs. 42.3%), or any postoperative medical complication (6.4% vs. 8.4%). On multivariate analysis, there was a 1.30 ($p=.009$) times increased odds of any medical complication, a 1.22 ($p<0.001$) times increased odds of an extended postoperative LOS, and a 1.60 ($p<0.001$) times increased odds of a non-home discharge destination for those receiving general vs. neuraxial anesthesia. There was no difference in readmission rates (1.19, $p=0.100$).

CONCLUSION: This study finds that neuraxial anesthesia is associated with improved short-term outcomes compared to general anesthesia for patients receiving THA for a femoral neck fracture. The results of this study would suggest that in the appropriate patient, spinal anesthesia may be preferable to general anesthesia for THA done for femoral neck fractures.

Does Inpatient Mobilization Predict One-Year Mortality After Nonoperative Management of Lateral Compression Pelvic Fractures

Paper 186

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INTRODUCTION: Orthopedic injuries that affect mobility can have devastating consequences for the elderly population. Studies on hip fractures have shown significant morbidity and mortality related to immobilization and delay in treatment and early intervention to facilitate mobility has now become standard of care. Lateral compression (LC) type pelvic ring fractures are another common injury in the same patient population. The primary objective of this study is to determine whether inpatient mobilization is associated with inpatient and 1-year mortality and 90-day readmission in patients treated nonoperatively for a lateral compression pelvic ring fracture.

METHODS: The records of patients diagnosed with LC1 and LC2 pelvic injuries were retrospectively reviewed. Baseline demographic and comorbidity data was collected. Inpatient documentation was reviewed for pre-injury ambulatory status, assistive device use, weight bearing recommendations, and whether the patient was able to ambulate with physical therapy. Mortality and readmission data was also collected. Analysis will be performed to determine the association of inpatient mobilization in patients treated nonoperatively with 1-year mortality and 90 day readmission.

RESULTS: 101 subjects met inclusion criteria. 29.7% of patients that did not ambulate while inpatient died within 1 year of injury compared to 20.3% of patients that did ambulate and logistic regression demonstrated a negative correlation between ambulation as an inpatient and mortality at 1 year, though these did not reach statistical significance. Ambulators were significantly less likely to be readmitted within 90 days ($p = 0.003$).

CONCLUSION: This data suggests that inpatient mobilization in patients being treated nonoperatively for LC type pelvic ring fractures may be associated with improved outcomes, similar to what has been found in hip fracture patients.

The Impact of Smoking on Hospital Course and Postoperative Outcomes in Patients with Fracture-Related Infections

Paper 187

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OBJECTIVE: Smoking negatively impacts bone metabolism, which may lead to increased risk of fracture, fracture nonunion, and postoperative infection. While previous studies have investigated the impact of smoking on the incidence of fracture-related infection (FRI), there is a paucity of literature comparing the patient presentation, hospital course characteristics, or postoperative outcomes of smoking vs. non-smoking patients with FRI. We sought to understand how smoking status impacts patient presentation, treatment course, and fracture resolution in patients with FRI.

METHODS: We performed a single-institution retrospective analysis of all patients undergoing reoperation for FRI from January 2013 to April 2021. Data including patient demographics, original fracture characteristics, infection presentation, hospital course characteristics, and post-infection outcomes were collected via review of the electronic medical record. Patients were grouped based on current smoker vs. non-smoker status and their hospital course and postoperative outcomes were compared.

RESULTS: A total of 301 patients undergoing reoperation for FRI, comprised of 155 (51.5%) current smokers and 146 (48.5%) non-smokers, were included. Compared to non-smokers, current smokers were younger at time of fracture-related reoperation (41.6 years vs. 49.9 years; p = 0.001), had lower mean BMI (27.5 vs. 32.3; p = 0.001), had lower mean Charlson Comorbidity Index (0.99 vs. 1.92; p = 0.001), and were more likely male (69.0% vs. 56.2%; p = 0.021). Compared to non-smokers, current smokers had higher rates of fistulas or sinus tracts at the fracture site (38.6% vs. 22.8%; p = 0.003), a higher proportion of MRSA infections (29.7% vs. 18.5%; p = 0.024), and a lower proportion of Staph epidermidis infections (11.0% vs. 19.9%; p = 0.032) on presentation. There were no significant differences in union rates, amputation rates, systemic complications, or total number of operations between groups. Using binary logistic regression, smoking remained an independent risk factor for MRSA infection (OR 1.99; p = 0.024) and development of fistulas or sinus tracts at the fracture site (OR 2.24; p = 0.005).

CONCLUSION: Among patients who develop FRI, current smoking status is associated with a higher proportion of MRSA infections and higher incidence of fistulas or sinus tracts at the fracture site at the time of reoperation.

Comparison of Synthes Femoral Neck System and Traditional Three Cannulated Screws for the Treatment of Femoral Neck Fractures

Paper 188

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OBJECTIVE: Femoral neck fractures are a common injury worldwide and remain an economic burden on health care systems as well as being a debilitating injury to those who sustain them. Despite advances in their treatment, complications and reoperation rates remain high. New implants such as the Femoral Neck System (Depuy Synthes) (FNS) are growing in use with further literature needed to investigate their utility. We hypothesized that the FNS would have improved outcomes with lower rates of complications compared to three cannulated screws (3CS).

METHODS: A retrospective chart review was performed for all patients that had undergone femoral neck fixation with 3CS or FNS by a single surgeon over the course of six years. Baseline demographics, fracture characteristics, intraoperative information, and postoperative information were gathered and compared using various statistical methods.

RESULTS: 197 patients with femoral neck fractures who underwent fixation either with FNS (106) or 3CS (91) during that time period were included. Initial analysis showed those treated with 3CS had significantly higher rates of osteonecrosis ($p = 0.0453$) and lower operative times. There were 4 cases of osteonecrosis and 2 cases of nonunion in patients over 65 treated with 3CS with a reoperation rate of 11%. In patients over 65 with nondisplaced femoral neck fractures treated with the FNS there were no cases of nonunion or osteonecrosis. The reoperation rate in this cohort was 2%. For nondisplaced femoral neck fractures in patients over 65, 3CS had statistically significant shorter mean operation time (30 minutes vs. 35 minutes; $p = 0.0173$) and higher ASA grade ($p = 0.043$).

CONCLUSION: Fixation of femoral neck fractures remains a challenging problem due to their increasing prevalence and high rates of complications and reoperation. Our data suggests that complications including osteonecrosis, malunion, and reoperation rates may be lower with FNS compared to 3CS. FNS may be considered as an alternative to 3CS in treating femoral neck fractures in individuals of all ages.

Evaluating the Quality of Hip Fracture Education on Short-Form Video Platform YouTube Shorts
Paper 189

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OBJECTIVES: The internet has become an increasingly common place for patients to gain medical information. The YouTube platform has been one of the most popular platforms for such information. However, the platform is unregulated, lacking in quality and content delivery. YouTube recently expanded into the short form video platform called YouTube Shorts (YTS). This study aims to evaluate the quality of hip fracture education on the YTS platform.

METHODS: The top 75 videos on YTS with the search query '#hipfracture + shorts' were aquired. Shorts without measurable content, duplicate shorts, and shorts containing irrelevant material were excluded. Included shorts were then scored using previously verified scoring systems: GQS Score, PEMAT Understandability %, PEMAT Actionability %, and JAMA Score. Various continuous variables were also acquired: Views, Date Posted, Likes, Comments, Followers, Video Engagement Rate (VER). Categorical variables were acquired: Advertisement Status, Verification, Creator Type. Channel authorship was identified based on American Board of Orthopedic Surgery (ABOS) certification.

Shorts were grouped into two comparison groups, ABOS channels vs. channels of any other education level. All variables were analyzed utilizing a one-way ANOVA for significance.

RESULTS: After applying our exclusion criteria, 20 of the top 75 videos remained. ABOS channels made up 11.1% of all channels. Out of the 20 videos, 2 were posted by ABOS channels. Videos posted ranged in date from June 2021 to February 2023. No channels were verified or had advertisements on their YTS.

ABOS channels had an average of 70 likes, 2 comments, 693,500 followers, 0.0177% engagement rate, GQS score of 4.5, JAMA score of 3, PEMATUnderstandability 100%, and PEMATActionability 33.4%. Channels of any other education level, average of 38 likes, 1 comment, 19,050 followers, 2.16% engagement rate, GQS score of 3.72, JAMA score of 3.33, PEMATUnderstandability 96.9%, and PEMATActionability 35.2%. Data for followers and engagement rate were the only variables with significance ($p < 0.05$). ABOS channels had higher follower counts, while other channels had a higher engagement rate.

CONCLUSION: Orthopedic surgeons excel at gathering a large audience on the YouTube Shorts platform. While there is room for improvement in engagement and call to action in their videos. To be on the forefront of hip fracture education on YTS and other online platforms, orthopedic surgeons need to leverage their popularity to deliver high quality education that is easily comprehensible and encourages tangible actions on the patient's part.

Work-Related Musculoskeletal Disorders and Surgical Ergonomics in Orthopedic Surgery
Paper 190

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OBJECTIVE: The Centers for Disease Control defines work-related musculoskeletal disorders (WMSDs) as disorders manifesting in the nerves, muscles, tendons, joints, spinal discs, and cartilage caused/exacerbated by the work environment or nature of the work. The objective of our systematic review was: (1) to estimate the career prevalence of WMSDs in orthopedic surgeons, (2) to estimate the treatment rates associated with WMSDs in orthopedic surgeons, (3) to estimate the disability burden of WMSDs in orthopedic surgeons, and (4) to evaluate the scope of orthopedic surgical ergonomic assessment and interventions.

METHODS: A systematic review of the English-language literature from PubMed, MEDLINE, Embase, and Scopus was performed in December 2022 reported in accordance with the PRISMA guidelines. Studies that assessed WMSDs or surgical ergonomics in orthopedic surgery were included. Studies were excluded if study populations included non-orthopedic surgeons. The literature search yielded 5,603 abstracts, and 24 survey-based studies with 4,876 orthopedic surgeons (mean age, 47.9 years; 81.5% male) were included for meta-analysis of WMSDs, and 18 articles were included for descriptive synthesis of ergonomic assessment. Outcomes were pooled by random-effects meta-analytic models. Heterogeneity was considerable for all crude analyses (mean I2 = 91.3%).

RESULTS: The career prevalence of WMSDs in orthopedic surgeons was 73.5% (95% CI, 65.7%-81.4%). By anatomical location, WMSDs were most commonly experienced in the head/neck (36.4% [1,475 of 3,960 surgeons], 95% CI: 25.9%-46.8%), back (35.7% [1,334 of 3,971 surgeons], 95% CI: 28.0%-43.5%), and forearm/wrist/hand (29.6% [955 of 3,273 surgeons], 95% CI: 25.0%-34.3%). Fifteen studies investigated the disability burden or treatment of WMSDs. Of orthopedic surgeons reporting WMSDs, 22.8% (358 of 1,489 surgeons, 95% CI: 17.3%-28.3%) required a leave of absence, practice restriction or modification, or early retirement, and 53.5% (1,087 of 1,883 surgeons, 95% CI: 42.6%-64.3%) received some form of treatment. Eighteen articles included for descriptive synthesis of orthopedic surgical ergonomics demonstrated significant biomechanical, cardiovascular, neuromuscular, and metabolic stress during procedures. Interventions to improve orthopedic surgical ergonomics are limited, but include robotic-assistance, proper visualization aids, appropriate use of power tools, and safely minimizing lead apron use.

CONCLUSION: Most (73.5%) orthopedic surgeons experience WMSDs, many (53.5%) of which go untreated and result in significant disability (22.8%). The orthopedic surgical ergonomics literature is limited. Future strategies to improve orthopedic surgical ergonomics include prospectively utilizing wearable devices for physiologic monitoring, motion capture with biomechanical modeling, workplace culture improvements, institutional wellness programs, and evidenced based ergonomics training.

A Novel Cannulated Screw and Locking Neutralization Plate Construct for Transverse Patella Fracture Fixation

Paper 191

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OBJECTIVE: Transverse patella fractures are the most common cause of patella fracture and require fixation when there is disruption of the extensor mechanism. Patients often report significant decreased ROM due to the time spent immobilized following surgery. In this study we seek to determine if the use of a variable angle locking plate can decrease gap formation at the fracture site after fixation through a cadaveric biomechanical model.

METHODS: 22 human cadaveric patellas were acquired and fractured transversely. 11 were repaired using a traditional TBW and 11 were fixed using a variable angle locking plate with cannulated screws construct. A biomechanical testing apparatus was constructed to flex and extend the patellas. A longitudinal force in line with the theoretical femur was applied cyclically to replicate extension with 10N of downward force acting as a counterforce to return the specimen to flexion. Specimens were cycled through 500 flexion/extension motions while spatial data was collected. After all cycling was complete, specimens were clamped above and below the patella and loaded until failure.

RESULTS: Two patellas (1 plate and 1 TBW) underwent failure below 400 N and were excluded from the study. At the experimental end point of 500 cycles, patellas fixed via plates had an average fracture gap of 0.09 ± .12mm compared to 0.77 ± .54mm in the cannulated screw and wire group (p=.004). The mean difference in fracture gap at 0 cycles vs 500 was 0.127mm and 0.956mm for plate fixation and TBW respectively. The average load to failure for the plate group was 1267.20N ± 393.30 compared to 820N ± 233 with TBW (p = 0.007).

CONCLUSION: Fixation of a transverse fracture with a variable angle locking plate resulted in a smaller overall gap and less increase in gap size during repeated flexion and extension. This suggests that plate fixation may lead to a more reliable and mechanically strong construct. Therefore, a plate fixation construct may decrease the rate of nonunion by maintaining a more anatomical alignment while simultaneously allowing for earlier mobilization and activity with less concern for construct failure.

Short-Term Morbidity and Mortality After Distal Femur Open Reduction Internal Fixation in the Geriatric Population

Paper 192

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OBJECTIVE: Distal femur fractures remain a significant cause of morbidity and mortality for elderly patients. There is a lack of large population studies investigating short-term outcomes after distal femur open reduction internal fixation (ORIF) in elderly patients. The purpose of this study is to assess the incidence of and risk factors for various short-term outcomes after distal femur ORIF in the geriatric population.

METHODS: The American College of Surgeons' NSQIP database was utilized to identify all primary distal femur ORIF cases in patients 60+ years-old between January 1, 2015 and December 31, 2020 using Current Procedural Terminology (CPT) codes 27511, 27513, 27514. Demographic, medical, and surgical variables were extracted for all patients. Propensity score matching was used to match cases in the two age groups based on various demographic and medical comorbidity variables. Several 30-day outcome measures were compared between the 60-79 year-old and 80+ year-old groups both before and after matching. Subsequent multivariate logistic regression was employed to identify independent risk factors for 30-day outcome measures in the matched cohort.

RESULTS: 2,913 patients were included in the final cohort – 1,711 patients in the 60-79 year-old group and 1,202 patients in the 80+ year-old group. The majority of patients were female (n=2,385; 81.9%). Prior to matching, the older group had a higher incidence of 30-day mortality (6.2% vs. 1.9%), readmission (9.7% vs. 7.3%, p=0.024), and non-home discharge (89.5% vs. 74.3%, p<0.001). Additionally, the older group had a higher rate of blood loss requiring transfusion (42.3% vs. 30.9%, p<0.001), and medical complications (16.4% vs. 10.4%, p<0.001), including myocardial infarction (2.7% vs. 0.7%, p<0.001), pneumonia (4.6% vs. 2.7%, p=0.008), urinary tract infection (6.1% vs. 4.1%, p=0.0188). After matching, the older group consistently had a higher incidence of mortality, non-home-discharge, blood loss requiring transfusion, and myocardial infarction. Various independent risk factors were identified for 30-day morbidity and mortality, including ASA classification, BMI status, operative duration, and certain medical comorbidities.

CONCLUSION: Geriatric patients undergoing distal femur ORIF are at significant risk for 30-day morbidity and mortality. After matching, octogenarians specifically are at increased risk for mortality, non-home discharge, and medical complications compared to patients aged 60-79 years old. Multiple factors – such as BMI status, ASA classification, operative time, and certain medical comorbidities – are independently associated with poor 30-day outcomes.

Virtual Reality Improves Procedural Confidence of Tibial Intramedullary Nail Insertion
Paper 193

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OBJECTIVE: Surgeon self-confidence is a valued trait that may be built over time. While newer technologies are being explored and utilized to improve procedural skills, training competent and confident surgeons remains difficult. In this study, we sought to understand how a trainees' confidence and short-term retention of a procedure can be improved through virtual reality (VR) training.

METHODS: Seventeen first year medical students and eight second year medical students were recruited to participate in the randomized control trial with intention-to-treat analysis. The 25 total participants were randomized into three comparison groups: a technique guide group (n=8), a VR group (n=8), and a combined VR and technique guide group (n=9). A commercially available VR headset was loaded with a procedural simulation based on a tibial nail system. All three groups were given a preparation period of 10-14 days. Prior to the study start, all participants took a baseline survey to establish their confidence of tibial nail insertion steps. Following this prep period, participants completed a confidence survey and procedure quiz. Retention was assessed three weeks after training.

RESULTS: There was no significant difference in baseline confidence, comprehension of procedural steps, or total preparation time in any group ($p>0.05$). After the preparation period, procedural knowledge increased significantly in the VR alone and combined group ($p<0.001$ and $p<0.001$, respectively). Self-reported knowledge of steps (out of 10) was higher in the VR group and combined group when compared to the technique guide group ($p=0.012$, $p=0.01$, respectively). Confidence in performing the procedure with the compact bone model was significantly increased in the VR and combined group compared to the technique guide ($p=0.019$, $p=0.006$). Post-preparation short-term retention of procedural steps was also significantly increased in the VR and combined group compared to the traditional technique guide ($p=0.011$, $p=0.009$).

CONCLUSION: Procedural confidence was significantly higher in trainees that utilized integrated VR simulation for preparation for a common orthopedic procedure, the insertion of an IM tibial nail. Ultimately, VR simulation would likely benefit orthopedic surgery trainees on various procedures and should be incorporated as an adjunct into more training programs

Reoperation in Extremity and Pelvic Fractures: An Analysis of Risk Factors and Hemoglobin A1c
Paper 194

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OBJECTIVE: Diabetes mellitus is a complex metabolic disorder that is considered an indicator for prognosis of wound healing, fracture healing, and operative complications. The purpose of this study was to evaluate the impact of hemoglobin A1c on risk for reoperation, nonunion, and deep infection.

METHODS: A retrospective chart review of all orthopedic trauma patients presenting to a level 1 tertiary academic medical center from January 2015 through December 2020 were screened for inclusion. Patients were included if they had an upper extremity including humerus, radius, or ulna fracture, pelvis or acetabulum fracture, or lower extremity fracture including femur, tibia, fibula fractures. Complete chart review and patient included if they had a HgbA1c within 60 days of index procedure. Chart review completed on included patients to gather demographic information, clinical history including type of fracture, polytrauma status, past medical history including thyroid disorders, diabetes mellitus, smoking status, and traumatic injury data. Superficial infection was defined as infection superficial to the fascia and a deep infection was defined as an infection deep to the fascia, including osteomyelitis. An unplanned reoperation was defined as any return to the operating room that was not anticipated as part of index fixation or deviated from routine postoperative course. A planned reoperation included staged soft tissue or osseous reconstruction or bone grafting, initial external fixation management, or anticipated need for reoperation. Polytrauma was defined as an ISS > 15.

RESULTS: We reviewed the medical records of 1,394 orthopedic trauma patients with a lab drawn HgA1c level- including 842 diabetic patients and 552 non-diabetic patients, to evaluate the correlation of HgA1c level with unplanned reoperation, nonunion, and deep infection. Patients with a HgA1c between 8.5-10.5 are at an increased risk of unplanned reoperation compared to those with HgA1c < 6.5 (OR 2.14, 95% CI 1.075-4.260, p=0.030); a regression analysis failed to find a significant different between HgA1c level linearly and outcomes. Polytraumatized patients (ISS > 15) had a significantly higher rate of reoperation and deep infection compared to non-polytrauma patients (ISS < 16) with a significant regression analysis between ISS and unplanned reoperation and deep infection.

CONCLUSION: This large retrospective review including 842 diabetic trauma patients did not find a significant linear association between diabetes and risk for unplanned reoperation, nonunion, and deep infection. Additionally, there was no significant regression analysis between continuous HgA1c and unplanned reoperation, nonunion, and deep infection. Interestingly, there was a significant association between ISS and reoperation, especially in polytrauma patients (ISS > 15). When controlling for polytrauma status and other variables, patients with a HgA1c between 8.5 and 10.4 had higher odds of an unplanned reoperation. This was not seen in risk of nonunion or deep infection.

Ballistic Injuries of the Humerus: A Matched Cohort Analysis
Paper 195

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INTRODUCTION: Ballistic fractures of the humerus secondary to gunshot wounds are increasingly common injuries that pose challenges for orthopedic surgeons. The primary purpose of this study was to examine the rates of neurovascular injury, compartment syndrome, and infection of ballistic humerus fractures relative to blunt, non-penetrating fractures.

METHODS: A consecutive cohort of 135 patients with ballistic humerus fractures and 167 patients with blunt humerus fractures treated at a level 1 trauma center were identified. Review of patient medical records and radiographic studies was performed to obtain demographic information, injury mechanism, fracture location, choice of treatment, and complications. Statistical analysis was performed using independent sample t-test, Chi-square tests, and Odds Ratios ($p<0.05$ significance).

RESULTS: Compared with blunt fractures, patients in the ballistic fracture cohort were younger, male, African American, test positive for illicit drug use, and sustain proximal fractures. Ballistic fractures had significantly lower ISS and NISS scores. Ballistic fractures were three times as likely to present with neurovascular injury than blunt fractures (OR: 2.927, $p<0.001$). The overall rate of spontaneous recovery of significant motor function for ballistic fractures with neurologic injury was 55%. There were no statistically significant differences in rates of vascular injury, compartment syndrome, infection, nonunion, or the need for soft tissue reconstruction.

DISCUSSION & CONCLUSION: Compared to blunt humeral fractures, ballistic fractures have a significantly higher rate of neurologic injury, but no increased risk for compartment syndrome or infection. Surgical treatment of ballistic humeral injuries was not associated with increased neurological recovery compared to nonoperatively managed fractures.

Feasibility of a Novel Fluoroscopic Trainer for the Orthopedic Trainee
Paper 196

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OBJECTIVE: We sought to create a novel method of teaching orthopedic trainees to efficiently obtain intraoperative radiographs using non-fluoroscopic digital cameras. Specifically, teaching them to make minor, uniplanar, adjustments while limiting the number of fluoroscopy images obtained during placement of a guidewire "start-point," for intramedullary nailing.

METHODS: Prospective cohort study including medical students from two academic centers. Two non-fluoroscopic digital cameras simulating orthogonal fluoroscopic images were utilized. A sponge was used to simulate soft tissue resistance while navigating a guidewire to the desired starting point. Three cannulated parallel cylinders in a triangular configuration are used to simulate our "start point." Students completed four phases; Trial and Error, Teaching, Testing, and Retention. The protocol was completed at a single academic teaching hospital at the primary authors institution. We utilized medical students from two GME accredited medical schools to complete the protocol. Students were selected from orthopedic surgery interest groups at their respective institutions and participation was voluntary.

RESULTS: Twenty-one medical students completed the protocol. The number of seconds to achieve each target along with the number of pictures to achieve each target were recorded and averaged. The paired t-test was used to compare the difference between phases. There is a statistically significant difference in the mean number of seconds and number of images required to achieve each target between phase 1 (baseline) and phase 3 (testing) ($p<0.0001$). These differences were retained during phase 4.

CONCLUSION: We were able to demonstrate a statistically significant decrease in the number of images and time to obtain the correct "start point." This could theoretically decrease operative time and morbidity while teaching students in a low-stress training environment without exposure to radiation.

Investigating Treatment Modalities and Outcomes of Bilateral Knee Extensor Mechanism Ruptures: A Retrospective Cohort Study

Paper 197

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OBJECTIVE: Bilateral knee extensor mechanism ruptures are rare injuries that can involve the quadriceps (QT) or patellar tendons (PT). They are commonly associated with comorbidities like systemic steroid use, chronic renal failure, and inflammatory diseases. This study aims to provide comprehensive data on a large cohort of patients with bilateral QT and PT ruptures and compare clinical and patient-reported outcome measures.

METHODS: A retrospective cohort study was conducted investigating adults treated for QT and PT ruptures in a high-volume level 1 trauma center. Demographic information, medical comorbidities, surgical interventions, and clinical outcomes like re-ruptures and revisions were collected from available chart data. Furthermore, patients were contacted to gather subjective scores including KOOS and VAS. Descriptive statistics, Student's t-test, and Kaplan-Meier survival analyses were performed to compare the two cohorts.

RESULTS: A total of 67 patients with bilateral knee extensor mechanism ruptures were included in the study. The QT cohort (N=49; mean age = 62.8 ± 1.9 years; BMI = 34.8 ± 1.2, follow-up = 18%) was treated with trans-osseous tunnels 92% of the time, with the remainder consisting of bone anchors and end-to-end repair. At an average follow-up of 6.0 ± 0.9 years, 10 patients (20.4%) experienced a re-rupture requiring suture repair (67%) or tendon grafts (33%). The PT group (N=18; mean age = 53.3 ± 3.3 years; BMI = 34.5 ± 1.3, follow-up = 56%) also largely received tunnel fixation (90.9%) and had a 23.3% re-rupture rate at 8.2 ± 2.6 years follow-up. Subjective scores were generally positive, and there was no significant difference between the two cohorts regarding KOOS, VAS, medical comorbidities, or survival. A sub-group analysis of re-rupture patients showed a significantly decreased KOOS composite score in QT patients and a reduced VAS score in PT patients compared to their non-revision counterparts.

CONCLUSION: Overall, this novel study shows adults with bilateral QT and PT ruptures tend to have great results with similar post-surgical outcomes. Further innovation in areas such as re-rupture prevention would greatly improve patients' quality of life and level of activity.

Outcomes Following Distal Humerus Fractures in Elderly Individuals: Should We Fix Them All?
Paper 198

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INTRODUCTION: Distal humerus fractures are challenging periarticular fractures, particularly those in the elderly population. Controversy exists regarding the optimal operative treatment in patients over the age of 65. The purpose of this study was to compare clinical outcomes and risk factors associated with complications and reoperation of distal humerus fractures in patients over the age of 65 and under 65. We hypothesize that age is not a significant predictor for postoperative complications and functional outcomes following ORIF of distal humerus fractures.

METHODS: A prospectively maintained database from a Level-1 trauma center focused on distal humerus fractures was retrospectively reviewed for all patients who underwent ORIF between 2015 to 2022. Patients included sustained a distal humerus fracture and underwent ORIF. “Elderly” was defined as age 65 or older. Electronic medical records were reviewed for patient demographic, injury, and treatment-related characteristics. Complications and reoperations were documented. The Disabilities of Arm, Shoulder, and Hand (DASH) outcome score was utilized as the patient reported outcomes measure.

RESULTS: A total of 215 patients were included. Ninety-three (43.2%) of patients were greater than 65 years of age (mean age 74.6 ± 6.1 years). When comparing demographic characteristics between those younger than 65 and those older, there were more smokers under the age of 65 ($p<0.001$). There were no differences in postoperative infection, wound dehiscence, hardware malfunction, painful hardware, hardware removal, or heterotopic ossification (HO) formation ($p<0.05$). There were no differences in rates of any complication or any secondary operation between the two age groups ($p<0.05$). When assessing for predictors of postoperative complications or re-operations following ORIF while age was not found to be a predictor, heart disease and diabetes were independent risk factors for postoperative complications ($p=0.042$; $p=0.010$). Diabetes was an independent risk factor for secondary reoperation ($p=0.036$). Female sex and kidney disease were predictors of worse patient reported functional outcome ($p=0.003$, $p=0.016$); while age was not a predictor.

DISCUSSION & CONCLUSION: Age is not a predictor of outcomes following ORIF for distal humerus fracture with respect to overall complications, reoperations, and functional outcomes. There were no differences in postoperative complications between elderly patients and those less than 65 years of age. These findings support the assertion of performing open reduction and internal fixation of distal humerus fractures in the elderly population with no greater risk of postoperative complications based on patient age.

The Impact of Nutrition Supplementation on Clinical Outcomes Among Orthopedic Trauma Patients: A Systematic Review and Meta-Analysis

Paper 199

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OBJECTIVE: Orthopedic trauma patients have high rates of preoperative malnutrition. This is exacerbated by acute stress of trauma and surgery, contributing to overall complication rates of roughly 20%. Although the AAOS recommends nutrition screening and treatment when appropriate, currently there are no recommendations for any specific type of screening or intervention. The purpose of the current study is to conduct a systematic review and meta-analysis of the literature regarding efficacy of protein or amino acid nutritional supplementation in orthopedic trauma patients undergoing operative fracture fixation.

METHODS: A systematic review was performed following PRISMA guidelines using the PubMed, CINAHL, Embase, and Cochrane CENTRAL databases. Criteria for considered studies were adapted from the American Academy of Orthopaedic Surgeons Clinical Practice Guideline Methodology v3.0. Inclusion criteria were Level I RCTs assessing the effects of oral amino acid supplementation on clinical outcomes in adult trauma patients undergoing operative fixation for their injuries. Outcomes included hospital length of stay, discharge disposition, unplanned readmission, wound healing complications, medical complications, refracture, or mortality. Titles, abstracts, and full-text articles were reviewed independently by two investigators. Disagreement was resolved with a third reviewer via consensus.

RESULTS: The updated search was completed in June 2021. Ultimately 11 studies published from 1998-2018 met the inclusion criteria. There were 1,170 patients included from the combined studies with an average hospital LOS of 15.8 days (13.26-18.34) reported from 11 studies. Meta-analysis found no difference in LOS between supplement and control patients (SMD 0.0076 95% CI 0.199; 0.214, p =0.9423) or Mortality (OR=0.95 (95%CI=0.56-1.61), p=0.8353). There was a reduced rate of medical complications among supplement groups seen in outcomes of combined studies (IRR:0.63 (0.42-0.94), p=0.0253), calculated using Poisson regression. One study was excluded from the assessment of medical complications due to lack of reported follow-up for complications. Heterogeneity was common among definitions of medical, surgical, and infectious complications.

CONCLUSION: Results of our study demonstrated reduced rates of medical complications among amino acid supplement intervention groups. However, the current evidence on the impact of amino acid supplementation on other postoperative clinical outcomes is limited. Amino acid supplementation is a low cost intervention which can limit adverse outcomes after orthopedic trauma. Future randomized controlled studies are needed to clarify its effects on clinical outcomes and identify patients who would benefit most.

LEVEL OF EVIDENCE: I – Systematic Review of Level I Studies

Increased Utilization of Total Joint Arthroplasty for the Treatment of Distal Femur Fractures
Paper 200

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BACKGROUND: Primary and revision arthroplasty have emerged as an alternative option for the treatment of distal femur fractures. The purpose of this study is to identify any trends in the management of distal femoral fractures among American Board of Orthopaedic Surgeons (ABOS) Part II candidates with regards to the utilization of open reduction internal fixation (ORIF) vs. total joint arthroplasty, and to investigate the complications associated with these two treatment strategies.

METHODS: This is a retrospective cohort study of The American Board of Orthopaedic Surgery (ABOS) Part II Examination Database which was queried between the years 2003 and 2021. Inclusion criteria were adult patients who sustained a distal femur fracture and underwent either ORIF or arthroplasty.

RESULTS: The proportion of distal femur fractures treated with arthroplasty compared to ORIF increased throughout the study period by 0.28% per year ($p < .001$) overall and 1.2% per year ($p < 0.001$) among arthroplasty-trained surgeons. Medical and surgical complications occurred at a significantly higher rate in patients after arthroplasty as compared to ORIF (31.5% vs. 20.9%, $p < .001$; 29.0% vs. 17.5%, $p < .001$, respectively). Reoperation and readmission were also higher following arthroplasty (10.8% vs. 6.2%, $p = .002$; and 16.5% vs. 9.3%, $p < .001$, respectively).

CONCLUSION: Distal femur fractures are occurring more commonly and more of them are being treated with arthroplasty. In the hands of surgeons who are early in their career, this treatment option may be associated with increased rates of revision, reoperation, and readmission.

Preliminary Outcomes of the ''Femoral Neck System'': Equivalent Outcomes at Two Years to a Matched Cohort of Cannulated Screws

Paper 201

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PURPOSE: Implant choice for fixation of femoral neck fractures remains controversial. The “Femoral Neck System” (FNS) provides the angular stability of a sliding hip screw with added rotational stability via an “anti-rotation screw.” This series is a follow-up to a previously presented cohort of patients reported with one year follow-up.

METHODS: From June 2019 to February 2021, 30 patients with femoral neck fractures were treated with the FNS. These cases were retrospectively reviewed for preoperative comorbidities, perioperative complications, and post-discharge complications/outcomes at one month postoperatively. These patients were randomly matched 2:1 by age, sex, and BMI to patients treated with 3 cannulated screws from 2000-2017.

RESULTS: Of these 30 patients, 20 (67%) were female with a mean age of 67 years and a mean BMI of 25 kg/m^2. Most (90%, n= 27) fractures were nondisplaced or valgus impacted and 10% (n=3) were displaced fractures in patients under the age of 50. The mean length of stay was 4 nights with a mean decrease in hemoglobin of 1.4 g/dl and a postoperative transfusion rate of 13%. Complications included avascular necrosis (n=3), nonunion (n=1), osteoarthritis (n=1), subtrochanteric femur fracture (n=1), and a delayed deep infection from hematogenous spread in an immunosuppressed patient. There were no wound healing issues or prominent implants. Five patients (16.7%) underwent repeat surgery. There was one revision bone grafting of the femoral neck, two conversions to total hip arthroplasty, one I&D, and one conversion to intramedullary nail for subtrochanteric fracture. The complication rate was 23.3% (n=7), compared to 14.4% (n=13) in patients treated with cannulated screws (OR=1.1, 95% CI 0.37-3.08, p=0.86). Reoperation rate was 16.7% (n=5) in the FNS cohort and 12.2% (n=11) in the cannulated screw cohort (p=0.54).

CONCLUSION: At two years, patients treated with the FNS have similar rates of complication and reoperation when compared to patients treated with cannulated screws. These results, in addition to the development of a single peri-implant subtrochanteric femur fracture, deserve further investigation.

Revisiting the "48-hour" Rule in Patients Undergoing Arthroplasty for Femoral Neck Fracture
Paper 202

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OBJECTIVE: While most displaced femoral neck fractures (FNFs) undergo expeditious hemiarthroplasty (HA) or total hip arthroplasty (THA), there is no consensus on the association between surgical delay and mortality. This multi-institutional study (1) compared outcomes between delayed (≥48 hours) and accelerated (<48 hours) HA or THA for FNFs, to (2) determine if time-to-surgery is independently associated with poor outcomes.

METHODS: A total of 1,493 FNFs in patients >60 years were treated with HA (n=963) or THA (n=530) between 2010-2019. Among all HA/THA, 85.5% (n=1,276) were accelerated (<48 hours) and 14.5% (n=217) were delayed (≥48 hours) due to medical and/or logistical reasons. Univariable associations were compared between groups and logistic regression was performed to adjust for confounders, with significance at $p<0.05$.

RESULTS: The delayed group were younger (76 vs. 78 years; p=0.002), had higher Injury-Severity Scores (9.5 vs. 9.1; p=0.05) and ASA 4 scores (88.9% vs. 81.1%; p=0.005), longer ICU stays (9.4 vs. 5.2 days; p=0.01), higher coronary artery disease (31.3% vs. 20.2% $p<0.001$) and general anesthesia rates, (91.2% vs. 85.0%; p=0.005), and were more likely to receive intraoperative transfusions (14.8% vs. 6.67%; $p<0.001$). On multivariable analysis among all included patients, delay ≥48 hours did not independently increase 90-day (OR, 1.429; 95% CI, 0.9-2.2; p=0.11) nor one-year (1.176; 0.8-1.7; p=0.40) mortality risks. Risks of 90-day mortality were age (1.033; 1.0-1.1; p=0.001), female sex (0.636; 0.4-0.9; p=0.012), ASA 1 vs. 4 scores (0.392; 0.2-0.9; p=0.023), ICU stay (2.99; 2.0 4.5; $p<0.001$) and delirium (1.675; 1.2-2.4; p=0.005), while one-year mortality risks were age (1.029; 1.01-1.05; $p<0.001$) and ASA 1 vs. 4 scores (0.246; 0.1- 0.5; $p<0.001$). Time-to-surgery ≥48 hours was not a risk factor for postoperative acute respiratory distress syndrome nor acute renal failure (1.408; 0.9-2.1; p=0.085), however, delay ≥48 hours was associated with increased risk of non-ambulatory status at discharge among all patients (1.995; 1.4-2.8; $p<0.001$).

CONCLUSION: FNF patients who had HA or THA performed ≥48 hours from admission were more likely to receive general anesthesia, had higher rates of intraoperative transfusions and ICU stays, ambulated less at discharge, and were more often non-ambulatory at discharge than the accelerated group (<48 hours). However, time-to-surgery of ≥48 hours did not independently increase the 90-day nor one-year mortality risk in patients >60 years undergoing HA or THA for FNFs. Rather, mortality risk among this cohort is increased with advanced age, male sex, mental status changes and ICU stays, and reduced with lower ASA scores.

The Fragility of Statistical Significance in the Use of Aspirin in Prevention of Venous Thromboembolism Events Following Hip Fracture Surgery: A Systematic Review

Paper 203

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OBJECTIVE: Comparative studies often use the P-value to convey the statistical significance of their findings, and fragility indices (FI) and fragility quotients (FQ) may better signify a study's statistical strength. Aspirin for venous thromboembolism (VTE) chemoprophylaxis following hip fracture surgery (HFS) has been debated between orthopedic and cardiac fields. The purpose of this study was to apply both the FI and FQ to evaluate the degree of statistical fragility in aspirin (ASA) use for VTE prevention in the HFS literature.

METHODS: Using preferred reporting items for systematic reviews and meta-analyses, we performed a PubMed search for HFS studies from 1998 to 2023 reporting comparisons between ASA and other chemoprophylaxis methods for VTE. The FI of each outcome was calculated through reversal of a single outcome event until significance was reversed. The FQ was calculated by dividing each fragility index by study sample size. The interquartile range (IQR) was calculated for the FI and FQ.

RESULTS: Of the 167 articles screened, 5 met the search criteria to be included for analysis. A total of 1,194 participants were included in these studies. There were 19 outcome events reported, with all 19 reported as nonsignificant ($P > 0.05$) outcomes. The overall FI and FQ for all 19 outcomes were 12 (IQR: 6.5-15) and 0.080 (IQR: 0.027-0.110), respectively. Ten studies (52.6%) reported a loss-to-follow-up (LTF) greater than the overall FI.

CONCLUSION: The majority of highest-level peer-reviewed literature concerning aspirin use following hip fracture surgery is less than robust, with more half of the studied outcomes considered statistically fragile. In addition to the reporting of the P value, the fragility index and quotient can further provide insight to the strength and trustworthiness of outcome measures.

No Relationship Between Funding and Outcomes in Syndesmotic Dynamic Fixation Devices: A Systematic Review of Bibliometrics and Conflicts of Interest

Paper 204

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BACKGROUND: Dynamic fixation (e.g., suture button) devices for the treatment of distal tibiofibular syndesmosis injuries have emerged as an appealing alternative to traditional static fixation with syndesmotic screws. However, industry-funded research and author conflicts of interest (COI) can influence results. The impact of financial relationships with industry and COI reporting on the outcomes of studies evaluating dynamic syndesmotic fixation has not been previously explored. This study aimed to identify and analyze the current body of research regarding the use of dynamic syndesmotic fixation and to determine whether investigator COI influenced the results of published studies.

METHODS: A systematic review using PRISMA guidelines identified articles reporting outcomes of dynamic syndesmotic fixation devices. Author disclosed COI were recorded and confirmed through the Open Payments database. Study outcomes were graded as favorable, unfavorable, or equivocal. The presence of author COI was tested for an association with overall favorability of reported outcomes. Additional bibliometric data (study level of evidence, journal impact factor [IF], and relative citation ratio [RCR]) were analyzed.

RESULTS: A total of 51 studies evaluating three different commercially available devices as well as several custom devices were included. Of these, eight studies (15.7%) were identified as having a potential COI. Overall, one-third of studies (17/51, 33.3%) reported favorable conclusions, while nearly two-thirds (33/51, 64.7%) reported equivocal conclusions. Favorable study conclusions were reported in 37.5% (3/8) of conflicted studies and in 32.6% (14/43) of nonconflicted studies. The overall small sample and in particular the small number of conflicted studies prevented any statistically meaningful comparisons of author COI and study outcomes from being made.

CONCLUSION: Industry sponsorship and COI are infrequent in the current body of literature evaluating the use of dynamic fixation devices for the treatment of distal tibiofibular syndesmosis injury. No association between author financial relationships and the favorability of reported study outcomes could be established. Dynamic fixation represents an attractive alternative to traditional static fixation, and additional high-quality research is warranted to clearly demonstrate and define its potential benefits.

Assessing Postoperative Pain and Spine Surgeons Opioid Prescription Practices in Patients Undergoing Spine Surgery Using the Detroit Intervention Pain Assessment Tool (DIPA)
Paper 205

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BACKGROUND: The Detroit intervention pain assessment scale (DIPA) is a tool that assesses patients' postoperative pain levels and providers' opioid prescription practices. It combines the Interventional Pain Assessment (IPA) scale (0= no pain; 1= tolerable pain; 2= intolerable pain) with the Michigan Automated Prescription System (MAPS) narcotics registry and is used to evaluate pain management. From a prior study, we found that our post-op prescription practice falls into 5 categories: A (no pain medication), B (over-the-counter meds), C (1-30 morphine milligram equivalents MME/daily), D (31-79 MME/daily), and E (> 80 MME/ daily). This study aimed to measure and evaluate the post-op pain management of a spine practice using the DIPA.

METHODS: 200 patients undergoing elective spine surgery over a 12-month period were included in the study. Informed consent was obtained, and demographic and ICD 10 codes were recorded. Patients were provided with a survey that rated their pain per the IPA scale at the 2-weeks, 6-weeks, 3-months, and 6-month postoperative visits to assess their postoperative pain satisfaction levels. Our data was further subcategorized based on cervical and thoracolumbar surgeries.

RESULTS: There were 127 females and 73 males with an average age of 54.2 years. 64 patients underwent cervical spine surgeries, and 136 patients underwent open thoracolumbar procedures. The average opioid consumption at the 2-week, 6-week, 3-month, and 6-month postoperative visits were 27.8, 14.8, 10.9, and 7.0 MME, respectively. 56% of patients felt that their pain was adequately treated at 2 weeks, 88.3 % at 6 weeks, 82% at 3 months, and 62.4 % at 6 months.. The percentage of patients receiving opioids (DIPA class C or higher) were 84%, 64.6%, 47.7%, and 36.7% during these respective periods. The use of narcotics steadily and significantly decreased from 2 weeks to 6 months ($P<0.05$). The practice routinely stopped narcotic pain meds after 6 weeks. Yet 36.7 % were still using narcotics prescribed by an outside prescriber unknown to the surgeons as patients did not request pain meds.

CONCLUSION: Patients were least satisfied with their pain management at 2 weeks post-op. Despite having a MAPS program, surgeons and providers did not coordinate narcotic prescriptions. Thirty-seven percent of patients were still using narcotics at 6 months post-op. A better understanding and coordination of narcotic prescriptions is required.

Thromboembolic Disease Following Adult Spinal Deformity Surgery: An Analysis of Over 7,400 Spinal Deformity Patients

Paper 206

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OBJECTIVE: The rate of multi-level adult spine deformity (ASD) surgeries has increased. Studies evaluating the incidence and risk factors of deep venous thrombosis (DVT), pulmonary embolism (PE), DVT or PE known as venous thrombus embolism (VTE) following ASD surgery have been limited by sample size. The purpose of this study was to identify risk factors and incidence of DVT and PE within 30 days following ASD surgery with ≥7 levels of posterior instrumentation and develop a prediction model for assessing risk.

METHODS: A retrospective observational study was conducted to evaluate patients aged 18 years and older who underwent surgical correction of ASD with ≥7 levels of correction from 2010 to 2019, using the American College of Surgeons-National Surgical Quality Improvement Program (ACS-NSQIP) database. Data collected included reported incidence of DVT and PE, patient demographics, medical co-morbidities, and outcomes, which were analyzed with bivariate and multiple logistic regression models.

RESULTS: A total of 7,445 (n) patients met inclusion criteria, 3,276 Males(44%) and 4,169 Females(56%). Postoperative case incidences: VTE(DVT or PE) n=254(3.4%), DVT n=151(2.0%), and PE n=127(1.7%). Correlation analysis and multiple logistic regression modeling identified independent predictors of either PE or DVT: Increased body mass (Odds Ratio [OR]: 1.005, 95% CI: 1.003-1.008), Age (Odds Ratio [OR]: 1.01, 95% CI: 1.001-1.019), BMI (Odds Ratio [OR]: 1.032, 95% CI: 1.015-1.049), bleeding disorders (Odds Ratio [OR]: 1.806, 95% CI: 0.994-3.281), medicated hypertension (Odds Ratio [OR]: 1.523, 95% CI: 1.168-1.987), chronic steroid use (Odds Ratio [OR]: 2.654, 95% CI: 1.848-3.812), ASA class (OR: 1.768, 95% CI: 1.426-2.192), discharge destination (OR: 2.607, 95% CI: 1.978-3.435), total operative time (OR: 1.002, 95% CI: 1.002-1.003), and total length of stay (OR: 1.055, 95% CI: 1.044-1.066). Final model = (Length of stay,h*0.044)+(Discharge Destinationhome=0 ,additional care=1*0.644)+(Operative Time,min*0.002)+(BMI*0.022)+(Steroid Medicationno=0,yes=1*0.836)-5.538 = Ln (Probability). Exp[Ln(Probability)]= %Risk of VTE.

CONCLUSION: Postoperative DVT, PE, and VTE were identified in 2.0%, 1.7%, and 3.4% of cases, respectively. Patients with chronic steroid usage had the highest risk for DVT and PE. Additionally patients on medicated for hypertension and those with bleeding disorders are also at high risk for DVT and PE. Further prospective research is necessary to verify these findings and determine if anti-coagulation can potentially reduce the risk of DVT and PE in these high-risk patient populations. The model developed here may also assist in assessing preoperative VTE risk.

A Prospective Analysis: Indolent Cutibacterium Acnes Infection in Primary Discectomy Patients
Paper 207

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INTRODUCTION: Degenerative disc disease (DDD) and low back pain have considerable influence on the healthcare system and productivity in the United States of America. There have been considerable research efforts to define the causes of DDD with recent literature exploring indolent infection as a possible cause. Some literature reports serologic evidence of gram-positive infection in up to 31% of DDD patients with radicular symptoms. Of positive disc cultures, the most common infectious agent is C. acnes with animal models suggesting low grade C. acnes infection can precipitate and progressively worsen DDD.

METHODS: This prospective study includes patients who presented to a single orthopedic spine surgeon for management of their DDD. Patients were enrolled into the study if they had no history of prior spinal surgery and were to be managed surgically via decompression of herniated discs or decompression and fusion of the spine. At time of enrollment patient history, pain scores, and PROMIS-10 patient reported outcome measure were collected. The intraoperative disc material was immediately processed for culturing in standard fashion based on previously reported literature. General demographic information including age, gender, medical comorbidities, smoking status, and infectious disease information were collected prospectively and retrospectively from chart review. Study data was statistically analyzed by way of Student's t-test, Pearson Chi-Square, and Mann-Whitney U Test for continuous, nominal, and ordinal outcomes respectively. The level of significance for the study was p=0.05.

RESULTS: 66 patients and 96 levels were included in analysis. The average age of the entire cohort was 51.02 years (± 13.89) with an average BMI of 29.76 (±6.53). 57.4% of the study participants were female with 91.2% of enrolled patients having a CCI of 3 or less. 22.72% of patients had positive cultures. 14 of these patients, 20.6%, were positive for C. acnes. Two patients with C. acnes growth had concurrent bacterial growth, one with Corynebacterium tuberculostearicum, one with Propionibacterium granulosum. One patient, 1.51% of patients, grew isolated Staphylococcus epidermidis. The population of patients that grew C. acnes, 14 of 66, were compared against patients who exhibited no bacterial growth, 51 of 66. The following results compare these two groups. There existed no statistically significant difference in Age, BMI, race, smoking history, preoperative steroid usage, duration of preoperative symptoms, preoperative radicular symptoms, preoperative antibiotic use, preoperative history of clinically significant infections, or MODIC score of operative disc levels; p-value ranged from p=0.291 to p=1.000. The distribution of patient sex between groups was near significance, p=0.066, with males demonstrating a higher rate of C. acnes growth. Although none of the individual components of the CCI differed significantly between those who grew C. acnes and those who did not, the cumulative CCI score was different between the groups with the C. acnes group having a lower distribution of CCI scores, p=0.041. The PROMIS-10 provides a Mental Health Score as well as a Physical Health score. There was no difference between groups regarding the distribution of the Mental Health Score, p=0.841. The distribution between the groups' Physical Health Score is near significance, p=0.069, with the group that grew out C. acnes demonstrating a higher, more functional score. Two pain related variables also neared a statistically significant

difference. Average preoperative pain neared a statistical difference, p=0.089, with the C. acnes group reporting a lower distribution of average pain scores. The distribution of constant vs. intermittent pain symptomology also neared statistical significance, p=0.058, with those who had C. acnes infection more likely to report intermittent rather than constant pain symptoms.

CONCLUSION: There have been considerable research efforts to define causes of DDD with recent literature suggesting indolent infection from C. acnes as a potential source. Our prospective analysis of 66 patients and 96 disc samples demonstrates a sizable prevalence of C. acnes in the DDD population at 20.6%. Our study also demonstrates that there may exist a subset of DDD patients whose presentation may favor suspicion for an indolent C. acnes infection. This population may overall be a healthier subset of patients as underscored by the lower CCI of the C. acnes patients. Further studies on associated risk factors for infectious DDD and its role in DDD are warranted; this is highlighted by many of the study's variables that neared statistical significance in the C. acnes patients such as: male predominance, increased prevalence of intermittent symptomology, lesser average pain severity, and increased overall physical functioning.

Patient Specific Three-Dimensional Printed Guides Reduced Operative Times and Blood Loss in Scoliosis Surgery: A Patient Matched Comparison

Paper 208

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OBJECTIVE: Customized pedicle screw guidance systems use preoperative imaging to construct 3-D printed guides that precisely fit the spinal anatomy of an individual patient at a specific level. These patient-specific guides are increasingly used in spinal deformity surgery, but few studies have measured the effectiveness of these systems. We aimed to evaluate whether the use of a patient-specific pedicle screw guidance system would lead to a reduction in operative time, blood loss, need for transfusion, and radiation exposure compared to conventional fusion techniques.

METHODS: We retrospectively reviewed a prospectively collected database to find 47 patients who underwent spinal fusion for scoliosis using patient-specific 3D printed pedicle screw guides (Firefly®, Mighty Oak Medical). A control cohort of 47 patients who underwent fusion using conventional techniques was constructed using propensity score matching based on scoliosis type and number of levels fused. All patients received treatment between the years of 2013-2022 by a single surgeon at a tertiary care pediatric center. Spinal deformity parameters, operative time, blood loss, transfusion volume, and intraoperative radiation exposure were compared between treatment groups.

RESULTS: Patients who were treated using customized pedicle screw guides and those treated using conventional techniques had similar major curve angles (56° vs. 58°), number of levels fused (14.1 vs. 13.6), and number of screws placed (20.7 vs. 19.5). Those treated with the Firefly system had reduced operative time (302 vs. 359 minutes, $p < 0.01$), lower blood loss (649 vs. 1134 mL, $p < 0.01$), lower average blood transfusion given (171 vs. 265 mL, $p = 0.04$), and reduced intraoperative fluoroscopy exposure time (10.9 vs. 31.7 seconds, $p < 0.01$).

CONCLUSION: The use of customized pedicle screw guides in spinal fusion leads to significantly reduced operative time, blood loss, and need for blood transfusion. Radiation exposure can be significantly decreased as well. Patient specific 3D printed guides improved surgical outcomes in this small cohort.

Resident Spine Education: A Simulation-Based Curriculum
Paper 209

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BACKGROUND: Previous investigations have shown surgical simulation to be a reliable and cost-effective method of teaching surgical skills to surgical residents. To our knowledge no structured simulation curriculum for spine surgery has been described. The primary objective of this study was to present a simulation-based curriculum that teaches residents core technical skills for surgical instrumentation of the spine. The secondary objective was to evaluate the effectiveness of the curriculum in improving residents' surgical skills.

METHODS: Twenty-eight orthopedic residents, postgraduate years (PGY) one through five, participated in this surgical training program. Using image tracked planar passive blunt probe while blinded to the rendered CT based navigation imaging, the residents were asked to simulate the starting points and trajectories for cervical lateral mass screws and lumbar pedicle screws in a cadaveric specimen. Additionally, residents were tasked to detect a cortical breach in thoracic pedicles. Residents were presented a didactic session by course faculty detailing the relevant anatomy, concepts, and surgical techniques for spine instrumentation. The same tasks were repeated after this session. Resident performance was evaluated by spine faculty. Significance was calculated using a Wilcoxon signed rank test with alpha level 0.05.

SOURCE OF FUNDING: An educational grant was provided for by Medtronic, PLC.

RESULTS: The median number of correctly placed lateral mass screws improved from 2 correct in the pre-test to 4 correct in the post-test ($p<0.05$). The median score of correct lumbar pedicle screws improved from 0 to 2 ($p< 0.05$). All PGY classes individually improved for both tests.

DISCUSSION: We designed a comprehensive and practical curriculum that uses simulation to safely teach residents surgical skills for instrumentation of the cervical, thoracic, and lumbar spine. This curriculum is applicable to all PGY levels and may be a useful component of resident education.

What is the Impact of Socioeconomic Status on the Mental and Physical Health, Functional Recovery, and Risk of Postoperative Complication After Surgery?

Paper 210

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OBJECTIVE: Disparities in orthopedic surgery persist despite an increased focus on the topic. Further research is required to better understand the source. Despite an increased understanding of the impact socioeconomic deprivation has on outcomes in orthopedic surgery, the role of neighborhood-level determinants on presenting physical and mental health, and changes in these metrics after spine surgery is not well understood. Given the paucity of data on this topic, our research sought to evaluate the relationship between neighborhood-level socioeconomic deprivation and outcomes in spine surgery. Our primary aim was to evaluate the association between socioeconomic deprivation and patient-reported physical and mental health in patients undergoing spine surgery. Our secondary aim was to evaluate the association between socioeconomic disparity and the risk for postoperative complication following spine surgery.

METHODS: A single-center retrospective cohort analysis using electronic medical record (EMR) data from patients undergoing spine surgery between Jan 1, 2019 and Dec 31, 2020. Patients aged 18 years and older who underwent thoracolumbar spine surgery with greater than 3 levels addressed were identified. Patient reported outcomes measures (PROM) scores used in our clinics, including Oswestry Disability Index (ODI), Modified Japanese Orthopaedic Association (mJOA), and Patient-Reported Outcomes Measurement (PROMIS) physical and mental health were assessed. Area Deprivation Index (ADI) was used to define socioeconomic deprivation. Participants were stratified into ADI tertiles and mean baseline, postoperative, and baseline to postoperative changes in PROM scores were compared among tertiles using generalized linear models. Logistic regression was used to model the association between ADI tertiles and odds of postoperative complication or 90-day reoperation.

RESULTS: 283 patients (mean age=61.3±14.3 years, 45% women) were included in analyses. Preoperative PROMs did not significantly differ among tertiles ($p = 0.549$). 3-month and 12-month follow-up PROMs showed significant differences in 3-month ODI with the middle deprivation group having less disability than the lowest and highest deprivation groups ($p=0.03$ and $p = 0.04$). Change in PROMs from baseline was only significant in the 12-month postoperative ODI with the middle deprivation outperforming the highest deprivation group ($p=0.03$).

CONCLUSION: Socioeconomic deprivation does not affect preoperative or postoperative PROMs of patients undergoing thoracolumbar spine surgery greater than 3 levels. ADI does not impact changes in postoperative PROMs when compared back to preoperative baseline nor is it associated with increased risk of complication.

The Impact of C2 Screw Placement Technique on Radiographic and Clinical Outcomes After C2-T2 Posterior Cervical Fusion

Paper 211

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OBJECTIVE: In posterior cervical fusions (PCF) involving the upper cervical spine, the utilization of C2 pedicle vs. C2 pars interarticularis screws varies by surgeon preference and patient anatomic considerations. When comparing both C2 screw placement techniques, there is a theoretical safety vs. mechanical stability tradeoff, where C2 pedicle screws are associated with a higher load failures but may be technically challenging and risk malpositioning. This study aimed to determine if C2 screw placement predicted change in cervical alignment and patient reported outcomes measures (PROMs) after C2-T2 PCF for degenerative indications.

METHODS: All adult patients who underwent C2-T2 PCF for myelopathy or myeloradiculopathy at a multi-institutional academic center between 2013-2020 were retrospectively identified. Patients were dichotomized by C2 screw placement technique into bilateral pedicle or bilateral pars screw groups determined through the operative note or postoperative CT scan. Preoperative and short- and long-term postoperative radiographic outcomes (upper cervical alignment, global alignment, fusion status) and PROMs (VAS Neck, Neck Disability Index) were collected. Univariate and multivariate analysis compared patient demographics, surgical factors, change in radiographic measures, and change in PROMs across C2 screw placement groups.

RESULTS: A total of 87 patients met the inclusion/exclusion criteria (47 pars, 40 pedicle). Preoperative bone mineral density, Hounsfield units, medical comorbidities, operative indication, and bone graft use did not differ significantly between groups (all $p>0.05$). There were no significant differences in fusion status, C2-3 pseudoarthrosis, C2 screw loosening, proximal junctional kyphosis, complications, and revision rate between C2 screw placement groups (all $p>0.05$). Similarly, preoperative to postoperative changes in upper cervical alignment (C2 slope, C2 tilt, C2-3 segmental lordosis, C2-3 listhesis, C0-2 cobb angle in neutral, flexion, and extension, ADI, distance between C1 lamina and occiput) and global cervical alignment (C2 SVA, C2-7 lordosis, T1 slope-cervical lordosis mismatch) and PROMs at immediate, > six months, and final postoperative follow-up did not vary significantly by screw placement groups (all $p>0.05$).

CONCLUSION: There were no significant differences in upper cervical alignment, C2 screw loosening, and proximal junctional kyphosis or failure based on C2 screw placement technique in C2-T2 PCF. C2 pars screws, a technically less demanding option given variable patient anatomy, can be utilized in the upper instrumented level of long-segment PCFs without compromising outcomes.

How Long Can You Delay? Curve Progression While Awaiting Vertebral Body Tethering Surgery
Paper 212

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OBJECTIVE: To evaluate curve progression for patients awaiting vertebral body tethering (VBT) and whether there was an impact on patient outcomes.

METHODS: A retrospective study of patients considering VBT surgery at a single tertiary referral center was conducted between 2015-2021. 95 patients were included. Patients were analyzed as part of the study if they had consultation radiographs and immediate preoperative radiographs taken a minimum of 30 days apart. Change in major coronal curvature, time elapsed, change in height, and any alterations to original surgical plan were noted.

RESULTS: 91 of the 95 patients adhered to their original treatment plan and received VBT surgery for the treatment of their scoliosis. 4 of these patients had progression of their scoliosis that led to change in their surgical plan and ultimately treatment with posterior spinal fusion (PSF). Mean time elapsed from consultation to surgical date for VBT patients was 76.8 days (range, 16 days to 246 days) while it was 329.5 days (range, 164 days to 792 days) for the PSF patients. Additionally, patients who received thoracic tethers had an average increase in major coronal curvature of 6.4 degrees (range, 2 degrees to 22 degrees) while the patients who received PSF had an average increase in major coronal curvature of 11.9 degrees (range, 0 degrees to 21 degrees). Additionally, the VBT patients grew an average of 0.5 cm (range, -1.6 cm to 6 cm) while the PSF patients grew an average of 1.3 cm (range, -1.7 cm to 6.2 cm).

CONCLUSION: The length of time between initial consultation and operation can have a significant impact on final surgical intervention for the treatment of scoliosis. Individuals with AIS can experience curve progression during this period that may necessitate more invasive intervention. In our cohort, we observed considerable curve progression that led to a change in surgical planning in four patients. These changes were attributed to delays in insurance approval. It is imperative that the time between consultation to operation is minimized and that family expectations are managed in cases where a long waiting time occurs.

Understanding the Impact of Family Member Presence During Pediatric Forearm Fracture Reductions in the Emergency Department

Paper 213

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OBJECTIVE: Pediatric fracture reduction under procedural sedation in the emergency department (ED) is a well-accepted practice. Though family member presence during many procedures has been investigated and supported, the impact of family member presence during sedated fracture reductions remains unclear. The purpose of this study is to assess family member, emergency medicine physician, and orthopedic surgery resident experience of sedated fracture reductions based on family member presence during the reduction.

METHODS: A retrospective survey study of family members, orthopedic surgery residents, and emergency medicine physicians for pediatric patients who sustained a distal radius or forearm shaft fracture requiring closed reduction under procedural sedation in the ED between October 2021 and July 2022. Family members who remained in the room during fracture reduction were compared to those who left the room. The primary outcome was family member satisfaction with patient care during the fracture reduction. Several secondary outcomes regarding family member and physician attitudes, experiences, and perceptions were also evaluated.

RESULTS: 297 patients were eligible during the study. 40.4% of family members, 49.5% of emergency medicine (EM) physicians, and 58.6% of orthopedic surgery residents responded to the survey. The majority (55%, 66/120) of family members indicated an initial preference to remain with their child during the fracture reduction. Ultimately, 51.7% (62/120) of family members remained in the room and 48.3% (58/120) left. Family members who were located in accordance with their initial preference had a more positive experience ($p=0.017$. Orthopedic surgery residents felt more negatively about family member presence than EM physicians ($p<0.001$), and the negative feeling related to resident post-graduate year. EM physicians believed family member presence had a positive impact on the family member ($p=0.013$) and child ($p<0.001$) without affecting them ($p=0.679$), while orthopedic surgery residents thought family member presence had a negative impact on the family member ($p=0.003$) and themselves ($p<0.001$). The attitude of EM physicians towards family member presence had an impact on family member location, while orthopedic surgery resident attitude did not ($p<0.001$).

CONCLUSION: Our study demonstrates family members who are located in accordance with their preference during sedated fracture reductions in the ED are more satisfied with their experience. Furthermore, we highlight differences between EM physicians and orthopedic surgeon experience and the impact this has on family member presence. Our findings support educated, family-centered care during fracture reductions.

Does Time to Surgery Impact Nerve Recovery in Supracondylar Humerus Fractures with Nerve Injury?
Paper 214

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INTRODUCTION: Supracondylar humerus (SCH) fractures are common and present with associated nerve injuries in 6-16% of cases. Historically, SCH fractures with nerve injuries have warranted urgent surgical treatment. Recent studies have shown no evidence that urgent treatment is needed in patients with anterior interosseous nerve (AIN) palsy nor in patients with a pulseless hand and median nerve palsy. Though indications for urgent treatment are loosening, no studies have evaluated the need for urgent surgical treatment in SCH fractures with any form of isolated nerve injury.

METHODS: A retrospective review of 103 patients with surgically managed SCH fractures and concomitant neurologic deficit on presentation was conducted at a single level 1 pediatric trauma hospital from 1997 to 2022. Information on presenting neurologic injury, time from injury to surgery, surgical intervention, and neurologic outcome was recorded. Exclusion criteria included concomitant vascular injury, ipsilateral forearm/wrist fracture, inadequate documentation, open fracture, unknown time of initial injury, pre-existing neurologic deficit, and compartment syndrome.

RESULTS: Sixty-seven patients with an average age of 7 ± 2 years and average time to surgery of 10 ± 6 hours were included. Fractures were Gartland Type II (n =3 [4%]), Type III (n = 57 [85%]), Type IV (n = 3 [4%]), and flexion-type (n = 4 [6%]). Sixty-five patients (97%) were followed to partial neurologic recovery and 39 (58%) were followed to neurologic plateau with 28 (42%) lost to follow-up. Neurologic deficit included median (n = 41 [61%]), radial (n = 24 [36%]), and ulnar (n = 17 [25%]) nerves. Ten patients (15%) had isolated AIN injury. Average time to partial neurologic recovery was 21 ± 24 days and time to full recovery was 100 ± 92 days. There was a statistically significant relationship between time to partial neurologic recovery and time to surgical intervention ($p = 0.004$), but no relationship between time to full neurologic recovery and time to surgery ($p = 0.3$). Of patients not lost to follow-up, there were no permanent neurologic deficits.

CONCLUSION: Shorter time to fixation of pediatric SCH fractures with isolated nerve injury was associated with slightly earlier partial recovery but not full neurologic recovery. Prioritizing urgent surgery in these patients does not improve their ultimate neurologic recovery.

Opioid vs. Non-Opioid Postoperative Pain Management of Supracondylar Humerus Fractures in a Pediatric Population

Paper 215

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OBJECTIVE: Opioid misuse is a leading cause of unintentional adolescent injury. The prescription of opioids for postoperative pain management in pediatric supracondylar humerus fracture fixation is controversial. The purpose of this study is to evaluate the baseline administration of opioid pain medication (average morphine milligram equivalent (MME)/kg) and outpatient pain control after supracondylar humerus fracture fixation.

METHODS: This is a retrospective review of subjects who underwent closed reduction and percutaneous pinning (CRPP) of Gartland type II-IV supracondylar humerus fractures. All subjects were <18 years old. Any patient who required open reduction, had other distracting injuries, or sustained complications that could impact pain tolerance such as compartment syndrome or vascular compromise was excluded. The primary outcome was the average MME/Kg of opioid medication prescribed. The secondary variables included demographics, Gartland classification, number of call-ins for pain, and pain rating at first post-operative visit. Univariate analyses were used to analyze relationships between the outcome variables.

RESULTS: The study included 270 subjects. The demographics demonstrated a near equal distribution of sex (52% female) and laterality (45% right arm). The most common fracture was a Gartland type III (64%). Most subjects had no pain at first postoperative visit (92%) and did not call-in regarding pain (82.3%). The average MME/kg was 2.8 (IQR 1.4-3.3). Hydrocodone-acetaminophen was the most frequently prescribed pain regimen (83.4%) and 92% of subjects did require a refill on their medication. No difference was identified in MME/Kg prescribed based on sex, race, or age. No significant difference was seen in MME/Kg prescribed in subjects who had pain at their first postoperative visit, return ED visit, or complications. A subset of patients opted to not receive opiate pain medications at hospital discharge (n=6). This subgroup had no medication refills, no call-ins for pain, and no unplanned emergency department visits at our institution.

CONCLUSION: Supracondylar humerus fractures are a common pediatric orthopedic injury treated surgically. The current practice for pain management includes opioid medications prescribed at hospital discharge. This study demonstrates that nearly all patients achieved adequate pain control with opioid pain medication. MME/Kg dosing of opioid medication was not associated with uncontrolled pain. The non-opioid pain medication group showed no difference in pain control compared to the opioid group. These findings warrant further evaluation of the efficacy of non-opioid pain medication regimens after CRPP of supracondylar humerus fractures.

Transitional Ankle Fractures: Selecting for Success in Emergency Department Closed Reduction
Paper 216

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BACKGROUND: The purpose of this study was to examine pediatric patients with a transitional ankle fracture (triplane or Tillaux) and to determine the risk factors associated with failed closed reduction (CR) in the emergency department (ED).

METHODS: A retrospective review of patients from a single Level 1 pediatric trauma center between 2004 and 2021 using fluoroscopy logs who were < 18 years with an open or closing, but not closed distal tibial physis, and had an attempted CR in the ED. X-rays were analyzed separately by two independent reviewers. Measurements of articular surface gap, maximum displacement of the metaphysis, and anterior displacement of the Tillaux fragment were recorded at three time points (pre-reduction, immediate post-reduction, and final follow-up in clinic). Statistical analysis was performed using chi-squared, paired t, and Mann-Whitney tests.

RESULTS: Seventy-six patients (63 with triplane fractures and 13 with Tillaux fractures) and a mean follow-up of 24.7 weeks (range, 1.9 to 126 weeks) were included. 48 patients (63%) were males, and the mean age was 12.4 years. The average time to CR was 21.5 hours.

A conservative cohort (39 patients) treated with CR and immobilization were compared to 37 patients that required operative fixation (OF). 12/15 (80%) patients that were placed into short leg immobilization after CR required OF whereas only 25/61 (41%) of patients required OF that were placed into long leg immobilization (p=0.005). Patients that required surgery had a statistically higher average pre-reduction articular surface gap (PRASG) 3.84 (1-10.7) mm compared to an average of 2.13 (0-6.7) mm (p= 0.001) in patients that were successfully treated with CR.

Multivariate logistic regression analysis showed both PRASG and immobilization type to be independent predictors of need for OF. Short leg immobilization was associated with an 8.8 X greater chance of resulting in OF (OR = 8.8, 95% CI [2.1-49.1]). With each millimeter of increased PRASG, the odds doubled when controlling for cast type (OR = 2.0, 95% CI [1.4-2.1]. ROC curve analysis revealed that PRASG had moderate predictive ability for OF at approximately 3.0 mm with an AUC of 0.77. After using this cut-off, linear regression showed a PRASG >3 mm was over 6 X more likely to result in OF (OR = 6.9, 95% CI [2.5-18.8].

CONCLUSION: Half (37/76 (49%)) of patients with transitional ankle fractures treated with CR and immobilization in the ED ultimately required OF. Larger average PRASG and short leg immobilization were independent risk factors associated with OF. Patients with >3mm PRASG were 6 X more likely to require OF, and therefore should be splinted without sedation. Adopting this strategy may save time, reduce costs, and avoid possible harm/complications associated with sedation in the ED.

Developmental Anatomy of the Radial Bow in Pediatric Patients Using 3D Imaging
Paper 217

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OBJECTIVE: While radial bow shape is well characterized in adults, its development in children is not well understood. Previous studies on the radial bow are limited because they use radiographs, thus rotational positioning of the forearm could alter bowing measurements. This study used 3D imaging to better assess the pediatric radial bow.

METHODS: Computed tomography scans from the New Mexico Decedent Image Database were obtained for children ages 2 to 16 in females and 18 in males (n = 152). Exclusion criteria included inadequate CT or any bone pathology (e.g. fracture), or age under 2 years due to underdeveloped epiphysis. 3D models were generated using Slicer and Rhino software. Length of the entire radial bow (bicipital tuberosity to sigmoid notch), maximum radial bow, location of the maximum radial bow (bicipital tuberosity to point of maximum bowing), and distal, middle, and proximal third radial bows were measured.

RESULTS: The length of the entire radial bow increased with age, range 74-222mm, with a strong correlation with age ($r = 0.90$, $P < 0.01$). The maximum radial bow also increased with age, range 3-18mm, with a strong correlation with age ($r = 0.78$, $P < 0.01$). The maximum radial bow normalized to the length of the entire bow increased mildly with age, mean 0.059 ± 0.012 ($r = 0.24$, $P = 0.0024$), but seems to plateau around age 8. The location of the maximum radial bow increased with age, range 22-138mm ($r = 0.85$, $P < 0.01$). The normalized location of the maximum bow remained constant between ages, mean 0.41 ± 0.10 ($r = 0.12$, $P = 0.14$). The normalized distal third radial bow mildly increased with age, mean 0.045 ± 0.014 ($r = 0.34$, $P < 0.01$), the normalized middle third radial bow mildly increased with age, mean 0.056 ± 0.012 ($r = 0.25$, $P < 0.01$), and the normalized proximal third radial bow remained constant between ages, mean 0.037 ± 0.008 ($r = 0.096$, $P = 0.24$).

CONCLUSION: The normalized values for maximum, distal third, and middle third radial bow increase with age, while the normalized values for location and proximal third radial bow remain relatively constant, suggesting the proportional shape of the radius changes during development, although qualitatively plateaus after age 8.

The Impact of Neighborhood Disadvantage on Outcomes in the Diagnosis and Management of Slipped Capital Femoral Epiphysis (SCFE)

Paper 218

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INTRODUCTION: Slipped capital femoral epiphysis (SCFE) remains potentially devastating for adolescents given the risk of outcomes such as femoroacetabular impingement (FAI), avascular necrosis (AVN), chondrolysis, and degenerative changes. While short- and long-term outcomes have been described in the literature, the impact of social determinants of health on these outcomes is not well understood. This study aimed to examine the impact of neighborhood disadvantage on presentation and clinical outcomes of SCFE in an urban level 1 pediatric trauma center.

METHODS: A retrospective review of patients presenting to an urban level 1 pediatric trauma center between 2010 and 2020 who were diagnosed and treated for SCFE was conducted. Demographic, clinical, radiographic, operative, and outcomes data were collected. Neighborhood disadvantage was measured using the national Area Deprivation Index (ADI) percentile from Neighborhood Atlas Mapping. Lower percentiles were less disadvantaged vs. higher percentiles more disadvantaged. Statistical analyses consisted of standard univariate and bivariate analyses. Logistic regression analyses and survival analyses were used to determine the effect of ADI percentile on postoperative outcomes. A $p<0.05$ was considered statistically significant.

RESULTS: A total of 122 children were included. The mean age at time of diagnosis was 11.9 years. The mean ADI percentile for the cohort was 69.5%. The most common health insurance was government-assisted (59.0%). There was a significant relationship between national ADI percentile and slip angle at diagnosis (Spearman's rho = 0.306, p = 0.002). Higher ADI was a predictor of greater activity/functional limitations on follow-up in a logistic regression (OR 1.03, p=0.020). The median ADI percentile for children with activity/functional limitations was 78% compared to 68% for those with no limitations. There were no significant relationships between ADI percentile and risk of FAI or AVN, persistent pain, slip progression, or need for further surgery.

CONCLUSION: Our findings suggest effects of neighborhood disadvantage on severity of SCFE at presentation and ability to return to activity without limitation after treatment. Considering that greater slip severity at diagnosis has been associated with delay in diagnosis, it is important to develop targeted interventions to mitigate these disparities in diagnosis time. While there were no differences in other outcomes such as FAI and AVN, it is worth accounting for neighborhood disadvantage in counseling patients presenting with SCFE from areas of socioeconomic deprivation.

Timing of Intrathecal Morphine Administration and Its Impact on Pain Control in Adolescent Idiopathic Scoliosis

Paper 219

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INTRODUCTION: Multimodal pain control following posterior spinal fusion (PSF) is a key factor driving functional recovery and hospital length of stay. Intrathecal morphine (ITM) can improve pain control, but the optimal timing of administration is unclear. Our study examines the effect of ITM administered preemptively vs. post-deformity correction in adolescent idiopathic scoliosis (AIS) patients.

METHODS: 146 consecutive AIS patients who underwent PSF at a single institution were retrospectively reviewed. Patients were either given ITM preoperatively before/at time of exposure (PRE, n=101), or post-correction at wound closure (PO, n=45), decided at the discretion of the surgical and anesthetic teams.

RESULTS: There were no differences between the PRE and PO groups in baseline demographic variables, including age, gender, BMI, or main curve magnitude (58.9° vs. 62.3°), or in number of instrumentation levels, estimated blood loss, or operative time (all $p \geq 0.1$). The IT morphine dose was similar in PRE and PO groups (5.0 vs. 4.7 ug/kg, $p=0.76$) with no difference in intraoperative vasopressor administration for hypotension or intraoperative total morphine milligram equivalents (MME, all $p \geq 0.1$). No patient in either group required allogeneic transfusion. Postoperatively, the PRE group had a trend for lower MME on the day of surgery (3.3 vs. 4.9, 0.078), but there was no difference in MME given on subsequent hospital days or during total hospitalization (68.0 vs. 75.3, $p=0.211$). There also was no difference in hospital length of stay (2.87 vs. 2.91 days), respiratory depression, pruritus, nausea/vomiting, or other complication, including 30-day ED visit or readmission (all $p \geq 0.1$).

CONCLUSION: Intrathecal morphine can be given either pre- or postoperatively at the discretion of the surgical and anesthetic teams. The timing of administration has no significant impact on perioperative pain control or functional recovery, with no difference in MME administration, hospital length of stay, potential side effects (hypotension, pruritis, nausea/vomiting), or 30-day ED visits/readmissions in the pre- and postoperative groups.

Motion Preservation Following Vertebral Body Tethering: An Analysis of 103 Patients
Paper 220

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INTRODUCTION: Motion-sparing approaches to scoliosis surgery such as vertebral body tethering (VBT) are growing in popularity. There is limited data evaluating motion preserving following the different tether approaches. We hypothesized that spinal motion would be preserved in both the sagittal and coronal planes in patients following thoracic, lumbar, and double vertebral body tethering procedures.

METHODS: Retrospective comparison study. Preoperative and postoperative coronal range of motion across the instrumented levels was compared using a standing microdose slot-scanning protocol. Flexion/extension radiographs were evaluated postoperatively to assess preserved sagittal arc of motion. Patients with known cord breakage were excluded.

RESULTS: Flexibility radiographs were available on 103 patients: 82 thoracic, 9 lumbar, and 12 with both lumbar and thoracic instrumentation. Mean age at surgery for VBT patients was 13.1 years. Overall, mean thoracic coronal arc of motion for postoperative VBT patients was 9.9° in the thoracic spine and 20.2° in the lumbar. This was a 59% (24.1° to 9.9°) decrease in thoracic range of motion and a 51% (39.9° to 20.2°) decrease in lumbar range of motion. Right-sided motion was greater in patients with thoracic instrumentation while left-sided motion was greater in patients with lumbar instrumentation. Additionally, patients also retained sagittal motion. Patients with single thoracic tethers had a total arc of motion of 22° while patients with single lumbar tethers had a total arc of motion of 25°. It was noted that both groups had a greater degree of flexion than extension.

DISCUSSION & CONCLUSION: Overall, motion was retained in all directions after VBT. It was observed that patients with lumbar tethers had a greater range of motion than those with thoracic tethers in both the sagittal and coronal planes. Additionally, it was noted that right-sided motion was greater in patients with thoracic tethers and left-sided motion was greater in patients with left-sided tethers.

Radiation Exposure in Navigated Techniques for AIS
Paper 221

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OBJECTIVE: Utilization of navigation improves pedicle screw accuracy in adolescent idiopathic scoliosis (AIS) and is a favorable alternative to fluoroscopic guidance. Our center switched from intraoperative CT (ICT) to an optical navigation system that utilizes a preoperative CT (PCT). We aim to evaluate the radiation dose and operative time for low-dose ICT compared to standard and low-dose PCT used for optical navigation in AIS patients undergoing posterior spinal fusion (PSF).

METHODS: A single-center matched-control cohort study of 38 patients was conducted. Nineteen patients underwent ICT navigation (O-arm) and were matched by sex, age, and weight to 19 patients who underwent PCT for use with an optical-guided navigation (7D, Seaspine). The PCT was either standard dose (N=7) or low dose (N=12). The mean volume CT dose index (CTDIvol), dose-length product (DLP), overall effective dose (ED), ED per level instrumented, and operative time per level were compared. EDs were determined by multiplying the DLP of the scan by an age-specific k-factor based on ICRP 103 tissue weighting factors.

RESULTS: ED per level instrumented was 0.061±0.030 mSv in low-dose PCT and 0.081±0.031 mSv in low-dose ICT (p=0.123). ED per level instrumented was significantly higher in the standard PCT group (1.471±0.365 mSv vs. 0.085±0.050 mSv; p<0.0001). Mean operative time per level was 31±7 minutes for ICT and 33±3 minutes for PCT (p=0.628).

CONCLUSION: Low-dose PCT resulted in 0.71 mSv exposure per case and 31 minutes per level, while ICT resulted in a similar amount of exposure and operative time. Use of a standard-dose PCT involves a radiation exposure 22 times higher than either low dose strategy.

Do Skeletal Maturity Estimates Correlate When Performed at Different Anatomical Locations?
Paper 222

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OBJECTIVE: Several skeletal maturity systems allow for accurate skeletal age assessment from a wide variety of joints. However, discrepancies in estimates have been noted when applying different systems on the same patient. This study compared the agreement between eight different skeletal maturity systems in modern pediatric patients and within a historical cohort.

METHODS: We performed a retrospective (1/2000-3/2022) query and included peripubertal patients who had ≥2 radiographs of different anatomic regions obtained ≤3 months apart for 8 systems: proximal humerus ossification system (PHOS), olecranon apophysis ossification staging system (OAOSS), lateral elbow system, modified Fels wrist system, Sanders Hand Classification, optimized oxford hip system, modified Fels knee system (mFKS), and calcaneal apophysis ossification staging system (CAOSS). Any abnormal (i.e., evidence of fracture or congenital deformity) or low-quality radiographs were excluded. These were compared to a cohort from a historic longitudinal study where subjects had radiographs at all sites at each visit. Standard error of the mean (SEM) skeletal age, representing variance of skeletal age estimates, was calculated for each system and used to compare system precision.

RESULTS: 700 radiographs from 350 modern patients and 954 radiographs from 66 historic patients were evaluated. In the modern cohort, the greatest variance was seen in PHOS (SEM 0.28 years), Sanders Hand (0.26 years), and CAOSS (0.25 years). The mFKS demonstrated the smallest variance (0.20 years). For historic children, the PHOS, OAOSS, and CAOSS were the least precise (0.20 years for all). All other systems performed similarly in historic children with lower SEMs (range 0.18-0.19 years). The lateral elbow system was more precise than the OAOSS in both cohorts.

CONCLUSION: Precision of skeletal maturity systems varies across anatomic regions. Staged, single-parameter systems (PHOS, Sanders Hand, OAOSS, CAOSS) may correlate less with other systems than those with more parameters.

The Blade Quality Scale: A Visual Classification System for the Use-Mediated Thermogenic Properties of Cast Saw Blades

Paper 223

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OBJECTIVE: Cast saw burns (CSBs) are a costly, avoidable iatrogenic injury in the treatment of pediatric injuries. One of the modifiable risk factors for CSB is the use and evaluation of cast saw blade quality. Cast saw blade characteristics responsible for increased CSB risk have not been previously described. Thus, this study aims to characterize the use-mediated thermogenic properties of cast saw blades to assist providers in determining when a blade becomes unsafe for clinical use.

METHODS: Stryker saw blades with a variable amount of wear were used with a Stryker vacuum cast saw by an experienced orthopedic surgeon to remove fiberglass casts. Blade temperatures were recorded with a K-type Proster thermocouple on the blade's surface and on the blade's teeth edge both before starting, after 5 passes, and after 10 passes. Three independent reviewers assessed blades according to a new qualitative Blade Quality Scale (BQS) based on the quantity of debris and presence of blade dullness, before and after each trial. Additionally, a Blade Degradation Index (BDI) was designed to quantify the amount of debris (% of blade tooth and gap debris coverage) assessed photographically.

RESULTS: A total of 78 trials were run with 21 different cast saw blades. Average maximum temperature (Tmax) blade temperature was 48.13 °C (range 41.6-58.7 °C). Tmax and change in Tmax had a positive correlation with all blade quality metrics. Blades with poor BQS and BDI demonstrated larger temperature variability and higher Tmax than better quality blades. The BQS classification had a high inter-rater reliability ($\kappa > .85$) with no significant difference among the three independent reviewers or their consensus with the quantifiable classification scores.

CONCLUSION: The positive correlation between temperature and BQS further supports that cast saw burn injuries related to blade temperature may be reduced if using a higher quality blade. The novel Blade Quality Scale, internally verified by the high inter-rater reliability and high consensus with quantifiable classification, provides orthopedic surgical trainees and surgeons with visual guidance on when a blade becomes unsafe for use.

Short-Term Outcomes of Hyperselective Neurectomy for Lower Extremity Spasticity in Pediatric Patients with Upper Motor Neuron Injury

Paper 224

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OBJECTIVE: Lower extremity spasticity secondary to upper motor injuries can be functionally limiting with profound social implications for patients and caregivers. We hypothesized that hyperselective neurectomy (HSN) of the gastrocnemius and soleus complex (GSC) would decrease lower extremity spasticity and improve ankle dorsiflexion without decreasing strength. The aim of this study was to report on the short-term outcomes of this procedure.

METHODS: Patients undergoing hyperselective neurectomy of the GSC for lower extremity spasticity from a single tertiary referral center were retrospectively reviewed. Patient demographics, preoperative Modified Ashworth Score (MAS) for spasticity in plantarflexion, ankle range of motion (ROM), concomitant procedures, and any complications were recorded. The primary outcomes were postoperative MAS score and ankle dorsiflexion ROM.

RESULTS: Seven pediatric patients met inclusion criteria (two male, five female with a mean age of 10 years) with varying underlying diagnoses (six with cerebral palsy and one with hereditary spastic paraparesis). Bilateral procedures (performed on three patients) were counted as separate procedures. The mean follow-up was 9 months (range 2 to 15 months). All patients demonstrated improved plantarflexion MAS scores at most recent follow up, with a mean preoperative ankle plantarflexion MAS of 3.0 which decreased to a mean of 0.6 postoperatively. Mean preoperative ankle dorsiflexion ROM with the knee in extension was -9° which slightly worsened to a mean of -13° postoperatively. With the knee in 90° flexion, ankle dorsiflexion improved from a mean of -6° preoperatively to a mean of 5° postoperatively. The only complication was wound dehiscence, noted for only one patient.

CONCLUSION: HSN of the GSC is safe in pediatric patients. This procedure effectively reduces spasticity in plantarflexion in short-term follow-up, with improved postoperative MAS scores and improved dorsiflexion with the knee flexed. This procedure should be examined in a larger population to more definitively determine risks and benefits associated with lower extremity hyperselective neurectomy in a pediatric population.

Elastic Stable Intramedullary Nailing of Tibial Shaft Fractures in Children: Clinical and Radiographic Outcomes

Paper 225

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OBJECTIVE: There is currently little evidence detailing patients' functional outcomes after elastic stable intramedullary nailing (ESIN). The purpose of our study was to assess clinical and functional outcomes of pediatric tibial diaphyseal fractures treated with ESIN.

METHODS: A retrospective review of charts and radiographs was performed. Patients who had ESIN of a tibial fracture from January 2006 to May 2022 at Cincinnati Children's Hospital Medical Center were identified. Patient medical records were reviewed for relevant clinical and demographic information, including age, sex, characteristics and classification of fracture, and presence of fibular fracture. Radiographic outcome measures included time to union, preoperative displacement, canal fill, and maximum residual deformity. Functional outcomes were assessed by documenting the release to low-impact (i.e., return to school and/or full weightbearing as tolerated) and high-impact (i.e., return to sports and/or full release of restrictions) activity levels after ESIN treatment. Mann-Whitney U tests and Chi-square tests were performed to compare differences between quantitative and categorical variables, respectively.

RESULTS: 154 patients were included in the study. Most fractures were closed (71.4%) and consisted of males (75.3%). The presence of length-unstable tibial fractures was more common with higher comminution on the Winquist-Hansen classification ($p < 0.001$). The time to fracture union and fluoroscopy time was greater with higher comminution types ($p = 0.004$, $p = 0.008$). There were no significant differences between Winquist-Hansen grades for return to low-impact or high-impact activities ($p = 0.08$, $p = .16$). Patients with union complications after their ESIN required more time before returning to low-impact and high-impact activities compared to those with no union complications ($p < 0.001$, $p = 0.008$). Those with union complications also had higher residual deformities after ESIN treatment in comparison to those without union complications (3.8° vs. 2.9°, $p = 0.003$).

CONCLUSION: ESIN can be a reliable treatment method when treating pediatric tibial fractures and assisting patients in returning to sports. Patients with higher-type comminution of tibial fractures have longer times until fracture union but continue to return to high-impact activities without obstruction. There is a longer time to fracture union and return to activities for patients experiencing postoperative union complications after ESIN.

Novel 3D Printed Compressible Highly-Porous Titanium Metaphyseal Cones in Revision TKA
Paper 226

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OBJECTIVE: Recently, compressible additive manufactured, highly porous titanium-alloy metaphyseal cones have been introduced for tibial and femoral bone loss in revision total knee arthroplasty (TKA). This novel cone design increases circumferential elasticity, which increases compressive hoop stress at the bone-implant interface while minimizing iatrogenic fracture risk. This study evaluated clinical and radiographic survivorship of these novel compressible porous titanium cones in a cohort of revision TKAs.

METHODS: 68 metaphyseal titanium-alloy cones (55 tibial, 13 femoral) utilized in revision TKA were retrospectively reviewed. Twenty-nine cones obtained minimum one-year follow-up (mean 1.1 years; range, 1 to 1.6). The cohort was 54% women and 74% ASA-PS class III/IV with mean age and BMI of 69 years (range, 41-83) and 31 kg/m^2 (range, 20-68). Bone loss was classified as ≥2 in 58% of cases using the Anderson Orthopaedic Research Institute (AORI) bone loss classification system. Revision-free survivorship was calculated using latest clinical follow-up. Radiolucent lines were evaluated using the Knee Society Radiographic Evaluation System.

RESULTS: The all-cause re-revision rate was 7.4% (5/68); however, only two cones (2.9%) were removed at re-revision due to aseptic loosening with severe bone loss. Both all-cause and aseptic revision-free survivorship related to the cone was 97.1% out to 1.6 years. Seven cones (10%) exhibited a partial radiolucent line on anteroposterior radiographs, though all were ≤1.5mm in depth. No radiolucent lines were present around the cones on lateral radiographs.

CONCLUSION: This compressible highly-porous titanium cone demonstrated excellent survivorship at 1.6-year follow-up. In addition, this cone demonstrated minimal radiolucent lines, which may be indicative of enhanced osseointegration at early follow-up, even in cases of moderate to severe boss loss. While early results are favorable, longer-term data are needed to ensure osseointegration as well as limited mechanical fatigue and stress-riser failures with the cone's increased circumferential elasticity.

Revision Total Knee Arthroplasty in Octogenarians: A Matched Cohort Comparison of Outcomes
Paper 227

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INTRODUCTION/PURPOSE: As the life expectancy of patients undergoing total knee arthroplasty (TKA) continues to increase, the incidence of older patients requiring revision TKA (rTKA) will similarly rise. There remains limited evidence regarding the safety of revision procedures in octogenarian patients. Therefore, the purpose of our analysis was to evaluate outcomes following rTKA in patients ≥ 80 years old compared to younger matched controls.

METHODS: The records of patients who underwent an aseptic all component revision total knee arthroplasty were reviewed from 2010 to 2020 at a multiple-surgeon, single-site institution. Data including demographics, revision etiology, and pos-operative outcomes were collected. Patients who were ages ≥80 years old (Group 1) were then matched to cohorts of patients 40 to 59 years old (Group 2) and 60 to 79 years old (Group 3) using one-to-one nearest neighbor matching based on gender, American Society of Anesthesiologists (ASA) Score, and body mass index (BMI). Multiple logistic regression was used to compare outcomes between groups via SPSS (IBM SPSS, Version 29.0. Armonk, NY: IBM Corp).

RESULTS: A total of 70 patients ≥80 years were included with a mean BMI of 29.8 ± 6.0, mean ASA of 2.5 ± 0.7, 37.1% males, and average CCI of 5.1 ± 1.2. The younger cohorts of Group 2 and Group 3 were matched using BMI (p=0.33), ASA (p=0.73), and gender (p=0.678). Aseptic loosening was the highest reason for revision in all groups at 71.4% in Group 1, 60% in Group 2, and 62.9% in Group 3. Periprosthetic fracture as a revision indication was only present in Group 1(11.4%) and 2 (8.6%). Range of motion increased in all 3 groups: Group 1 (7.1°), Group 2 (6.9°), Group 3 (6.6°) with a p=0.99. There was no difference in intraoperative or postoperative 90-day complications between groups. Group 1 re-operations for any reason (10%) were significantly lower than Group 2 (21.4%) with a p=0.03 and similar to Group 3 (12.9%) with p=0.3.

CONCLUSION: Patients who were 80 years and older did very well compared to the younger matched groups with no significant increase in complications or re-operations. The etiology necessitating rTKA may be an important factor that determines outcomes and complications in elderly patients. Revision TKA procedures can provide substantial clinical benefit for patients over 80. Clinical decision making, not solely based on age, should be used to determine if aseptic revision surgery is appropriate.

Metal-Backed Patella in Revision TKA: A Viable Option in a Bone-Preserving Approach
Paper 228

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OBJECTIVE: New generations of metal-backed patella (MBP) use highly porous titanium coating applied by 3D printing which may provide improved survival compared to prior generations. No studies have assessed outcomes of the new generation of MBP in revision TKA. This study aimed to determine (1) healthcare utilization, (2) preoperative and 1-year PROMs and (3) implant survivorship in patients who received a MBP during revision TKA.

METHODS: A consecutive series of patients who received MBP from 2017-2022 were retrospectively reviewed. Of 46 patients identified, 4 (8.7%) were non-revision cases and excluded, resulting in a final cohort of 42 patients (mean follow-up, 25.5 months; Interquartile Range, 10.2-44.3 months). PROMs included Knee injury and Osteoarthritis Outcome Score (KOOS) Pain, KOOS Physical Function Shortform (PS), KOOS Joint Replacement (JR) and Veterans RAND 12-Item Health Survey Mental Component Score (VR-12 MCS). MBP revision history, infection history, and patella thickness were collected via chart review. Prior ipsilateral prosthetic joint infection was common (PJI; n=31, 73.8%).

RESULTS: Length of stay averaged 3.4 days (SD, 2.2 days). Most patients experienced non-home discharge (n=33, 78.6%). The 90-day readmission rate was 11.9% (n=5), and patient 1-year mortality was 2.4% (n=1). Significant improvement was noted in KOOS JR ($p<0.001$), KOOS Pain ($p<0.001$), and KOOS PS ($p=0.009$), but not VR-12 MCS ($p=0.139$). MBP survivorship was 92.9% at a median follow-up of 2.1 years. One (2.4%) revision was due to aseptic loosening, and the remaining two (4.7%) resulted from PJI. Patellar thickness was a mean of 11.7 mm (SD 2.3 mm).

CONCLUSION: MBP used during revision TKA resulted in 93% survivorship at a median follow-up of 2.1 years, and significantly improved scores of pain, function, and overall joint health. Thus, MBP appears to be a viable option in addressing patellar component revision, even with limited remaining patellar bone stock.

Do Outcomes Differ After Medial UKA Based on Indications? A Prospective Cohort Study
Paper 229

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INTRODUCTION: The purpose of this study was to determine whether clinical outcomes differ after medial unicompartmental knee arthroplasty (UKA) between patients indicated with strict vs. liberal criteria.

METHODS: We prospectively enrolled 94 patients (110 knees) undergoing UKA by a single surgeon. Mean age was 62.7, 48% were female, and mean BMI was 31.6. Patients were categorized preoperatively as strict using Kozinn and Scott criteria or liberal if they met Nuffield criteria. Intraoperatively, patients were again categorized as strict or liberal based on intraoperative findings. KOOS JR, SANE, KSS, UCLA scores, VR-12, range of motion, revisions, reoperations, and complications were recorded. A two-sample t-test power analysis determined that 45 patients per group were required to identify a KSS difference of 6 (MCID) with 80% power. There were no differences in demographics between groups and mean follow-up was 3.2 years (range, 1.7-4.6 years).

RESULTS: Preoperatively, 58 patients (53%) met strict criteria and 52 (47%) met liberal criteria. 26 Strict patients were recategorized intraoperatively to the liberal group based on the identification of full-thickness patellofemoral changes of the central or medial facet/trochlea. Seven patients (4 strict and 3 liberal) had a TKA performed based on intraoperative findings. The final group categorization was 28 strict and 75 liberal. Preoperative liberal criteria patients had greater improvements in VR-12 mental scores (8.67 vs. 4.30, $p = .02$). Final liberal patients had greater improvements in UCLA scores (2.16 vs. 1.11, $p = .03$). No other differences were detected between groups including when comparing both preoperative and final criteria. Two patients were revised to a TKA (both in the liberal group): one for a periprosthetic fracture at 3 weeks and one at 14 months for unexplained pain.

CONCLUSION: The use of stricter indications potentially leads to underutilization of UKA as at short-term follow-up patient outcomes were similar.

High Area Deprivation Index Decreases Attainment of Patient Acceptable Symptom State Following THA
Paper 230

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OBJECTIVE: The impact of Area Deprivation Index (ADI) on reaching clinically relevant Patient Reported Outcome Measure (PROM) improvement thresholds and satisfaction has yet to be investigated in patients undergoing total hip arthroplasty (THA). This study aimed to assess the association between ADI and failure to achieve (1) Minimal Clinically Important Difference (MCID), (2) Patient Acceptable Symptom State (PASS), and (3) self-reported satisfaction at one-year following THA.

METHODS: This was a retrospective review of a prospective cohort who underwent primary unilateral THA from January 2016 to July 2021. There were 10,430 patients available for inclusion. Patients were excluded for missing preoperative PROMs (n=852, 8.2%). Of the remaining patients, 7,506 patients (78.4%) achieved 1-year follow-up. Patients had a median age of 66.0 years, median BMI of 29.2, and were 88.6% white. Multivariable logistic regression models investigated association between ADI and 1-year PROMs Hip disability and Osteoarthritis Outcome Score (HOOS) Pain, HOOS Physical function Shortform (PS) and HOOS Joint Replacement (JR)] while controlling for age, sex, race, BMI, CCI, smoking education, Narx score, insurance, PROM Phenotypes, and baseline HOOS JR.

RESULTS: There was no association between ADI and failure to achieve of MCID for HOOS Pain (p=0.424), HOOS PS (p=0.909) or HOOS JR (p=0.198). Higher ADI was independently associated with increased odds of failing to achieve PASS for HOOS Pain (p=0.002), HOOS PS (p=0.003), and HOOS JR (p=0.017). ADI was not associated with failure to achieve patient satisfaction at 1-year (p=0.932).

CONCLUSION: In patients undergoing primary THA, higher ADI scores, indicative of greater socioeconomic disadvantage, resulted in decreased odds of achieving PASS for HOOS Pain, HOOS PS and HOOS JR, but no other outcomes. ADI as a proxy of socioeconomic status, may aid in setting preoperative patient expectations, and socioeconomic interventions may present an opportunity improve outcomes following THA.

Does the Amount of Noise Generated Differ Between Manual and Robotic TJA?
Paper 231

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INTRODUCTION: The purpose of this study was to evaluate whether noise that is generated during manual and robotic-assisted total joint arthroplasty (TJA) exceeds the Occupational Safety Health Administration (OHSA) action limits.

METHODS: Personal dosimeters were used to record the decibel (dB) level in real time during manual and robotic-assisted total hip and knee arthroplasty (THA/TKA). The attending surgeon wore the dosimeter on their scrubs or attached to their protective helmet. All robotic procedures utilized the same company. Peak decibel levels (LCPeak) and continuous decibel levels (LAeq) were captured in each procedure, measuring the peak noise exposure and the average sound level. 2-tailed student T-test was calculated to evaluate a difference between LCPeak values between groups. An online exposure calculator was used to calculate the 8hr Time-Weighted-Average (TWA).

RESULTS: Forty total procedures were recorded; 10 for each robotic and manual THA and TKA. The average LAeq dB levels for the robotic THA and TKA were 71.55 and 69.70 dB, and for manual THA and TKA levels were 69.83 and 71.32 dB. The max LCPeak decibel in each group did not exceed the 140 dB OHSA peak sound pressure limit. Peak noise exposure in manual THA was higher than robotic THA ($p=0.01$). Manual and robotic TKA peak noise exposure showed no difference ($p=0.36$). Greater than 12 cases would be required for any of the groups to reach the 8hr TWA limit of 85 dB when using the online TWA calculator.

CONCLUSION: TJA surgeons have significant noise exposure during surgery regardless of surgical technique. However, peak sound pressures and 8hr TWA discovered during these procedures did not exceed OHSA limits in any of the groups and 8hr limits would only be exceeded if 12 or more cases were done within that time frame.

Preoperative Osteoporosis Impact on Healthcare Utilization and Clinical Outcomes Following TKA
Paper 232

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OBJECTIVE: This study aimed to uncover how osteoporosis (OP), a known risk for complications after total knee arthroplasty (TKA), impacts healthcare utilization and patient-reported outcomes post-TKA, and the correlation of DEXA scan-derived T-scores with the same outcomes.

METHODS: A prospective cohort of 6,318 primary TKA patients from 2015-2018 was analyzed, with 77.2% completing a one-year follow-up. Outcomes included healthcare utilization measures and improvement in Knee Injury and Osteoarthritis Outcome Score (KOOS) Pain, HOOS-function, and patient acceptable symptomatic state (PASS) attainment.

RESULTS: The prevalence of OP pre-TKA was 66.7%. Interestingly, 33.6% of OP patients were not on OP medications, and only 19.1% had a DEXA scan. Compared to non-OP patients, OP patients had higher odds of 90-day readmissions (OP with medications: odds ratio (OR):1.79 (95% confidence interval (CI):1.41-2.27); OP without medication: OR:1.69 (1.3-2.2). Medicated OP patients had prolonged length of stay (OR: 1.21 (1.02-1.43) and were less likely to be discharged home (OR: 1.56 (1.25-1.95). Non-medicated OP patients reported lower 1-Year HOOS PS scores (OR: 0.87 (0.76-1). Patients with higher T-scores had better 1-Year KOOS PS but no significant association with KOOS pain, length of stay, discharge disposition, 90-day readmission, or overall pain and function improvement.

CONCLUSION: A substantial proportion of patients undergoing TKA had osteoporosis, yet a significant number did not receive pharmacotherapy before surgery, and only a limited few had available DEXA scan results. OP patients faced increased risk of 90-day readmissions, with medicated OP patients showing longer LOS and non-home discharge. Non-medicated OP patients were less likely to achieve higher 1-Year KOOS PS scores, implying OP's potential impact on functional recovery. These outcomes highlight the intricate relationship between OP, its management, and post-TKA results, warranting further research to refine strategies for OP patients undergoing TKA.

A Comparison of Charlson Comorbidity, Elixhauser Comorbidity, Frailty Indices to Predict Outcomes Following Total Hip Arthroplasty

Paper 233

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INTRODUCTION: 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). While all of these tools have been validated for general use, the best risk assessment tool is still debated. Appropriate risk stratification is particularly important in elective surgery, such as total joint arthroplasty. The aim of this study is to compare the predictive power of the CCI, ECI, and HFR in the setting of total hip arthroplasty (THA).

METHODS: All patients who underwent THA 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: A total of 1,236,461 patients undergoing THA were included in our analysis. For mortality, ECI was most predictive (0.96 Area Under the Curve (AUC)), while CCI and HFR were 0.77 and 0.76 AUC, respectively. For 30-day readmission, ECI was 0.78 AUC, while HFR and CCI were 0.61 AUC. For 30-day reoperation, ECI was 0.7 AUC, while HFR was 0.57 AUC and CCI was 0.56 AUC. For periprosthetic fractures, ECI was 0.76 AUC, HFR was 0.67 AUC, and CCI was 0.65 AUC. For joint infections, ECI was 0.79 AUC, HFR was 0.61 AUC, and CCI was 0.6 AUC.

CONCLUSION: These results indicate that ECI is a stronger predictor of adverse outcomes following THA than CCI or HFR. Orthopedic surgeons should consider utilizing ECI in preoperative patient risk assessment.

Body Mass Index Severity as a Predictor of Total Hip Arthroplasty Complications
Paper 234

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OBJECTIVE: There is no consensus on the types of complications faced by patients of increased body mass index (BMI) that undergo total hip arthroplasty (THA). The purpose of this study was to stratify complications following THA in patients of various BMI categories, after adjusting for demographic factors and comorbidities.

METHODS: We reviewed the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database to identify patients between 2012-2021. Patients were filtered using the Current Procedural Terminology (CPT) codes who underwent primary THA (CPT code 27130), over the age of 18. Patients were stratified to 6 BMI categories from underweight (<18.5) to obese class III (>50). Multivariate analysis, adjusted for demographic factors and comorbidities, was performed to determine the association between BMI class and complications. Odds ratios with 95% confidence intervals (CIs), and p-values were determined for each postoperative complication's association with BMI class.

RESULTS: We identified 322,418 patients who underwent primary THA between 2012 and 2021. We adjusted for age, race, ethnicity, and ASA classification. For example, postoperative bleeding requiring transfusion (OR: 1.34, $p<0.001$) and death (OR: 2.66, $p<0.001$) were significantly greater in the underweight population relative to normal BMI population. Whereas odds of reoperation (OR: 2.56, $p<0.001$), wound disruption (OR: 8.28), $p<0.001$), prosthetic joint infections (OR: 8.37, $p<0.001$), and periprosthetic fractures (OR: 3.52, $p<0.002$) were significantly positively correlated with increasing BMI severity.

CONCLUSION: Degree of obesity has been a strong consideration for THA patient selection. While instituting BMI cut-offs may reduce some complications, this also restricts patient access to surgery. We show that the likelihood of specific complications, namely wound disruptions, prosthetic joint infections, periprosthetic fractures, and re-operations increase significantly as a function of rising BMI. Likewise, there other important complications, such as postoperative bleeding requiring transfusion and death, that are significantly greater in the underweight group.

Comparative Outcomes After Cemented Unicompartmental and Total Knee Arthroplasty Based on BMI
Paper 235

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OBJECTIVE: Aseptic revision is higher for unicompartmental (UKA) than total (TKA) knee arthroplasty. Additionally, high body mass index (BMI) has been linked to higher TKA aseptic revision rates. The purpose of this study was to compare revision and patient-reported outcomes (PROMs) following cemented UKA and TKA based on BMI.

METHODS: 238 UKAs and 291 TKAs were evaluated with mean follow-up of 22±12 and 24±23 months, respectively. Patients were dichotomized into BMI <35 and ≥35 kg/m^2. One-year PROMs including activity level, pain walking on level surface, pain climbing stairs, knee feeling normal, KOOS JR. score, and satisfaction were analyzed. Potential covariates including sex, age, ASA-PS class, implant type, inflammatory diseases, lumbar spine disease, preoperative narcotic use, and depression were controlled in multivariable analysis. For TKA and UKA, respectively, 72% and 46% were female with average age of 68±9 and 64±10 years.

RESULTS: Aseptic revision rates were higher for UKA patients with BMI ≥35 (5.2%) than those with BMI <35 (0.6%, P=.046). Aseptic revision rates were higher in the BMI <35 group (3% vs. 0%, P=.072). KOOS JR. knee health was lower in UKA patients with BMI ≥35 (76.5 vs. 86.4, P=.004) but did not differ for TKA (79.4 vs. 79.9, P=.850). More TKA patients with BMI ≥35 were satisfied (93% vs. 79%, P=.005) with no difference in UKA patients (86% vs. 87%, P=.757). TKA patients with BMI ≥35 reported greater reduction in pain climbing stairs (P=.047), but improvement in stair pain did not differ based upon BMI for UKA patients (P=.555).

CONCLUSION: Aseptic revision rates were low for both procedures, but higher BMI was associated with increased revision risk following UKA. Additionally, UKA patients with BMI ≥35 experienced lower knee health scores postoperatively. Additional study is recommended to define ideal indications for successful UKA.

Image-Based vs. Image-Less Computer-Navigation in THA: A Comparison of Measurements in the Same Cases

Paper 236

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BACKGROUND: Image-based (IBCN) and image-less computer-navigation (ILCN) have demonstrated improved accuracy for acetabular component positioning in total hip arthroplasty (THA). The aim of this prospective study was to compare IBCN vs. ILCN for acetabular component version and inclination utilized in the same case.

METHODS: 100 consecutive patients undergoing posterior approach primary or revision THA at a single, tertiary academic center from July 2022 to May 2023 were included. Both IBCN (Radlink) and ILCN (Intellijoint) were used for in each case. Demographics, diagnosis of lumbar spine disease, and prior spinal fusion were collected. Mean age was 63 years, 58% were female, and average body mass index (BMI) was 32 kg/m^2. 76% had lumbar disc degenerative disease and 9% had prior spinal fusion. Postoperative standing anteroposterior (AP) pelvis radiographs were analyzed to assess acetabular component position using the validated Martell Hip Analysis Suite. The differences in acetabular component position measurements were directly compared between IBCN and ILCN and compared to the Martell measurements. Data were compared using independent means, t-tests and chi-square tests for continuous and categorical variables, respectively.

RESULTS: There were no differences in intraoperative mean inclination between IBCN and ILCN (41.5° vs. 41.7°, p=0.62), however, there was a difference of >5° in 21% of cases. There were no differences in intraoperative mean anteversion between IBCN and ILCN (24.7° vs. 25.1°, p=0.41), however, there was a difference of >5° in 32% of cases. When comparing to postoperative standing AP inclination and anteversion measurements, over 37% of IBCN measurements and 46% of ICLN measurements were discordant by 5° or more.

CONCLUSION: This intra-case comparison of IBCN and ILCN and postoperative AP measurements demonstrates that measurements of acetabular component position are discordant in many cases. Surgeons should use caution when relying solely on computer-navigation for acetabular component positioning in THA.

Three Differing Methods of Treating Intraoperative Non-Displaced Calcar Fractures Demonstrate Equivalent Radiographic Stem Subsidence

Paper 237

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BACKGROUND: Several management strategies have been described to treat intraoperative calcar fractures during total hip arthroplasty (THA), including retaining the primary implant and utilizing cerclage cables, or switching the implant to one which bypasses the fracture and achieves diaphyseal fixation. However, the radiographic and clinical outcomes of these differing strategies have never been described and compared.

METHODS: We retrospectively identified 50 patients who sustained an intraoperative calcar fracture out of 9,129 primary THAs (0.55%) performed by one of three surgeons between 2008-2022. Each of the three surgeons consistently employed a distinct strategy for the management of these fractures: retention of the primary metaphyseal-engaging implant and placement of cerclage cables (CC), exchange to a modular, tapered-fluted stem (MTF) or exchange to a fully-coated, diaphyseal-engaging stem (FC). Stem subsidence was then evaluated on standing AP pelvis radiographs at three months and one year postoperatively. Postoperative medical and surgical complication rates were evaluated.

RESULTS: Fifteen patients were treated with CC, 15 with MTF and 20 with FC. At three-month follow-up, mean stem subsidence was 0.43±0.08 mm, 1.47±0.36 mm and 0.68±0.39 mm for CC, MTF and FC cohorts, respectively (p=0.323). At one-year, mean stem subsidence was 0.70±0.08 mm, 1.74±0.69 mm and 1.88±0.90 mm for CC, MTF and FC cohorts, respectively (p=0.485). Medical complications included 2 DVTs (4%) within 90 days of surgery. There were 6 reoperations (12%); 3 (6%) for acute periprosthetic joint infection (all within the FC cohort), 2 (4%) for periprosthetic fractures (both occurred at 5 weeks postoperatively, one fracture distal to the stem in the FC cohort and one fracture at the level of the stem in the MTF cohort) and 1 (2%) closed reduction for instability (within the CC cohort).

DISCUSSION: The three described methods of managing intraoperative nondisplaced calcar fractures demonstrated little radiographic stem subsidence however the risk of reoperation was much higher than expected.

Early Outcomes Following Tourniquetless Uncemented and Cemented Total Knee Arthroplasty: A Matched Cohort Analysis

Paper 238

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OBJECTIVE: Uncemented and tourniquetless total knee arthroplasty (TKA) have gained popularity as an alternative to cemented TKA, particularly in the ambulatory clinical setting. The goal of this study was to evaluate whether there is a difference in early clinical outcomes between cemented and cementless TKA without a tourniquet.

METHODS: 218 consecutive cementless primary TKAs were case control matched to 218 cemented primary TKAs on sex (exact match), ASA-PS classification (exact match), age (± 1 year), and BMI (± 1 kg/m^2). Cases were performed by the same surgeon without a tourniquet. Prospectively documented hospital length of stay (LOS), Hahn-Klimroth estimated blood loss on postoperative day 1 relative to preoperative baseline, blood transfusions, thromboembolic rates, and reoperations were compared in multivariable analysis controlling for fixation type and other relevant covariates.

RESULTS: 58% of patients were female, with average age of 63 years and BMI of 36 kg/m^2 ($P \geq .823$). Procedure duration for cementless was 9.4 minutes faster (62.3±9.4 vs. 71.7±10.5 minutes; $P < .001$) and time under anesthesia was 11.5 minutes faster (93.7±12.0 vs. 105.2±12.7 minutes; $P < .001$). When cementless fixation was used, LOS decreased by 0.39 days (95% CI 0.23, 0.55, $P < .001$). Estimated blood loss did not differ based on fixation type (P=.304) and blood transfusion and thromboembolic rates were zero for both groups. At mean follow-up of 32.2 (range:10-77) months, there were no group differences in aseptic (P=.999) or septic (P=.499) reoperation rates. Two cementless tibial components mechanically failed within a year of the index surgery compared to no cemented implants (P=.499).

CONCLUSION: With proper patient selection, the shorter operative and anesthesia times associated with cementless TKA compared to cemented TKA may favor its use in a modern outpatient surgical setting by enhancing rapidity of discharge and likelihood for successful same day discharge without significant increases in other early postoperative complications.

Osteoporosis is Associated with Increased Healthcare Utilization and Clinical Outcomes after THA
Paper 239

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OBJECTIVE: The impact of Osteoporosis (OP) on healthcare utilization and patient-reported outcomes post total hip arthroplasty (THA) is under-explored. This study aimed to examine the relationship between pre-THA OP diagnosis and healthcare outcomes, and the association between DEXA scan-based T-scores and the same outcomes.

METHODS: A prospective cohort of 5,321 primary elective THA patients (2015-2018), with 76.6% completing a one-year follow-up was analyzed. Outcomes included healthcare utilization measures and improvement in Hip Disability and Osteoarthritis Outcome Score (HOOS) Pain, HOOS-function, and patient acceptable symptomatic state (PASS) attainment.

RESULTS: OP prevalence pre-THA was 56.9%, with 39.8% not prescribed OP medications and 15.3% having a DEXA scan. OP patients demonstrated higher odds of prolonged length of stay (LOS) (OP with medications: odds ratio (OR):1.82 (95% confidence interval (CI):1.5-2.22); OP without medication: OR:1.46 (1.17-1.81), non-home discharge (OP with medication: OR:1.55 (1.24-1.94); OP without medication: OR:1.52 (1.17-1.98) and 90-day readmission (OP with medication: OR:2.68 (2-3.58), OP without medication: OR: 1.51 (1.08-2.12). Medicated OP patients showed higher 1-year reoperation (OR: 1.81 (1.06-3.08) and higher odds of failing to achieve minimal clinically important difference (MCID) for HOOS-PS (OR:1.41 (1.06-1.89) and PASS (OR:1.5 (1.16-1.93). Higher T-Scores were associated with lower odds of prolonged LOS, non-home discharge, and less failure to achieve MCID in HOOS-Pain and HOOS-PS.

CONCLUSION: OP patients have higher risk of prolonged LOS, non-home discharge, 90-day readmission, one-year reoperation, and poor pain/function improvement. This was confirmed when evaluating bone mineral density (BMD) quantitatively via T-scores. Greater awareness and screening of OP before THA is recommended.

Robot-Assisted Total Hip Arthroplasty Increases the Risk of Periprosthetic Fracture
Paper 240

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INTRODUCTION: Total Hip Arthroplasty (THA) aims to restore joint function and relieve pain. New technology, such as robot assistance offers the potential to reduce human error, improve precision, and improve postoperative outcomes. The aim of this study is to compare outcomes between conventional and robot-assisted THA.

METHODS: This is a retrospective cohort study utilizing the National Readmissions Database, years 2016-2019. Patients undergoing THA, conventional or robot-assisted, were identified via ICD-10 code. Multivariate regression was performed to assess outcomes between groups. Quasi-Poisson regression was used to assess total charges. Patient demographics and comorbidities, measured via Elixhauser comorbidity index, were controlled for in our analysis.

RESULTS: 1,216,395 patients undergoing THA, 18,417 (1.51%) with robotic assistance, were identified. Patients undergoing robot assisted procedures had increased surgical complications (Odds Ratio (OR) 1.314; $p<0.001$), including periprosthetic fracture (OR 1.633; $p<0.001$). Notably, these patients also had significantly greater total charges (OR 1.2; $p<0.001$).

CONCLUSION: Robot assistance in THA is associated with worse outcomes and is significantly more expensive. Patients undergoing a robot-assisted THA had an increased risk of surgical complications, including periprosthetic fracture, while incurring greater total charges.

Short-Term Incidence of Reoperation and Associated Risk Factors in Aseptic Revision Total Hip Arthroplasty Using Cementless Distal Fixation Modular Stems

Paper 241

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OBJECTIVE: Cementless distal fixation modular stems are commonly used in aseptic revision total hip arthroplasty (rTHA). This study aimed to report the cumulative incidence of any reoperation and associated risk factors in a large cohort of aseptic rTHA patients with cementless distal fixation modular stems.

METHODS: All patients undergoing aseptic rTHA with cementless distal fixation modular stems and prospectively enrolled in the outcomes reporting system at our institution between 2015-2020 were included. Median follow-up time was 3.8 years (range, 0.1-7.9 years). Patients who underwent reoperation of the hip with the stems of interest were identified. Demographic and clinical information were collected at the times of rTHA and reoperation. A cumulative incidence plot was used to visualize the incidence of reoperation. Death was a competing event. A multivariable subdistribution hazard model was used to model risk factors of reoperation of the hip with the stem of interest. All tests were two-sided, with a Type I error rate of 0.05. Analyses were performed using R software (Version 4.2; Vienna, Austria).

RESULTS: 335 patients underwent aseptic rTHA with cementless distal fixation modular stems. The median age at aseptic rTHA was 71.2 years (IQR: 62.9, 78.8). Aseptic loosening (40.0%, 134/335 patients) was the most common indication for rTHA. The median length of stay was 3 days (IQR: 2; 5). 52.2% of patients (175/335) were discharged to their homes, and 15.0% (50/334) were re-admitted to the hospital within 90 days of discharge. 24 patients underwent reoperation of the hip with the stem of interest during the follow-up period. The most common causes of reoperation were infection (8/24, 33.3%), dislocation (8/24, 33.3%), and aseptic loosening (3/24, 12.5%). The median time to reoperation was 54.0 days (IQR: 31.0, 153.0). At 2 years after aseptic rTHA, the cumulative incidence of any reoperation was 6.9% (95% CI: 4.5%, 9.9%). After adjusting for sex, the relative incidence of reoperation in patients with Restoration modular (Stryker) stems was 56% lower as compared to patients with Arcos modular (Zimmer Biomet) stems (HR=0.44; 95% CI: 0.19, 0.98; p=0.044).

CONCLUSION: The cumulative incidence of reoperation in aseptic rTHA with cementless distal fixation modular stems was 6.9% at 2 years. Stem model may play a role in the risk of reoperation in aseptic rTHA.

The Impact of Computer Navigation on Total Hip Arthroplasty Outcomes
Paper 242

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INTRODUCTION: Computer navigation is associated with improved limb alignment and implant position in total joint arthroplasty. While it is commonly used in total knee arthroplasty, adoption in the setting of total hip arthroplasty (THA) has been slower. Further, the literature is equivocal on whether computer navigation improves outcomes. The aim of this study is to assess the impact of computer navigation on perioperative outcomes in the setting of THA.

METHODS: This was a retrospective cohort study. The National Readmissions Database, years 2016-2019, was queried via ICD-10 code for all patients undergoing THA. To compare outcomes between conventional and computer navigated THA, multivariate regression was performed to assess perioperative complications. Quasi-Poisson regression was performed to assess total charges and length of stay (LOS). Demographics and comorbidities, measured by the Elixhauser comorbidity index, were controlled for in all regressions.

RESULTS: A total of 1,216,395 patients who underwent THA were identified. 19,764 (1.62%) of procedures were computer navigated while 1,196,631 (98.38%) were conventional procedures. Computer navigation was associated with reduced medical (Odds Ratio (OR) 0.871; $p=0.022$), but increased surgical complications (OR 1.867; $p<0.001$), namely blood transfusions (OR 2.689; $p<0.001$). Computer navigated procedures were also associated with significantly reduced LOS (OR 0.857; $p<0.001$); however, total charges were greater (OR 1.315; $p<0.001$).

CONCLUSION: Computer navigated THA is significantly more expensive, but may reduce medical complications following surgery and reduce LOS. While there were increased surgical complications, namely blood transfusion, computer navigation may still be safe and appropriate in carefully selected patients.

Comparison of Short-Term Outcomes Between Direct Anterior and Posterolateral Approach in Robotic-Assisted Total Hip Arthroplasty

Paper 243

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OBJECTIVE: The objective was to compare rates of dislocation, reoperation, revision, and patient reported outcome measures (PROMs) between direct anterior approach (DAA) and posterolateral approach (PLA) for robotic-assisted primary total hip arthroplasty (THA).

METHODS: We identified 2,040 consecutive robotic-assisted primary THAs for primary osteoarthritis, performed by DAA (n = 497) and PLA (n = 1542) between 2017-2020. Mean age was 63; median follow up was 24 months. There were more females (61% vs. 55%, p=0.012) and lower mean BMI (26 kg/m^2 vs. 29 kg/m^2, p<0.001) in the DAA cohort. Kaplan-Meier analysis estimated cumulative survivorship and logistic-regression controlled for baseline differences. Patient acceptable symptom state (PASS) and minimum clinically important difference (MCID) were used to compare changes in the Hip Disability and Osteoarthritis Outcome Score, Joint Replacement (HOOS JR) and Visual Analogue Scale (VAS) following THA.

RESULTS: The incidence of dislocation was rare in this series (14 in 2040, 0.7%); this included 1/497 (0.2%) dislocation in the DAA cohort and 13/1542 (0.8%) dislocations in the PLA cohort treated by closed reductions which was not significantly different (p = 0.20). There was no difference in cumulative reoperation-free survivorship (2-year: 97.8% vs. 98.6%, p = 0.59) and revision-free survivorship (2-year: 98.8% vs. 99.0%, p = 0.64). After controlling for age, sex, BMI, and surgeon, there was no difference in reoperation or revision. At 6-weeks follow-up, more patients in the DAA vs. the PLA cohort achieved HOOS PASS (69% vs. 55%, p = 0.017), HOOS MCID (79% vs. 65%, p = 0.015), and VAS MCID (78% vs. 64%, p = 0.016). There were no differences in PROMs by three months.

CONCLUSION: For robotic-assisted primary THA, DAA may confer enhanced early (<6 weeks) functional and pain recovery compared to the PLA, but we found no significant difference in postoperative dislocation, reoperation, and revision rates.

Mapping the Importance of Each Individual Element of PROMs on One-Year Satisfaction After THA
Paper 244

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Objective: To date, no studies have examined the specific contributions of individual metrics in patient reported outcome measures to satisfaction after total hip arthroplasty (THA). Therefore, this study aimed to (1) identify drivers associated with one-year satisfaction; and (2) designate individual weights by which each element accounted for by the hip osteoarthritis outcome score (HOOS) as well as the VR–12 mental composite score (MCS) contributes to attaining a patient acceptable symptomatic state (PASS) after primary THA.

METHODS: All patients who underwent primary unilateral elective THA at a tertiary medical system between 2016 and 2021 were screened for inclusion (N = 11,715). A total of 7,903 patients; (77.5%) completed one-year follow-up. Multivariable logistic regression were performed to assess the relationship between risk factors and the outcome. The relative importance of variables were provided by Random forest based on the Gini impurity index.

RESULTS: The ability to sit comfortably as a function of daily living was the only activity/pain-related independent predictor of achieving PASS at one-year postoperatively (OR 0.85 [0.75–0.97]). In contrast, patient-reported mental status was associated with attaining PASS at one year. Specifically, 1 level deterioration of calmness (OR 0.9, [0.83–0.97]), and energy levels (OR 0.88 [0.82–0.95] were associated with lower satisfaction at one-year postoperatively. Similarly, 1 level improvement in patients' reported downheartedness (OR 1.08 [1.00–1.16]) was associated with achieving PASS at one year postoperatively. BMI, ADI (as an indicator of social deprivation), age, education, and comorbidity burden were the highest five contributors to PASS attainment at one year.

CONCLUSION: Identifying physical and mental domains associated with improved patient satisfaction after THA can help identify major patient needs as well as expectations from THA and optimize targeted care provision addressing such metrics.

Comparing 30-Day Complications Between General and Spinal Anesthesia in Patients with Chronic Obstructive Pulmonary Disease (COPD) Undergoing Arthroplasty Procedures for Femoral Neck Fractures
Paper 245

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OBJECTIVE: The purpose of this study is to compare the incidence of 30-day complications for patients with COPD undergoing general versus spinal anesthetic for arthroplasty procedures for femoral neck fractures using a large national database.

METHODS: Primary total hip or hemiarthroplasty procedures for femoral neck fractures were identified on the American College of Surgeons' NSQIP database using Current Procedural Terminology (CPT) and International Classification of Diseases (ICD) codes between January 1, 2015 and December 31, 2020. Patients with a diagnosis of COPD were subsequently identified. Demographics, patient variables, and surgical variables were compared between patients with COPD undergoing the aforementioned procedures with general versus spinal anesthesia. Various 30-day outcome measures were compared between the general and spinal/MAC anesthesia groups using Chi-squared tests. Multivariate logistic regression was used to identify independent factors associated with various short-term complications of interest.

RESULTS: 5,040 patients were identified with a history of COPD who underwent arthroplasty procedures for femoral neck fractures using either spinal (n=1,240) and general (n=3,800) anesthesia. Patients who underwent general anesthesia had a higher rate of 30-day mortality ($p=0.015$), hospital readmission ($p=0.041$), non-home discharge ($p=0.008$), bleeding requiring transfusion ($p<0.001$), unplanned intubation ($p<0.001$), and being ventilated for >48 hours ($p=0.026$). On multivariate analysis, general anesthesia was independently associated with mortality, non-home discharge, overall surgical complications, unplanned intubation, and bleeding requiring transfusion ($p<0.05$).

CONCLUSION: General anesthesia is associated with a higher incidence of 30-day complications relative to spinal anesthetic in patients with COPD undergoing arthroplasty procedures for femoral neck fractures. Specifically, general anesthesia was associated with a higher incidence of 30-day hospital readmission, mortality, prolonged length of stay, non-home discharge, surgical complications (blood loss requiring transfusion) and medical complications (prolonged intubation and unplanned intubation) relative to spinal anesthesia.

A 10-Year Analysis of Major Shifts in Outpatient Total Hip Arthroplasty in the United States
Paper 246

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OBJECTIVE: With the removal of total hip arthroplasty(THA) from the inpatient-only list, arthroplasty surgical practices across the United States have undergone a significant but so far uncharacterized change. Therefore, this study aimed to (1) describe the volume and changes in volume for inpatient and outpatient primary THAs; (2) evaluate patient attributes before and after the year 2020; (3) relate trends in healthcare utilization parameters, 30-day complications, and 30-day readmissions for inpatient and outpatient THAs.

METHODS: The National Surgical Quality Improvement Program was queried for patients who underwent primary THA between January 2010 and December 2021 resulting in 332,423 patients. The primary outcome of interest was the volume of outpatient and inpatient THA in the years involved. Secondary outcomes involved 30-day complications, 30-day readmissions, and 30-day reoperations. The variables between cohorts were analyzed using goodness-of-fit Chi-square tests.

RESULTS: Of the 332,423 THAs between 2010 and 2021, 88% were inpatient THA(n = 292,974) and 12% underwent outpatient THA(n = 39,449). From 2019 to 2021, the volume of inpatient THA decreased by 55%(42,779 to 19,075) while outpatient THA increased by 751%(2,518 to 21,424). Patients who had outpatient THA after 2019 were older($P<0.001$), more commonly female($P<0.001$), more commonly white($P<0.001$), and more likely to be American Society of Anesthesiologists Class III ($P<0.001$). The outpatient cohort had lower rates of any 30-day complications, 30-day readmissions, and 30-day reoperations. While the length of stay for both cohorts decreased until 2019, it increased in 2020 and 2021 for inpatient THAs. In contrast, home discharge and operative time increased for both cohorts.

CONCLUSION: The volume of outpatient THA increased almost eightfold in the US-associated hospitals. Although the patients undergoing outpatient THA were older and had more comorbidities, 30-day complications, length of stay, and readmissions did not increase. Furthermore, home discharge and operative time increased, showing that even with potentially more complex cases, outcomes are improving.

Validation of a Classification System for Appropriate Use of Debridement, Antibiotics, and Implant Retention in Periprosthetic Knee Infection: A Retrospective Review

Poster 001

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INTRODUCTION: Periprosthetic joint infection (PJI) continues to be a devastating complication following total knee arthroplasty (TKA). Implant retention for certain patients could be ideal and current treatment options suggest debridement, antibiotics, and implant retention (DAIR) could be a good choice for acute PJI. However, success rates of DAIR using the existing scoring systems and algorithms are variable. We aim to evaluate the accuracy of a new scoring system for use of DAIR at our institution.

METHODS: 161 TKA patients from 2008-2019 who were diagnosed with PJI by MSIS criteria and subsequently underwent DAIR were queried from a multiple surgeon single-site institution. 30 patients with any prior infection-related procedure were excluded. Data was collected on demographics, laboratory values, and clinical outcomes. Failure was defined as persistent or recurrent infection requiring surgical intervention. The scoring system parameters consisted of PJI acuteness (scores 2-6), micro bacterium (scores 1-3), and host health using CCI (scores 1-3). DAIR was indicated with scores less than 6, feasible with scores less than 8, and contraindicated with scores 8 or above. Univariate analysis was done including sensitivity and specificity in SPSS (IBM SPSS, Version 29.0. Armonk, NY: IBM Corp).

RESULTS: Mean follow up for the 131 included patients was 2.5 years with an average age of 65.3 ± 9.3, BMI of 32.9 ± 7.8 and CCI of 3.1 ± 1.8. The cohort consisted of 58% males, 6.1% current smokers, 32.1% former smokers, and 61.8% never smokers. Successful eradication was found in 72.5% of patients. The classification system showed a sensitivity of 53.2% and specificity of 80.6% with a PPV of 87.7% when the cut-off for DAIR was a score of less than 6. If the cut-off was set for a score less than 8 the sensitivity was 95.7% and specificity was 50% with a PPV of 83.3%.

CONCLUSION: To date, there has not been an agreed upon classification system or algorithm for patients to accurately predict the failure or success of DAIR. This novel Israeli DAIR classification system may be considered given its high specificity when patients score below 6 or high sensitivity when patients score below 8.

Surgical Start Time as a Predictor of Postoperative Length of Stay and Morbidity in Elective Total Knee Arthroplasty

Poster 002

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INTRODUCTION: Total Knee Arthroplasty (TKA) is a common procedure for treatment of end-stage arthritis. Numerous studies have identified factors, like surgical duration, which may increase the risk of morbidity and length of stay. Start time of a TKA has not yet been well studied, although it has been associated with poor outcomes in other procedures. In our study, we examined whether the start time had an effect on length of stay and complication rate in elective TKAs

METHODS: 540 patients who underwent elective, primary TKA at an urban, academic medical center between 6/8/2012 and 6/8/2019 were retrospectively reviewed. Patients were classified into two groups based on the start time of their procedure: morning (7AM - 12PM) and afternoon (12PM - 7:30 PM). Procedures complicated by superficial infection, deep/periprosthetic infection, need for revision, 90-day readmission, and other medical complications such as UTI, pneumonia, or DVT within two years of surgery were recorded. Length of stay (LOS), estimated blood loss (EBL), and operative time were recorded for each case. Chi-squared and independent t-tests were used to determine differences between each cohort.

RESULTS: 429/540 (79%) of total cases were in the morning, while 110/540 (21%) were in the afternoon. The mean surgical duration was 144 minutes (32) for both the afternoon and morning group ($p>0.9$). There was no significant difference in preoperative variables between both groups. The average length of stay was 3.85 (2.90) days for the afternoon group and 3.65 (2.09) days for the morning group ($p>0.9$). There was a statistically significant difference in the rate of superficial infections: 8.2% in the afternoon group compared to 3.0% in the morning ($p=0.027$). There was a significantly lower rate of revision in the morning group ($p=0.048$). There was no significant difference between the rate of deep infection, readmission rate, EBL, or other complication rate.

DISCUSSION: We found a higher rate of superficial infections and revisions among patients that had a TKA beginning in the afternoon compared to the morning. This may be attributed to reduced hospital staffing and/or access to postoperative resources, although further study is needed. Adjustments to perioperative staffing and preoperative risk assessment may improve outcomes.

Intraosseous vs. Intravenous Vancomycin in Tourniquetless Primary Total Knee Arthroplasty - A Prospective, Randomized Controlled Trial

Poster 003

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INTRODUCTION: Intraosseous (IO) administration of prophylactic vancomycin at the time of total knee arthroplasty (TKA) has been shown to be safe and more effective than intravenous (IV) administration at preventing early prosthetic joint infection. Previous studies have relied on thigh tourniquet inflation to mitigate systemic release of the antibiotic. It is unknown whether IO administration of vancomycin prior to tourniquetless TKA is a similarly effective method for antibiotic prophylaxis. The purpose of this study is to compare local and systemic levels of vancomycin after IO administration vs. IV administration during tourniquetless TKA.

METHODS: This is a prospective, randomized, single-blinded controlled trial. Our current study size involves 4 patients in each arm: 4 given IV vancomycin, and 4 given IO vancomycin. The IV group received weight-dosed vancomycin in the preoperative period approximately 1 hour prior to incision and weight-dosed cefazolin immediately prior to incision. The IO group received weight-dosed cefazolin just prior to incision, and 500mg vancomycin delivered via IO technique into the proximal tibia at time of incision. Systemic samples for vancomycin levels were taken prior to the incision and at time of closure. During the procedure, bone and soft tissue samples were taken at time of distal femoral cut (T1), at tibial cut (T2), and from suprapatellar synovium at start of incision closure (T3). Tissue vancomycin concentrations were calculated after processing via high-performance liquid chromatography.

RESULTS: No patient demographic or serum creatinine differences were present. Significant differences in systemic vancomycin levels (ug/mL) were found at the start of the case: IV= 32.7 ± 9.0, IO = 0 ± 0, $p<0.01$; and at the end of the case: IV = 18.7 ± 3.4, IO = 8.3 ± 1.0, $p<0.03$. No significant differences were seen in the average vancomycin concentration in the distal femur: IV = 72.4 ± 23.1, IO = 79.2 ± 6.5 $p= 0.79$; or in the proximal tibia IV= 59.7 ± 29.9, IO = 73.9 ± 28.8, $p= 0.74$. Similarly, synovial levels were not significantly different, IV = 11.45 ± 6.8, IO = 10.4 ± 3.8, $p= 0.9$. There were no complications of vancomycin administration in either group.

CONCLUSION: Our study shows that similar local tissue concentrations of vancomycin in femur, tibia, and synovium can be achieved using a standard 500mg IO vancomycin dose in tourniquetless TKA compared to IV administration of vancomycin. Additionally, total systemic levels in IO administration are significantly lower than in IV administration, potentially minimizing systemic risks of vancomycin.

Synovial Barium and Zirconium Ions are Promising Markers for Aseptic Loosening
Poster 004

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INTRODUCTION: Implant loosening following primary total knee arthroplasty (TKA) remains the most common aseptic indication for revision. Aseptic loosening can be difficult to diagnose as radiographic findings may be absent. Therefore, effective screening tests are needed. The purpose of this study was to evaluate if synovial Barium and/or Zirconium levels would be elevated in cases of confirmed aseptic loosening. We hypothesized that loose implants release detectable amounts of these bone cement radiopacifiers and would be possible markers of aseptic loosening.

METHODS: Patients undergoing revision TKA at a single institution were prospectively enrolled in this study. Synovial fluid was sampled at the time of revision surgery prior to arthrotomy, any instrumentation, or cement manipulation. Synovial fluid samples were processed and then analyzed by inductively coupled plasma mass spectrometry. Detection of Barium or Zirconium was considered a positive result if the sample exceeded the lowest calibration standard (22 µg/L). Components were assessed intraoperatively and determined to be either well fixed or loose by the fellowship-trained arthroplasty surgeon of record.

RESULTS: Twenty patients (7 aseptic loosening, 13 well-fixed) were prospectively enrolled in this study. The mean barium and zirconium levels were 314.21 µg/L vs. 32.46 µg/L (p=0.0937), and 45.24 µg/L vs. 0 µg/L (p=0.01) for loose versus well-fixed implants, respectively. Zirconium was 57.14% sensitive and 100% specific for component loosening while Barium was 85.71% sensitive and 53.85% specific.

DISCUSSION & CONCLUSION: Aseptic loosening remains a challenging clinical diagnosis. While the current sample size is limited, our results indicate that the common cement radiopacifiers Barium and Zirconium are promising synovial fluid markers that are elevated in patients with implant loosening. These synovial fluid markers demonstrate potential to improve the diagnosis of aseptic loosening. We continue to enroll patients and are planning future multicenter studies to confirm these preliminary results.

Assessing TKA Alignment: Accurate and Adjustable Annotation using Artificial Intelligence
Poster 005

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INTRODUCTION: Optimal implant position and alignment remains a controversial, yet critical topic in primary total knee arthroplasty (TKA). Future study of ideal implant position requires the ability to measure component positions at scale. While artificial intelligence possesses potential, current algorithms have limited accuracy, do not allow for oversight, and require extensive training time. Therefore, the purpose of this study was to develop and validate a machine learning model that can automate, with surgeon directed adjustment, implant position annotation.

METHODS: A retrospective series of 280 primary TKAs, performed in 160 patients was identified. The femoral-tibial angle (FTA), distal femoral angle (dFA), and proximal tibial angle (pTA) were manually annotated from the immediate post-op radiograph. We then trained a neural network to predict each annotated position. Training employed a novel label augmentation procedure of dilation, reweighting, and scheduled erosion steps. The model was compared against three previously described predication methods (Baseline 0, 1, and 2). Accuracy was then assessed using a validation set of 19 patients.

RESULTS: The model significantly improved accuracy compared to the baseline non-augmented training models Baseline 0 and Baseline 1 across all measures (dFA: $p<0.0001$, pTA: $p<0.0001$, FTA: $p<0.0001$), and Baseline 3 for two of three measures (dFA: $p<0.0001$, pTA: $p<0.0001$, FTA; $p = 0.443$). In the final model, the mean squared prediction error (difference from clinician annotation) was 0.5 degrees for dFA, 0.1 degrees for FTA, and 0.6 for pTA.

DISCUSSION: Utilizing a novel algorithm, trained on a limited dataset, the accuracy of component position was approximately 0.6 degrees. This accuracy is within the standard error of manual measurements and has substantial implications for analyzing large datasets, intraoperative implant alignment, as well as implant positioning in other joint replacements. Additionally, the model outputs annotated, adjustable points from which the angles are calculated allowing for clinician oversight.

Preoperative Weight Loss Before Total Knee Arthroplasty Does Not Improve Postoperative Risks
Poster 006

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OBJECTIVE: Many surgeons recommend weight loss for patients with obesity before total knee arthroplasty (TKA). However, surgeons and patients frequently ask how much weight loss is clinically significant? The goals of this study were to determine how many patients lose weight before TKA, predictors of preoperative weight loss, and if preoperative weight loss improves outcomes.

METHODS: Among 23,726 primary TKAs performed between 2002 and 2019, we identified 3,665 patients with preoperative body mass indices (BMIs)>30 kg/m^2 measured 1-24 months before surgery and a weight measured at surgery. The mean age was 68 years with 59% female. The mean BMI was 36 kg/m^2. Univariable logistic and linear regressions and Cox proportional hazard models evaluated length of stay, discharge disposition, operative time, complications, revisions, and reoperations among patients maintaining preoperative weight compared to those losing ≥10 pounds before surgery. Mean follow-up was five years.

RESULTS: Overall, 41% lost ≥5 pounds, 24% lost ≥10 pounds, and 9% lost ≥20 pounds before TKA. The odds of losing ≥10 pounds were not significantly associated with age (OR=1.0 per 10 years younger, p=0.97) or male sex (OR=0.95, p=0.53). When comparing those who lost ≥5 pounds, ≥10 pounds, or ≥20 pounds to those who maintained preoperative weight, there were no differences in 1-year, 2-year, 5-year, or 10-year survivorship free of infection, complication, revision, or reoperation. Across overall follow-up, losing ≥10 pounds was not associated with significant differences in operative time, length of stay, extended length of stay, discharge disposition, operative time, complications, revisions, or reoperations.

CONCLUSION: Relatively few patients lose meaningful weight before TKA, suggesting that current practices promoting preoperative weight loss are not effective. Even those achieving common patient benchmarks for weight loss did not improve overall outcomes. While weight loss benefits overall health, preoperative weight loss alone may not be sufficient to reduce postoperative risks.

Total Knee Replacement or Open Reduction and Internal Fixation for Geriatric Distal Femur Fractures
Poster 007

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INTRODUCTION: Distal femur fractures are severe injuries, particularly in the geriatric population. Conventional open reduction and internal fixation (ORIF) approaches are challenging in this older demographic, and may result in poor outcomes. Alternatively, total knee arthroplasty (TKA) may be used, potentially improving outcomes. The aim of this study is to compare ORIF and TKA in the setting of geriatric distal femur fractures.

METHODS: This retrospective cohort study utilized the National Readmissions Database, years 2016-2019. Patients over the age of 65 with distal femur fractures treated via ORIF or TKA were identified via ICD-10 codes. Multivariate regression was performed to assess outcomes while negative binomial regression was performed to assess 30-day readmission and reoperation. Quasi-Poisson regression was performed to assess length of stay (LOS) and total charges. Demographics and comorbidities, measured via Elixhauser comorbidity index, were controlled for in our analysis.

RESULTS: A total of 34,189 patients were identified. 32,289 (94.4%) underwent ORIF while 1,900 (5.6%) underwent TKA. The mean age was 78.6 years. Patients undergoing TKA had increased medical (Odds Ratio (OR) 1.056; $p=0.031$) and surgical complications (OR 1.404; $p<0.001$), including joint infections (OR 3.113; $p<0.001$). They also had increased odds of 30-day readmission (OR 1.423; $p<0.001$), reoperation (OR 2.547; $p<0.001$), longer LOS (OR 1.256; $p<0.001$), and greater total charges (OR 1.953; $p<0.001$).

CONCLUSION: TKA is associated with worse outcomes compared to ORIF in the setting of geriatric distal femur fractures. Not only is it associated with increased complications, but also readmission, reoperation, and longer hospital stays. Importantly, despite the worse outcomes, total charges were significantly greater for these patients, indicating it is less cost effective than ORIF as well.

Unicompartmental Knee Arthroplasty in Octogenarians: An Analysis of 733 Patients with 2-Year Follow-Up
Poster 008

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INTRODUCTION: Unicompartmental knee arthroplasty (UKA) has been shown to improve pain and function in appropriately selected patients. Limited data exists regarding outcomes and complication rates following UKA among octogenarians.

METHODS: The PearlDiver Mariner database was queried for patients undergoing primary UKA between 2018-2020. Patients <80 years old were matched 4:1 to the octogenarian cohort (≥80 years old) by sex, year, Elixhauser Comorbidity Index (ECI), tobacco use, obesity, and diabetes. Multivariate logistic regression was utilized to evaluate and compare medical complications at 90-days post-operatively and surgical complications at 1- and 2-years post-operatively between the two cohorts. Our regression analysis controlled for sex, ECI, tobacco use, obesity, and diabetes.

RESULTS: After matching, a total of 733 octogenarians and 2,884 controls were included in our analysis. Octogenarian patients demonstrated an increased risk of acute kidney injury (Odds Ratio [OR]: 2.999 0.594, 95% Confidence Interval [95% CI]:1.451-6.072; p=0.002), wound dehiscence (OR: 2.753, 95% CI: 1.129-6.424; p=0.021), pneumonia (OR: 2.569, 95% CI: 1.109-5.702; p=0.022), emergency department visits (OR: 2.399, 95% CI: 1.487-3.803; p<0.001), and any complication (OR: 1.680, 95% CI: 1.301-2.154; p<0.001) at 90-days postoperatively. However, there were no differences between cohorts in rates of periprosthetic infection (OR: 1.032, 95% CI: 0.384-2.776; p=0.950), periprosthetic fracture (OR: 0.277, 95% CI: 0.015-1.383; p=0.215), aseptic loosening (OR: 0.231, 95% CI: 0.013-1.132; p=0.155), or all-cause revision (OR: 0.618, 95% CI: 0.342-1.040; p=0.087) at 2-years postoperatively. The mortality rate was 0% for both cohorts at 2-years postoperatively.

DISCUSSION: These findings suggest that despite an increased risk of certain medical complications within the acute postoperative period, octogenarians undergoing UKA experienced similar rates of surgical complications to younger matched controls at 2-year follow-up.

Mid-Term Survivorship and Patient Outcomes of 1,306 Conforming Bearings in Modern Primary TKA
Poster 011

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OBJECTIVE: Conforming and congruent bearings in total knee arthroplasty (TKA) have rapidly increased due to benefits of increased stability and potential for replicating normal knee kinematics. However, limited data exist for these newly available bearings. This study examined revision-free survivorship and patient-reported outcome measures (PROMs) of a large granular database of primary TKAs using a single conforming bearing design.

METHODS: 1,306 consecutive primary TKAs performed using a single conforming bearing design (85% cemented and 15% cementless) were retrospectively reviewed. Kaplan-Meier (KM) survivorship estimates were calculated based on latest clinical follow-up. PROMs and minimal clinically important differences (MCIDs) related to satisfaction; activity level; and knee pain and function were evaluated. The cohort was 70% women and 38% ASA-PS class I/II with mean age and BMI of 67 years (range, 24-93) and 34 kg/m^2 (range, 17-65). 93% of cases achieved minimum 1-year follow-up (mean 3.5 years; range, 1-7) with a subset of 261 cases that achieved minimum 5-year follow-up (mean 5.8 years; range, 5-7).

RESULTS: All-cause and aseptic KM survivorship estimates were 97.6% (95CI, 96.5-98.7) and 98.1% (95CI, 97.1-99.1) at 7.0 years. Revision-free survivorship did not differ by cemented or cementless fixation (98 vs. 97%, p=0.163). All mean PROM scores significantly improved from preoperative baseline (p<0.001), and ≥86% of patients achieved MCIDs for Knee Society pain and KOOS JR total scores. A total of 89% of cases reported their knee to ‘sometimes or always’ feel normal. For cases with minimum 5-year PROMs, satisfaction was 93% with numbers available.

CONCLUSION: Conforming bearing TKA demonstrated excellent survivorship out to 7.0 years. In addition, PROMs were comparable to other designs reported in the literature. While mid-term results are promising, long-term data are warranted on survivorship due to potential polyethylene wear in conforming bearings with more surface area in contact with articulating surfaces.

Biofilm Formation is Durably Prevented on Pre-Fabricated Antibiotic Cement Spacer Designed to Increase Antibiotic Elution Compared to Cobalt Chrome and Polyethylene

Poster 012

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OBJECTIVE: Two-stage revision remains the standard for managing chronic periprosthetic joint infection (PJI). Despite multiple spacer options, whether a particular one better resists biofilm formation has not been established. Prefabricated polymethylmethacrylate (PMMA) articulating spacers containing antibiotics and a proprietary pore structure to increase antibiotic elution have recently become commercially available. Antibiotic elution from those spacers is characterized by a rapid burst phase for the initial 1-2 days and an extended slow-release phase for >28 days. This in vitro study determined whether biofilm formation is prevented by antibiotic release during the initial rapid burst phase and/or the slow-release phase.

METHODS: S. aureus-Xen36 was incubated in 1.5ml of LB broth with PMMA discs with the proprietary pore structure and either with or without high-dose gentamycin and vancomycin or with 'Hoffman style' positive-control discs (UHMWPE or cobalt-chrome). Non-adherent bacteria were removed by three PBS rinses every 20-24 hours. Planktonic bacterial growth in the culture broth and biofilm formation on the discs were measured by Colony Forming Unit (CFU) counting and resazurin reduction assays. Experiments were repeated >4 times.

RESULTS: No detectable planktonic bacterial growth or biofilm formation occurred in cultures containing PMMA with high-dose antibiotics (≤15 CFUs/disc), whereas biofilms formed on PMMA without antibiotics, UHMWPE, and cobalt-chrome (1x107 - 4x108 CFUs/disc, $p<0.0001$). Biofilm formation was confirmed by a 100-fold decrease in sensitivity to vancomycin. To determine whether the antibiotic slow-release phase is sufficient to block biofilm formation, PMMA discs with antibiotics were pre-eluted for 14 days with multiple saline changes prior to bacterial inoculation. After antibiotic elution, still no detectable biofilms formed on PMMA discs with antibiotics (≤15 CFUs/disc, $p<0.0001$).

CONCLUSION: Antibiotic release during both the initial and slow-release phases prevented biofilm formation on PMMA with the proprietary pore structure. This may translate into improved infection eradication rates clinically.

No Difference in Postoperative Complications Between Simultaneous and Staged, Bilateral Unicompartmental Knee Arthroplasty

Poster 013

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BACKGROUND: The safe timing of contralateral surgery following unicompartmental knee arthroplasty (UKA) remains unknown. Therefore, the objective of this study was to examine the differences in postoperative complications in patients undergoing unilateral, simultaneous, and staged bilateral UKA.

METHODS: The PearlDiver administrative claims database was queried for patients undergoing UKA between 2015-2020. Patients undergoing unilateral UKA were matched in a 1:1 fashion based on age, gender, Elixhauser Comorbidity Index (ECI), obesity, diabetes, and smoking status to patients undergoing simultaneous bilateral UKA, bilateral UKA staged 1-90 days and bilateral UKA staged 91-365 days. Univariate and multivariate analyses were performed to examine the impact of timing of bilateral procedures on 90-day postoperative complications relative to patients who underwent unilateral UKA. Outcomes were considered significant at $p<0.05$.

RESULTS: A total of 9,638 patients undergoing UKA were included in the final analysis, of which 5,672 (58.9%) were unilateral, 396 (4.1%) were simultaneous bilateral, 1,496 (15.5%) were bilateral staged between 1-90 days and 2,074 (21.5%) were bilateral staged between 91-365 days. Univariate analysis identified no significant differences in complications between matched groups except for an increased incidence of wound dehiscence amongst patients who underwent simultaneous bilateral UKA (0.0% vs. 2.1%, $p=0.040$) compared to unilateral UKA. However, multivariate analysis demonstrated that simultaneous or staged bilateral UKA at either time point did not increase the risk of any postoperative complication relative to unilateral surgery.

CONCLUSION: Bilateral UKA can be performed simultaneously or in a staged fashion without increasing the risk of the studied 90-day complications relative to unilateral UKA.

Assessing the Reproducibility of Database Studies in Total Joint Arthroplasty
Poster 014

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INTRODUCTION: Research studies greatly influence treatment guidelines, as orthopedic surgeons should practice evidence-based medicine. However, studies follow an evidence hierarchy, which ranks their strength of evidence based on data collection method and presence of randomization or controls. Database studies have gained popularity in orthopedics, but generally do not achieve high levels of evidence, and their reproducibility of findings are often overlooked. This study aims to determine the reproducibility of ACS–NSQIP arthroplasty studies on smoking and its complications by employing identical dataset and statistical methods.

METHODS: A PubMed search including terms “arthroplasty”, “smoking”, “complications”, and “ACS-NSQIP” was used to identify studies between 2011 and 2022. Each study’s methods were reproduced by a trained statistician based on the reported methodology. If a required step in was not stated in the original publication, the task was reproduced at our statistician’s discretion. The adjusted odds ratios (aORs) and p-values (α=0.05) were compared between the original and reanalyzed dataset.

RESULTS: The initial search generated 43 studies, and 11 studies met the inclusion criteria producing 268 reanalyzed aORs. 12.69% of the original studies’ aORs changed protectiveness upon reanalysis, and 12.83% changed statistical significance. Across all studies, the average magnitude change of each aOR was 17.22%, and the N in the analyses varied by up to 47.84%.

CONCLUSION: This study aimed to improve the reliability and consistency of evidence by reanalyzing published database studies. Across 11 commonly cited studies, approximately one of eight objective conclusions changed whether the exposure (smoking) was harmful or protective to the outcome. Additionally, 12.83% of the compared results had changes in statistical significance. The variability between the original and reproduced results are likely secondary to both systems and individual issues. For example, with one reproduced study including just over 50% of the original study’s N there are likely preferences in each statisticians’ data cleaning and handling of missing values. Furthermore, systems issues, such as how institutions store and report their data to registries, likely contribute to the overall data aggregation. Overall, the variability between original studies and this reproduced data indicates that orthopedic surgeons should take heed of the level of evidence of database studies and seek higher validity studies when available. This research fills a crucial gap in assessing the reliability and consistency of evidence in orthopedic surgery.

Does Satisfaction after Total Knee Arthroplasty Change with Patient Age?
Poster 015

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OBJECTIVE: Patient age remains an important factor in satisfaction after total knee arthroplasty (TKA). Despite well-fixed components, young patients have higher rates of dissatisfaction. This study intends to evaluate the differences in satisfaction and residual symptom rates between those over and under 60 years undergoing TKA.

METHODS We surveyed patients in 2022 who received primary TKA at our tertiary care center between 2014 and 2016 for information regarding their surgical satisfaction and frequency of residual symptoms. The results of the survey were analyzed by bivariate analysis between those under 60 years and those 60 years or older at the time of surgery.

RESULTS: We collected 410 responses from patients under 60 years and 1,167 responses in those over 60. The groups averaged 54.2 years of age and 68.0 years ($p< 0.001$). Dissatisfaction rates were similarly high between the two groups (<60: 20.2% vs. ≥60: 17.7%; $p=0.292$). However, the younger cohort was less frequently satisfied with their ability to perform activities of daily living (80.0% vs. 84.5%; $p=0.043$). In addition, younger patients were more likely to experience knee pain (64.4% vs. 52.5%; $p< 0.001$), tightness (56.3% vs. 42.6%; $p< 0.001$), ipsilateral stiffness (65.4% vs. 57.7%; $p< 0.001$), contralateral stiffness (71.7% vs 59.1%; $p< 0.001$), and ipsilateral clicking (52.9% vs. 39.8%; $p< 0.001$) in the 30 days prior to the survey. The young patients were more likely to report and limping (62.2% vs. 50.8%; $p< 0.001$) in the last 30 days and less likely to report that their replaced knee felt normal (66.3% vs. 75.4%; $p< 0.001$). Revision TKA rates were similar between the two groups (10.2% vs. 8.1%; $p=0.231$)

CONCLUSION: Patients under 60 years of age are more likely to report residual symptoms after TKA, but these symptoms do not appear to significantly impact their overall satisfaction. Younger patients should be carefully counseled on functional expectations after TKA.

Is the Rise of Medicare Advantage Impacting the Fidelity of Traditional Medicare Claims Data? Implications for AJRR Reporting of Long-Term TKA Survivorship

Poster 016

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INTRODUCTION: The American Joint Replacement Registry (AJRR) utilizes traditional Medicare (TM) claims data to report long-term TKA survivorship. The purpose of this study was to determine whether the large number of patients leaving TM for Medicare Advantage (MA) has compromised the fidelity of TM data used to evaluate long-term TKA survivorship.

METHODS: We identified 15,310 Medicare-eligible patients who underwent primary TKA from 2000-2020 at a single institution. Insurance type was analyzed over time and 84% of patients had TM at time of TKA. Survivorship free of any reoperation and any revision were calculated at 5- and 10- years for patients with TM. The same survivorship endpoints were then re-calculated with censoring performed when a patient transitioned to MA after surgery to model the impact of losing this patient from the TM dataset. Differences in survivorship were compared. Mean follow-up was 10 years.

RESULTS: From 2000-2020, there was decrease in TM insurance (94% to 68%) and corresponding increase in MA insurance (0% to 19%) amongst TKA patients. Following TKA, 25% of TM patients switched to a MA plan. Modeling the loss of patients from TM to MA did not demonstrate a significant impact on the 5- or 10-year survivorship free from any reoperation (95% vs 95% and 93% vs 94%, respectively) or any revision (98% vs. 99% and 97% vs. 97%, respectively; $p>0.05$ for all).

CONCLUSION: In this study, 1 in 4 patients left TM for MA after their primary TKA, effectively making them lost to follow-up within a TM dataset. The mass exodus of patients out of TM did not impact reported 10-year survivorship free from revision or reoperation. This is reassuring for current AJRR methodology and for research utilizing TM claims data. However, if MA continues to grow exponentially, efforts to obtain MA data will likely become necessary.

Considering Mobility Status and Home Environment in a Comparison of Readmission Risk for Patients Discharge to a Skilled Nursing Facility vs. Home Healthcare after Total Knee Arthroplasty
Poster 017

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INTRODUCTION: Discharge disposition following total knee arthroplasty (TKA) offers varying levels of postacute care monitoring depending on the medical status of the patient and his/her ability to function independently. Research has suggested that discharge disposition following TKA may be associated with 30- and 90-day hospital readmission rates. However, prior studies have not consistently considered confounding due to post-TKA mobility status, available caregiver support, and social determinants of health. The purpose of this study was to compare 30- and 90-day readmission risk for patients discharged to a skilled nursing facility (SNF) vs. home healthcare (HHC) following TKA after controlling specifically for postoperative functional status (i.e., Activity Measure for Post-Acute Care 6-Clicks basic mobility short form), caregiver support, and area deprivation index, among other covariates.

METHODS: This was a retrospective cohort study of patients undergoing TKA at any of 11 hospitals in a single, large, academic healthcare system between January 2, 2017 and August 31, 2022 who discharged to a SNF or HHC. The adjusted relative risk of readmission within 30 and 90 days of discharge to a SNF (vs. HHC) was estimated using modified Poisson regression models.

RESULTS: There were 15,212 patients discharged to HHC and 1,721 patients discharged to a SNF. Among those discharged to a SNF, 7.1% were readmitted within 30 days (vs. 2.4% for HHC) and 12.1% within 90 days (vs. 4.8% for HHC). The adjusted relative risk for 30-day readmission after discharge to a SNF was 1.07 (95% confidence interval [CI]: 0.79-1.46; P=0.65) and for 90-day readmission was 1.45 (95% CI: 1.16-1.82; P<0.01).

CONCLUSION: Discharge to a SNF (vs. HHC) was independently associated with 90-day readmission, but not 30-day readmission, after controlling for post-TKA mobility status, available caregiver support, and area deprivation index, among other covariates.

30- and 90-Day Readmissions Following TKA Negatively Impact 1-Year Patient Outcomes
Poster 018

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OBJECTIVE: This study aims to investigate the relationships between readmission within 30 and 90 days following TKA and patient outcomes at 1 year by assessing (1) improvements in the Knee Injury and Osteoarthritis Outcome Score (KOOS) Pain and Physical Function (PS) and joint replacement (JR) subscales, (2) the attainment of Patient Acceptable Symptom State (PASS) thresholds, and (3) the occurrence of reoperation within one year.

METHODS: A prospective cohort of primary TKAs performed at a large tertiary academic center was included (n=10,521). Orthopedic-related readmissions were specific complications affecting the prosthesis or the surgical wound. Medical readmissions were due to medical diagnoses requiring medical treatment or management and were grouped by the principal organ system involved.

RESULTS: Overall, 444 (4.2%) and 704 (6.9%) patients were readmitted within 30 and 90 days of discharge, respectively. Readmission was associated with failure to achieve satisfaction at 1 year (30 day: OR 1.41, 1.05-1.9; 90 day: OR 1.32, 1.05- 1.67). Moreover, 30-day medical but not medical/orthopedic 90-day readmissions were associated with a higher risk of failure to achieve satisfaction compared to those who were not readmitted (OR 1.3, 1.01- 1.87). Those who were readmitted within 90 days were more likely to fail achievement of significant improvements in KOOS JR (OR 1.3, 1-1.88) compared to those who were not readmitted. Neither medical nor orthopedics 30- or 90-day readmissions were associated with improvement or achievement of PASS thresholds for all KOOS subdomains. Moreover, readmitted patients exhibited a significantly higher reoperation rates compared to those who were not readmitted.

CONCLUSION: Overall, 30–90-day readmissions were found to negatively influence 1 year patient satisfaction rates and the attainment of clinically significant improvements. Notably, 30-day readmissions demonstrated a negative association with patient satisfaction, with the effect being more pronounced for medically driven readmissions than for orthopedic-related readmissions.

Porous Tantalum Acetabular Cup and Augment Constructs in Complex Revision Total Hip Arthroplasty - A Minimum 10-Year Follow Up

Poster 019

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INTRODUCTION: Porous tantalum acetabular cup and augment constructs have demonstrated excellent mid-term survivorship when used to address severe bone loss in revision total hip arthroplasty (THA). However, longer-term data for these constructs are lacking. The purpose of this study was to evaluate porous tantalum acetabular cup and augment constructs in revision THA at a minimum 10-year follow-up with specific emphasis on implant survivorship, radiographic appearance, and clinical outcomes.

METHODS: Between 2000 and 2012, 157 revision THAs were performed at a single institution utilizing porous tantalum cup and augment constructs. Seventeen (11%) of the hips had preoperative pelvic discontinuity (PD). All cases were included in the survivorship analyses. All hips were assessed clinically with use of the Harris Hip Score at a minimum of 10 years. Postoperative radiographs were evaluated at regular intervals for implant stability and the presence of radiolucent lines. Forty-nine patients had radiographic follow-up at a minimum of 10 years.

RESULTS: The 10-year survivorship free of aseptic construct removal was 93%, free of all-cause construct removal was 91%, free of all-cause re-revision was 77%, and free of all-cause reoperation was 75%. Patients with preoperative PD experienced a 2.8 times increased risk of reoperation, 3.2 times increased risk of re-revision, and 9.9 times increased risk of aseptic construct removal. Of the unrevised cases with x-rays at 10 years and beyond, there were 4 hips with radiographic evidence of loosening and gapping in zone 3. Mean Harris Hip Scores improved from 47 preoperatively to 79 at 10-years.

CONCLUSION: Porous tantalum acetabular cup and augment constructs remain a durable option to address severe bone loss despite segmental defects in revision THA when the acetabulum is intact, with excellent implant survivorship at 10 years. PD poses a challenge to long-term survivorship of revision implants when these constructs are used without additional fixation.

Periprosthetic Joint Infections: Is an Ipsilateral Uninfected Total Joint Arthroplasty at Risk?
Poster 020

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OBJECTIVE: Periprosthetic joint infections (PJI) of a total hip arthroplasty (THA) or total knee arthroplasty (TKA) may occur in the setting of an uninfected ipsilateral prosthetic joint. However, the risk to that uninfected ipsilateral joint is unknown. We analyzed the survivorship free from PJI in THAs and TKAs following treatment of an ipsilateral knee or hip PJI, respectively.

METHODS: Using our institutional total joint registry, we identified 205 patients who underwent treatment for PJI (123 THAs, 83 TKAs) between 2000 and 2019. All had a clinically uninfected ipsilateral TKA (123) or THA (83) at the time of their other joint PJI. The mean age was 70 years, 47% were female, and the mean BMI was 32 kg/m^2. Index procedures primarily consisted of two-stage exchange (61%) and debridement, antibiotics, and implant retention (DAIR; 25%). Kaplan-Meier survivorship analyses were performed. Mean follow-up was 6 years.

RESULTS: The 5-year survivorships free of PJI in the ipsilateral in situ THAs and TKAs were 97% and 99%, respectively. Three PJIs occurred (2 THAs and 1 TKA), all over 1 year from the index ipsilateral PJI. One of the 2 newly infected ipsilateral THAs resulted when the corresponding TKA failed to have source control (same organism as at index two-stage exchange). The other hip PJI was an acute hematogenous PJI with a different organism than at index DAIR. The new knee PJI developed after its corresponding THA had recurrence of its PJI (same organism as at index two-stage exchange).

CONCLUSION: When diagnosed with PJI in a single joint, the risk of PJI in an ipsilateral prosthetic joint within 5 years was low (1-3% risk). In the rare event of an ipsilateral infection, all occurred greater than one year from the index PJI, and 2 of 3 were with the same organism when source infection control failed.

Can AI Models Produce High-Quality, Readable Patient Education Materials for Total Joint Arthroplasty?
Poster 021

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OBJECTIVE: As total joint arthroplasty (TJA) becomes more common, patients increasingly turn to online patient education materials (PEMs) for orthopedic health information. Generating effective PEMs requires personnel, time, and capital resources, and can result in PEMs that do not meet standards for quality or readability. The generative capabilities of artificial intelligence (AI) models may improve the quality, readability, and cost-effectiveness of PEMs. This study aims to compare the quality and readability of AI-generated PEMs related to TJA topics with those written by orthopedic organizations.

METHODS: Twenty text articles relating to TJA topics were indexed from the websites of orthopedic organizations. Microsoft's BingAI, Google's Bard, and OpenAI's ChatGPT were each queried using a standardized prompt to generate similar articles. Eighty articles (twenty original, sixty AI-generated) were blinded and reviewed by the authors using the DISCERN quality assessment instrument. Flesch-Kincaid scores were calculated for each article. Kruskal-Wallis tests were used to compare DISCERN and Flesch-Kincaid scores between sources. Post-hoc analysis was performed using Dunn's test.

RESULTS: A significant difference in DISCERN scores was found ($p < 0.05$), with Bard's DISCERN scores being significantly lower than those of Bing ($p < 0.025$) and the original articles ($p < 0.025$). There was no significant difference in DISCERN scores between the other sources. No significant difference in Flesch-Kincaid scores between each source was found ($p = 0.505$).

DISCUSSION: BingAI and ChatGPT produced articles of similar quality to those published by orthopedic organizations. The articles produced by Bard were of lower quality, largely due to Bard's inability to provide citation information, thus resulting in lower scores in the citation dimension of the DISCERN criteria. All three AI models produced articles of comparable readability to existing articles, though all articles used in this study were above the recommended 6th-grade reading level. Our data shows that BingAI and ChatGPT can generate PEMs of readability and quality comparable to existing TJA PEMs.

Malnutrition Does Not Limit the Effect of Preoperative Weight Loss Before Total Joint Arthroplasty
Poster 022

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OBJECTIVE: Malnutrition is paradoxically highly prevalent among patients with obesity undergoing total hip (THA) and knee (TKA) arthroplasty. Clinical guidelines recommend preoperative weight loss, but its benefits may be limited in malnourished patients by exacerbating nutritional deficiencies. The goals of this study were to determine if preoperative malnutrition and insulin resistance (IR) laboratory markers predict postoperative outcomes and limit the effect of preoperative weight loss.

METHODS: Among 21,038 primary THAs and 23,726 TKAs performed between 2002 and 2019, we identified 6,128 patients with preoperative BMIs>30 kg/m^2 measured 1-24 months before surgery, a weight measured at surgery, and preoperative laboratory makers of malnutrition and IR. Malnutrition was defined as total lymphocyte count (TLC) <1,500 cells/mm3, albumin <3.5 g/dL, or transferrin <200 mg/dL, and IR as hemoglobin A1c >6.5%. The mean age was 67 years with 55% female. The mean BMI was 36 kg/m^2. Logistic and Cox regressions evaluated prosthetic joint infections (PJI), complications, revisions, and reoperations. Mean follow-up was five years.

RESULTS: Preoperative labs met criteria for malnutrition and IR in 38% (2,131/5,547) and 26% (773/2,943) of patients, respectively. Malnutrition overall was not significantly associated with PJI, complications, revisions, or reoperations, however, hypoalbuminemia increased the risk of reoperation (HR=1.5, p=0.035). IR increased the risk of PJI (HR=2.45, p=0.003) and complications (HR=1.4, p=0.041) but was not significantly associated with revisions or reoperations. In multivariable analyses comparing losing ≥10 pounds to maintaining preoperative weight, malnutrition was not a significant effect modifier of PJI (HR=1.03, p=0.89), complication (HR=1.2, p=0.11), revision (HR=0.95, p=0.72), or reoperation (HR=1.1, p=0.25).

CONCLUSION: Malnutrition (38%) and IR (26%) are relatively common among patients with obesity undergoing THA and TKA. Preoperative screening should include albumin and hemoglobin A1c, while TLC and transferrin do not predict postoperative risks. Malnutrition does not significantly impact the effect of preoperative weight loss on postoperative outcomes.

Accuracy of Intra-Operative Approximation of Pelvic Tilt Using Pre-Operative Standing Radiographs
Poster 023

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OBJECTIVE: Anterior approach surgeons who utilize intraoperative fluoroscopy often try to match a preoperative radiograph as a reference for intraoperative cup position. However, it is unclear how accurately this is achieved and every degree of inaccuracy in tilt leads to a roughly 0.7 degree change in anteversion. This study aims to determine how closely pelvic tilt (PT) is approximated intraoperatively when compared to preoperative anteroposterior (AP) radiographs.

METHODS: This was a retrospective review of 193 primary THA's done by 2 surgeons at an academic tertiary referral center between September 2021 - January 2023. 24 patients were excluded for distorted anatomy, post-traumatic arthritis, insufficient x-rays, or a sacroiliac joint that could not be visualized on film. Data collected included age, BMI, and calculated PT using the formula, Tilt = -(ln((B/A) x (1/0.483))) / 0.051. Value A was measured as the distance from the base of the SI joint to the superior margin of the obturator foramen; value B was measured as the height of the obturator foramen. Neutral PT is determined by a tilt ratio (B/A) of 0.5, which is calculated as -0.7° in the Tilt formula. More positive calculations indicate a more anterior tilt, and negative calculations a more posterior tilt. PT was measured in degrees with 95% confidence intervals. Analyses for statistical significance were calculated with independent samples t-tests, and linear regression was used to calculate correlation between BMI and absolute difference in PT.

RESULTS: Mean preoperative PT was 0.15° (CI 95%: -1.34°, 1.64°) vs. intraoperative PT was 3.44° (CI 95%: 2.35°, 4.53°) ($p < 0.001$). Mean absolute difference was 6.49° (CI 95%: 5.59°, 7.39°). 48% of patients (n=81) had an absolute difference less than 5°, 31% (n=52) between 5° and 10°, 14% (n=24) between 10° and 15°, and 7% (n=12) greater than 15°. There was no correlation between BMI or age and PT discrepancy.

CONCLUSION: 21% of patients had a discrepancy of 10 degrees or greater between their preoperative radiographs and intraoperative fluoroscopic images. Surgeons should be aware of this potential source of error in cup positioning and be particularly diligent in high-risk cases.

Influence of Head Size and Implant Position on Impingement-Free Range of Motion in Primary Total Hip Arthroplasty: A Simulation Study

Poster 024

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BACKGROUND: Dislocation is a known risk after primary total hip arthroplasty (THA). Previous studies have suggested an optimal range of combined anteversion to maximize impingement-free range of motion. However, the impact of head size on impingement-free range of motion has not been elucidated. We performed a simulation using CT-based robotic planning software to determine the impact of head size on (1) impingement-free range of motion and (2) range of femoral and acetabular component version that allows for a functional impingement-free range of motion.

METHODS: We retrospectively reviewed five patients who underwent robotic-assisted THA. Mean patient age was 63.2 years, and three were female. Using CT-based robotic planning software, we varied femoral and acetabular version from 0 to 37 degrees and simulated bony and implant impingement testing with flexion and internal rotation as well as extension and external rotation. Maximum impingement-free range of motion was recorded with each version combination. We performed these measurements with 28, 32, 36, and 40mm heads, resulting in 57,760 simulation trials. We calculated the sum of internal rotation in flexion and external rotation in extension to estimate impingement-free motion. We defined functional range of motion as at least 40º of internal rotation at 90º flexion and at least 10º external rotation at 20º extension.

RESULTS: For every 4mm increase in head size, impingement-free motion increased by an average of 4.6 degrees ($p<0.001$). The range of acceptable femoral and acetabular version angles to achieve a functional range of motion increased by an average of 150% when head size increased from 28mm to 32mm. This increase was 83% when head size increased from 32mm to 36mm and 31% when head size increased from 36mm to 40mm. The range of anteversion values to maximize impingement-free motion was different for each patient and dependent on underlying anatomy.

CONCLUSION: Impingement-free range of motion increases with increasing head size. The range of femoral and acetabular implant position that achieves a functional impingement-free motion varies by both head size and individual anatomy.

SUMMARY: In total hip arthroplasty, increasing femoral head size increases range of motion before impingement and expands the tolerance of implant position to achieve a functional range of motion.

Outcomes of Cementless Distal Fixation Modular Stems in Aseptic Revision Total Hip Arthroplasty in Patients Greater than 75 Years Old

Poster 025

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OBJECTIVE: Cementless distal fixation modular stems are commonly used in aseptic revision total hip arthroplasty (rTHA); however, outcomes in elderly populations have seldom been reported. The goal of this study was to characterize patients 75 years and older who received these stems and report the cumulative incidence of reoperation in this patient population.

METHODS: All patients aged 75 years and older undergoing aseptic rTHA with cementless distal fixation modular stems and prospectively enrolled in the outcomes reporting system at our institution between 2015-2020 were included. Median follow-up time was 3.5 years (range, 0.1-7.8 years). Patients who underwent reoperation for any cause of the hip with a stem of interest were identified. Demographic and clinical information were collected at the times of rTHA and reoperation. Summary statistics are reported as medians with interquartile ranges (IQR) or means with standard deviations (SD). A cumulative incidence plot was used to visualize the incidence of reoperation over the follow-up period. Death was considered a competing event. Analyses were performed using R software (Version 4.2; Vienna, Austria).

RESULTS: 119 patients aged 75 years and older underwent aseptic rTHA with cementless distal fixation modular stems. The median age at rTHA was 81.3 years (IQR: 78.2, 85.5). Aseptic loosening (38.7%, 46/119 patients) was the most common indication for rTHA. Of 119 patients, 75 (63%) received Restoration modular (Stryker) stems, while 44 (37%) received Arcos modular (Zimmer Biomet) stems. The median length of stay was 4 days (IQR: 3, 5.5). 74.8% of patients (89/119) were discharged to locations other than home, and 16.8% (20/119) were re-admitted to the hospital within 90 days of discharge. Five patients underwent reoperation. Causes included fracture of the distal femur (2/5), infection (1/5), periprosthetic fracture (1/5), and dislocation (1/5). The median number of days to reoperation was 68 (IQR: 52.0, 83.0). 80% (4/5) of patients who underwent reoperation were implanted with an Arcos modular stem at aseptic rTHA. The cumulative incidence of reoperation at 2 years was 4.2% (95% CI: 1.6%, 8.9%), with all reoperations occurring within 9 months of rTHA.

CONCLUSION: The cumulative incidence of reoperation in aseptic rTHA patients older than 75 years who had cementless distal fixation modular stems was 4.2% at 2 years. Distal fixation stems demonstrate satisfactory performance in the setting of aseptic rTHA in elderly patients.

Do Overall Body Weight, Body Mass Index, or Clinically Significant Weight Changes Occur after Total Hip Arthroplasty? A Meta-Analysis of 18,932 Patients

Poster 026

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OBJECTIVE: Despite improved function and pain outcomes after total hip arthroplasty (THA), it remains unclear whether patients lose, gain, or maintain body weight/body mass index (BMI) after surgery. While previous studies have suggested that most THA patients maintain their preoperative body weights, most are limited to single institutions or small patient cohorts. The goal of this meta-analysis was to quantitatively assess whether patients lose, gain, or maintain body weight/BMI after THA.

METHODS: This study followed the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Ovid MEDLINE, Embase, and the Cochrane Central Register of Controlled Trials databases were queried from the time of inception through July 2022. Included studies: (1) reported on weight, BMI, or body composition after elective, primary THA and (2) weight/BMI change was deemed to be associated with THA. Excluded studies: (1) included weight/BMI interventions or (2) partial arthroplasty, revision arthroplasty, or joint arthroscopy. Meta-analyses for weight change, BMI change, and proportion of patients achieving clinically significant change after arthroplasty were performed using random-effects models. A clinically significant change was defined by the FDA-established threshold of greater than 5% of preoperative body weight/BMI. Patient and clinical factors associated with clinically significant loss and gain were systematically reported.

RESULTS: 18,932 patients (from 19 studies) were included. The average age (± standard deviation) of THA patients was 64.1 ± 10.7 years. The reported proportion of female patients was 58.1% (9,518/16,389). Follow-up ranged from 6 months to 5 years. Pooled analyses demonstrated no statistically significant differences between preoperative and postoperative weights ($p=1.0$) or BMIs ($p=1.0$) after THA. 66% of THA patients ($p<.01$) did not experience clinically significant weight/BMI change after arthroplasty. The factor most often associated with clinically significant weight/BMI loss was patient sex, while age was most often associated with clinically significant weight/BMI gain.

CONCLUSION: Two out of every three patients undergoing THA maintain their preoperative body weight/BMI after arthroplasty. Orthopedic surgeons should counsel patients that they are unlikely to lose or gain body weight/BMI after THA.

What is the Burden of Medical and Orthopaedic-Related 90-Day Readmissions Following Total Hip Arthroplasty?

Poster 027

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OBJECTIVE: This study aimed to: (1) determine the overall 90-day THA readmission rate; (2) report the timing of readmission by weeks post-discharge; (3) identify the most frequent causes of 90-day readmissions (i.e., medical- or orthopedic-related); and (4) identify the rate of repeat readmissions.

METHODS: A consecutive cohort of all primary, elective, unilateral, THAs performed from 2016-2020 at a large tertiary academic center were followed using a validated, institutional prospective data collection system (n=8,893 patients). Orthopaedic-related readmissions were specific complications affecting the prosthesis or the surgical wound. Medical readmissions were due to medical diagnoses requiring medical treatment or management and were grouped by the principal organ system involved.

RESULTS: Overall, the 90-day readmission rate was 5.6% (502 out of 8,893 patients). Unplanned readmissions occurred most commonly during the first 30 days post-discharge (n= 312; 62%) decreasing subsequently at 31-60 days (n=119, 24%) and 31-90 days (n=71; 14%) post-discharge. The overall rate of medical and orthopedic related readmissions were 4.2% and 1.4%, respectively. Medical readmissions (n=377; 75%) were 4 times more frequent than orthopedic readmissions (n=125; 25%). The most frequent medical causes of 90-day readmissions were gastrointestinal (n=82; 23.4%), cardiac (n=47; 13.4%), pulmonary (n= 45; 12.8%), and neurologic (n=42; 12%). The most frequent orthopedic causes of 90-day readmissions were periprosthetic fractures (n=37; 23.7%), wound complications (n=33; 21.2%), and periprosthetic joint infection (PJI; n=31; 19.9%).The rate of repeat readmissions was 22.5%, with no difference among those with an initial medical and orthopedic-related readmission (20.7% vs 28.0%; p-value = 0.09)

CONCLUSION: One of 18 patients are expected to be readmitted within 90 days of discharge following primary THA. Enhanced and targeted medical care should be emphasized during the first month post-discharge, considering that most readmissions occurred early in the postoperative period and were 4 times more likely to be due to medical reasons.

Higher Risk of Poor One-Year Outcomes in THA Patients Readmitted within 90 Days
Poster 028

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OBJECTIVE: This study aims to investigate the relationships between readmission within 90 days following Total hip arthroplasty (THA) and patient outcomes at 1 year, including (1) improvements in the Hip disability and Osteoarthritis Outcome Score (HOOS) Pain and Physical Function (PS) and joint replacement (JR) subscales, (2) the attainment of Patient Acceptable Symptom State (PASS) thresholds for patient satisfaction, and (3) the occurrence of reoperation within 1 year.

METHODS: A prospective cohort of primary unilateral THAs performed at a large tertiary academic from 2016-2020 was included (n=8,893). Orthopedic-related readmissions were specific complications affecting the prosthesis or the surgical wound. Medical readmissions were due to medical diagnoses requiring medical treatment or management.

RESULTS: Overall, 502 patients (5.6%) were readmitted within 90 days of discharge. Those who were readmitted were more likely to fail achievement of significant improvements in HOOs JR (OR 1.9, 1.26-2.87) compared to those who were not readmitted. These patients were also more likely to fail to achieve satisfaction at 1 year (OR 1.62, 1.24- 1.24) and PASS thresholds for HOOS pain and JR (OR 1.3, 1.07-1.77; OR 1.4, 1.05-1.92). Orthopedic readmissions were associated with a higher risk of failure to achieve improvements in HOOS JR (OR 3.2, 1.71-6.02), satisfaction at 1 year (OR 2.4, 1.52-3.96) and HOOS pain, PS, and JR PASS thresholds compared to those who were not readmitted (OR 1.7, 1.12-2.86; OR 1.84, 1.02-3.32; OR 1.7, 1.06-2.93, respectively). Moreover, readmitted patients exhibited a significantly higher reoperation rate compared to those who were not readmitted.

CONCLUSION: 90-day readmitted patients following THA experience worse 1-year outcomes compared to those who were not readmitted. Specifically, readmitted patients have a higher likelihood of failing to achieve significant clinical improvements and face a greater risk of dissatisfaction at the one-year follow-up.

Comparison of Non-Augmented vs. Augmented Double-Row Rotator Cuff Repair with a Bioinductive Collagen Implant vs. Acellular Dermal Allograft

Poster 029

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INTRODUCTION: Various products have been used to augment primary rotator cuff repair using an onlay technique. The aim of this study was to examine healing rates of rotator cuff tears treated with primary double-row repair with and without augmentation using a bioinductive collagen implant (CI) or acellular dermal allograft (DA).

METHODS: Patients undergoing primary arthroscopic rotator cuff repair were prospectively enrolled at a single institution. Patient demographics, past medical history, rotator cuff tear size (small, medium, large, or massive), and preoperative Goutallier classification were recorded. The control group was double-row repairs without augmentation. The augmented groups were repairs performed using onlay augmentation with either a CI or a DA. Between 6-12 months postoperatively, patients received a MRI to assess healing using the Sugaya classification. Patient reported outcomes (PROs), including SANE, ASES, and VAS, were collected at 3-month, 6-month, and >1 year follow-up. Univariate analysis using Chi square was performed to assess differences in healing between treatment groups. PROs were compared utilizing one-way ANOVA. Statistical significance a p value < 0.05.

RESULTS: There are 106 patients enrolled with follow-up imaging (40 control, 37 CI, 29 DA). Groups were similar in terms of cuff tear chronicity. The overall healing rate was 64%, with rates similar for control (58%), CI (76%), and DA (59%). There was no difference in healing rate for gender, smoking status, renal disease, and diabetes, or mechanism. Those with cardiac history had significantly worse healing (50%) compared to those without cardiac history (70%) ($p=0.046$). For small, medium, and large sized tears (n=79) healing rates were similar for control, CI, and DA. In massive tears (n=27), healing was greater for CI (60%) compared to control (0%) and DA (43%) ($p=0.04$). In tears with preoperative Goutallier stage ≤1 (n=93), healing was greater for CI (84%) compared to control (60%) and DA (67%), but not statistically significant. No significant differences were found for those with a Goutallier stage >1 (n=13; control 33%, CI 20%, DA 20%). There were no differences in PROs between groups at one-year follow-up.

DISCUSSION: Onlay augmentation of a double-row rotator cuff repair with the CI implant demonstrated a higher healing rate over non-augmented repairs and DA augmentation in patients with minimal fatty infiltration. Healing of large to massive tears and those with fatty infiltration continue to remain a challenge.

Bioabsorbable Collagen Implant for Treatment of Lateral Epicondylitis: A Prospective Randomized Study
Poster 030

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OBJECTIVE: Bioabsorbable implants, made from a type 1 bovine collagen, has been used in the treatment of partial and full-thickness rotator cuff repair with some studies demonstrating rapid recovery, significant improvement in pain, and increased tendon thickness postoperatively. Lateral epicondylitis is one of the most common causes of elbow pain and is described as an overuse injury of the extensor carpi radialis brevis (ECRB) tendon. The purpose of this study was to determine the efficacy of the bioabsorbable collagen implants in the treatment of lateral epicondylitis.

METHODS: This single-blinded (patient), randomized prospective study compared patients diagnosed with lateral epicondylitis who were treated surgically with a bioabsorbable implant vs. patients that underwent the same surgical procedure without an implant (control group). Inclusion criteria required that patients failed six months of conservative management for lateral epicondylitis and were indicated for surgical management. Exclusion criteria included patients with previous surgeries on the lateral epicondyle and <18 years old. Patient reported outcomes collected included Visual Analog Scale (VAS) pain scores and Patient Reported Outcome Measurement Information System (PROMIS) assessments for up to one year after surgery. Data was analyzed using Mann-Whitney U and Wilcoxon Rank-Sum Tests.

RESULTS: From October 2019 to September 2022, 13 patients met all the inclusion criteria and underwent surgical treatment for lateral epicondylitis. Seven patients were randomized to the implant cohort and six to the control cohort. There were no differences between the groups in terms of age (P = 0.211), sex (P = 0.266), race/ethnicity (P = 0.147), smoking status (P = 0.220) or overall comorbidities (P = 0.452). Preliminary results indicated that there was a significant decrease in VAS pain at six weeks (P = 0.004) and three months (P = 0.010), and in PROMIS-PI (P = 0.010) at six weeks postoperatively from preoperative time points in both groups. However, there was no statistical significance observed between the groups in VAS pain, PROMIS-UE, and PROMIS-PI scores at any time point. Complications such as 90-day hospital readmissions and revision surgery were not significantly different between the groups.

CONCLUSION: In the early postoperative period, surgical treatment of lateral epicondylitis, whether or not surgical treatment was augmented with a bioabsorbable patch, provided significant pain relief without any increased complication rates.

Fulfillment of Patients' Expectations For Reverse Total Shoulder Arthroplasty (RTSA)
Poster 031

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OBJECTIVE: Despite the increasing utilization of RTSA, there remains limited data regarding perioperative expectations and fulfillment of expectations. Thus, the purpose of this study was to determine the proportion of expectations that are fulfilled following RTSA, and to determine which patient characteristics are associated with fulfillment of expectations.

METHODS: This prospective cohort study was performed from 2017-2022 and is a continuation of a prior study that characterized preoperative expectations for patients undergoing RTSA. Patients were included in the study if they completed their expectations surveys and underwent primary RTSA for a diagnosis of glenohumeral arthritis. Patients completed the Hospital for Special Surgery's Shoulder Surgery Expectation Survey (HSS-ES), American Shoulder and Elbow Surgeons (ASES), visual analogue pain score (VAS), and Single Assessment Numeric Evaluation (SANE) score. Demographic information including age, sex, race, BMI, education, and employment status were collected, along with range of motion (ROM). At two-year follow-up, patients were asked to what extent each of their corresponding preoperative expectations which they had previous cited as "very important" were now fulfilled, with answers ranging from "not at all" to "very fulfilled".

RESULTS: Out of 94 patients, 81 (86%) completed their 2-year postoperative fulfillment questionnaires. There were 45 females (56%) and 36 males (44%) and mean age was 70. Eighty-two percent were white, 19% employed, and 57% college graduates. Postoperatively, the average ASES improved from 42-87, average VAS score improved from 55-2, and average SANE score improved from 35-88. Patients demonstrated improvements in ROM, with average forward flexion from 100°-150°, abduction from 90°-130°, and external rotation from 20°-30°. Of the 17 items on the HSS-ES, the most frequently cited expectation was relief of daytime pain (88%) and the least frequently cited was employment for monetary reimbursement (10%). "Very fulfilled" expectations were improvement in self-care (82%), improvement in ability to drive (77%), and relief of daytime pain (76%). Conversely, employment for monetary reimbursement (50%), stopping shoulder from dislocating (54%), and improvement in ability to exercise/participate in sports (54%) were the least fulfilled expectations. 80% cited improvement in ROM as an important expectation preoperatively but only 57% reported being "very fulfilled". Patients with better postoperative ASES ($p<0.01$), VAS ($p<0.01$), and SANE ($p<0.01$) compared to the average had a greater proportion of expectations fulfilled.

CONCLUSION: Patients undergoing RTSA had greatest fulfillment of expectations for improvement in self-care, ability to drive, and relief of daytime pain.

Prior Shoulder Arthroscopy is Associated with Worse Outcomes Following Primary Reverse Shoulder Arthroplasty

Poster 032

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BACKGROUND: Expanded indications for reverse shoulder arthroplasty (RSA) have led to its increased use as an end-stage treatment when patients have persistent rotator cuff pathology or recurrent symptoms following shoulder arthroscopy. The extent to which prior shoulder arthroscopy impacts clinical outcomes following RSA remains poorly characterized. The aim of the present study was to evaluate the impact of previous ipsilateral shoulder arthroscopy on patient-reported outcomes and range of motion following RSA.

METHODS: All patients who underwent RSA for either rotator cuff arthropathy or glenohumeral osteoarthritis from June 2014 to September 2019 by a single surgeon were retrospectively identified through a prospectively collected database. Patients who underwent RSA following prior ipsilateral shoulder arthroscopy were propensity-matched based on sex and age to a control group of patients who underwent RSA without previous shoulder surgery. Prior shoulder arthroscopy procedures included rotator cuff repair (70%), anterior instability repair (5%), and diagnostic arthroscopy and debridement (25%). Patient-reported outcomes (PROs), including the Simple Shoulder Test (SST), American Shoulder and Elbow Surgeons score (ASES), University of California-Los Angeles (UCLA) score, and active range of motion were measured preoperatively and at a minimum two years postoperative.

RESULTS: Forty patients (n=20 RSA with prior arthroscopy (RSAPA), n=20 control RSA) were analyzed in the cohort. Mean duration of follow-up for patients with prior ipsilateral shoulder arthroscopy and control patients was similar ($p = 0.449$) (RSAPA= 40.9 ± 14.4 months and RSA=44.5 ± 16 months. All PROs improved postoperatively ($p < 0.0001$). Improvements in PROs for RSAPA were diminished relative to RSA control group patients, including SST (RSAPA=4.6 vs RSA=8, $p = 0.002$), ASES (RSAPA=40.5 vs. RSA=56.4, $p = 0.011$), and UCLA (RSAPA=14.5 vs. RSA=21.9, $p = < 0.0001$) scores. Sixty-five percent of patients who had prior shoulder arthroscopy and 95% of control patients without prior shoulder arthroscopy rated their postoperative forward elevation as “normal” ($p = 121$). One patient (5%) with prior shoulder arthroscopy required revision due to recurrent instability, whereas no patients in the control group required revision surgery.

CONCLUSION: Patients who underwent RSA following prior ipsilateral shoulder arthroscopy had inferior two-year postoperative clinical outcomes scores and decreased shoulder range of motion compared to a propensity-matched control group of RSA patients. This is concerning given the rates of shoulder arthroscopy and the utilization of RSA as a salvage procedure. Further research is needed to understand the relationship of prior arthroscopy and risk factors that negatively impact outcomes after RSA.

Failure of Liposomal Bupivacaine in Managing Postoperative Pain Following Shoulder Surgery
Poster 033

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BACKGROUND: Amidst a national opioid crisis, increased focus has been placed on reducing opioid consumption. Novel multimodal pain protocols, including the use of liposomal bupivacaine (LB) have shown success in minimizing opioid usage after orthopedic surgery. There is disputing evidence on the effectiveness of LB use in shoulder surgery, the purpose of our study was to analyze the risk factors of LB failure for postoperative pain control after shoulder surgery.

METHODS: A retrospective review of 121 patients undergoing shoulder surgery treated by two fellowship-trained shoulder surgeons at a single institution was performed from 2018 to 2020. All patients received a standardized multimodal pain management protocol that included an LB interscalene block. Local infiltration of LB was also administered at closure. Visual analog scales (VAS) were administered at 24, 48, 72 hours, and 7 days postoperatively. LB failure was defined as VAS score >7 any time within the 7-day postoperative period. Twenty-one patients were included in the liposomal bupivacaine failure (LBF) group and 100 in the liposomal bupivacaine success (LBS) group. Patient demographics, pain scores, and opioid consumption were compared between groups.

RESULTS: Baseline characteristics were comparable, except the LBF cohort had a greater proportion of females (p=0.03). The LBF group had 20% of patients with a history of chronic opioid use compared to none in the LBS group (p=0.003). Logistic regression showed strong and independent associations between failure of LB and performing surgeon, chronic opioid use, gender, and history of prior surgery. Patients in the LBF group had an average of 20 total morphine equivalents (TME) 7-14 days following surgery compared to 0 TME (p=0.002) in the LBS group, and an average of 2.9 opioid prescriptions within the first 6 months compared to 1.7 in the LBS group (p=0.028).

CONCLUSION: Performing surgeon, gender, history of opioid use, and prior surgeries were all identified as strong, independent risk factors for failure of LB to control postoperative pain. In this study, performing surgeon is likely indicative of differences in patient education on postoperative pain expectations and alternate nonopioid regimens. We recommend that surgeons incorporate further preoperative patient education and take into account the specific risk factors when deciding to incorporate LB into their multimodal postoperative pain management plan for patients undergoing shoulder surgery.

Body Mass Index Does Not Affect Outcomes or Survivorship in Reverse Total Shoulder Arthroplasty
Poster 034

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BACKGROUND: The link between elevated body mass index (BMI) and poorer outcomes as well as complications in hip and knee surgeries is extensively documented. Nevertheless, there is still a need to fully determine the impact of BMI on the long-term success and clinical outcomes of reverse total shoulder arthroplasty (rTSA).

METHODS: An examination of institutional records was carried out to identify individuals who underwent primary rTSA between 2009-2020 using the Current Procedural Terminology code 23472. The selection process required a minimum follow-up of two years. A retrospective analysis of medical records was subsequently conducted to gather data on demographic characteristics, comorbidities, lifestyle factors, and pre- and postoperative measurements of range of motion and strength in forward elevation, external rotation, and internal rotation. The patients were categorized into three cohorts based on their body mass index (BMI): underweight or normal weight (U/NW, BMI ≤ 25), overweight (OW, 25 < BMI ≤ 30), and obese (BMI > 30).

RESULTS: Among the 221 patients who underwent rTSA, 33 were U/NW, 79 were overweight, and 109 were obese, with average BMIs of 22.4±1.9, 27.4±1.4, and 37.2±6.2, respectively. Male patients had a higher likelihood of obesity compared to U/NW individuals (U/NW: 18% vs. obese: 43% male; p=0.029), and BMI exhibited an inverse correlation with age at the time of surgery (U/NW: 72.4±8.8 years vs. overweight: 69.3±8.3 years vs. obese: 65.7±8.3 years; p<0.001). The average follow-up duration was 3.3±1.5 years, and all three cohorts demonstrated significant improvements in range of motion and strength testing (all p<0.001), following rTSA. There were no notable differences in these functional measurements among the three cohorts during preoperative assessment and postoperative follow-up. Moreover, there was no significant disparity in the 5-year implant survival rates between U/NW (85.9%), overweight (83.7%), and obese patients (86.1%) (p=0.9736).

CONCLUSION: The results of this study highlight that male patients with a higher body mass index (BMI) had a higher incidence of requiring rTSA. However, BMI did not play a significant role in determining long-term success or clinical outcomes.

Body Mass Index Does Not Affect Outcomes or Survivorship in Reverse Total Shoulder Arthroplasty
Poster 034

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CONCLUSION: The results of this study highlight that male patients with a higher body mass index (BMI) had a higher incidence of requiring rTSA. However, BMI did not play a significant role in determining long-term success or clinical outcomes.

Proximal Humerus Fracture Treated with Reverse Total Shoulder Arthroplasty Compared to Rotator Cuff Arthropathy: A Retrospective Review

Poster 035

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INTRODUCTION: Proximal humerus fractures in older individuals present challenges to orthopedic surgeons. Historically, hemiarthroplasty has been successful in relieving pain following proximal humerus fracture, yet functional deficits remain. Originally indicated for rotator cuff arthropathy (RCA), reverse total shoulder arthroplasty (RTSA) is an increasingly common intervention that allows for improved function after proximal humerus fracture independent of rotator cuff integrity. There is limited research assessing differences in outcomes between RTSA for fracture and elective indications such as RCA. The purpose of this study was to examine differences in clinical and functional outcomes in patients undergoing RTSA for fracture and RCA.

METHODS: Institutional records were searched for all patients who underwent RTSA for proximal humerus fracture and RCA between 7/01/2009 to 10/01/2019 with a minimum 2-year follow-up. Electronic medical records were retrospectively evaluated for demographic information, postoperative range of motion and strength measurements, and complications. Continuous variables were analyzed via the Two-sample t-Test, ordinal variables via ordinal logistic regression, categorical variables via the Chi-squared test, and a five-year survivor analysis was performed.

RESULTS: A total of 154 patients met the criteria for inclusion, with 33 in the fracture cohort and 121 in the RCA cohort. Fracture patients exhibited higher mean BMI (33.6 ± 10.7 vs. 30.4 ± 5.9; p-value 0.0295) and proportion of female patients (78.8% vs. 54.5%; p-value 0.012) than the RCA group. The fracture group exhibited worse forward elevation (122.4° ± 42.9° vs. 141.8° ± 21.3°; p-value < 0.001) at final follow-up. External rotation, internal rotation, and strength measurements showed no significant differences between groups. Survival analysis showed a 5-year implant survival rate of 72.3% (26.2-92.5% confidence interval) in the fracture cohort and 89.3% (78.5-94.8% confidence interval) in the RCA cohort respectively.

DISCUSSION: RTSA is a useful intervention that improves shoulder functionality in acute fracture and fracture sequelae patients. Despite improved functionality, implant longevity, particularly at five years, and forward elevation after RTSA for fracture remain significant challenges that must be further assessed.

The Influence of Parkinson's Disease on Outcomes After Total Shoulder Arthroplasty: Inconsistencies in Outcomes Due to Neuromuscular Compromise

Poster 036

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INTRODUCTION: Total shoulder arthroplasty (TSA) is an increasingly common surgical procedure involving total replacement of the Glenohumeral (GH) joint with prosthetic material. There exists a complex set of indications and contraindications to consider when selecting eligible patients. Parkinson's Disease, a progressive neurological disorder that results in progressive muscular dysfunction, has been linked to higher rates of instability following TSA. With limited literature in this field, this study seeks to explore the relationship Parkinson's Disease (PD) and outcomes following TSA.

METHODS: The institutional electronic medical record was used to retrospectively identify all patients with Parkinson's Disease who underwent shoulder arthroplasty procedures from 2009 to 2020. Patient records were retrospectively reviewed to assess demographic information, pre- and postoperative range of motion and strength measurements, and complications. Mean ± standard deviation was reported for continuous variables.

RESULTS: A total of 10 shoulders met the inclusion criteria. The mean age of the cohort was 57.6 ± 10.6 years (range 45-84) at the time of PD diagnosis and 68.1 ± 6.9 years (range 58-83 years) at the time of surgery. The mean follow-up was 1.5 ± 0.5 years (range 1-2.4 years). Mean forward elevation declined from 137.5º ± 17.2º to 124.0º ± 28.7º. Mean external rotation and internal rotation improved from 36.0º ± 10.2º to 37.0º ± 10.1º. Mean internal rotation showed no improvement. All three types of arthroplasty resulted in decreased forward elevation, while anatomic TSA improved external rotation and hemiarthroplasty resulted in improved internal rotation.

DISCUSSION: Shoulder arthroplasty in the setting of Parkinson's Disease presents unique challenges. For patients undergoing shoulder arthroplasty, functional outcomes and complications can be consistent and predictable. In this study, outcomes varied significantly between regardless of the type of arthroplasty being performed. This suggests that these outcomes are likely influenced by PD-specific factors, notably the highly incongruent progression of this disease between individuals resulting in neuromuscular dysfunction at unpredictable rates. Important considerations must be made based on the unique presentation of each patient as TSA carries significant perioperative risk.

A Large-Scale National Database Analysis on the Effects of Allergies on Total Shoulder Arthroplasty Outcomes and Complications

Poster 037

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INTRODUCTION: The objective of this study is to investigate the effect of allergies on complications and the number of revisions following total shoulder arthroplasty (TSA).

MATERIALS & METHODS: All data was collected by using the PearlDiver national database to identify patients who had undergone TSA (anatomic or reverse) between 1/1/2010-10/31/2021. Patients were stratified into two groups: with allergies and without allergies. Comparisons were made regarding surgical complications, medical complications and revision surgeries. Complications were compared at both 30 and 90 days postoperatively, while revisions were additionally compared at 1 year, 5 years, and 10 years postoperatively.

RESULTS: This study identified 28,182 patients with allergies and 126,296 patients without reported allergies. Patients with allergies were more likely to require revision surgery at all time points analyzed ($p<0.001$). At 90 days, patients with allergies were more likely to have experienced an episode of bleeding (OR 1.26 [95% CI 1.05 to 1.50], $p = 0.012$). Patients with allergies were more likely to have sepsis within 30 days (OR 1.53 [95% CI 1.30 to 1.80], $p < 0.001$) and 90 days (OR 1.71 [95% CI 1.51 to 1.94], $p < 0.001$) postoperatively. Patients with allergies were more likely to experience a wound complication within 30 days (OR 1.89 [95% CI 1.58 to 2.26], $p < 0.001$) and 90 days (OR 1.81 [95% CI 1.58 to 2.08], $p < 0.001$). The allergy group experienced higher rates of prosthetic joint infections (90 days: OR 2.14 [95% CI 1.81 to 2.54], $p < 0.001$) and implant complications (30 and 90 days: OR 1.52 [95% CI 1.42 to 1.62], $p < 0.001$).

CONCLUSION: Patients with allergies were more likely to require revision surgery, experience wound complications, sepsis, postoperative stiffness, and prosthetic joint infections following TSA.

Analyzing Outcomes of Total Shoulder Arthroplasty in Solid Organ Transplant Recipients
Poster 038

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BACKGROUND: Currently, there is limited literature investigating shoulder arthroplasty outcomes in patient with prior solid organ transplant (SOT). In this series, we present the largest case series to date on this topic. SOT recipients are commonly prescribed immunosuppressive therapies, which have been implicated in causing avascular necrosis (AVN). AVN prior to shoulder arthroplasty may result in a difference in outcomes when compared to SOT recipients who lack AVN preoperatively.

METHODS: Institutional records were obtained for patients who underwent SOT prior to shoulder arthroplasty between 2010-2020. Patient medical records were reviewed to determine indication of surgery, pre- and postoperative range of motions (ROM) and strength, type and date of solid organ transplant, immunosuppressive therapy used, and any surgical complications and revisions. Wilcoxon ordered logistic regression, Rank-Sum test, and Chi-Squared test were used to analyze ordinal, continuous, and categorical variables, respectively.

RESULTS: 39 patients (19 female, 20 male) were included and the mean follow-up was 2.5 years. There was significant improvements in range of motion: external rotation (ER) (34° ± 22° to 45° ± 16°; p=0.030), forward elevation (FE) (90° ± 42° to 138° ± 26°; p=<0.001), internal rotation (IR) (Sacrum to L3; p=0.001), and supraspinatus strength (4/5 to 4+/5; p=0.028). Post-hoc power analysis for ER, FE, IR, and strength was 0.710, 0.999, 0.904, and 0.727, respectively. There was no significant difference in preoperative ROM between AVN and non-AVN patients, but strength differed: ER (AVN: 44° ± 9°; non-AVN: 32° ± 23°; p=0.160), FE (AVN: 8° ± 20°; non-AVN: 93° ± 45°; p=0.437), IR (AVN: Ls; non-AVN: Sacrum; p=0.567), and strength (AVN: 5/5; non-AVN 4/5; p=0.078). Similarly, there was no significant difference in postoperative ROM, but strength differed: ER (AVN: 52° ± 19°; non-AVN: 45° ± 14°; p=0.339), FE (AVN: 138° ± 17°; non-AVN: 140° ± 26°; p=0.551), IR (AVN: L4; non-AVN: L3; p=0.094), and strength (AVN: 4/5; non-AVN: 5/5; p=0.028). 3/39 (8%) of patients were surgically revised. The 10-year Kaplan-Meier survival estimate was 94%.

CONCLUSION: Individuals that undergo shoulder arthroplasty after SOT gain significantly better function postoperatively compared to preoperatively. Individuals with preoperative AVN produce similar results to those without AVN on external rotation, forward elevation, internal rotation, but display a significant difference in strength.

Distal Humerus Nonunions: Salvage Total Elbow Arthroplasty vs. Revision Internal Fixation Utilizing the S.O.S. (Supracondylar Ostectomy and Shortening) Procedure

Poster 039

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BACKGROUND: Distal humerus nonunions are associated frequently with bone loss and can be difficult to treat. Many consider internal fixation the procedure of choice for distal humerus nonunions. However, limited bone stock, associated joint fibrosis, and cartilage damage may compromise the outcome of internal fixation, and total elbow arthroplasty (TEA) may be a better alternative for selected patients. At our institution, we have tried to maximize the success of internal fixation with the supracondylar ostectomy and shortening (S.O.S.) technique, which combines humeral shortening, parallel plating, and bone grafting. The purpose of this study was to compare the outcomes of revision fixation utilizing S.O.S vs. salvage TEA for distal humerus nonunions.

MATERIALS & METHODS: A retrospective review of electronic medical records identified 25 distal humerus nonunions treated with the SOS internal fixation procedure and 45 TEA performed specifically for distal humerus nonunion, all performed between 1995 and 2019. Elbows without prior internal fixation attempts were excluded from the study. The S.O.S. cohort had a younger mean age, shorter clinical and radiographic follow-up, and less common intra-articular nonunion compared to the TEA cohort. Outcomes included complications, reoperations, range of motion, and Mayo Elbow Performance Scores (MEPS).

RESULTS: In the SOS cohort, 2 elbows were lost to follow-up, 21 elbows achieved union, and 2 elbows developed nonunion and required revision to TEA. Complications occurred in 9 elbows (36%) following S.O.S. compared to 18 elbows (40%) following TEA (OR 0.8, p=0.7). All-cause reoperation occurred in 12 elbows (48%) after S.O.S vs. 12 elbows (27%) after TEA (OR 2.5, p=0.08). Compared to TEA, the S.O.S. cohort had a lower mean flexion-extension arc (100° vs. 115°, p=0.06) and a higher mean pronation-supination arc (155° vs. 145°, p=0.2), although neither met statistical significance. MEPS scores were similar between groups (S.O.S 79 points, TEA 82 points, p=0.6). When stratifying by location of nonunion, elbows with intra-articular nonunion undergoing S.O.S had higher rates of reoperation (75%) compared to extra-articular nonunions (35%, OR 5.5, p=0.08). MEPS were also significantly worse for intra-articular vs. extra-articular nonunions treated with the SOS procedure (51 points vs. 88 points, p<0.01; TEA (85 points, p<0.01).

CONCLUSION: Despite achieving a high union rate, the SOS procedure presented similar results compared to TEA in terms of MEPS, motion, complications, and reoperations. Outcomes after internal fixation using the SOS procedure were worse for nonunions with an intra-articular component, which may be better suited for TEA.

Increasing Severity of Preoperative Anemia is Associated with Higher Postoperative Medical and Surgical Complications after Primary Shoulder Arthroplasty

Poster 040

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OBJECTIVE: Anemia is a major cause of morbidity worldwide and compounds numerous medical conditions. Studies have found associations between anemia and both medical and surgical complications after shoulder arthroplasty (SA); however, most of these studies have used commercially available national databases with limited information on outcomes and typically short-term follow-up. Our study sought to evaluate the mid-term outcomes of primary SA at a single institution when stratified by the degree of preoperative anemia.

METHODS: Between 2000 and 2020, 5,231 primary SA (477 hemiarthroplasties [Hemi], 2,091 anatomic total SA [aTSA], and 2,335 reverse SA [RSA]) with preoperative hematocrit values available and a minimum follow-up of 2 years were collected from a single institution joint registry database. The severity of anemia was subclassified as: no anemia (hematocrit > 39% for males, > 36% for females; n = 4,194 [80.2%]), mild anemia (hematocrit 33%-39% for males, 33%-36% for females; n = 742 [14.2%]), and moderate to severe anemia (hematocrit < 33% for both males and females; n = 295 [5.6%]). Mean follow-up time for the entire cohort was 5.9 years (range, 2 to 22 years). Medical and surgical complications, reoperations, revisions, and implant survivorship were assessed.

RESULTS: SA with moderate to severe anemia had the highest rate of non-fatal and non-transfusion medical complications (5.1%) relative to the non-anemic (1.2%; P < .001) and mild anemic groups (1.5%; P < .001). Similarly, SA with moderate to severe anemia had the highest rate of surgical complications (19.3%) compared to mild anemia (14.3%; P = .044) and no anemia (11.6%; P < .001). Postoperative transfusion was most frequent in the moderate to severe anemia cohort (40.3%) compared to the mild anemia (14.2%; P < .001) and non-anemic groups (2.5%; P < .001). Furthermore, SA who received postoperative transfusions had a higher risk of non-fatal medical complications (8.2% vs. 1.0%; P < .001), 90-day mortality (1.5% vs. .03%; P = .001), and surgical complications (19.5% vs. 12.0%; P < .001) when compared to those without transfusion.

CONCLUSION: Moderate to severe anemia (hematocrit < 33% for both males and females) was identified in approximately 5.6% of patients undergoing SA at a single institution and was associated with increased medical and surgical complications. Patients who received postoperative transfusions presented elevated rates of medical complications, 90-day mortality and surgical complications. Healthcare teams should be aware of these risks in order to provide more individualized medical optimization and postoperative monitoring.

Same-Day Discharge vs. Inpatient Total Shoulder Arthroplasty: An Age Stratified Comparison of Postoperative Outcomes and Hospital Charges

Poster 041

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OBJECTIVES: As the demand for total shoulder arthroplasty (TSA) increases, there is a growing emphasis on improving patient safety and outcomes while simultaneously reducing costs and optimizing efficiency. The purpose of this study was to compare 90-day postoperative outcomes of primary TSA in the same-day discharge (SDD) and inpatient (IP) settings, length of stay (LOS), emergency department (ED) utilization, readmissions, reoperations, and hospital charges in an age stratified comparison.

METHODS: Patients that underwent primary TSA were categorized into either the SDD surgery cohort or IP cohort determined by LOS. Length of stay ≤8 hours was defined as SDD per institutional protocols. Patient demographics, including age, gender, body mass index (BMI), and preoperative medical comorbidities were collected. Collected outcomes included length of stay (LOS), minor and/or major complications, ED visits, readmissions, reoperations, and hospital charges. Continuous variables were presented with descriptive analyses while categorical variables were presented with frequencies and percentages. Continuous variables was evaluated by two sample t-test and categorical variables were evaluated by X2 or Fisher's exact test. All analyses were two-tailed and $p<0.05$ was considered to be statistically significant.

RESULTS: There were 295 patients with 121 in the SDD group and 174 in the IP group with a mean age of 66.43±9.71 and 70.83±10.19 ($p<0.001$), respectively. There were more female patients in the IP cohort compared to the SDD cohort ($p=0.003$). There were no differences in BMI, ASA classification, ECI score, or other preoperative comorbidities. The median LOS in the SDD cohort was 5.04 hours compared to 25.20 hours in the IP cohort ($p<0.001$). There were no differences in rates of overall 90-day minor complications, 90-day major complications, 90-day ED utilization, 90-day readmission, or 90-day reoperation between the SDD and IP cohorts. When stratified by age, there were no differences in overall major and minor complications among the groups. However, the LOS was directly correlated with increasing age (LOS=8.4 hours in ≥65 to < 75-year cohort vs. LOS=25.9 hours in ≥80-year cohort; $p<0.001$). There were no differences in hospital charges between SDD and IP primary TSA in all 3 age groups.

CONCLUSION: SDD TSA had a shorter LOS without an increase in the complication profile. Older age was not associated with increased complications. These results suggest that TSA can be safely performed expeditiously in an outpatient setting.

National Incidence and Economic Burden of Revision Shoulder Arthroplasty in the United States: Projections Through 2030

Poster 042

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PURPOSE: This study sought to use an all-payor inpatient claims database to investigate the incidence and national cumulative costs of revision shoulder arthroplasty in the United States, including those being performed for PJI. In addition, we also aimed to project the incidence and national economic impact of revision shoulder arthroplasty in the US through 2030.

METHODS: The National Inpatient Sample (NIS) was used to estimate the annual number of revision shoulder arthroplasties performed between 2008 and 2019 using ICD procedure codes. Cumulative national costs were estimated. Septic revision shoulder arthroplasties were identified (i.e., cases being done for a prosthetic joint infection). Independent Poisson and linear regression models were used to project the future incidence and national cumulative cost for revision shoulder arthroplasty and septic revision shoulder arthroplasty.

RESULTS: Between 2008 and 2019, the annual incidence of all-cause revision TSA increased from 4,066 to 12,200 and septic revision TSA increased from 818 to 3,520. Infection represented 20.0% of all revision cases in 2008, which increased to 28.9% of all cases in 2019. The yearly national cumulative cost for all-cause revision TSA increased from 75 million dollars in 2008 to 253 million dollars in 2019. Likewise, the national cumulative cost associated with PJI increased from 14 million dollars in 2008 to 81 million dollars in 2019. By 2030, the linear model predicted that the volume of all-cause revision TSA will increase to 19,046 cases/year and the Poisson model predicted the volume will increase to 32,366 cases/year. The projections for septic revision TSA demonstrated increases by the linear and Poisson models to an estimated 5,789 and 14,771 procedures by 2030. The national cumulative cost of all-cause revision TSA is predicted to increase to 400-753 million dollars per year by 2030. Septic revision TSA is expected to have a cumulative cost burden of 141-475 million dollars by 2030.

CONCLUSION: From 2008-2019, there has been a dramatic rise in the incidence of revision shoulder arthroplasty in the US with a significant projected economic burden. This study provides a more complete picture of the impact that shoulder arthroplasty has and will have on the US healthcare system and will help determine the proper allocation of healthcare resources for the future.

Long-Term Outcomes of Partial Meniscectomy for Medial Meniscus Posterior Root Tears: A Cautionary Tale
Poster 043

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OBJECTIVE: Previous studies have demonstrated that repair of medial meniscus posterior root tears (MMPRTs) is superior to debridement in terms of patient reported outcomes, rates of conversion to total knee arthroplasty (TKA), and long-term costs. Despite the known poor mid-term outcomes, long-term results of partial meniscectomy for MMPRTs have yet to be elucidated. The purpose of this study is to (1) evaluate long-term patient reported and radiographic outcomes of patients who underwent partial medial meniscectomy (PMM) for MMPRTs and (2) determine rate and risk factors for conversion to total knee TKA.

METHODS: A previously identified cohort of 26 patients from 2005-2013 diagnosed with isolated MMPRTs was prospectively followed for long-term outcomes following partial meniscectomy for MMPRT at minimum 10-year follow-up. Patients were evaluated for International Knee Documentation Committee (IKDC) outcome score, reoperation, and conversion to TKA. Failure was defined as conversion to arthroplasty or severely abnormal patients subjective (IKDC) score of <75.4.

RESULTS: This study included 26 patients (10 males, 16 females, age: 54 ± 8.7 years (range, 38-71) at diagnosis, BMI: 32.9 ± 5.5) who were followed for 14.0 ± 3.6 years (range, 10.1 - 19.6). At final follow-up, one patient was deceased, and 18 (72%) of the remaining 25 patients had progressed to TKA, with one (4%) patient undergoing repeat meniscectomy. The six (24%) patients who had not progressed to TKA or revision surgery reported a mean IKDC score of 57 ± 23. Nineteen patients underwent subsequent surgery and 5 demonstrated severely abnormal IKDC scores resulting in a clinical failure rate of 96% (24 of the 25 living patients) at mean 14-year follow-up.

CONCLUSION: Partial medial meniscectomy for medial meniscus posterior horn root tears demonstrates 72% progression to TKA and 96% failure of subjective clinical outcomes at minimum 10-year follow-up.

Clinical Outcome of Meniscus Centralization with Medial Meniscus Root Repair for the Extruded Medial Meniscus

Poster 044

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OBJECTIVE: The purpose of this study was to (1) describe the patient reported clinical outcomes following medial meniscus root repair with meniscus centralization, and (2) determine any complications, including revision or conversion to arthroplasty.

METHODS: Patients undergoing medial meniscus root repair with meniscus centralization from 2020-2022 were identified using an institutional database. Patients were followed prospectively using postoperative Tegner Activity Scale, Visual Analogue Scale (VAS) for pain, Knee Injury and Osteoarthritis Outcome Score, Joint Replacement (KOOS Jr.), International Knee Documentation Committee (IKDC) score, a Likert score for improvement, surgery satisfaction, and subsequent surgeries at two-year follow up. Demographics, injury characteristics, and surgical details were also collected.

RESULTS: Twenty-five patients (age: 50 ± 11 years; sex: 76% female; BMI: 33 ± 8 kg/m^2) were included in this study. Postoperative Tegner score was maintained at preoperative levels ($p = 0.233$), while VAS at rest, VAS with use, KOOS Jr., and IKDC improved significantly postoperatively ($p = 0.003$, $p < 0.001$, $p < 0.001$, $p = 0.023$, respectively). Eighty-eight percent of patients reported subjective improvement in their knee at final follow-up. Postoperative radiographs did not show any significant OA progression, and no patients had undergone a revision meniscus surgery or total knee arthroplasty (TKA) at the time of follow-up.

CONCLUSION: At two-year follow-up, patients undergoing medial meniscus root repair with meniscus centralization demonstrated significant post-operative improvements in pain, function, and quality of life and reported high rates of surgery satisfaction. There was no evidence of significant arthritic progression on postoperative imaging, and no patients underwent revision meniscus surgery or TKA.

Series of Isolated Arthroscopic Debridement of Acetabular Labral Tears: High Rates of Failure and Conversion to Total Hip Arthroplasty at 13-Year Minimum Follow-Up

Poster 045

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OBJECTIVE: Hip labral repair has become the standard treatment for labral pathology; however, to date, there are limited long-term studies regarding the outcomes of isolated labral debridement. The purpose of this study was to (1) evaluate the long-term patient reported outcomes of isolated labral debridement, (2) report reoperation and arthroplasty rates, and (3) identify risk factors contributing to reoperation or poor clinical outcomes.

METHODS: A retrospective review of a prospectively generated cohort of 59 hips in 57 patients from 1996-2010 that underwent hip arthroscopy with labral debridement was performed. Pre- and postoperative modified Harris Hip Score (mHHS), Hip Outcome Score Activities of Daily Living (HOS-ADL) and Sports (HOS-Sports) as well as reoperation, conversion to total hip arthroplasty (THA), and risk factors were analyzed.

RESULTS: Forty-eight hips in 47 patients (14 males, 33 females, age: 48.0 ± 12.9 years) met inclusion criteria and were followed for an average of 17 ± 3 years (range 13-27). Mean mHHS, HOS-ADL and HOS-Sports scores at final follow-up were 82.2 ± 16.6, 81.9 ± 20.5, and 79.9 ± 23.0, respectively. Nineteen hips underwent subsequent reoperation at a mean of 5.5 ± 6.2 years (range 0.5-21.2) postoperatively including 16 patients (33% overall) converting to THA. Higher acetabular ICRS chondral grades at the time of surgery were observed in patients who went on to subsequent surgery (2.3 ± 1.6 vs. 1.1 ± 1.5, p = 0.02). In reoperation-free hips, Tönnis grade demonstrated a trend of increasing over time (1.4 preoperatively vs. 1.7 at radiographic follow-up, p = 0.08). At final follow-up, 19 hips (40%) had undergone reoperation and 5 additional hips (10%) rated their hip function as “abnormal” or “severely abnormal” resulting in an overall clinical failure rate of 50%.

CONCLUSION: Isolated labral debridement was found to result in high rates of failure and reoperation, with a third of patients converting to arthroplasty and half of patients meeting criteria for reoperation or clinical failure. Of note, for patients remaining reoperation free, satisfactory outcome scores were observed.

Utilizing Machine Learning to Identify Ideal Candidates for Nonoperative Treatment of ACL Tears
Poster 046

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BACKGROUND: Although most often treated with reconstruction, some patients may benefit from nonoperative treatment of anterior cruciate ligament (ACL) tears. Though nonoperative management is less common in comparison to reconstruction, development of predictive models for patients likely to succeed this form of management can help inform clinical decision making and optimize patient selection. The purpose of this study was to identify predictive factors for success in nonoperatively managed ACL injuries.

STUDY DESIGN: Cohort Study

METHODS: Patient charts were reviewed for ACL injuries occurring between January 1, 1990 and July 31, 2016. Patients were included if they had either a partial or complete primary ACL tear and did not undergo reconstruction for a minimum of 6 months. Patients receiving surgery within 6 months of ACL rupture were excluded, as well as those who had a primary reconstruction with retear treated nonoperatively. Success was defined as those who did not undergo ACL reconstruction for the duration of follow-up. Machine learning algorithms were utilized to predict success of nonoperative management. Performance of the algorithms was assessed through discrimination using area under the receiver operating characteristics curve (AUROC), calibration, and decision curve analysis.

RESULTS: A total 880 patients underwent nonoperative management of ACL injuries. 447 patients were successfully managed nonoperatively while 433 patients eventually underwent ACL reconstruction (follow-up 84 and 113.5 months, respectively). Variable importance plots identified the following factors significant in nonoperative success: sedentary occupation, activity level, noncontact sport athlete, older age at injury, absence of previous knee surgery, absence of complete tear, absence of concomitant meniscus injury, lack of residual laxity, and concomitant LCL or MCL injury. The best performing model was the XGBClassifier (AUROC = 0.87).

CONCLUSION: Machine learning models identified sedentary occupation, lower activity level, noncontact sport athlete, older age at injury, absence of previous knee surgery, absence of complete tear, absence of concomitant meniscus injury, and lack of residual laxity as predictive of nonoperative success following ACL tear; however, these patients also had higher occurrence of osteoarthritis and progression to TKA at final follow up.

Does Concomitant Meniscus Allograft Transplantation Influence Outcomes of Osteochondral Allograft Transplantation? A Comparative Matched-Pair Analysis

Poster 047

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OBJECTIVE: Osteochondral allograft transplantation (OCAT) and meniscus allograft transplantation (MAT) are both joint preserving operations that are often performed concurrently. However, there remains a paucity in literature reporting on outcomes and failure rates after concomitant procedures. The purpose of this study was to determine (1) the mid-term clinical success rate after OCAT with MAT in comparison to a matched-pair cohort undergoing isolated OCAT, (2) if patient specific and procedural variables influence the risk of failure, and (3) patient-reported outcome measures over time.

METHODS: Patients undergoing OCAT of the medial or lateral femoral condyle with and without MAT between 2004-2020 were identified. Patients were matched 1:1 by age±5 years, gender, BMI±5, and grouped Kellgren and Lawrence (KL) grade (0,1/2,3). Minimum follow-up time was two years. Radiographic variables (ICRS/KL grades) were assessed. Patient reported outcome measures (PROMs) were collected, including Lysholm, KOOS, IKDC score, and VAS Scores. Clinical failure was defined as revision surgery or conversion to TKA. Patient-reported, clinical, and radiographic outcomes were compared between groups.

RESULTS: 66 patients (33 isolated OCAT,33 OCAT+MAT) with mean age 26.3 years were followed for a mean of 5.6 years. Both cohorts showed no difference in KL grade postoperatively($p=0.59$). There was a significantly higher ICRS grade at follow-up in the OCAT+MAT group (2.8±1.1) compared to the OCAT group (2.0±1.0)($p<0.05$). There were no significant differences between the groups regarding reoperation rate, time to reoperation, and failure rate ($p\geq0.061$). In the OCAT+MAT group, increased tibial slope conferred a 1.65-fold increase in the hazards for failure over decreased slope (HR 1.65, $p<.05$). PROMs were significantly improved at final follow-up compared to preoperative status. No significant differences in PROMS were seen between groups except for the KOOS symptoms subscale score, which was significantly higher in the OCAT+MAT group as compared to the OCAT group ($p<0.05$) and did exceed the minimal clinically important difference threshold of 10.7.

CONCLUSION: Long-term results after isolated OCAT and OCAT+MAT show sustainable subjective improvement of knee function and quality of life. A survival rate of 87% was noted at a mean follow-up of 5.6 years. Cohorts did not significantly differ in terms of failure rate and patient reported outcomes. These results imply that isolated OCA is an efficient joint preserving treatment that can be combined with MAT in well-selected patients with meniscus insufficiency without negative influence on global clinical outcomes.

Comparing Outcomes of Labral Reconstruction and Repair Performed in Conjunction with Periacetabular Osteotomy

Poster 048

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INTRODUCTION: Periacetabular Osteotomy (PAO) can be performed in conjunction with arthroscopic treatment of the labrum. In patients who have failed prior arthroscopic repair, labral reconstruction may be indicated. The goal of this study is to compare changes in patient-reported outcome scores in patients undergoing labral repair and labral reconstruction in conjunction with PAO.

METHODS: We prospectively collected demographics, patient reported outcome scores, and imaging measurements both preoperatively and postoperatively between 10/2018-12/2022. The modified Harris Hip Score (mHHS) and International Hip Outcome Tool (iHOT) are PROs collected for hip pain and dysfunction with established reliability. The lateral center edge angle (LCEA) and Tönnis angle (TA) are radiographic measurements commonly used to assess presence and severity of hip dysplasia. Patients undergoing PAO with concurrent arthroscopy at the University of Iowa were grouped based on whether arthroscopic repair or reconstruction of the damaged labrum was performed. Patients were age (± 3 years) and sex matched in a 1:1 ratio. Mean mHHS, iHOT, LCEA, and TA were compared at baseline and minimum 1-year postoperatively. Students' t-tests were performed with p values <0.05 considered significant.

RESULTS: Complete preoperative and postoperative PROs were obtained on 3 patients that underwent labral reconstruction at the time of their PAO procedure. Mean and standard deviation of preoperative mHHS and iHOT scores in the reconstruction group were 51.0 ± 13.0 and 20.1 ± 14.1, respectively. mHHS scores in the repair group were 50.7 ± 12.7 (p=0.981) and iHOT scores were 33.0 ± 29.4 (p=0.291). Preoperative LCEA was 21.5° ± 2.3° in the reconstruction group and 21.2° ± 8.5° in the repair group (p=0.937). Preoperative TA was 9.8° ± 3.9° in the reconstruction group and 13.2° ± 3.8° in the repair group (p=0.248). There were no differences in raw mHHS scores (p=0.184) or iHOT scores (p=0.864) between the two groups postoperatively. The entire cohort saw a mean improvement of 28.4 ± 25.8 in mHHS and 37.8 ± 49.0 in iHOT via surgery. Patients undergoing reconstruction experienced a 31.0 ± 24.6 point difference and repair a 25.7 ± 32.3 point difference in mHHS score via surgery (p=0.739). iHOT scores were improved by an average of 45.9 ± 38.2 in reconstruction and 29.8 ± 55.6 in repair (p=0.300). There were no preoperative differences between the groups in LCEA or TA. Postoperative LCEA was 31.7° ± 5.5° in reconstruction and 34.7° ± 6.0° in repair (p=0.618). TA was 0.33° ± 2.5° and -5.33° ± 6.7° postoperatively in reconstruction and repair, respectively (p=0.278).

DISCUSSION: Both repair and reconstruction of the labrum in conjuction with PAO yield good results. Patients undergoing reconstruction trended toward having greater degree of improvement in PRO scores, but did not reach statistical significance. This study is limited by sample size, likely due to infrequent indications for labral reconstruction.

Sulcus Deepening Trochleoplasty and Medial Patellofemoral Ligament Reconstruction for Patellofemoral Instability: A Mean Five-Year Follow-Up

Poster 049

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OBJECTIVE: The objective of this study was to prospectively evaluate clinical outcomes in a series of patients undergoing DeJour sulcus-deepening trochleoplasty and concomitant patellar stabilization procedures for high-grade trochlear dysplasia at mid-term follow-up, and to compare clinical outcomes to those obtained in short-term follow-up within the same cohort.

METHODS: 67 patients (76 knees) with severe trochlear dysplasia and recurrent patellar instability were enrolled prospectively and underwent Dejour sulcus-deepening trochleoplasty and concomitant patellar stabilization procedures between 2011 to 2019 by a single surgeon at a single academic institution. Patients meeting inclusion criteria for enrollment had lateral patellar instability refractory to conservative management, DeJour type B or D trochlear dysplasia with supratrochlear spur height ≥7 mm, and a 'jumping J-sign' on physical examination. Patients were excluded from analysis if minimum follow-up was less than two-years postoperatively. Clinical and radiographic follow-up was performed via postoperative clinic follow-up visits and by phone calls and email. Patient-reported outcome scores were compared to those previously published in the same patient cohort at minimum two-year follow-up.

RESULTS: 34 patients (42 knees) who had complete 2-year follow up were included. Follow-up ranged from 2.1 years to 11.9 years (mean 5.0 years, SD 2.7). 36 patients (85.7%) were female with a mean age of 18.4 years (standard deviation [SD] 4.8; range 13.2-37.1). 18 patients (42.9%) had failed prior surgery for patellar instability. 2 knees (4.7%) experienced subjective episodes of recurrent patellar instability without definite dislocation. 0 knees (0%) underwent further surgery to address patellar instability. The mean International Knee Documentation Committee score was 51.1 preoperatively (SD 18.3) and improved to 79.1 (SD 19.5) at mean 3.6 year follow-up, and 80.5 (SD 17.4) at mean 5.0 year follow-up ($p < 0.001$). The mean Kujala score was 58.1 preoperatively (SD 18.3) and improved to 86.5 (SD 14.2) at mean 3.6 year follow-up, and 88.9 (SD 12.9) at mean 5.0 year follow-up ($p < 0.001$). Mean satisfaction rate at most recent follow-up was 9.3 (SD 1.3) out of 10. When applicable, 100% of patients returned to work, and 88.6% returned to sport.

CONCLUSION: DeJour sulcus-deepening trochleoplasty along with concomitant patellar stabilization procedures are efficacious in resolving recurrent lateral patellar instability and improving functional outcomes in patients with severe trochlear dysplasia meeting strict preoperative criteria. Early improvements in knee function are durable at mid-term follow-up.

Comparing Distal Triceps Tendon Repair Outcomes by Surgical Technique
Poster 050

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OBJECTIVE: Distal triceps tendon ruptures are relatively uncommon but debilitating injuries. Surgical repair techniques include transosseous tunnel only (TT), suture anchor only (SA), and transosseous tunnel plus suture anchor (TTSA). We sought to compare functional outcomes and complication rates amongst these techniques.

METHODS: We retrospectively identified patients undergoing distal triceps repair at a single institution and categorized them by repair technique: TT, SA, or TTSA repairs. The electronic medical record was reviewed for patient demographics, triceps rupture characteristics, repair technique, range of motion outcomes, and postoperative complications. Complications were followed for one-year after surgery. We excluded all patients undergoing triceps repairs with prior total elbow arthroplasty, those with allograft supplemented repairs, direct suture only repairs, those with prior olecranon hardware, and large intra-articular or comminuted olecranon fractures requiring repair.

RESULTS: We include 199 patient with 82 TT, 69 SA, and 48 TTSA repairs. All groups were similar in demographics and medical comorbidities. In the preoperative period, patients receiving an SA repair were less likely to have incomplete elbow extension (TT: 27.1%, SA: 8.93%, TTSA: 27.0%; p=0.025). However, in the postoperative period the SA group was more likely to have incomplete elbow extension (TT: 8.57%, SA 26.4%, TTSA, 10.0%, p=0.014). The degrees of missing elbow extension were similar between the three groups with an average of 9.0 degrees. The three repair techniques had similar rates of postoperative complications (TT: 15.9%, SA: 17.4%, TTSA: 18.8%; p=0.911) which includes rates of triceps re-rupture (TT: 6.1%, SA: 4.35%, TTSA: 12.5%; p=0.245), ulnar neuropathy (TT: 6.10%, SA: 8.70%, TTSA: 4.17%; p=0.672), and wound complications (TT: 2.44%, SA: 4.35%, TTSA: 2.08%; p=0.765). The all cause reoperation rate was also similar between groups (TT: 11.0%, SA: 11.6%, TTSA: 14.6%; p=0.822). Multivariate regression identified current smoking as a risk factor for triceps re-rupture (OR: 1.17; p=0.009) and repair by SA technique (OR: 1.21; p=0.003) and associated avulsion fractures (OR: 1.28; p=0.009) as risk factors for having incomplete elbow extension postoperatively.

CONCLUSION: One-year postoperative complications and re-rupture rates are similar amongst triceps repair techniques. Repairs by SA technique may be associated with a loss of elbow extension. Surgeons may provide equivalent outcomes regardless of technique, but should consider the additional cost of SA repairs.

Outcomes of Hip Abductor Repair and Reconstruction: Durably Improved Patient Reported Outcome Scores and High Satisfaction at Minimum Five-Year Follow-Up

Poster 051

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BACKGROUND: The hip abductors are essential for dynamic hip and pelvis stabilization and ambulation; however, the abductor tendons are also susceptible to tearing which can be painful and debilitating. Nonoperative treatments of abductor tears were historically employed, with modest results. With increasing recognition of surgical treatment for cases refractory to conservative management, published long-term outcomes are necessary to evaluate repair efficacy.

HYPOTHESIS/PURPOSE: The purpose of this study is to (1) report patient outcomes at minimum five years follow-up after hip abductor surgery, (2) determine the retear and reoperation rate of this cohort, and (3) evaluate the impact of injury characteristics, patient demographics, and treatments on outcomes.

METHODS: Patients undergoing hip abductor surgery were identified and followed prospectively for Hip Disability and Osteoarthritis Outcome Score (HOOS), Satisfaction score, Visual Analogue Scale (VAS) for pain, Likert score for improvement, Forgotten Joint Score (FJS), subjective hip preference, and subsequent surgeries at minimum five-year follow-up. Demographics and surgical details were collected. A board-certified radiologist analyzed MRIs for injury characteristics.

RESULTS: Thirty-three patients were eligible for inclusion and followed for a mean of 8.0 ± 2.2 years postoperatively (range 5-13). Overall gluteus medius and minimus atrophy grades on preoperative MRI were 2 ± 1 and 3 ± 1, respectively. Four patients (9%) had prior total hip arthroplasties, 16 patients (36%) underwent gluteus maximus augmentation at the time of repair, and 32 patients (71%) had Achilles tendon allografts augmentation. Mean patient reported outcome scores were improved at final follow-up compared to their preoperative baseline ($p < 0.001$), with 27 patients (87%) reporting a subjective improvement after surgery as measured via Likert scale. Intraoperative allograft use corresponded with higher postoperative VAS scores with use ($p = 0.046$), although there were no differences in preoperative or postoperative VAS scores at rest. The failure rate in this cohort was 8%, and the revision rate was 3%.

CONCLUSION: Patients demonstrate significant clinical improvements in pain, function, and satisfaction after hip abductor surgery with low failure and revision rates at minimum five-year follow-up.

What is known about the subject: Hip abductor tendon tears have been investigated in the adult population. It is known that surgical treatment of these tears results in improved patient outcome scores at short- and mid-term follow-up; however, data on these outcomes is limited, and the quality and composition of these studies are variable.

What this study adds to existing knowledge: This study contributes important knowledge regarding outcomes after hip abductor repair or reconstruction surgery. This study reports on patient outcomes, including patient-reported pain and function scores, failure rates and re-tear rates at minimum five-year follow-up.

Predictors of Surgical Outcome in Patients Undergoing Meniscectomy
Poster 052

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OBJECTIVE: The benefits and outcomes of meniscectomy surgery are controversial among orthopedic surgeons. Few studies have identified predictors of postoperative outcomes. Meniscectomy may be prudent in certain populations and not in others. This study aimed to identify predictors/risk factors of postoperative outcomes in patients undergoing meniscectomy.

METHODS: This single-center prospective study included 90 patients who underwent meniscectomy from 2021-2022. General demographic information and patient-reported outcomes were prospectively collected using SF-12, SF-36, and IKDC surveys prior to surgery and at 6-month follow-up. Preoperative clinical and surgical information was collected via electronic medical records. Post-surgery outcomes were patient-reported satisfaction (answered “yes” or “no”) and obtaining a pass on postoperative IKDC score. Data were analyzed with odds ratios and binomial logistic regression.

RESULTS: 90 patients undergoing meniscectomy were enrolled. Average age was 52.54 ± 13.06 years and average BMI was 30.42 ± 6.16 kg/m^2. 44.56% of patients were male.

Odds ratios (OR) of patient demographics were calculated. Patient demographics that were deemed as significant predictors of obtaining a pass on postoperative IKDC score were Medicaid insurance (OR=0.056; 95% CI 0.003, 1.001), psychiatric history (OR=0.091; 95% CI 0.025, 0.335), chronic pain (OR=0.106; 95% CI 0.013, 0.873), and preoperative SF-36 physical health (OR=1.098; 95% CI 1.039, 1.160) and mental health scores (OR=1.071; 95% CI 1.014, 1.130). Preoperative SF-36 physical health score was the only significant predictor of patient-reported satisfaction post-surgery (OR=1.069; 95% CI 1.016, 1.125).

Odds ratios of injury characteristics were calculated. Characteristics found to be significant predictors of obtaining a pass on postoperative IKDC score include acuity of injury (OR=0.387; 95% CI 0.164, 0.914) and patellar arthritis (OR=0.325; 95% CI 0.122, 0.868). No injury characteristics were found to be significant predictors of patient-reported satisfaction. Specific Kellgren-Lawrence grades of arthritis were not significant predictors of outcome.

CONCLUSION: Psychiatric history is associated with lower odds of an IKDC pass score. Preoperative PHS and MHS values from the SF-36 survey were both predictive of obtaining pass on post-op IKDC score, while only PHS was predictive of patient satisfaction, therefore, highlighting the usefulness of SF-36 surveys prior to meniscectomy. Kellgren-Lawrence grades of arthritis were not significant, but the presence of either patellar or lateral compartment arthritis had higher odds of obtaining an IKDC pass score. These predictive factors will assist orthopedic surgeons in selecting appropriate surgical candidates, leading to improved patient outcomes.

Staff Presence and Operating Room Efficiency in Total Shoulder Arthroplasty
Poster 053

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OBJECTIVE: Staff and trainees/residents in the orthopedic operating room can significantly impact operating time and thus overall surgeon efficiency and productivity. This study aims to quantify the impact of staff and resident presence within the OR during total shoulder arthroplasty (TSA) cases and to create models by which OR time can be predicted preoperatively.

METHODS: This is a single center retrospective study. The study included patients who underwent TSA (anatomic and reverse) by a single orthopedic surgeon from 2018-2023. Type of staff present in the operating room and total operating time were collected via electronic medical records. Data was analyzed with relative risk ratios and multiple linear regression.

RESULTS: 424 patients were included in the study, 52 of which were included in this preliminary analysis. Relative risk ratios were calculated for the presence of staff in the OR and OR time of greater than 60 minutes in total shoulder arthroplasty cases. The presence of residents (PGY3, PGY3 & PGY5) had an increased risk on OR time being over one hour. Surgeon-preferred circulator and surgical assistant had a decreased risk. A multiple linear regression model was created to predict operating room time for TSA: OR time = 63.951 - (7.747 x preferred circulator present*) + (7.685 x number of residents in surgery) - (6.790 x number of surgical assistants in surgery) + (7.138 x preferred industry representative present*);*Presence is measured by either present (1) or not present (0), $p<0.001$. All four variables added statistically significantly to the prediction, $p < 0.05$.

CONCLUSION: The presence of staff and trainees in the operating room has a significant effect on total operating time in TSA cases. Operating time, via the multiple regression equation, can be predicted preoperatively based on who is present in the surgery. Trainees/residents partaking in the surgery will have a negative impact on overall surgical time. The data supports prioritizing surgeon-preferred staff in the OR to decrease operating time, leading to decreased patient cost and increased flexibility for additional operative cases per day.

Clinical and Radiographic Outcomes After Arthroscopic Meniscal Allograft Transplantation Using Bone Fixation

Poster 054

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OBJECTIVE: Meniscal allograft transplantation (MAT) has good to excellent outcomes in the short- and mid-term. However, there is limited long-term data. The purpose of this study was to determine the long-term clinical success rate after meniscal allograft transplantation with bony fixation, and if patient specific and procedural variables influence clinical, anatomic, and subjective failure rates.

METHODS: All patients undergoing MAT at a single institution from 2005 to 2020 were retrospectively identified. Patients with soft tissue allograft fixation and less than two years minimum follow-up were excluded. Patient data was reviewed for radiographic measurements, and patient reported outcome measures (PROMs) including Lysholm Score, Knee Disability and Osteoarthritis Outcome Score/Subscores, International knee Documentation Committee Score, and Visual Analogue Score were collected. Patients were also assessed for clinical failure (revision surgery or subsequent TKA), anatomic failure (tears or dislocation of the graft), and subjective failure (Lysholm score ≤65). Survival analyses were performed utilizing the Kaplan-Meier estimate. Univariate and multivariate analyses were performed to determine risk factors for clinical and anatomic failure.

RESULTS: A total of 157 patients were included with a mean age at index surgery of 25±9 years and mean follow-up of 7±4 years. 14 (8.9%) patients experienced clinical failure, 26 (16.6%) were identified as anatomic failure, and 13 (8.3%) had subjective failure. Concurrent osteochondral allograft transplantation was identified as a predictor of both clinical (HR 4.55; p=0.009) and anatomic failure (HR 3.05; p=0.008). Cartilage damage of ICRS grade 3 or 4 conveyed an increased risk for clinical (HR 3.41; p=0.04) and anatomic failure (HR 3.04; p=0.01). There were no differences in outcomes between medial and lateral MAT. High grade cartilage damage (ICRS grades 3 and 4) preoperatively (HR 10.67; p=0.046), patient age over 25 (HR 5.44; p=0.384), and a BMI >30 (HR 2.24; p=0.149) were associated with subjective failure. PROMs were significantly improved at final follow-up compared to preoperative scores across all measurements ($p<0.05$).

CONCLUSION: Concurrent osteochondral allograft transplantation was associated with higher clinical failure rate after MAT. Patients with high grade preoperative ICRS grade reported good clinical scores but were at a higher risk for anatomic failure. Long-term results after meniscal repair showed high rates of healing and sustainable subjective improvement of knee function and quality of life. The clinical survival rate was 91% and the anatomic survival rate was 83% at a mean follow-up of 7 years.

Complications and Outcomes After High Energy Lisfranc Injuries

Poster 055

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PURPOSE: Lisfranc tarsometatarsal fractures and dislocations are uncommon injuries, most resulting from high energy trauma. Reduction and fixation are recommended to restore alignment and to promote function. The purpose of this study was to evaluate patient and injury features and to describe potential associations with early and late complications and secondary operations.

METHODS: 129 consecutive adults with tarsometatarsal fractures and dislocations treated at a single Level 1 Trauma center during the period 2000-2018 were identified from a fracture registry. Reduction and fixation were performed using standard techniques of rigid medial fixation and flexible lateral fixation. Complications included infections, wound healing problems, nonunion, malunion, and post-traumatic arthrosis (PTA). Secondary unplanned procedures were documented.

RESULTS: 129 patients with mean age of 40 years (range, 18-73) and 96 (74%) males were included. Comorbidities included obesity (n=32: 40%), diabetes mellitus (n=12: 9%), and tobacco use (n=67: 52%). The majority occurred via high-energy mechanisms, including motor vehicle collisions (28%), motorcycle crash (20%), falls from height (18%), and crush injuries (12%); only 9% occurred via ground level fall. Thirty (23%) were open injuries (3A=6, 3B=18, 3C=6), and concomitant forefoot injuries were present in 47% and hindfoot injuries in 12%. Eleven patients underwent amputation acutely due to unsalvageable injury and were excluded from the remaining analysis.

Of the 118 patients which received fixation, unplanned secondary procedures were performed on 39 patients (33%), most often for removal of painful or prominent implants (26%), infectious debridement (9%), and amputation due to late infection or wound healing complications (5%). A total of 67 complications occurred (58%), with PTA occurring most frequently (37%). Deep infections occurred in 8% of patients and superficial wound infections occurred in 8% of patients. Two patients went on to malunion, while three failed to achieve union. On multivariate analysis, open injury ($p = 0.028$, CI = 1.22 – 30.63, OR = 6.12) and concomitant forefoot injury ($p = 0.030$, CI = 1.12 – 9.76, OR = 3.31 were independent risk factors for the development of a complication.

CONCLUSION: Midfoot fracture dislocation injuries are most often the result of high energy mechanisms. Open and/or unsalvageable injuries requiring amputation are common. Modest rates of postoperative infection and wound healing complications are seen with these injuries. Secondary procedures were most often performed for pain relief and the most common late complication was PTA, warranting counseling of patients about the long-term sequelae of their injury.

Postoperative Dorsal Step Off Size Predicts Olecranon Osteotomy Nonunion
Poster 056

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PURPOSE: Olecranon osteotomy is a powerful approach to complex intra-articular distal humerus fractures allowing for visualization and judgement of articular reduction. The technique is associated with loss of reduction, nonunion, implant failure, and migration of wires. We aim to evaluate quality of reduction as a risk factor of nonunion following olecranon osteotomy.

METHODS: The study retrospectively reviewed 125 distal humerus fractures that underwent open reduction internal fixation at a single, academic level 1 trauma center. Information regarding demographics, injury, medical history, and operative technique were collected. Amount of dorsal step off was measured from the lateral image from the second postoperative visit. A receiver operating curve (ROC) analysis to assess the predictability of nonunion based on dorsal displacement was performed.

RESULTS: Between 2014-2022, 37 patients received a chevron olecranon osteotomy (33%). The cohort was comprised of females (56%) with a mean age of 58 (range 20-82), who sustained a majority of ground level falls (58%) with an average follow-up of 335 days. Most osteotomies were predrilled followed by an opening reamer and tap prior to oscillating saw and osteotome (56%). Of the 37 patients, 7 (19%) failed to successfully unite at the osteotomy site. Of the 7 patients, 2 experienced aseptic nonunion, 2 were malreduced leading to nonunion, 2 malunited, and 1 had persistent fracture lines following poor osteotomy cut. Patients that developed a nonunion had a mean displacement of 3.87 mm compared to 1.15 mm ($p<0.001$). The ROC demonstrated excellent prediction for nonunion based on displacement (AUC=0.896, p=0.002). Youden's index was determined at a sensitivity of 86% and a specificity of 73% which corresponds to a dorsal step off of 2.07mm. This finding was confirmed on multivariate logistic regression showing a step off over 2.07mm is an independent predictor of olecranon osteotomy nonunion (p=0.021).

CONCLUSION: A malreduction resulting in a dorsal step off larger than 2.07mm is predictive of olecranon osteotomy nonunion. Therefore, the success of the olecranon osteotomy approach is directly dependent on quality of anatomic reduction. Supplemental fixation can provide assistance in achieving and maintaining reduction.

Increased Complication and Reoperation Rate in Polytrauma Patients with Obesity Undergoing Fracture Surgery Compared to Matched Controls

Poster 057

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OBJECTIVE: Obesity incidence continues to increase worldwide. Obesity is associated with a baseline pro-inflammatory state that predisposes patients to infection and complications after illness or injury. The impact of obesity on orthopedic care and outcomes is ill defined among patients with polytrauma. This study aims to assess complications and outcomes among obese patients with polytrauma and at least one appendicular fracture.

METHODS: This study is a matched retrospective cohort study performed at an urban level one trauma center. An institutional trauma registry was queried for patients with polytrauma (defined as Injury Severity Score [ISS] > 16) who sustained at least one fracture. 200 patients, of which 100 had body mass index (BMI) > 30 and 100 had BMI < 30, were matched according to age, sex, ISS, and number of surgically treated fractures and were included in the analysis. Data about each patient's demographics, comorbidities, injuries, inpatient/surgical course, and complications were obtained from the electronic medical record and the trauma registry. Continuous variables were not normally distributed and, therefore, group medians were analyzed by Mann Whitney U Test. Categorical data were assessed by Chi squares or Fisher's Exact Test (if expected counts were less than 5). The level of significance for this study was $\alpha = .05$ and post-hoc tests underwent Bonferroni correction. Data were analyzed using IBM SPSS Statistics 29.0.0.0.

RESULTS: Between the matched groups there was no difference in sex (62% male), age (37 years), ISS (22), or the number of surgically treated fractures (2 fractures) at admission. Median BMI was 24 for the control group and 39 for the obese group ($p< 0.001$). While the two groups had the same median number of long bone fractures (1 long bone), patients in the obese group were more likely to present with open fractures, particularly with high grade open fractures (32 vs. 19% for all open fractures [$p=0.04$]; 59.4 vs. 5.3% for Gustilo Anderson type IIIA open fractures [$p<0.001$]). While the number of surgically treated fractures (2 fractures) was the same between groups, patients in the obesity group underwent more orthopedic surgeries during their initial inpatient admission (2 vs. 1; $p=0.031$) and were more likely to undergo either staged or definitive treatment with external fixation (36% vs. 21%; $p=0.019$), to develop a surgical complication related to their orthopedic procedure(s) during their index admission (48 vs. 21%; $p<0.001$), and to require an unplanned reoperation at any point prior to fracture healing (37 vs. 23%; $p=0.031$).

DISCUSSION: Polytrauma patients with obesity have a protracted treatment course for orthopedic injuries despite having the same injury severity scores and number of surgically treated fractures. Surgeons should be aware of this information when recommending and planning treatment for patients with obesity. Future studies should try to better understand this pathway to determine how surgeons can tailor their interventions to optimize treatment and outcomes in individuals with obesity.

Bispectral EEG Effectively Predicts Delirium After Femoral Fragility Fracture in Older Adults
Poster 058

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PURPOSE: Delirium is a common complication after femoral fragility fracture that is strongly associated with medical complications, poor oral nutrition intake, prolonged skill nursing facility admission, and mortality. Current delirium screening instruments are difficult to implement in busy hospital workflows. Bispectral electroencephalography (BSEEG) is a noninvasive point-of-care test designed to identify older adults at risk of delirium. Identifying high-risk older adults will allow clinicians to provide targeted interventions to mitigate risk of delirium. The aim of this study was to evaluate the ability of BSEEG to predict delirium in older adults with femoral fragility fractures.

METHODS: We prospectively enrolled older adults over 50 years old indicated for operative fixation of a low-energy femoral fragility fracture, defined as hip or distal femur fracture. Baseline demographics were collected including age, sex, and Charlson Comorbidity Index (CCI). BSEEG was collected twice daily during hospital admission, for up to six days. After each BSEEG recording, delirium was assessed clinically using the 3-Minute Diagnostic Interview for Confusion Assessment Method (3D-CAM) and Delirium Observation Screening Score (DOSS). Baseline cognitive function was evaluated using the Mini-Mental State Examination (MMSE). Power spectral density ratio (PSDR) was used to classify subjects with or without delirium. A prediction threshold chosen in previous clinical trials was used. Descriptive characteristics were compared between delirious and non-delirious participants using t-tests.

RESULTS: Sixty-three participants (67% female) mean age 76.6±9.6 years were enrolled. The incidence of delirium during hospital admission was 32%. Participants with delirium were more cognitively impaired (19.5±3.7 vs. 24.9±3.0 MMSE points, $p< 0.001$). Age, sex, and CCI score did not differ between groups. The performance metrics of BSEEG to detect delirium were: sensitivity, 90%; specificity, 60%; accuracy, 70%; positive predictive value, 51%; negative predictive value, 93%.

CONCLUSION: BSEEG effectively predicts delirium in older adults with femoral fragility fracture. BSEEG is a feasible, practical method to objectively measure risk of delirium in this high-risk population. At risk individuals identified with BSEEG should be provided with interventions to prevent cognitive impairment. Further development is needed prior to implementing BSEEG as a clinical tool in these populations.

Suprapatellar Intramedullary Nailing vs. ORIF of Displaced Tibial Plateau Fractures: A 10-Year Clinical and Radiographic Follow-up Study

Poster 059

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OBJECTIVE: To provide clinical and radiographic follow up on tibial plateau fractures treated with suprapatellar intramedullary nailing (IMN). Measure the preoperative and healed fracture displacement along with evaluation of clinical outcomes for suprapatellar IMN in the treatment of tibial plateau fractures

METHODS: Retrospective clinical case series at a level one academic trauma center between 2012 and 2022. Thirty three (33) patients with tibial plateau fractures who were treated with suprapatellar IMN in the semi-extended position over the course of 10 years by fellowship-trained orthopedic surgeons were analyzed. A second group of patients with tibial plateau fractures who underwent open reduction and internal fixation (ORIF) treated by the same surgeons during the same 10-year time period served as a matched comparison group. Radiographic analysis was performed by two blinded fellowship-trained orthopedic researchers. Outcome measures included articular displacement at time of injury, articular reduction at time of surgery, post-op axial alignment of tibia at time of surgery, final articular displacement at time of radiographic union, final axial alignment at time of bony union, knee range of motion, and symptomatology of implants.

RESULTS: There was no statistically significant difference between the two groups in terms of age, preoperative joint displacement in millimeters, fracture pattern and classification, Schatzker class, wounds class or injury mechanism. All patients in both IMN and ORIF groups achieved 100% radiographic union following IMN of tibial plateau fractures with a minimum of 12-months follow-up. No patients required any additional surgeries of the knee or operative tibia related to the IMN within 12 months of the index surgery. Radiographic evidence of articular displacement was changed on average <1 mm at time of fracture union (average 4 months) in the IMN group compared to the ORIF group which was changed on average 2 mm.

CONCLUSION: Suprapatellar IMN of tibial plateau fractures can be safely performed in patients who meet certain radiographic criteria, resulting in good clinical and radiographic outcomes. We did not note a significant radiographic loss of reduction or axial alignment in tibial plateau fractures treated with suprapatellar IMN. This technique may be useful in circumstances where ORIF of the tibial plateau fractures places the soft tissue envelope at particular risk or where an intramedullary implant is otherwise preferred.

Opinions Regarding Dual-Implant Fixation and Weight Bearing in Distal Femur Fractures: A Survey from the 2022 Orthopaedic Trauma Association (OTA) Traveling Fellowship

Poster 060

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INTRODUCTION: To determine opinions of OTA surgeons on indications and methods for dual-implant fixation of distal femur fractures, and their impact on postoperative weightbearing protocols.

METHODS: A survey was designed to assess opinions on techniques and indications for dual implant fixation of distal femur fractures. The survey was completed by 138 surgeons and trainees. Five cases were included: simple extraarticular fracture, periprosthetic fracture, simple intraarticular fracture, open fracture with articular comminution and bone loss, and a metaphyseal nonunion. Participants responses on implant choice and postoperative weight bearing were recorded. Opinions on technique of dual-implant fixation and importance of interlocking the constructs were collected.

RESULTS: Most respondents reported they preferred a single implant (73% retrograde IMN [RIMN] or lateral locked plate [LLP]) and weight bearing as tolerated (WBAT, 52-67%) for the extra-articular and periprosthetic fracture. The preference for dual-implant fixation increased with metaphyseal bone loss (43%) and for nonunion treatment (63%). Articular involvement had the strongest effect on weight bearing instructions (20% WBAT with simple articular split, 9% with articular comminution). The majority of respondents preferred a RIMN plus LLP over dual plate fixation (76% vs. 13%). More respondents preferred a long RIMN and shorter LLP, as opposed to a short RIMN and long LLP (40% vs. 8%). A minority of surgeons reported that it was important to interlock screws between a RIMN and LLP distally (46%) or proximally (28%). The most common stated reasons for dual-implant fixation were ability to mobilize sooner (35%), poor distal fixation (30%), and absence of medial column support (23%).

DISCUSSION: Indications for dual-implant fixation of distal femur fractures remain unclear. This survey of current practice among institutions participating in the 2022 OTA Traveling Fellowship demonstrates common fracture-related indications for dual-implant fixation are in nonunion treatment or comminuted fractures with bone loss. Respondents indicated that the ability for earlier mobilization or poor distal fixation were the most common reasons for the use of two implants. This survey highlights the need for more prospective studies to investigate the best treatment for distal femur fractures and sets the stage for future studies to investigate the clinical utility of dual-implant constructs.

Outcomes of SARS-CoV-2 Infection: Patients with Orthopedic Fracture Surgery
Poster 061

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OBJECTIVE: This study aimed to examine the outcomes of orthopedic fracture surgery in patients who tested positive for COVID-19. We utilized a national database comprising data from adult individuals in the United States who underwent inpatient SARS-CoV-2 testing for COVID-19.

METHODS: This is a retrospective cohort study utilizing the National COVID Cohort Collaborative database to examine and compare the outcomes of orthopedic fracture surgery in COVID-19-positive and COVID-19-negative patients across the United States. The study included participants aged 18-99 who underwent orthopedic fracture surgery between March and December 2020. The primary focus was on COVID-19 status as the main exposure. Demographics, comorbidities, and perioperative complications were gathered for analysis.

RESULTS: The total population of 6.5 million patient records was queried, identifying 76,697 participants with a fracture. There were 7,628 participants in the National COVID Cohort who had a fracture and operative management. Patients with COVID-19 were significantly older (63.3, 57.7, $p<0.001$), had a longer length of stay (28.5d vs. 9.3d, $p<0.001$), and had a higher Charlson Comorbidity Index (2.2 vs. 1.4, $p<0.001$). Patients with COVID-19 were significantly more likely to have a previous myocardial infarct (15.3% vs. 10.6%, $p=0.002$), congestive heart failure (26.9% vs. 16.6%, $p<0.001$), peripheral vascular disease (24.8% vs. 18.1%, $p<0.001$), previous stroke (22.3% vs. 17.8%, $p=0.020$), chronic pulmonary disease (38.9% vs. 26.8%, $p<0.001$), diabetes mellitus (39.5% vs. 28.2%, $p<0.001$), renal disease (25.2% vs. 16.0%, $p<0.001$), and peptic ulcer disease (4.8% vs. 2.7%, $p=0.010$). Patients with COVID-19 were significantly more likely to have perioperative complications of venous thromboembolic events (19.1% vs. 10.9%, $p<0.001$) and sepsis (13.2% vs. 5.2%, $p<0.001$). The COVID-19-positive group had higher rates of mortality (13.2% vs. 5.2%, $p<0.001$) than the COVID-19-negative group with higher odds of death in the fully adjusted model (Odds Ratio=1.59; 95% Confidence Interval: 1.16-2.18).

CONCLUSION: Patients who tested positive for COVID-19 with an orthopedic fracture surgery had increased rates of mortality and perioperative complications than patients without COVID-19. COVID-19 associated risks can provide a guide to treatment options, as well as counseling for patients and families. Future studies can continue to assess risk factors associated with COVID-19 on a granular level to assist with treatment guidance.

Superior Locking Plate with Braided PDS Coracoclavicular Fixation for the Unstable Distal Clavicle Fracture

Poster 062

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BACKGROUND: Unstable distal clavicle fractures remain challenging as nonoperative treatment results in a high rate of nonunion. The ideal method of operative fixation remains controversial, particularly the need to restore the normal coracoclavicular distance. Our preferred method of fixation includes ORIF with a distal clavicle locking plate in combination with a PDS suture wrapped around the plate and coracoid to restore the coracoclavicular distance. The purpose of this study is to report clinical, radiographic, and functional outcomes in patients with unstable distal clavicle fractures treated with this method of fixation and compare these results to a cohort of patients treated with a hook plate.

METHODS: There were 9 included patients that underwent surgical fixation of a distal clavicle fracture with PDS augmentation of the coracoclavicular ligaments from 2018 to 2021. Minimal follow-up time was two years after surgery. Clinical outcome measures included complications and reoperations. Radiographic outcomes include union rates and maintenance of the coracoclavicular reduction. Functional outcomes were assessed by postoperative range of motion/strength and ASES scores. Patients were then matched 2:1 based on age, sex, and BMI to a cohort of patients treated with hook plates.

RESULTS: Complications included two cases of hardware prominence and one proceeded with elective hardware removal. There were two cases of asymptomatic nonunion. There were no wound complications. The coracoclavicular reduction was maintained on final radiographic follow-up for all patients. The average ASES score was 89 (±10). All patients had full strength in all planes. The cohort of patients treated with a hook plate had a 100% rate of hardware prominence and hardware removal. There were two cases of symptomatic nonunion that required revision ORIF.

DISCUSSION: Our preferred method of fixation for unstable distal clavicle fractures has been safe, effective, and reproducible with a high rate of radiographic union while maintaining ligamentous reduction. When compared to a tradition hook plate, there is a significantly low rate of hardware prominence and subsequent removal.

Assessing the Quality of Short-Form Video Platform YouTube Shorts Regarding Ankle Fractures
Poster 063

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OBJECTIVES: Prior investigations into the YouTube platform have shown that the content is unregulated, lacking in quality, and content delivery. The YouTube platform has recently expanded into short form videos (YTS) that receives over 50 billion views per day, approximately 635% of the US population. Our study aims to analyzes the quality of ankle fracture education on YTS and the distribution of the topic's video creators.

METHODS: For this analysis, we acquired the top 75 videos on YTS with the search query '#anklefracture + shorts.' Exclusion criteria included duplicate shorts, shorts without measurable content, and shorts containing irrelevant material. Shorts that met inclusion were scored using previously verified scoring systems: GQS Score, PEMAT Understandability %, PEMAT Actionability %, and JAMA Score.
Continuous variables were also acquired, including: Views, Date Posted, Likes, Comments, Followers, Video Engagement Rate (VER). Categorical variables were acquired: Advertisement Status, Verification, Creator Type. Channel authorship was identified based on American Board of Orthopedic Surgery (ABOS) certification.

We utilized two comparison groups, ABOS channels vs. channels of any other education level. All variables were analyzed utilizing a one-way ANOVA for significance.

RESULTS: Of the top 75 videos, 21 meet criteria for inclusion. Only 3 authors, 27.2%, had ABOS certification. Of the 6 verified YT channels none were orthopedic surgeons. Nine videos were created by ABOS certified channels and 12 by other channels. The video upload date ranged from February 2021 to January 2023.

The average scores for ABOS authors were 790 likes, 10 comments, 359,666 followers, 0.448% engagement rate, GQS score 3.67, JAMAScore3, PEMATUnderstandability 91.9%, and PEMATActionability 14.8%. Average scores for authors of any other education level: 142 likes, 3.5 comments, 148,056 followers, 3.61% engagement rate, GQS score 3.83, JAMAScore 3.08, PEMATUnderstandability 94.5%, PEMATActionability 50%. Followers and Actionability were the only significant variables ($p < 0.05$); ABOS channels had more followers while other channels had higher actionability.

CONCLUSION: This study illustrates that ABOS channels excel at capturing followers but fall short when comparted to other channels in providing their viewers actionable content. It also shows how Orthopedic surgeons are equivalent when it comes to educating viewers in an understandable and verified manner. In order to direct ankle fracture education on YTS and other social media platforms, orthopedic surgeons must utilize their popularity to deliver content that is actionable and improves in categories that non-orthopedic surgeons dominate on YouTube Shorts.

Early Periprosthetic Femur Fractures After Primary Total Hip Arthroplasty Associated with Increased Incidence of Reoperation and Periprosthetic Joint Infection

Poster 064

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INTRODUCTION: Periprosthetic femur fracture (PFF) in the early recovery following total hip arthroplasty (THA) is a leading cause of early reoperation and revision. The objective of this study was to compare the rate of periprosthetic joint infection (PJI) and reoperation following PFFs sustained in the early postoperative period (<90 days) to those that occur remotely (>90 days).

METHODS: We retrospectively identified 173 consecutive surgically-managed PFFs following primary THA between 2008 through 2020. Cases were categorized as “early” if the PFF occurred within 90-days from the primary THA (n=116) or “late” if they occurred following the 90 days (n=57). Mean age at PFF was 68 years (range, 26—96 years) and 60% were female. Mean body mass index was 29±7 kg/m^2. By Vancouver classification, 147 fractures were B2, 15 were B1, 8 were AG, 2 were C, and 1 was B3. Mean follow-up was 2 years (range, 0—14 years). Kaplan Meier survival analysis was used to estimate cumulative incidence of PJI and reoperation. Multivariate Cox proportional hazard regression was conducted to determine the association of having an early or late PFF with the time to reoperation.

RESULTS: The early PFF group had higher PJI (2-year cumulative incidence: 11% vs. 0%, p=0.009) as well as all-cause reoperation (2-year cumulative incidence: 24% vs. 12%; p=0.04) and compared to late. A late fracture was associated with a lower hazard for reoperation compared to having an early fracture (HR = 0.40 [95%CI: 0.11-0.98]). Following early PFF, 27 patients required reoperation (13 for PJI, 5 for instability, 2 for re-fracture, 2 for painful hardware, 2 for nonunion, 1 for adverse local tissue reaction, and 1 for leg length discrepancy). Following late PFF, 6 patients required reoperation (3 for instability, 1 for re-fracture, 1 for aseptic loosening, and 1 for nonunion).

CONCLUSION: There is greater incidence of PJI and overall reoperations following early PFFs compared to PFFs that occur remotely following THA. In addition to focusing efforts on prevention of early PFFs, surgeons should consider all perioperative antiseptic measures possible to mitigate the risk of infection following an early PFF.

The Effect Lateral Mass Screw Facet Joint Violation on Radiographic and Clinical Outcomes After Posterior Cervical Fusion

Poster 065

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INTRODUCTION: In posterior cervical fusion, lateral mass screw placement is defined by a lateral and cranial trajectory avoiding the transverse foramen medially and the facet joint superiorly. While the devasting effect of vertebral artery injury from lateral mass screw over-medialization is understood, the impact of a cranial screw trajectory leading to facet joint violation is yet to be characterized. Intra- or trans-articular lateral mass screw placement could risk persistent axial neck pain, screw loosening, and pseudoarthrosis. However, placement of trans-articular lateral mass screws would increase cortical purchase area and construct strength. This study determined if lateral mass screw facet joint violation relative to standard lateral mass screw placement predicted adverse clinical or radiographic outcomes after C2-T2 posterior cervical fusion (PCF) for degenerative indications.

METHODS: All adult patients who underwent C2-T2 PCF for myelopathy or myeloradiculopathy at a multi-institutional academic center between 2013-2020 were retrospectively identified. Patients were grouped based on the presence or absence of lateral mass screw facet joint violation assessed on postoperative CT scan. Subgroups included unilateral vs. bilateral facet joint violation and the absolute number of facet joint violations within construct. Preoperative and short- and long-term postoperative radiographic outcomes (fusion status, local cervical alignment, global alignment) and PROMs were collected. Univariate analysis compared patient demographics, surgical factors, and change in alignment and PROMs across facet joint violation groups.

RESULTS: A total of 79 patients met the inclusion criteria (51 with facet joint violation present, 20 with bilateral facet joint violation). There were no significant differences in patient demographics, medical comorbidities, surgical characteristics, and preoperative bone quality between unilateral and bilateral facet joint violation groups (all $p>0.05$). Preoperative and postoperative alignment parameters (PJK, DJK, T1-T4 kyphosis, C2 SVA, C2-7 lordosis, T1 slope) or PROMs (VAS Neck, NDI, SF-12) at all short and long-term follow-up interval did not differ significantly by the presence or absence of unilateral and bilateral facet joint violation (all $p>0.05$). There were no significant variations in rates of fusion, screw loosening, and revision surgery across facet joint violation groups (all $p>0.05$). The number of facet joint violations was not found to correlate with radiographic or clinical outcomes (all $rho<0.3$).

CONCLUSION: There were no significant differences in PROMs, fusion status, and screw loosening based on the presence or extent of lateral mass facet joint violation in C2-T2 PCF. Surgeons may place trans-articular lateral mass screws to maximize cortical purchase area and construct rigidity without apparent compromise to postoperative outcomes.

Scar Satisfaction After Anterior Cervical Spine Surgery
Poster 066

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OBJECTIVE: Patients undergoing surgery are often more concerned about their surgical scar than their surgeons realize. This study evaluates the association between patient-reported surgical scar outcomes and overall surgical satisfaction in order to help orthopedic surgeons better understand patient scar perceptions.

METHODS We surveyed patients who were at least six months removed from anterior cervical surgery on surgical satisfaction and scar satisfaction by the validated SCAR-Q survey for patient reported evaluation of scar appearance, symptoms, and psychosocial impact. These three categories were independently scored on a scale from 0 to 100 with 100 signifying the best outcome. Bivariate statistical analysis was performed comparing those expressing surgical satisfaction to those expressing surgical dissatisfaction on demographic information and SCAR-Q results. Subgroup bivariate analyses compared male and female respondents separately based on surgical satisfaction, and male versus female respondents.

RESULTS: A total of 660 responses were evaluated with 540 patients expressing satisfaction with their surgery and 120 expressing dissatisfaction. These two groups were similar with regards to baseline demographics. The satisfied group had a higher overall satisfaction with psychosocial impact (93.1 vs. 85.2; p=0.003) of their scar. The groups were similar with regards to their scar appearance (82.5 vs. 77.2; p=0.052) and scar symptoms (71.0 vs. 69.1; p=0.125) satisfaction. For the female subgroup, the satisfied and dissatisfied groups were similar with regards to scar appearance (78.8 vs. 76.8; p=0.867), symptoms (70.6 vs. 69.8; p=0.677), and psychosocial impact (88.9 vs. 84.3; p=0.554). For the male subgroup, the satisfied group reported better scores for scar appearance (86.4 vs. 77.6; p=0.009), symptoms (71.3 vs. 68.2; p=0.007), and psychosocial impact (97.4 vs. 86.0; p<0.001). When comparing male and female respondents, male respondents had better scores for scar appearance (84.8 vs. 78.4; p<0.001) and psychosocial impact (95.4 vs. 88.0; p<0.001), but similar scar symptom scores (70.7 vs. 70.5; p=0.367).

CONCLUSION: In general, surgical satisfaction does not appear to be associated with surgical scar outcomes for anterior orthopedic neck surgery. However, female patients on average have a more negative perception of their scar than male patients. This difference by sex appears to be true regardless of overall surgical satisfaction as scar outcomes were similar regardless of surgical satisfaction for females. Whereas male patients satisfied with their surgical outcome appeared to be less bothered by their scar.

Outcomes of Operative Spinal Fractures in COVID-19-Positive Patients Using Data from a U.S. National Database

Poster 067

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OBJECTIVE: Increases in COVID-19 positive patients and subsequently, patients sustaining spinal fractures with COVID-19, raises the question as to whether these individuals were at an increased risk of postoperative complications and mortality. The objective of this study was to characterize the cohort of COVID-19-positive patients who required surgery following a spinal fracture and investigate if these patients were at increased risk for all-cause mortality and perioperative events.

METHODS: A multi-center retrospective cohort study using a United States national database with clinical data from 72 sites. Adults with operative spinal fractures between March 15, 2020 and June 31, 2021 including COVID-19-positive and COVID-19-negative groups were included. The primary outcome was all-cause mortality. Secondary outcomes included 30-day mortality, venous thromboembolic events, and sepsis. Unadjusted and adjusted multivariable logistic regression was performed. Subgroup analyses were done for cervical spinal cord injury.

RESULTS: Among 3,086 patients with operative spinal fractures, 233 (8%) were COVID-19-positive. Among patients with spinal cord injury, the all-cause mortality was 11% (28/265). In the unadjusted analysis, the COVID-19-positive cohort had 6 percent higher all-cause mortality (14% vs. 8%, p=0.002) than the COVID-19-negative group. All-cause morbidity in the COVID-19-positive cohort was also increased, with significant differences in surgical site infection ($p = 0.05$), acute kidney injury ($p = 0.04$), venous thromboembolism (0.04), and sepsis ($p < 0.001$), as well as increased length of stay ($p < 0.001$). In adjusted analysis for all-cause mortality, the Odds Ratio for COVID-19-positive was 2.47 (CI 1.35-4.50, p=0.003) with adjusting for Charlson Comobridity Index Score 3 or more, cervical spinal cord injury, and gender.

CONCLUSION: To date, this represents the largest study of operative spinal fractures with and without COVID-19. We found COVID-19-positive patients sustaining spinal fractures who subsequently underwent operative management had higher all-cause mortality as compared to COVID-19-negative patients suffering from these injuries.

Upper Level Instrumentation at C2 vs. C3 Does Not Influence Radiographic or Clinical Outcomes After Posterior Cervical Fusion

Poster 068

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OBJECTIVE: Posterior cervical laminectomy and fusion (PCLF) is a common procedure for treatment of multilevel cervical spondylotic myelopathy. For patients who require posterior cervical instrumentation, 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 for PCLF comparing constructs with UIV at C2 vs. C3.

METHODS: Adult patients undergoing PCLF for CSM from 2014 to 2019 at a single center were identified. Patients with UIV at either C2 or C3, and a LIV up to T2, were included. Demographic data, surgical characteristics, clinical outcomes, and radiographic outcomes were compared. 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. On univariate analysis, 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 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 ($p>0.05$).

CONCLUSION: 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 laminectomy and fusion for myelopathy.

Cost Analysis of Back Injuries in National Hockey League Athletes
Poster 069

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BACKGROUND: Hockey is a high-velocity sport with unique forces on the back and spine and elite players are at elevated risk for injuries most commonly due to a direct trauma and overuse. Hockey has been shown to have the highest incidence of cervical and lumbar spine injuries. Despite the documented prevalence, the economic loss following back and spine injuries in National Hockey League (NHL) players has not been evaluated. The purpose of our study was to report on the incidence of back injuries sustained by players as well as quantify the financial impact of these injuries on NHL teams.

METHODS: Public injury databases were used to identify NHL players from 2008 to 2019 that had reported back or spine injuries and subsequently missed regular season games. Statistics including the number of games missed per season and annual salary were used to calculate an estimated value for the total number of games missed by the player. Additionally, an online search was utilized to characterize each player's injury further for symptoms, diagnosis, surgery, return to play status, and level of return. Descriptive statistics were reported for all study variables.

RESULTS: A total of 194 unique NHL players were reported to have a back and or spine injury between 2008 and 2019, missing a total of 170 regular season games. A total of 43 players (22%) underwent surgical intervention, of which only 80% of players returned to play. A total of 30 players (15%) did not return to the same level of play after their injuries, of which 15 players (50%) had a career-ending injury after which they subsequently retired. The value of total number of missed games per season for all players was on average $1.5 million, and has increased over time. This is in contrast to the total number of injured players per season which has steadily decreased over time. The total value of all missed games by players due to back and spine injuries from 2008 to 2019 was $167 million.

CONCLUSIONS: Back and spine injuries have a substantial economic impact on NHL players and the league, with a total of $167 million lost on injured players from 2008 to 2019. Players with these injuries miss a greater number of games than other common injuries experienced in the NHL. The number of games missed and money lost per game has increased over time.

Tendon Transfer is Associated with Increased Donor Site Morbidity After Extensor Pollicis Longus Reconstruction

Poster 070

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OBJECTIVE: The choice of reconstruction method for extensor pollicis longus rupture (EPL) rupture can include tendon transfer or graft. The most commonly described tendon used for transfer is the extensor indicis proprius (EIP) whereas the most commonly described tendon used for graft is palmaris longus (PL) autograft. We aimed to evaluate outcomes after EIP transfer or PL graft in regards to donor site morbidity, reoperation,and reconstruction failure.

METHODS: After institutional review board approval, a retrospective chart review of patients undergoing reconstruction of a ruptured EPL using either EIP transfer or PL autograft was performed. Data was collected including demographics, mechanism of injury (MOI), type of surgery, number of reoperations, and reconstruction failure. Reconstruction failure was defined as an event that lead to dysfunction of the reconstruction, such as rupture, adhesions, or attenuation. MOI was divided into direct trauma to the tendon such as a degloving injury (group 1), rupture after isolated distal radius or carpus fracture (group 2), and spontaneous rupture without predisposing injury (group 3), such as in the setting of rheumatoid arthritis. Fischers exact test statistics and T-test statistics were used to examine associations between variables.

RESULTS: One-hundred and five patients were included in the study. Eighty-nine patients underwent treatment with EIP tendon transfer and 16 underwent treatment with PL tendon graft. Average age at the time of surgery was 54.69 years. Average follow-up was 2.09 years after surgery. Surgery type was not associated with number of number of reoperations (mean 0.15 for transfer, 0.12 for graft; p=0.74). There was no association between surgery type and reconstruction failure (p=0.6637). Reconstruction failure was significantly associated with the mechanism by which EPL injury occurred (p=0.0175). Rates of reconstruction failure were 50%, 19%, and 35% for group 1, 2, and 3 respectively. Mechanism of injury was not associated with reoperation rates, with reoperation rate of 23%, 8%, and 16% for group 1, 2, and 3 respectively (p=0.22). The relative risk of donor site morbidity was higher in the transfer group compared to the graft group when looking at patients who underwent EIP transfer vs. PL graft. (RR 1.0 for transfer, 0.88 for graft, p=0.0299).

CONCLUSION: Both PL graft and EIP transfer have similar rates of reconstruction failure and reoperation. EIP transfer has higher rates of donor site morbidity, primarily pain or dysfunction of index finger extension.

Limb Spasticity and Telemedicine Consultation for Reconstructive Surgery: Patient Perspectives of Surgical Assessment

Poster 071

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OBJECTIVE: To characterize patient perceptions of telemedicine consultation for spasticity surgery and determine its effectiveness for indicating reconstructive procedures.

METHODS: Our study included an electronic survey consisting of 16 questions that was distributed to all patients after the virtual consultation that was part of a neuro-orthopedic evaluation. Included participants were patients over the age of 18 with a diagnosis of upper and/or lower extremity spasticity who were evaluated by telemedicine visit. Patients were excluded if their consultation was for a condition aside from spasticity or if they returned an incomplete survey. Domains of inquiry included patient demographic and diagnosis information, satisfaction with provider assessment, ease of use, appointment preference, and whether surgery was eventually performed.

RESULTS: Nearly all (95%, n=18) patients felt the provider expressed maximal concern for patient questions/worries, included them in decisions regarding care, and appropriately discussed treatment strategies. Similarly, the majority (89%, n=17) were maximally satisfied with explanations about their condition and would recommend the care provider to others. Most patients (84%, n=16) also felt that the ease of communication via the virtual platform was very good. All patients were eventually indicated for and subsequently underwent reconstructive surgery for spasticity.

CONCLUSION: Spasticity patients were overwhelming satisfied with their initial virtual consultation as an alternative to face-to-face visits. Telemedicine provides a clinical opportunity for seeking information about spasticity surgery and offers a cost-effective and convenient option for patients who find travel to specialty centers prohibitive.

Performance of ChatGPT on Hand Surgery Board-Style Examination Questions
Poster 072

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INTRODUCTION: ChatGPT is an example of a large language model (LLM) that is trained on massive amounts of data and is able to respond to complex questions/prompts. The use of ChatGPT in medicine has been preliminarily explored. Of particular interest has been ChatGPT's ability to perform on medical examinations, such as the United States Medical Licensing Exam and various specialty-specific board exams. The purpose of this study is to evaluate ChatGPT's performance on American Society for Surgery of the Hand's (ASSH) board-style examination questions and to compare it to human performance on the exams.

MATERIALS & METHODS: All questions from the ASSH Hand 100 Exam, Beginner Practice Exam, and Intermediate Practice Exam were entered into ChatGPT (Version: May 24th, 2023) using a standardized format. The response was regenerated two additional times to identify any inconsistencies in ChatGPT's answer. The following variables were recorded: (1) the question/answer choices, (2) topic of the questions – as designated by the ASSH, (3) ChatGPT's selected answer/explanation, (4) if the answer changed after regeneration of the responses, (5) whether ChatGPT identified the correct answer, and (6) the percentage of human respondents who selected the correct answer. Questions with figures/videos, duplicate questions, and questions that ChatGPT refused to provide a response to were excluded from the final analysis.

RESULTS: 117 questions from 3 AASH assessment tools were included in the final analysis.. On the first try, ChatGPT answered 42.73% (50/117) of questions correctly, but it changed its answer to 42 questions after regeneration of the response. Of the 117 questions, 49 were from the ASSH Hand 100 Exam, 36 were from the Beginner Practice Exam, and 32 were from the Intermediate Practice Exam. On the first try, ChatGPT answered 40.82% (20/49), 44.44% (16/36), and 50.0% (16/32) correct, respectively. On the Intermediate and Beginner Exams, humans on average answered 62.73% and 56.64% of questions correctly.

CONCLUSION: ChatGPT excelled in topics (>60% correct) of mass/tumor, nerve (atraumatic/compressive), wrist (DRUJ, TFCC, arthritis); and performed poorly (≤40% correct) on questions regarding anatomy/basic science/imaging, brachial plexus trauma/damage, congenital, elbow, tendon (atraumatic and traumatic), vascular disorders (trauma). Human respondents outperformed ChatGPT on both the Beginner and Intermediate Practice exams. ChatGPT has the potential to be a versatile tool for medical education; however, its current knowledge base appears insufficient to match the performance level of human orthopedic fellows.

Patient Expectations Before and After Distal Radius Fracture Fixation: Differences by Age, Education, and Surgeon's Perception

Poster 073

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OBJECTIVES: : We hypothesize that patients with lower educational attainment will expect their postoperative recovery following open reduction internal fixation (ORIF) for distal radius fractures (DRF) to be more involved.

METHODS: Thirty-seven consecutive patients suffering from DRF treated with ORIF by four fellowship-trained orthopedic surgeons were included in this study. All patients completed a preoperative survey capturing demographic data and information related to their expected postoperative recovery including pain, narcotic use, and presumed return to physical activity. Details regarding postoperative expectations were not given to participants prior to the completion of this survey to prevent exposure bias. Following surgery, all 37 patients were given a separate postoperative survey along with the Disabilities of the Arm, Shoulder, and Hand (DASH) outcomes questionnaire at intervals of two weeks, six weeks, three months, and six months or greater. The treating surgeon completed the preoperative form based on his expectations of a typical patient's recovery.

RESULTS: We analyzed and compared data by five-way stratification: educational attainment (high school, college, and graduate) and age (<60 and >=60 years old). College graduates expected more two-week finger range of motion than the other two education cohorts. High school graduates expected lower physical activity levels at two weeks and six weeks compared to college graduates and graduate school graduates. There was a trend toward expecting higher immediate postoperative pain among higher education patients. High school graduates expected more pain at three months and six months of recovery. All groups expected at least one week of narcotic use and at least five-six weeks of limited activity. There were no statistically significant differences between the two age cohorts on the preoperative survey. Expectations regarding pain postoperative were similar between the treating surgeon and patients on postoperative day one, three months, and six months. Patients expect to be more satisfied at two and six weeks, though these expectations converged at six months. Patients expected more physical function and participation in recreational activities at all early time points compared to the expectations of their surgeon.

CONCLUSION: Following ORIF for DRF, lower educational attainment is associated with lower expectations in early postoperative physical activity and higher postoperative pain at three and six months. Higher educational attainment is associated with increased expectations in early postoperative finger mobility and immediate postoperative pain following ORIF for DRF. Patients expected an earlier return to physical and recreational activities than their surgeons.

Long-Term Outcomes at Skeletal Maturity of Combined Pelvic and Femoral Osteotomies for the Treatment of Legg-Calve-Perthes Disease

Poster 074

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INTRODUCTION: Surgical treatment for Legg-Calve-Perthes disease (LCPD) is recommended for older children with moderate to severe disease. We sought to determine whether one-stage combined pelvic and femoral osteotomies lead to improved radiologic outcomes compared to outcomes reported with nonoperative management.

METHODS: Single-center consecutive cohort study. Patients older than six years of age diagnosed with LCPD lateral pillar B or C were treated with pelvic and femoral osteotomies. Radiologic outcomes and leg length discrepancies were assessed using Stulberg classification and were compared with data from the current literature.

RESULTS: Fifteen hips in 14 patients were treated with double osteotomy for LCPD of which 7 were lateral pillar C (47%). Mean age at surgery was 8.6 years (range, 6.4 – 10) and mean age at follow-up was 20.2 years (range, 14.2 – 35.6). At a mean 11.6 years follow-up (range, 6.3 – 25.2), double osteotomy resulted in 40% of patients with a Stulberg I/II scores, 27% Stulberg III scores, and 33 Stulberg IV/V scores. The mean leg-length discrepancy was 1.4 cm in lateral pillar C patients compared to 0.8 cm in lateral pillar B patients. Four patients underwent additional surgeries, two of which were THAs.

DISCUSSION & CONCLUSION: Double osteotomy as an alternative surgical procedure for the treatment of LCPD did not show improved outcome when compared to historic nonoperative cohorts. Additional long-term follow-up of these patients is needed to assess the success of these procedures in the context of conversion to total hip arthroplasty, impingement, and arthritis.

Can Serial Height Measurements in Modern Children be Used to Develop and Update Skeletal Maturity Systems?

Poster 075

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OBJECTIVE: Skeletal maturity systems (SMS) are generally developed using historic longitudinal growth data. While recent studies suggest skeletal growth patterns differ in modern children, few modern datasets exist that include both serial height measurements and corresponding radiographs. This study compared the performance of a recalibrated knee-based SMS using modern data routinely collected in pediatric records.

METHODS: Using a retrospective database, we applied superimposed translation and rotation (SITAR) longitudinal growth modeling for patients with (1) ≥1 knee radiograph obtained during peripubertal years between 2014-2022 and (2) ≥5 height measurements spanning ≥5 years and extending to skeletal maturity. Using the SITAR model, age at 90% final height (FH) and corresponding years from 90% FH was calculated for each patient to provide true skeletal age for each radiograph. Chronological age at image, sex, and all seven modified Fels Knee (mFK) system parameters were obtained by a single rater for each radiograph after confirming inter- and intra-rater reliability (ICC 0.63-0.91). Generalized estimating equation procedures were used to estimate skeletal age and generate a recalibrated mFK system. To evaluate system performance, radiographs were divided into 80%/20% train/test subsets. Discrepancy in skeletal age estimates between the original and recalibrated mFK systems compared to the true skeletal age were evaluated using Wilcoxon signed rank testing ($p<0.05$ as significant).

RESULTS: 250 radiographs of 85 girls and 95 boys were included. Mean ages at 90% FH for females and males were 11.2 and 12.7 years, respectively. Estimates using the recalibrated mFK system had a smaller mean absolute difference to true skeletal age (0.63 ± 0.66 years) compared to the original system (1.03 ± 0.78 years, $P<0.001$), indicating better performance.

CONCLUSION: This novel methodology demonstrates that routinely recorded height data and corresponding radiographs can be used to develop or recalibrate new skeletal maturity systems in modern children.

Comparison of Pre- and Postoperative Range of Motion in Patients Treated with Unilateral, Peri-Apical Distractors Device (ApiFix) for Adolescent Idiopathic Scoliosis

Poster 076

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INTRODUCTION: Fusionless devices are being investigated for the surgical management of adolescent idiopathic scoliosis (AIS), traditionally managed with posterior spinal fusion. ApiFix functions as an internal brace that can elongate via a ratchet mechanism. Potential advantages of fusionless instrumentation for eligible patients are less invasive procedures and preserved range of motion (ROM) compared to fusion. Strict inclusion criteria include skeletally immature patients with a single, flexible 40-60° Lenke type 1 or 5 curve that reduces to 30° or less on side-bending with thoracic kyphosis less than 55° from T5-T12. The current study aims to compare pre- and postoperative ROM of patients who underwent ApiFix instrumentation for AIS.

METHODS: Local IRB approval was obtained. Patients who met inclusion criteria were consented for enrollment. All patients were enrolled in a standardized physical therapy program. Patients had measurements of trunk ROM analysis taken preoperatively and postoperatively at one year in a motion capture laboratory. Preliminary results are reported.

RESULTS: The present analysis included eight patients (7 female, 1 male) with AIS treated with ApiFix device. Six Lenke 1 and two Lenke 5 curves averaged 49° preoperatively (SD=3.7). Mean curve immediately postoperative was 23° (SD=3.7) and 20° (SD=6.1) at 1-year. The mean preoperative scoliometer reading was 14° (SD=2.0) and 5°(SD=2.4) postoperative. Changes in pre- and postoperative ROM are reported in relation to the pelvis. The mean trunk extension post-operatively decreased -12.0° (SD=13.3), while mean flexion increased 26.5° (SD=21.9). The mean decrease in left side-bending was -11.2° (SD=8.7). Mean right side-bending was 3.7° (SD=16.5). The mean decrease in left rotation was -7.3° (SD=8.1). Average right-sided rotation remained similar at -0.2° (SD=5.31). All patients returned to activity postoperatively ranging from two weeks (golf) to four months (gymnastics) depending on activity. All others returned within 2-3 months.

CONCLUSION: Preliminary results show that patients with AIS treated with a fusionless device appear to have improvements in curve magnitude and rotation with retention of functional ROM in multiple planes. Patients typically returned to activity within 2-3 months. While trunk extension was slightly decreased postoperatively, flexion increased. Postoperative side-bending and rotation to the right was better than side-bending or rotation to the left. Laterality of scoliotic curves or implant position may explain these differences. Ongoing data analysis includes 53 patients, including 21 with one-year postoperative data.

Pediatric Synovial Sarcoma: A Review of 21 Cases from a Single Institution
Poster 079

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BACKGROUND: Synovial sarcoma is rare, yet remains the most commonly diagnosed soft tissue sarcoma in childhood and adolescent patients. There are few studies reporting on the outcomes of synovial sarcoma in patients under 18 years of age. We sought to describe the rates of recurrence and disease-specific survival in pediatric patients diagnosed with synovial sarcoma.

METHODS: We retrospectively reviewed the medical records of 361 patients with synovial sarcoma. Twenty-one patients (6%) were diagnosed with synovial sarcoma prior to the age of 18. All patients were evaluated at a single institution between 2000 and 2020. Mean age at diagnosis was 11 years (range 4 – 17) and 13 patients (62%) were male. Nineteen primary lesions were located in the extremity, one tumor was located in submandibular region, and one tumor was located in the buttock. The mean maximum pre-treatment dimension of primary lesions was 4.7±2.8cm (range 1.1-10.8). Median follow-up for survivng patients was 62 months (range 9-192).

RESULTS: All patients underwent surgical treatment of the primary lesion in the form of limb salvage. Seven patients with low risk lesions (<5cm, completely resected) were treated with surgery alone. Eleven patients received both perioperative chemotherapy (doxorubicin/ifosfamide [n=9], VDC/IE [n=2]) and radiotherapy. Three patients received perioperative radiotherapy (mean 50Gy) without chemotherapy.

Eleven patients (52%) underwent reoperation for infection/wound complications (n=5), scar tissue (n=2), recurrence (n=2), leg length discrepancy following rotationplasty (n=1), and amputation for radiation-associated osteosarcoma (n=1). Three patients developed local recurrence at 5, 20, and 21 months. Only one of these patients had positive margins. Four patients developed lung metastases at a mean 20 months from biopsy. Recurrence-free survival (RFS) at 1 and 5 years was 95% and 73%, respectively. Disease-specific survival (DSS) was 100% at 1 year and 78% at 5 years. Compared with adult patients with synovial sarcoma, pediatric patients had a lower risk of recurrence (HR 0.36, 95% CI [0.15, 0.90], p=0.02) and higher disease-specific survival (HR 0.38, 95% CI [0.14, 1.05], p=0.05).

CONCLUSION: Pediatric patients comprise a small percentage of patients diagnosed with synovial sarcoma. Local control including limb salvage surgery and perioperative radiotherapy resulted in low rates of local recurrence, but high rates of reoperation. Compared with adult patients, pediatric patients have higher recurrence-free and disease-specific survival rates. Overall, surgical treatment of pediatric synovial sarcoma with neoadjuvant or adjuvant chemoradiation, when indicated, results in high five-year survival for the majority of patients.

Chondrosarcoma of the Flat Bones: Differential Survival Between High Grade Lesions of the Pelvis and Scapula

Poster 080

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BACKGROUND: Studies have shown flat bone chondrosarcoma have worse outcomes than extremity tumors, but there is no data directly comparing different flat bone lesions. The primary aim of this study was to examine differences in recurrence and survival between pelvic and scapular chondrosarcoma.

METHODS: Forty-two patients with scapular chondrosarcoma and 127 patients with pelvic chondrosarcoma who underwent surgical resection between 1989 and 2022 were retrospectively reviewed. Demographic and tumor characteristics were collected in addition to disease-specific survival (DSS) and recurrence-free survival (RFS). High grade tumors were defined as lesions that were grade 3 or 4 on surgical pathology.

RESULTS: Patients with low-intermediate grade lesions of the scapula were more likely to have positive margins during definitive surgical management (14% vs. 3%, OR 5, 95% CI [1.15,22.6], p=0.02), however, this did not translate to differences in recurrence or survival (p>0.05). Among high grade tumors, patients with scapular lesions had worse RFS (HR 3.43, [1.21, 9.75], p=0.02) and DSS (HR 2.99, 95% CI [1.05, 8.51], p=0.04). Five-year DSS for high grade pelvic and scapular tumors was 55% and 17%, respectively. There were no significant differences between the rate of positive margins or minimum tumor-free margin on final pathology for high grade lesions (p>0.10).

CONCLUSION: Five-year DSS survival for high grade chondrosarcoma of the flat bones is poor, particularly for those of the scapula. Despite a higher rate of positive margins for low-intermediate grade lesions of the scapula, there was no significant difference in survival compared to low-intermediate grades lesions of the pelvis.

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Nick	Bender	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Ilya	Bendich	Submitted on: 10/07/2022 DePuy, A Johnson & Johnson Company: Research support Stryker: Research support
Alex	Benedick	Submitted on: 06/12/2023 Orthopaedic Trauma Association: Board or committee member Prichard Medical - family member has invested in medical device startup: Stock or stock Options
Elizabeth	Benson	(This individual reported nothing to disclose); Submitted on: 12/28/2023
Matthew	Benson	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Richard	Berger	Submitted on: 06/01/2023 MicroPort: IP royalties
Zachary	Berliner	(This individual reported nothing to disclose); Submitted on: 07/21/2022
David	Bernholt	Submitted on: 10/07/2022 Arthrex, Inc: Other financial or material support Smith & Nephew: Other financial or material support
David	Bernholt	Submitted on: 10/07/2022 Arthrex, Inc: Other financial or material support Smith & Nephew: Other financial or material support
Carter	Berry	(This individual reported nothing to disclose); Submitted on: 06/12/2023

First Name	Last Name	Disclosure
Daniel	Berry	Submitted on: 10/07/2022 Bodycad: Paid consultant; Stock or stock Options Current Concepts in Joint Replacement (Hip Society and Knee Society): Board or committee member DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant; Research support Elsevier: Publishing royalties, financial or material support International Hip Society: Board or committee member Journal of Bone and Joint Surgery - American: Editorial or governing board Orthopaedic Research and Education Foundation: Board or committee member Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Marc	Berstein	(This individual reported nothing to disclose); Submitted on: 03/28/2024
Kathryn	Besserman	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Benjamin	Best	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Tarun	Bhalla	(This individual reported nothing to disclose); Submitted on: 01/10/2024
Joshua	Bingham	(This individual reported nothing to disclose); Submitted on: 06/26/2023
Julie	Bishop	Submitted on: 04/14/2023 AAOS: Board or committee member American Shoulder and Elbow Surgeons: Board or committee member Arthrex, Inc: Research support CONMED Linvatec: Paid consultant Mid American Orthopaedic Association: Board or committee member Ohio Orthopaedic Society: Board or committee member Smith & Nephew: Paid consultant; Research support Stryker: Paid consultant
Neil	Blanchard	(This individual reported nothing to disclose); Submitted on: 02/22/2024
Joshua	Bland	(This individual reported nothing to disclose); Submitted on: 06/02/2023
Alan	Blank	Submitted on: 06/14/2023 ad hoc reviewer for CORR, JOP, JSO, Lancet Oncology,: Editorial or governing board Bone Support - Cerament: Paid consultant exparel/pacira: Stock or stock Options Musculoskeletal Tumor Society: Board or committee member Onkos Surgical: Paid consultant Rare Tumors: Editorial or governing board Rush Orthopedic Journal: Editorial or governing board Springworks therapeautics: Paid consultant Swim Across America Cancer Research Grant: Research support
Jason	Blevins	Submitted on: 05/24/2022 Globus Medical: Paid consultant KCI: Paid consultant LimaCorporate: Paid consultant
Michael	Bloomfield	Submitted on: 10/07/2022 AAOS: Board or committee member Stryker: Paid consultant
Lauryn	Boggs	(This individual reported nothing to disclose); Submitted on: 03/07/2024

First Name	Last Name	Disclosure
John	Bonamer	(This individual reported nothing to disclose); Submitted on: 05/24/2023
Kevin	Bondar	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Alexander	Boos	(This individual reported nothing to disclose); Submitted on: 05/10/2023
Matthew	Booth	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Therese	Bou-Akl	(This individual reported nothing to disclose); Submitted on: 07/03/2023
Amir	Boubekri	(This individual reported nothing to disclose); Submitted on: 04/17/2023
Maria	Bozoghlian	(This individual reported nothing to disclose); Submitted on: 05/25/2023
Eugene	Brabston	Submitted on: 02/17/2023 EBSCO: Editorial or governing board Link Orthopaedics: Paid consultant Orthopaedic Design NA: Paid consultant
Skylar	Braga	(This individual reported nothing to disclose); Submitted on: 06/24/2023
Zachary	Braig	(This individual reported nothing to disclose); Submitted on: 11/08/2022
Michael	Braman	Submitted on: 05/28/2023 Merck: Stock or stock Options
Tiffany	Bridges	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Clayton	Brinkley	(This individual reported nothing to disclose); Submitted on: 05/26/2023
Bryan	Brockman	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Stephen	Brockmeier	Submitted on: 12/09/2022 American Orthopaedic Society for Sports Medicine: Board or committee member American Shoulder and Elbow Surgeons: Board or committee member AOSSM MPBOT, Video Journal of Sports Medicine: Editorial or governing board; Publishing royalties, financial or material support Arthrex, Inc: Paid consultant; Paid presenter or speaker; Research support Association of Clinical Elbow and Shoulder Surgeons: Board or committee member Biomet: IP royalties Exactech, Inc: IP royalties; Paid consultant; Paid presenter or speaker; Stock or stock Options Johnson & Johnson: Stock or stock Options MidAtlantic Shoulder and Elbow Society: Board or committee member Orthopaedic Journal of Sports Medicine: Editorial or governing board Springer: Publishing royalties, financial or material support Techniques in Shoulder and Elbow Surgery: Editorial or governing board WRS: Paid consultant Zimmer: IP royalties
David	Brogan	Submitted on: 11/01/2023 American Society for Surgery of the Hand: Board or committee member Checkpoint Surgical: Paid presenter or speaker; Research support DePuy, A Johnson & Johnson Company: Research support Neuraptive Therapeutics: Research support OrthoCell: Paid consultant Springer: Publishing royalties, financial or material support Treasurer for Missouri State Orthopedic Association: Board or committee member
Samuel	Broida	(This individual reported nothing to disclose); Submitted on: 05/31/2023

First Name	Last Name	Disclosure
Tyler	Brolin	Submitted on: 05/19/2023 AAOS: Board or committee member American Shoulder and Elbow Surgeons: Board or committee member Arthrex, Inc: IP royalties; Paid consultant; Research support Elsevier: Publishing royalties, financial or material support Orthofix, Inc.: Research support Orthopedic Clinics of North America: Editorial or governing board Zimmer: Research support
Jaysson	Brooks	Submitted on: 05/02/2022 DePuy, A Johnson & Johnson Company: Paid consultant Medtronic: Paid presenter or speaker OrthoPediatrics: Paid consultant
Nicholas	Brown	Submitted on: 04/24/2023 AAOS: Board or committee member Corin U.S.A.: Paid consultant DePuy, A Johnson & Johnson Company: Paid consultant Link Orthopaedics: Paid consultant
Timothy	Brown	Submitted on: 05/23/2022 American Association of Hip and Knee Surgeons: Board or committee member Mid-America Orthopedic Association (MAOA): Board or committee member Musculoskeletal Infection Society (MSIS): Board or committee member Stryker: Paid consultant
David	Brueggeman	(This individual reported nothing to disclose); Submitted on: 06/28/2022
Parker	Brush	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Neil	Buac	(This individual reported nothing to disclose); Submitted on: 05/25/2022
Joseph	Buckwalter	Submitted on: 04/24/2023 MTF Biologics: Board or committee member Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Joseph	Buckwalter, V	Submitted on: 10/07/2022 American Society for Surgery of the Hand: Board or committee member
Lainey	Bukowiec	(This individual reported nothing to disclose); Submitted on: 05/01/2023
Leonard	Buller	Submitted on: 05/31/2023 American Association of Hip and Knee Surgeons: Board or committee member DJ Orthopaedics: Paid consultant Link Orthopaedics: Paid consultant OsteoRemedies: Paid consultant; Research support
Timothy	Bullock	(This individual reported nothing to disclose); Submitted on: 10/21/2022
Gabriel	Burdick	(This individual reported nothing to disclose); Submitted on: 06/06/2023
Zachary	Burke	(This individual reported nothing to disclose); Submitted on: 09/26/2023
Robert	Burkhart	(This individual reported nothing to disclose); Submitted on: 04/27/2023
Mike	Burton	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Ashleigh	Bush	(This individual reported nothing to disclose); Submitted on: 04/02/2023
Galo	Bustamante	(This individual reported nothing to disclose); Submitted on: 07/03/2023

First Name	Last Name	Disclosure
Frank	Buttacavoli	Submitted on: 05/24/2023 KCI: Paid consultant Medtronic: Paid consultant Zimmer: Paid consultant
Jacob	Calcei	(This individual reported nothing to disclose); Submitted on: 06/18/2023
Tyler	Calkins	Submitted on: 09/21/2023 AAOS: Board or committee member
John	Callaghan	Submitted on: 05/30/2023 DARI: Board or committee member DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant Joint Vue: Board or committee member; Stock or stock Options Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Megan	Callaghan	(This individual reported nothing to disclose); Submitted on: 05/19/2023
Christopher	Camp	Submitted on: 03/20/2023 Arthrex, Inc: Paid consultant Major League Baseball: Research support Springer: Publishing royalties, financial or material support
Collier	Campbell	(This individual reported nothing to disclose); Submitted on: 06/08/2023
Shauna	Campbell	(This individual reported nothing to disclose); Submitted on: 04/12/2023
Juan	Campos	(This individual reported nothing to disclose); Submitted on: 12/06/2023
Lisa	Cannada	Submitted on: 08/31/2023 Association of Women's Surgeons: Board or committee member Journal of Bone and Joint Surgery - British: Editorial or governing board Journal of Orthopaedic EXperience & Innovation: Editorial or governing board Orthopaedic Trauma Association: Board or committee member Orthopedics: Editorial or governing board Ruth Jackson Orthopaedic Society: Board or committee member Southeast Fracture consortium: Board or committee member Speak Up Ortho: Board or committee member Wolters Kluwer Health - Lippincott Williams & Wilkins: Editorial or governing board
James	Cardinal	(This individual reported nothing to disclose); Submitted on: 07/03/2023
Christopher	Carender	Submitted on: 05/30/2023 Journal of Arthroplasty: Editorial or governing board
Courtney	Carlson Strother	(This individual reported nothing to disclose); Submitted on: 01/05/2023
Jordan	Carter	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Karen	Carter	(This individual reported nothing to disclose); Submitted on: 05/17/2023
Hector	Castillo	(This individual reported nothing to disclose); Submitted on: 05/17/2022
Julio	Castillo-Tafur	(This individual reported nothing to disclose); Submitted on: 06/21/2023
Joshua	Castle	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Parker	Cavendish	(This individual reported nothing to disclose); Submitted on: 06/04/2022
Leonardo	Cavinatto	(This individual reported nothing to disclose); Submitted on: 04/03/2023
Ryan	Centanni	(This individual reported nothing to disclose); Submitted on: 12/15/2023
Sarah	Chaides	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Brian	Chalkin	Submitted on: 06/23/2023 DJ Orthopaedics: Paid consultant; Paid presenter or speaker

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Brian	Chalmers	Submitted on: 10/10/2022 HSS Journal: Editorial or governing board
Sonia	Chandi	(This individual reported nothing to disclose); Submitted on: 04/03/2023
Paige	Chapman	(This individual reported nothing to disclose); Submitted on: 01/03/2024
Rishi	Chatterji	(This individual reported nothing to disclose); Submitted on: 04/29/2023
Jake	Checketts	(This individual reported nothing to disclose); Submitted on: 05/13/2023
Kallie	Chen	(This individual reported nothing to disclose); Submitted on: 04/04/2023
Ling	Chen	(This individual reported nothing to disclose); Submitted on: 05/19/2023
Mingda	Chen	(This individual reported nothing to disclose); Submitted on: 06/10/2023
Raymond	Chen	(This individual reported nothing to disclose); Submitted on: 05/21/2022
Xiao	Chen	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Stephen	Chenard	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Christina	Cheng	(This individual reported nothing to disclose); Submitted on: 04/19/2023
Christopher	Cheng	(This individual reported nothing to disclose); Submitted on: 05/12/2022
Steven	Cherney	(This individual reported nothing to disclose); Submitted on: 05/23/2023
Samuel	Chmell	Submitted on: 10/10/2022 AAOS: Board or committee member
Stephanie	Choo	(This individual reported nothing to disclose); Submitted on: 05/23/2023
Apurva	Choubey	(This individual reported nothing to disclose); Submitted on: 04/15/2023
David	Christian	(This individual reported nothing to disclose); Submitted on: 05/29/2022
Matthew	Christie	(This individual reported nothing to disclose); Submitted on: 02/01/2023
Michael	Christie	Submitted on: 08/29/2022 DePuy, A Johnson & Johnson Company: IP royalties Signature Orthopedics: Unpaid consultant
Kyle	Cichos	Submitted on: 10/18/2022 Symcel: Paid consultant
Peter	Cirrincione	(This individual reported nothing to disclose); Submitted on: 05/23/2022
Sean	Clark	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Emmett	Cleary	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Terry	Clyburn	Submitted on: 05/16/2022 Conformis: Research support
Alex	Coffman	Submitted on: 01/11/2024 Medtronic: Stock or stock Options
Mark	Cohen	Submitted on: 06/01/2022 Integra: IP royalties
Anna	Cohen-Rosenblum	Submitted on: 07/05/2023 American Association of Hip and Knee Surgeons: Board or committee member Arthroplasty Today: Editorial or governing board Elsevier: Publishing royalties, financial or material support Journal of Arthroplasty: Editorial or governing board Journal of Bone and Joint Surgery - American: Publishing royalties, financial or material support Ruth Jackson Orthopaedic Society: Board or committee member

First Name	Last Name	Disclosure
Anna	Cohen-Rosenblum	Submitted on: 11/14/2023 American Association of Hip and Knee Surgeons: Board or committee member Arthroplasty Today: Editorial or governing board Elsevier: Publishing royalties, financial or material support Journal of Arthroplasty: Editorial or governing board Journal of Bone and Joint Surgery - American: Publishing royalties, financial or material support Microport: Paid presenter or speaker Ruth Jackson Orthopaedic Society: Board or committee member Zimmer: Paid consultant
Matthew	Colman	Submitted on: 06/07/2023 Alphatec Spine: IP royalties; Paid consultant AO Spine North America: Board or committee member; Research support Cervical Spine Research Society: Board or committee member CSRS: Research support DePuy, A Johnson & Johnson Company: Paid presenter or speaker K2M: Paid presenter or speaker K2M/Stryker Spine: Paid consultant LSRS: Board or committee member Musculoskeletal Tumor Society: Board or committee member North American Spine Society: Board or committee member Orthofix: Paid consultant Orthofix, Inc.: Paid presenter or speaker Spinal Elements: IP royalties; Paid consultant Xenix Medical: Paid consultant
Brendan	Comer	(This individual reported nothing to disclose); Submitted on: 08/11/2022
Tyler	Compton	(This individual reported nothing to disclose); Submitted on: 06/06/2022
Ryan	Cone	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Erik	Contreras	(This individual reported nothing to disclose); Submitted on: 05/24/2023
Ryan	Conyer	(This individual reported nothing to disclose); Submitted on: 05/01/2023

First Name	Last Name	Disclosure
James	Cook	Submitted on: 10/10/2023 AANA: Research support AO Trauma: Research support Arthrex, Inc: IP royalties; Paid consultant; Research support Bioventus: Paid consultant Boehringer Ingelheim: Paid consultant Collagen Matrix Inc: Paid consultant; Research support GE Healthcare: Research support Journal of Knee Surgery: Editorial or governing board Midwest Transplant Network: Board or committee member Musculoskeletal Transplant Foundation: Board or committee member; IP royalties; Research support National Institutes of Health (NIAMS & NICHD): Research support OREF: Research support Orthopaedic Trauma Association: Research support PCORI: Research support Regenosine: Research support SITES Medical: Research support Thieme: Publishing royalties, financial or material support Trupanion: Paid consultant U.S. Department of Defense: Research support
Chris	Cornett	(This individual reported nothing to disclose); Submitted on: 10/12/2023
Agnes	Cororaton	(This individual reported nothing to disclose); Submitted on: 05/23/2022
Christopher	Cosgrove	Submitted on: 01/04/2024 Acera Medical: Paid consultant
Andrew	Coskey	(This individual reported nothing to disclose); Submitted on: 01/24/2024
Cory	Couch	Submitted on: 11/19/2022 American Association of Hip and Knee Surgeons: Board or committee member Zimmer: Paid consultant
Zachary	Crawford	(This individual reported nothing to disclose); Submitted on: 09/08/2023
Ashley	Creager	(This individual reported nothing to disclose); Submitted on: 11/17/2022
Charles	Crellin	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Alexander	Crespo	Submitted on: 04/25/2023 Abbott: Stock or stock Options Globus Medical: Paid consultant; Stock or stock Options

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Brett	Crist	MAOA Program Committee Member Submitted on: 10/06/2022 AO Trauma North America: Board or committee member Globus Medical: IP royalties International Geriatric Fracture Society: Board or committee member Journal of Hip Preservation: Editorial or governing board Journal of Orthopaedic Trauma: Editorial or governing board KCI: Paid consultant; Paid presenter or speaker Orthopaedic Implant Company: Stock or stock Options Orthopaedic Trauma Association: Board or committee member Osteocentric: Unpaid consultant RomTech: Stock or stock Options SLACK Incorporated: Editorial or governing board Synthes: Paid consultant; Research support
John	Crockarell	Submitted on: 05/31/2023 Elsevier: Publishing royalties, financial or material support Heron Therapeutics: Stock or stock Options
John	Cromwell	Submitted on: 06/01/2023 Excere Medical: Paid consultant Steel Therapeutics: Paid consultant
Jennifer	Crook	(This individual reported nothing to disclose); Submitted on: 12/04/2023
William	Cross, III	Submitted on: 10/17/2022 OsteoCentric: IP royalties; Paid consultant
Christopher	Crowe	(This individual reported nothing to disclose); Submitted on: 02/24/2024
Matthew	Crowe	(This individual reported nothing to disclose); Submitted on: 06/04/2022
Andrew	Curley	(This individual reported nothing to disclose); Submitted on: 05/20/2023
Gregory	Cvetanovich	Submitted on: 10/06/2022 AAOS: Board or committee member American Orthopaedic Society for Sports Medicine: Board or committee member American Shoulder and Elbow Surgeons: Board or committee member Arthroscopy Association of North America: Board or committee member Smith & Nephew: Paid consultant; Research support
Johnathan	Dallman	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Siddhartha	Dandamudi	(This individual reported nothing to disclose); Submitted on: 08/23/2023
Alan	Daniels	Submitted on: 09/27/2023 Medicrea: IP royalties Medtronic: Paid consultant; Research support Orthofix, Inc.: Research support Spineart: IP royalties Stryker: IP royalties
Ryan	Dare	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Valarie	Davidson	(This individual reported nothing to disclose); Submitted on: 03/29/2023
John	Davison	(This individual reported nothing to disclose); Submitted on: 10/16/2022
Jad	Daw	(This individual reported nothing to disclose); Submitted on: 12/18/2023
Charles	Day	Submitted on: 05/03/2023 AM Surgical: Research support
Robert	Dean	(This individual reported nothing to disclose); Submitted on: 07/04/2023

First Name	Last Name	Disclosure
Anne	DeBenedetti	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Austin	DeBoer	(This individual reported nothing to disclose); Submitted on: 06/27/2023
Evan	Deckard	(This individual reported nothing to disclose); Submitted on: 05/09/2022
Madeleine	DeClercq	(This individual reported nothing to disclose); Submitted on: 01/12/2023
Augustine	Deering	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Kristin	Delfino	(This individual reported nothing to disclose); Submitted on: 03/30/2023
Irving	Delgado-Arellanes	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Gregory	Della Rocca	Submitted on: 08/31/2023 AAOS: Board or committee member American College of Surgeons: Board or committee member American Orthopaedic Association: Board or committee member Association of Bone and Joint Surgeons: Board or committee member BioPoly: Unpaid consultant Geriatric Orthopaedic Surgery and Rehabilitation: Editorial or governing board Journal of Orthopaedic Trauma: Editorial or governing board Orthopaedic Trauma Association: Board or committee member Wright Medical Technology, Inc.: IP royalties
Craig	Della Valle	Submitted on: 10/07/2023 Arthritis Foundation: Board or committee member BD: IP royalties DePuy, A Johnson & Johnson Company: Paid consultant Knee Society: Board or committee member MidAmerica Orthopaedic Association: Board or committee member Navbit: Stock or stock Options Orthopedics Today: Editorial or governing board Parvizi Surgical Innovations: Stock or stock Options SLACK Incorporated: Editorial or governing board; Publishing royalties, financial or material support Smith & Nephew: IP royalties; Research support Stryker: Research support Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support Zimmer: IP royalties; Paid consultant; Research support
Alex	Demers	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Spencer	Dempewolf	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Taylor	Den Hartog	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Matthew	Deren	Submitted on: 05/03/2022 RomTech: Stock or stock Options
Ajay	Desai	(This individual reported nothing to disclose); Submitted on: 06/07/2022
Sterling	DeShazo	(This individual reported nothing to disclose); Submitted on: 05/21/2023
Abhishek	Deshpande	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Clarabelle	DeVries	(This individual reported nothing to disclose); Submitted on: 07/13/2022

First Name	Last Name	Disclosure
David	Diduch	Submitted on: 06/06/2022 Aesculap/B.Braun: Research support American Orthopaedic Society for Sports Medicine: Board or committee member DJ Orthopaedics: Research support Mitek: Paid consultant Moximed: Research support Osteocentric: Paid consultant Smith & Nephew: IP royalties Springer: Publishing royalties, financial or material support
Benjamin	Diedring	(This individual reported nothing to disclose); Submitted on: 02/28/2023
Paula	Dietz	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Matthew	Dilisio	MAOA Program Committee Member Submitted on: 10/27/2022 Arthrex, Inc: Paid presenter or speaker Arthroscopy: Editorial or governing board Mid-America Orthopaedic Association, Program Committee: Board or committee member Orthopedics: Editorial or governing board
Julian	Dilley	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Zachary	Diltz	(This individual reported nothing to disclose); Submitted on: 05/08/2023
Srikanth	Divi	Submitted on: 05/11/2023 Kuros Biosciences: Paid presenter or speaker
Derek	Dixon	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Dang-Huy	Do	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Mitchell	Doerr	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Benjamin	Domb	Submitted on: 08/23/2023 AANA Learning Center Committee: Board or committee member American Hip Institute: Stock or stock Options American Hip Institute Research Foundation: Board or committee member American Orthopedic Foundation: Board or committee member Arthrex, Inc: IP royalties; Paid consultant; Paid presenter or speaker; Research support Arthroscopy Journal: Board or committee member; Editorial or governing board DJO Global: IP royalties Journal of Hip Preservation Surgery: Editorial or governing board Medacta: IP royalties Munster Specialty Surgical Center: Stock or stock Options North Shore Surgical Suites: Stock or stock Options Orthomerica: IP royalties Ossur: Research support St. Alexius Medical Center: Board or committee member Stryker: Paid consultant; Paid presenter or speaker; Research support University of Illinois College of Medicine: Board or committee member
Oliver	Dong	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Connor	Donley	(This individual reported nothing to disclose); Submitted on: 06/16/2022

First Name	Last Name	Disclosure
Patrick	Donnelly	(This individual reported nothing to disclose); Submitted on: 05/22/2023
Jennings	Dooley	(This individual reported nothing to disclose); Submitted on: 08/21/2023
R. Mychael	Dopirak	(This individual reported nothing to disclose); Submitted on: 12/02/2022
Brett	Drake	(This individual reported nothing to disclose); Submitted on: 08/18/2023
Elizabeth	Driskill	(This individual reported nothing to disclose); Submitted on: 05/29/2023
Emily	Ducaji	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Kyle	Duchman	Submitted on: 10/07/2022 AOSSM Team Physician and Athlete Advocacy Committee: Board or committee member Arthrex, Inc: Other financial or material support CONMED Linvatec: Other financial or material support Smith & Nephew: Other financial or material support Video Journal of Sports Medicine: Editorial or governing board
Evan	Dugdale	(This individual reported nothing to disclose); Submitted on: 05/31/2023
George	Durisek	Submitted on: 05/31/2023 Forge Biologics: Employee (the content of the activity is not related to the business lines or products of their employer/company)
Samuel	Eaddy	(This individual reported nothing to disclose); Submitted on: 07/03/2023
Jeffrey	Earhart	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Robert	Eason	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Stanley	Eboh	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Kostas	Economopoulos	(This individual reported nothing to disclose); Submitted on: 04/19/2023
Macllain	Edington	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Noah	Elagamy	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Jacob	Elkins	Submitted on: 05/11/2022 DePuy, A Johnson & Johnson Company: Research support Journal of Arthroplasty: Editorial or governing board
Jonathan	Ellis	(This individual reported nothing to disclose); Submitted on: 04/23/2023
Mouhanad	El-Othmani	Submitted on: 05/16/2023 Springer: Publishing royalties, financial or material support
Joseph	Elphingstone	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Ahmed	Emara	(This individual reported nothing to disclose); Submitted on: 04/13/2023
A. Scottie	Emmert	(This individual reported nothing to disclose); Submitted on: 09/21/2023
Chimobi	Emukah	(This individual reported nothing to disclose); Submitted on: 04/21/2023
Emma	Eng	(This individual reported nothing to disclose); Submitted on: 01/04/2024
D. Ian	English	(This individual reported nothing to disclose); Submitted on: 04/30/2023
Stephen	Engstrom	Submitted on: 11/19/2022 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member DJ Orthopaedics: Paid consultant Link Orthopaedics: Paid consultant
Lawrence	Enweze	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Ian	Erkkila	(This individual reported nothing to disclose); Submitted on: 10/22/2023

First Name	Last Name	Disclosure
Andrew	Evans	Submitted on: 01/18/2023 Center for Orthopaedic Trauma Advancement: Board or committee member Zimmer: Paid consultant
Hardy	Evans	(This individual reported nothing to disclose); Submitted on: 06/05/2023
William	Evans	Submitted on: 06/05/2023 Abbott: Stock or stock Options Eli Lilly: Stock or stock Options Medtronic: Stock or stock Options Merck: Stock or stock Options Pfizer: Stock or stock Options Procter & Gamble: Stock or stock Options Roche: Stock or stock Options Stryker: Stock or stock Options
Adam	Fahs	(This individual reported nothing to disclose); Submitted on: 12/17/2023
Kevin	Farley	(This individual reported nothing to disclose); Submitted on: 07/01/2023
Hassan	Farooq	(This individual reported nothing to disclose); Submitted on: 05/11/2022
Amanda	Faust	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Marina	Feffer	(This individual reported nothing to disclose); Submitted on: 04/10/2023
David	Fei-Zhang	(This individual reported nothing to disclose); Submitted on: 02/20/2024
Carlos	Fernandez	(This individual reported nothing to disclose); Submitted on: 07/24/2022
John	Fernandez	Submitted on: 06/29/2022 Arthrex, Inc: Paid presenter or speaker
Aliya	Feroe	(This individual reported nothing to disclose); Submitted on: 10/08/2022
Kathryn	Fideler	(This individual reported nothing to disclose); Submitted on: 05/16/2023
Lori	Fitton	(This individual reported nothing to disclose); Submitted on: 03/04/2023
Daniel	Fitzpatrick	Submitted on: 02/21/2024 Mend: Stock or stock Options Synthes: Research support Synthes CMF: IP royalties Zimmer: IP royalties; Research support
James	Fitzsimmons	(This individual reported nothing to disclose); Submitted on: 06/02/2023

First Name	Last Name	Disclosure
David	Flanigan	Submitted on: 10/07/2022 Aesculap/B.Braun: Research support American Orthopaedic Society for Sports Medicine: Board or committee member Anika Therapeutics: Research support Arthrex, Inc: Research support Arthroscopy Association of North America: Board or committee member Cartiheal: Research support CartiLife: Research support Ceterix: Research support CONMED Linvatec: Paid consultant DePuy, A Johnson & Johnson Company: Paid consultant Episurf: Research support Hyalex: Paid consultant Moximed: Research support Musculoskeletal Transplant Foundation: Paid consultant; Research support Smith & Nephew: Paid consultant; Research support Stryker: Research support Vericel: Paid consultant; Research support Zimmer: Research support
Paul	Fleissner	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Jeffrey	Fleming	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Daniel	Fletcher	(This individual reported nothing to disclose); Submitted on: 06/22/2022
Lorena	Floccari	Submitted on: 10/10/2022 Pediatric Orthopaedic Society of North America: Board or committee member Xellia Pharmaceuticals: Employee (family member)
Harold	Fogel	(This individual reported nothing to disclose); Submitted on: 09/18/2023
Jeremy	Fogelson	Submitted on: 06/13/2022 Medtronic: Paid consultant
Matthew	Folkman	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Clyde	Fomunung	(This individual reported nothing to disclose); Submitted on: 10/09/2022
Jake	Foote	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Marcus	Ford	Submitted on: 03/27/2023 American Association of Hip and Knee Surgeons: Board or committee member DePuy, A Johnson & Johnson Company: Paid consultant; Research support Medacta: IP royalties; Paid consultant; Research support Osteoremedies: Paid consultant
Enrico	Forlenza	(This individual reported nothing to disclose); Submitted on: 08/11/2022
Lauren	Foropoulos	(This individual reported nothing to disclose); Submitted on: 02/22/2024
Luc	Fortier	(This individual reported nothing to disclose); Submitted on: 03/22/2023
Paul	Fortin	Submitted on: 06/05/2023 Nuvasive: Paid consultant Paragon 28: IP royalties; Paid consultant; Paid presenter or speaker

First Name	Last Name	Disclosure
Brett	Freedman	Submitted on: 05/01/2023 Ankasa: Research support AO Spine: Paid presenter or speaker Clear Choice Therapeutics: Stock or stock Options Kuros: Paid consultant Medtronic: Paid consultant; Research support Neuroinnovations: Stock or stock Options Synthes: Paid consultant Theradaptive: Paid consultant
Matthew	Freeman	(This individual reported nothing to disclose); Submitted on: 01/31/2024
Sarah	Fried	(This individual reported nothing to disclose); Submitted on: 06/23/2022
Richard	Friedman	Submitted on: 05/30/2023 American Shoulder and Elbow Surgeons: Board or committee member Exactech, Inc: IP royalties; Paid consultant; Paid presenter or speaker; Research support Journal of Knee Surgery: Editorial or governing board
Nicholas	Frisch	Submitted on: 04/01/2022 Advanced Orthopaedic Specialties: Stock or stock Options American Association of Hip and Knee Surgeons: Board or committee member Don Joy: Research support PeerWell: Stock or stock Options Smithfield Surgical Partners: Stock or stock Options Zimmer: Paid consultant; Paid presenter or speaker; Research support
Kristin	Fruth	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Mike	Fry	(This individual reported nothing to disclose); Submitted on: 10/08/2022
Ryan	Furdock	(This individual reported nothing to disclose); Submitted on: 05/20/2023
Christopher	Furey	Submitted on: 05/31/2022 AAOS Board of Councilors: Board or committee member North American Spine Society: Board or committee member Ohio Orthopedic Society: Board or committee member
Daniel	Gallagher	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Christal	Gammage	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Burke	Gao	(This individual reported nothing to disclose); Submitted on: 06/07/2022
Matthew	Gao	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Nickolas	Garbis	Submitted on: 05/05/2022 Additive Implant: Stock or stock Options Aevumed: Unpaid consultant Arthrex, Inc: Paid presenter or speaker DJ Orthopaedics: Paid presenter or speaker
Ignacio	Garcia Fleury	(This individual reported nothing to disclose); Submitted on: 05/30/2022
Kristin	Gardner	(This individual reported nothing to disclose); Submitted on: 06/01/2022

First Name	Last Name	Disclosure
Matthew	Gardner	Submitted on: 05/03/2023 Curvafix: Paid consultant; Paid presenter or speaker; Stock or stock Options DePuy, A Johnson & Johnson Company: Paid consultant; Paid presenter or speaker Mid Central States Orthopaedic Society: Board or committee member Nuvasive: IP royalties; Paid consultant; Paid presenter or speaker
Matthew	Gasparro	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Michael	Gaudiani	(This individual reported nothing to disclose); Submitted on: 11/16/2022
Elizabeth	Gausden	Submitted on: 04/19/2023 American Association of Hip and Knee Surgeons: Board or committee member BICMD: Paid consultant International Orthopaedic Education Network: Board or committee member Zimmer: Paid consultant
Andrew	George	(This individual reported nothing to disclose); Submitted on: 06/12/2023
Edgar	George	(This individual reported nothing to disclose); Submitted on: 01/30/2024
Tracy	George	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Gregory	Georgiadis	(This individual reported nothing to disclose); Submitted on: 10/19/2022
Erik	Gerlach	(This individual reported nothing to disclose); Submitted on: 06/03/2023
Tad	Gerlinger	Submitted on: 05/29/2023 Smith & Nephew: IP royalties; Paid consultant; Research support
Alexander	Ghanayem	American Orthopaedic Association: Board or committee member Journal of Spinal Disorders and Techniques: Editorial or governing board
Elie	Ghanem	Submitted on: 04/20/2023 PSI: Stock or stock Options
Julian	Giakas	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Joseph	Gibian	(This individual reported nothing to disclose); Submitted on: 07/05/2023
William	Gilbert	(This individual reported nothing to disclose); Submitted on: 05/28/2023
Robert	Gillespie	Submitted on: 10/23/2023 Aevumed: Stock or stock Options American Shoulder and Elbow Surgeons: Board or committee member Collamedix: Stock or stock Options DJ Orthopaedics: Paid consultant; Paid presenter or speaker Genesis Innovation Group: Stock or stock Options Shoulder Innovations: IP royalties; Paid consultant
Sarah	Girshfeld	(This individual reported nothing to disclose); Submitted on: 03/30/2023
Steven	Gitelis	Submitted on: 05/25/2022 Onkos: Paid consultant; Stock or stock Options USMI: Stock or stock Options
Nick	Giusti	(This individual reported nothing to disclose); Submitted on: 06/24/2023
Amy	Glasgow	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Natalie	Glass	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Georgina	Glogovac	(This individual reported nothing to disclose); Submitted on: 12/01/2023
Paige	Gloster	(This individual reported nothing to disclose); Submitted on: 05/30/2023

First Name	Last Name	Disclosure
Michael	Glotzbecker	Submitted on: 10/07/2022 Biomet: Paid presenter or speaker DePuy, A Johnson & Johnson Company: Paid presenter or speaker Medtronic: Paid presenter or speaker Member of HSG: Research support Member PSSG: Research support Nuvasive: Paid consultant; Paid presenter or speaker Orthobullets: Paid consultant; Publishing royalties, financial or material support; Stock or stock Options Orthopediatrics: Paid consultant
Abbey	Glover	(This individual reported nothing to disclose); Submitted on: 05/16/2023
Haley	Goble	(This individual reported nothing to disclose); Submitted on: 06/14/2022
Brianna	Godinez	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Jake	Goguen	(This individual reported nothing to disclose); Submitted on: 12/04/2023
Mark	Gonzalez	(This individual reported nothing to disclose); Submitted on: 09/10/2022
Ezra	Goodrich	(This individual reported nothing to disclose); Submitted on: 04/06/2023
Michael	Gottschalk	Submitted on: 05/15/2022 American Society for Surgery of the Hand: Board or committee member Journal of Hand Surgery - American: Editorial or governing board Konica Minolta: Research support Stryker: Research support Surgical Techniques In Orthopedics: Editorial or governing board
Eryn	Gould	(This individual reported nothing to disclose); Submitted on: 01/04/2024
Heath	Gould	(This individual reported nothing to disclose); Submitted on: 06/04/2023
Brian	Grawe	Submitted on: 06/12/2023 American Orthopaedic Society for Sports Medicine: Board or committee member American Shoulder and Elbow Surgeons: Board or committee member Journal of Shoulder and Elbow Surgery: Editorial or governing board Mitek: Paid consultant Zimmer: Paid consultant
Marc	Greenberg	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Edward	Greenfield	Submitted on: 04/17/2023 Journal of Orthopaedic Research: Editorial or governing board
Justin	Greiner	Submitted on: 10/22/2023 Arthroscopy: Editorial or governing board
Emmanouil	Grigoriou	(This individual reported nothing to disclose); Submitted on: 10/30/2022
Jessica	Grimm	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Lauren	Grobaty	(This individual reported nothing to disclose); Submitted on: 05/24/2022
Evan	Gross	(This individual reported nothing to disclose); Submitted on: 10/01/2023
Joel	Grunhut	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Anthony	Guanciale	Submitted on: 07/18/2022 North American Spine SocietyPatient Care Committee: Board or committee member
Sergio	Guarin	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Lakshmi	Gudapati	(This individual reported nothing to disclose); Submitted on: 06/04/2023
Trevor	Gulbrandsen	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Zachary	Gunderson	(This individual reported nothing to disclose); Submitted on: 09/12/2023

First Name	Last Name	Disclosure
Nakul	Gupta	Submitted on: 06/13/2023 GE Healthcare: Paid presenter or speaker Siemens healthineers: Research support
Pradyumna	Gurusamy	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Charles	Gusho	(This individual reported nothing to disclose); Submitted on: 06/06/2023
S. Trent	Guthrie	Submitted on: 10/26/2022 AAOS: Board or committee member American Orthopaedic Association: Board or committee member Michigan Orthopaedic Society: Board or committee member Mid-America Orthopaedic Association: Board or committee member
Daniel	Guy	Submitted on: 08/13/2023 Treace Medical Concepts: Employee (family member)
James	Guyton	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Lucas	Haase	(This individual reported nothing to disclose); Submitted on: 05/21/2023
Jordan	Haber	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Elizabeth	Haberman	Submitted on: 05/31/2023 Annals of Surgical Oncology: Editorial or governing board Mayo Clinic Proceedings: Editorial or governing board Surgery: Editorial or governing board
Matthew	Hadley	(This individual reported nothing to disclose); Submitted on: 09/20/2022
Mark	Haft	(This individual reported nothing to disclose); Submitted on: 06/22/2023
John	Hagedorn	Submitted on: 06/24/2022 Abbvie: Employee (family member); Stock or stock Options Current Orthopaedic Practice: Editorial or governing board Johnson & Johnson: Paid consultant Orthopaedic Trauma Association: Board or committee member Wolters Kluwer Health - Lippincott Williams & Wilkins: Editorial or governing board
Varan	Haghshenas	(This individual reported nothing to disclose); Submitted on: 08/03/2023
Katherine	Hajdu	(This individual reported nothing to disclose); Submitted on: 05/27/2023
Blake	Hajek	(This individual reported nothing to disclose); Submitted on: 05/05/2023
Martina	Hale	Submitted on: 06/01/2023 Abbott: Employee (family member); Stock or stock Options
Penelope	Halkiadakis	(This individual reported nothing to disclose); Submitted on: 06/08/2022
James	Hall	(This individual reported nothing to disclose); Submitted on: 06/06/2022
Alexander	Hallwachs	(This individual reported nothing to disclose); Submitted on: 05/26/2023
Jennifer	Halpern	(This individual reported nothing to disclose); Submitted on: 05/30/2023
David	Hamilton	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Rob	Hand	(This individual reported nothing to disclose); Submitted on: 05/25/2023
Charles	Hannon	MAOA Program Committee Member Submitted on: 10/25/2022 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member Orchard Medical: Paid consultant Stryker: Research support
Logan	Hansen	(This individual reported nothing to disclose); Submitted on: 12/19/2022

First Name	Last Name	Disclosure
Chad	Hanson	Submitted on: 06/23/2022 CIT: Research support Flexion Therapeutics: Paid presenter or speaker Maxx: Paid consultant Nevada Orthopaedic Society: Board or committee member Zimmer: Paid consultant
Christina	Hardesty	Submitted on: 05/19/2023 American Academy for Cerebral Palsy and Developmental Medicine: Board or committee member Medtronic: Paid consultant OrthoPediatrics: IP royalties; Paid consultant Pediatric Orthopaedic Society of North America: Board or committee member Scoliosis Research Society: Board or committee member Spasticity Teaching and Research Society: Board or committee member
Jessica	Hardin	(This individual reported nothing to disclose); Submitted on: 06/30/2023
Morgan	Hardman	(This individual reported nothing to disclose); Submitted on: 06/13/2023
Kevin	Hardt	Submitted on: 06/02/2022 Journal of Knee Surgery: Editorial or governing board Medacta: Paid consultant; Research support Moximed: Paid consultant
James	Harkess	Submitted on: 06/01/2023 Elsevier: Publishing royalties, financial or material support
Ethan	Harlow	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Joshua	Harmer	(This individual reported nothing to disclose); Submitted on: 04/01/2023
Melvyn	Harrington	Submitted on: 05/02/2023 American Heart Association: Board or committee member American Orthopaedic Association: Board or committee member J. Robert Gladden Society: Board or committee member Smith & Nephew: Research support
Alexander	Harris	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Jacob	Harris	(This individual reported nothing to disclose); Submitted on: 05/30/2022
Joshua	Harris	Submitted on: 08/14/2023 AAOS: Board or committee member American Orthopaedic Society for Sports Medicine: Board or committee member Arthroscopy: Editorial or governing board Arthroscopy Association of North America: Board or committee member International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine: Board or committee member Orthopaedic Research Society: Board or committee member PatientPop: Stock or stock Options SLACK Incorporated: Publishing royalties, financial or material support Smith & Nephew: Paid consultant Thieme Medical Publishers: Publishing royalties, financial or material support

First Name	Last Name	Disclosure
Robert	Hart	Submitted on: 06/02/2022 American Orthopaedic Association: Board or committee member Cervical Spine Research Society: Board or committee member DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant; Paid presenter or speaker Globus Medical: IP royalties; Paid consultant; Paid presenter or speaker International Spine Study Group: Board or committee member ISSLS Textbook of the Lumbar Spine: Editorial or governing board Medtronic: Paid consultant; Paid presenter or speaker North American Spine Society: Board or committee member Orthofix, Inc.: Paid consultant; Paid presenter or speaker Scoliosis Research Society: Board or committee member SeaSpine: IP royalties Spine Connect: Stock or stock Options Western Ortho Assn: Board or committee member
Emiko	Hasegawa	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Robert	Havey	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Samuel	Hawkins	(This individual reported nothing to disclose); Submitted on: 05/26/2023
Christian	Hecht	(This individual reported nothing to disclose); Submitted on: 10/09/2022
Nathanael	Heckmann	Submitted on: 10/05/2022 AAOS: Board or committee member AJRR: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member Corin U.S.A.: IP royalties; Paid consultant Intellijoint Surgical: Paid consultant; Stock or stock Options MicroPort Orthopedics: Paid consultant Zimmer: Paid consultant
William	Hefley	Submitted on: 06/03/2022 Exactech, Inc: IP royalties; Paid consultant
Nathan	Heineman	(This individual reported nothing to disclose); Submitted on: 07/01/2023
Karen	Hernandez	(This individual reported nothing to disclose); Submitted on: 10/11/2022
Yvette	Hernandez	(This individual reported nothing to disclose); Submitted on: 05/25/2022
Matthew	Hess	(This individual reported nothing to disclose); Submitted on: 06/07/2022
Mario	Hevesi	Submitted on: 09/15/2022 DJO - Enovis: Paid consultant Journal of Cartilage and Joint Preservation: Editorial or governing board Moximed: Paid consultant Vericel: Paid consultant
Krystin	Hidden	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Shota	Higashihira	(This individual reported nothing to disclose); Submitted on: 06/12/2023
Devan	Higginbotham	(This individual reported nothing to disclose); Submitted on: 05/04/2022
John	Higgins	(This individual reported nothing to disclose); Submitted on: 06/29/2023

First Name	Last Name	Disclosure
Carlos	Higuera	Submitted on: 05/01/2023 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member Ferring Pharmaceuticals: Research support Journal of Arthroplasty: Editorial or governing board Journal of Bone and Joint infection: Editorial or governing board Journal of Hip Surgery: Editorial or governing board KCI: Paid consultant; Paid presenter or speaker; Research support OREF: Research support Osteal Therapeutics: Research support PSI: Stock or stock Options SICOT: Board or committee member Stryker: Paid consultant; Research support Zimmer: Research support
Madelyn	Hill	(This individual reported nothing to disclose); Submitted on: 03/27/2024
Tessa	Hill	(This individual reported nothing to disclose); Submitted on: 03/27/2024
David	Hiltzik	(This individual reported nothing to disclose); Submitted on: 02/20/2024
Takashi	Hirase	(This individual reported nothing to disclose); Submitted on: 05/24/2022
Christine	Ho	Submitted on: 10/07/2022 AAOS: Board or committee member American Academy of Pediatrics, Section On Orthopaedics: Board or committee member Pediatric Orthopaedic Society of North America: Board or committee member Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Sandra	Hobson	Submitted on: 06/05/2023 Association of Women Surgeons: Board or committee member Medtronic: Paid consultant Ruth Jackson Orthopaedic Society: Board or committee member
Taylor	Hobson	(This individual reported nothing to disclose); Submitted on: 09/19/2023
Noah	Hodson	(This individual reported nothing to disclose); Submitted on: 01/17/2024
Charles	Holliday	(This individual reported nothing to disclose); Submitted on: 02/21/2023
Ginger	Holt	Submitted on: 12/17/2022 Musculoskeletal Tumor Society: Board or committee member
Rachel	Honig	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Alexander	Hooke	(This individual reported nothing to disclose); Submitted on: 06/02/2023
William	Hopkinson	Submitted on: 10/17/2022 AAOS: Board or committee member Johnson & Johnson: Stock or stock Options Pfizer: Stock or stock Options Zimmer: Stock or stock Options
Keenan	Horani	(This individual reported nothing to disclose); Submitted on: 07/04/2023
Catherine	Hord	Submitted on: 01/10/2024 American Society of Pediatric Hematology/Oncology: Board or committee member

First Name	Last Name	Disclosure
Brandon	Horne	Submitted on: 10/10/2022 GE Healthcare: Stock or stock Options
Pooria	Hosseini	(This individual reported nothing to disclose); Submitted on: 03/10/2023
Matthew	Houdek	Submitted on: 09/26/2022 Link Orthopaedics: Paid consultant Mid-America Orthopaedic Association: Board or committee member Musculoskeletal Tumor Society: Board or committee member
Conner	Howard	(This individual reported nothing to disclose); Submitted on: 05/08/2023
Wellignton	Hsu	Submitted on: 05/25/2022 Amphix Bio: Stock or stock Options Asahi: Paid consultant Bioventus: Paid consultant Cervical Spine Research Society: Board or committee member Lumbar Spine Research Society: Board or committee member Medtronic Sofamor Danek: Paid consultant North American Spine Society: Board or committee member Stryker: IP royalties; Paid consultant
Griffin	Hughes	(This individual reported nothing to disclose); Submitted on: 05/15/2023
Martin	Husen	(This individual reported nothing to disclose); Submitted on: 06/03/2022
Jibreel	Hussain	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Cassim	Igram	Submitted on: 10/08/2022 AAOS: Board or committee member Allosource: Paid consultant Clinical Neurology and Neurosurgery: Editorial or governing board Iowa Orthopedic Society Board Member: Board or committee member Medtronic Sofamor Danek: Paid consultant
Stephen	Incavo	Submitted on: 01/03/2023 Innomed: IP royalties Kyocera: IP royalties Osteoremedies: IP royalties Smith & Nephew: IP royalties Wright Medical Technology, Inc.: IP royalties Zimmer: IP royalties
Heidi	Israel	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Amogh	Iyer	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Mohamed	Jabal	(This individual reported nothing to disclose); Submitted on: 06/03/2022
Garrett	Jackson	(This individual reported nothing to disclose); Submitted on: 06/30/2023
Chrystina	James	(This individual reported nothing to disclose); Submitted on: 05/26/2022
Adam	Jamnik	(This individual reported nothing to disclose); Submitted on: 06/05/2022
Achraf	Jardaly	(This individual reported nothing to disclose); Submitted on: 06/02/2022
Jordan	Jay	(This individual reported nothing to disclose); Submitted on: 06/30/2023
Eleanor	Jenkins	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Olivia	Jenks	(This individual reported nothing to disclose); Submitted on: 01/27/2024
Brenton	Jennewine	(This individual reported nothing to disclose); Submitted on: 02/14/2023
Jenna	Jensen	(This individual reported nothing to disclose); Submitted on: 06/09/2023

First Name	Last Name	Disclosure
Eric	Jiang	(This individual reported nothing to disclose); Submitted on: 04/10/2023
Bharadwaj	Jilakara	(This individual reported nothing to disclose); Submitted on: 05/23/2022
Julie	Jin	(This individual reported nothing to disclose); Submitted on: 01/09/2024
Yuxuan	Jin	(This individual reported nothing to disclose); Submitted on: 06/14/2022
Devin	John	(This individual reported nothing to disclose); Submitted on: 11/21/2022
Brian	Johnson	(This individual reported nothing to disclose); Submitted on: 06/07/2022
Eric B.	Johnson	(This individual reported nothing to disclose); Submitted on: 12/01/2023
Evan	Johnson	(This individual reported nothing to disclose); Submitted on: 05/29/2023
Jeffrey	Johnson	Submitted on: 09/14/2023 American Orthopaedic Foot and Ankle Society: Board or committee member Extremity Development Corporation: Stock or stock Options; Unpaid consultant
Joseph	Johnson	Submitted on: 05/15/2023 American Orthopaedic Association: Board or committee member Orthopaedic Trauma Association: Board or committee member Stryker: Paid presenter or speaker
Joshua	Johnson	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Quinn	Johnson	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Peter	Johnston	Submitted on: 06/05/2023 Aevumed: IP royalties; Paid consultant; Stock or stock Options Shoulder Innovations: IP royalties; Paid consultant; Stock or stock Options Stryker: Paid consultant; Paid presenter or speaker; Research support Tensor Solutions: Unpaid consultant Tigon: IP royalties
Brandon	Jonard	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Kenlee	Jonas	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Conor	Jones	(This individual reported nothing to disclose); Submitted on: 06/05/2022
Grant	Jones	Submitted on: 10/07/2022 American Orthopaedic Society for Sports Medicine: Board or committee member Musculoskeletal Transplant Foundation: Board or committee member; Other financial or material support
Sherrea	Jones	(This individual reported nothing to disclose); Submitted on: 01/19/2024
Noah	Joseph	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Robert	Juniewicz	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Kevin	Jurgensmeier	(This individual reported nothing to disclose); Submitted on: 05/09/2022
Scott	Kaar	(This individual reported nothing to disclose); Submitted on: 06/13/2023

First Name	Last Name	Disclosure
Sanjeev	Kakar	Submitted on: 05/16/2022 Arthrex, Inc: Paid consultant ASSH: Editorial or governing board Journal of Bone and Joint Surgery - British: Editorial or governing board Minnesota Orthopaedic Society: Board or committee member Restor3d: Paid consultant Sonex Healthcare: Stock or stock Options
Josh	Kalk	(This individual reported nothing to disclose); Submitted on: 01/23/2024
Atul	Kamath	Submitted on: 10/09/2022 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member Anterior Hip Foundation: Board or committee member BodyCad: Paid consultant Innomed: IP royalties Johnson & Johnson: Stock or stock Options Ortho Development: Paid consultant Procter & Gamble: Stock or stock Options United Ortho: Paid consultant Zimmer: Paid consultant; Paid presenter or speaker; Stock or stock Options
Mark	Karadsheh	Submitted on: 10/07/2022 Orthobullets: Publishing royalties, financial or material support Stryker: Paid consultant
Joseph	Karam	(This individual reported nothing to disclose); Submitted on: 06/06/2022
Matthew	Karam	MAOA Program Committee Member Submitted on: 05/01/2023 Iowa Orthopedic Research Foundation/Iowa Orthopedic Society: Board or committee member Iowa Simulation Solutions LLC: Stock or stock Options Mid American Orthopedic Assocaiton: Board or committee member Orthopaedic Trauma Association: Board or committee member
Brian	Karamian	Submitted on: 04/25/2023 Clinical Spine Surgery: Editorial or governing board
Vasili	Karas	Submitted on: 04/24/2023 Corin U.S.A.: IP royalties; Paid consultant Stryker: Paid consultant; Research support
Daniel	Karczewski	(This individual reported nothing to disclose); Submitted on: 10/06/2022
S. Mohammed	Karim	Submitted on: 05/05/2023 Journal of Bone and Joint Surgery - British: Editorial or governing board The Spine Journal: Editorial or governing board
Michael	Karns	(This individual reported nothing to disclose); Submitted on: 02/08/2023
Jarod	Karom	(This individual reported nothing to disclose); Submitted on: 06/23/2023
Anjali	Kashyap	(This individual reported nothing to disclose); Submitted on: 06/02/2023
Johnny	Kasto	(This individual reported nothing to disclose); Submitted on: 02/15/2023
Erryk	Katayama	(This individual reported nothing to disclose); Submitted on: 05/30/2023

First Name	Last Name	Disclosure
Konstantinos	Katsos	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Ani	Kazanjian	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Tim	Keating	(This individual reported nothing to disclose); Submitted on: 06/06/2023
Jacob	Keeley	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Jay	Keener	Submitted on: 05/20/2023 American Shoulder and Elbow Surgeons: Board or committee member Journal of Shoulder and Elbow Surgery: Editorial or governing board Shoulder Innovations: IP royalties Stryker: Paid consultant; Research support Wright Medical Technology, Inc.: IP royalties
James	Keeney	Submitted on: 05/15/2022 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member Journal of Knee Surgery: Editorial or governing board Mid-American Orthopaedic Association: Board or committee member Missouri State Orthopaedic Association: Board or committee member Orthopedics: Editorial or governing board
Yves Jordan	Kenfack	(This individual reported nothing to disclose); Submitted on: 12/01/2023
Yehuda	Kerbel	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Ankur	Khanna	(This individual reported nothing to disclose); Submitted on: 05/29/2023
Scott	Kilpatrick	Human Pathology: Editorial or governing board
Brandon	Kim	(This individual reported nothing to disclose); Submitted on: 05/20/2023
Elizabeth	King	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Tessa	Kirkpatrick	(This individual reported nothing to disclose); Submitted on: 04/11/2022
Mateo	Kirwan	(This individual reported nothing to disclose); Submitted on: 06/18/2023
Eric	Kiskaddon	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Harold	Kitaoka	Submitted on: 06/05/2023 American Orthopaedic Foot and Ankle Society: Board or committee member
Rebekah	Kleinsmith	(This individual reported nothing to disclose); Submitted on: 05/24/2023
Alison	Klika	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Michael	Kloby	(This individual reported nothing to disclose); Submitted on: 05/16/2022
Emma	Klosterman	(This individual reported nothing to disclose); Submitted on: 06/22/2022
Jeff	Klott	(This individual reported nothing to disclose); Submitted on: 04/03/2023
Pam	Kluck	MAOA staff (This individual reported nothing to disclose); Submitted on: 01/22/2023
Derrick	Knapik	Submitted on: 04/29/2022 Arthrex, Inc: Research support DJ Orthopaedics: Paid presenter or speaker Encore Medical: Other financial or material support Smith & Nephew: Other financial or material support
David	Knowles	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Mark	Kodsy	(This individual reported nothing to disclose); Submitted on: 05/26/2023
Daniel	Koehler	Submitted on: 11/29/2023 Arthrex, Inc: Paid consultant

First Name	Last Name	Disclosure
George	Kolettis	(This individual reported nothing to disclose); Submitted on: 06/30/2023
David	Kolin	(This individual reported nothing to disclose); Submitted on: 06/04/2022
Patricia	Kolowich	Submitted on: 06/05/2023 FORUM: Board or committee member Wayne County Medical Society: Board or committee member
Patricia	Kolowich	Submitted on: 06/05/2023 FORUM: Board or committee member Wayne County Medical Society: Board or committee member
Travis	Kotzur	(This individual reported nothing to disclose); Submitted on: 09/28/2023
Kent	Kraus	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Viktor	Krebs	Submitted on: 08/30/2023 Journal of Arthroplasty: Editorial or governing board Stryker: IP royalties; Paid presenter or speaker Stryker Orthopaedics: Paid consultant
Joseph	Krob	(This individual reported nothing to disclose); Submitted on: 05/17/2023
Elisabeth	Kroneberger	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Trinity	Kronk Samson	(This individual reported nothing to disclose); Submitted on: 10/23/2023
Aaron	Krych	Submitted on: 04/29/2022 Aesculap/B.Braun: Research support American Journal of Sports Medicine: Editorial or governing board Arthrex, Inc: IP royalties; Paid consultant; Research support International Cartilage Repair Society: Board or committee member International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine: Board or committee member
Henry	Kuechly	(This individual reported nothing to disclose); Submitted on: 06/05/2022
Gabrielle	Kuhn	(This individual reported nothing to disclose); Submitted on: 05/26/2023
Kyle	Kunze	Submitted on: 05/30/2023 Arthroscopy: Editorial or governing board
Andy	Kuo	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Steven	Kurina	(This individual reported nothing to disclose); Submitted on: 05/28/2023
Sarah	Kurkowski	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Jared	Kushner	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Nicolas	Kuttner	(This individual reported nothing to disclose); Submitted on: 11/07/2022
Maya	Lach	(This individual reported nothing to disclose); Submitted on: 05/11/2023
Benjamin	Lack	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Rahim	Laiwalla	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Brittany	Lala	(This individual reported nothing to disclose); Submitted on: 06/27/2023
Alan	Lam	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Gabriel	Lama	(This individual reported nothing to disclose); Submitted on: 07/06/2023
Abhinav	Lamba	(This individual reported nothing to disclose); Submitted on: 06/03/2022
Bradley	Lambert	Submitted on: 05/30/2023 Delfi: Research support Major League Baseball: Other financial or material support
Mark	Langhans	(This individual reported nothing to disclose); Submitted on: 06/12/2023
Jace	Lapierre	(This individual reported nothing to disclose); Submitted on: 06/05/2023

First Name	Last Name	Disclosure
A. Noelle	Larson	Submitted on: 06/01/2022 DePuy, A Johnson & Johnson Company: Research support Globus Medical: Research support Medtronic: Research support Orthopediatrics: Research support Pediatric Orthopaedic Society of North America: Board or committee member Scoliosis Research Society: Board or committee member Zimmer: Research support
Christopher	Larson	Submitted on: 11/29/2023 Responsive Arthroscopy: Paid consultant; Stock or stock Options Smith & Nephew: Paid consultant
Dirk	Larson	(This individual reported nothing to disclose); Submitted on: 05/30/2022
Jill	Larson	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Richard	Laughlin	Submitted on: 06/18/2022 American College of Surgeons: Board or committee member American Orthopaedic Foot and Ankle Society: Board or committee member
Alessia	Lavin	(This individual reported nothing to disclose); Submitted on: 06/04/2023
Patrick	Lawler	(This individual reported nothing to disclose); Submitted on: 04/16/2023
Joshua	Lawrenz	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Charles	Lawrie	Submitted on: 05/26/2022 American Association of Hip and Knee Surgeons: Board or committee member Kowa Pharmaceuticals: Paid presenter or speaker Medtronic: Paid consultant MicroPort Orthopedics: Paid consultant OPUM Technologies: Stock or stock Options Zimmer: IP royalties; Paid consultant
Sophia	Le	(This individual reported nothing to disclose); Submitted on: 06/06/2023
Virginia	Leadbetter	(This individual reported nothing to disclose); Submitted on: 02/27/2024
Steven	Leary	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Cameron	Ledford	Submitted on: 10/06/2022 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member American Board of Orthopaedic Surgery, Inc.: Board or committee member
Adrienne	Lee	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Andrew	Lee	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Sheng-Hsun	Lee	(This individual reported nothing to disclose); Submitted on: 05/24/2023
Tiffany	Lee	(This individual reported nothing to disclose); Submitted on: 04/07/2023
Andrea	Lese	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Milos	Lesevic	(This individual reported nothing to disclose); Submitted on: 02/22/2024

First Name	Last Name	Disclosure
Brett	Levine	Submitted on: 10/30/2023 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member Arthroplasty Today: Editorial or governing board Elsevier: Editorial or governing board Exactech, Inc: Paid consultant Human kinetics: Editorial or governing board Knee Society: Board or committee member Lima: Paid consultant Link Orthopaedics: IP royalties; Paid consultant MAOA: Board or committee member Merete: Paid consultant SLACK Incorporated: Editorial or governing board Wolters Kluwer Health - Lippincott Williams & Wilkins: Editorial or governing board Zimmer: Paid consultant; Research support
Eli	Levitt	(This individual reported nothing to disclose); Submitted on: 08/30/2022
Bruce	Levy	Submitted on: 02/13/2023 Arthrex, Inc: IP royalties; Paid consultant COVR Medical LLC: Stock or stock Options Journal of Knee Surgery: Editorial or governing board Knee Surgery, Sports Traumatology, Arthroscopy: Editorial or governing board Orthopedics Today: Editorial or governing board Smith & Nephew: Paid consultant
Hannah	Levy	(This individual reported nothing to disclose); Submitted on: 05/06/2023
David	Lewallen	Submitted on: 12/06/2022 Accuitive Technologies: Paid consultant Acuitive Technologies: Stock or stock Options Corin U.S.A.: Research support Ketai Medical Devices: Stock or stock Options Mid America Orthopedic Association: Board or committee member Orthopaedic Research and Education Foundation: Board or committee member Zimmer Biomet: IP royalties; Paid consultant
Laura	Lewallen	Submitted on: 12/06/2023 Zimmer: IP royalties Zimmer (family member): Research support
Jefferson	Li	(This individual reported nothing to disclose); Submitted on: 11/23/2022
Asher	Lichtig	(This individual reported nothing to disclose); Submitted on: 05/24/2022

First Name	Last Name	Disclosure
Jay	Lieberman	Submitted on: 10/30/2023 BD Surgiphor: Stock or stock Options DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant Hip Innovation Technology: Stock or stock Options Hip Society: Board or committee member Musculoskeletal Transplant Foundation: Board or committee member Saunders/Mosby-Elsevier: Publishing royalties, financial or material support Western Orthopaedic Association: Board or committee member
Ye	Lin	(This individual reported nothing to disclose); Submitted on: 10/13/2022
Kevin	Lindsay-Rivera	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Kevin	Lindsay-Rivera	(This individual reported nothing to disclose); Submitted on: 12/10/2023
Nithya	Lingampalli	(This individual reported nothing to disclose); Submitted on: 02/09/2023
Milton	Little	Submitted on: 07/23/2023 DePuy, A Johnson & Johnson Company: Paid consultant Globus Medical: Paid consultant Orthopaedic Trauma Association: Board or committee member Restor3D: Paid consultant Western Orthopaedic Association: Board or committee member
Connor	Littlefield	(This individual reported nothing to disclose); Submitted on: 04/23/2023
Jennifer	Liu	(This individual reported nothing to disclose); Submitted on: 05/22/2022
Raymond	Liu	Submitted on: 07/23/2022 AAOS: Board or committee member Journal of Pediatric Orthopedics: Editorial or governing board; Publishing royalties, financial or material support Limb Lengthening and Reconstruction Society (LLRS): Board or committee member Orthopediatrics - Royalties paid to my university: IP royalties Pediatric Orthopaedic Society of North America: Board or committee member
Nicholas	Livingston	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Vincent	Lizzio	(This individual reported nothing to disclose); Submitted on: 06/06/2023
Tony	Logli	(This individual reported nothing to disclose); Submitted on: 11/01/2022
Daniel	London	Submitted on: 07/31/2023 AAOS: Board or committee member American Society for Surgery of the Hand: Board or committee member Trimed: Research support
Steven	Long	Submitted on: 01/17/2024 Iowa Simulation Solutions: Employee; Stock or stock Options (the content of the activity is not related to the business lines or products of their employer/company) Sawbones/Pacific Research Laboratories: IP royalties
Amber	Lopez	(This individual reported nothing to disclose); Submitted on: 10/07/2022

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Philip	Louie	Submitted on: 03/07/2023 Alphatec Spine: Paid consultant AO Spine: Board or committee member Elsevier: Publishing royalties, financial or material support Springer: Publishing royalties, financial or material support StreaMD: Stock or stock Options Thieme: Publishing royalties, financial or material support Viseon: Paid consultant
Yining	Lu	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Kenzie	Lundqvist	(This individual reported nothing to disclose); Submitted on: 03/27/2024
Scott	Lunos	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Taylor	Luster	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Elizabeth	Lyden	(This individual reported nothing to disclose); Submitted on: 01/11/2024
Joseph	Lyons	(This individual reported nothing to disclose); Submitted on: 07/26/2023
Nicholas	Maassen	(This individual reported nothing to disclose); Submitted on: 10/26/2023
Tad	Mabry	(This individual reported nothing to disclose); Submitted on: 08/15/2022
Ashley	MacConnell	(This individual reported nothing to disclose); Submitted on: 04/27/2023
Brandon	Macknofsky	(This individual reported nothing to disclose); Submitted on: 06/14/2022
Ian	MacLean	(This individual reported nothing to disclose); Submitted on: 04/07/2022
Robert	Magnussen	Submitted on: 05/04/2022 ACL Study Group: Board or committee member American Orthopaedic Society for Sports Medicine: Board or committee member Arthrex, Inc: Other financial or material support International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine: Board or committee member Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board Orthopaedic Journal of Sports Medicine: Editorial or governing board Smith & Nephew: Research support Zimmer: Research support
Ajay	Mahenthiran	(This individual reported nothing to disclose); Submitted on: 07/10/2023
Bhargavi	Maheshwer	Submitted on: 06/06/2022 AAOS: Board or committee member
Craig	Mahoney	Submitted on: 10/07/2022 Iowa Orthopaedic Society: Board or committee member Mercy Medical Center - Des Moines, Iowa: Board or committee member
Jared	Mahylis	Submitted on: 04/06/2023 AAOS: Board or committee member Exactech, Inc: Paid consultant; Paid presenter or speaker FX Shoulder: Paid consultant; Paid presenter or speaker
Jacob	Maier	(This individual reported nothing to disclose); Submitted on: 05/31/2022

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Eric	Makhni	Submitted on: 04/21/2022 AAOS: Board or committee member American Orthopaedic Society for Sports Medicine: Board or committee member Arthroscopy: Editorial or governing board OutcomeMD: Stock or stock Options Protera Health: Stock or stock Options Smith & Nephew: Paid consultant Springer: Publishing royalties, financial or material support
David	Maldonado	(This individual reported nothing to disclose); Submitted on: 12/17/2023
Arthur	Malkani	Submitted on: 05/30/2023 Parvizi Surgical Innovation: Stock or stock Options stryker: IP royalties; Paid consultant; Paid presenter or speaker; Research support
Katherine	Mallett	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Benjamin	Mallinger	(This individual reported nothing to disclose); Submitted on: 05/25/2023
Noah	Mallory	(This individual reported nothing to disclose); Submitted on: 10/02/2021
Connor	Maly	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Jonathan	Manfredi	(This individual reported nothing to disclose); Submitted on: 04/30/2023
Nicholas	Mangutz	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Shannon	Manno	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Kailey	Mansour	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Erick	Marigi	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Ian	Marigi	(This individual reported nothing to disclose); Submitted on: 04/10/2023
Michael	Marinier	(This individual reported nothing to disclose); Submitted on: 10/13/2022
David	Markel	Submitted on: 06/02/2023 Arboretum Ventures: Stock or stock Options Arthroplasty Today: Editorial or governing board Ascension Providence Hospital: Research support HOPCo: Stock or stock Options Journal of Arthroplasty: Editorial or governing board Michigan Arthroplasty Registry Collaborative Quality Initiative: Board or committee member Michigan Orthopedic Society: Board or committee member Plymouth Capital: Stock or stock Options Smith & Nephew: IP royalties; Paid consultant Stryker: Paid consultant; Research support
Jacob	Markel	MAOA Program Committee Member (Resident Ad Hoc Member) (This individual reported nothing to disclose); Submitted on: 07/03/2023
Olivia	Marquardt	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Brandon	Marshall	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Scott	Marston	(This individual reported nothing to disclose); Submitted on: 11/29/2023
John Ryan	Martin	Submitted on: 05/31/2023 DePuy, A Johnson & Johnson Company: Paid consultant
Victor	Martinez	(This individual reported nothing to disclose); Submitted on: 05/19/2022
Jeremy	Marx	(This individual reported nothing to disclose); Submitted on: 05/15/2023

First Name	Last Name	Disclosure
Thomas	Matelic	(This individual reported nothing to disclose); Submitted on: 03/18/2024
Lauren	Matteini	Submitted on: 05/08/2023 DePuy, A Johnson & Johnson Company: Paid consultant Medtronic: Paid consultant
Catherine	May	(This individual reported nothing to disclose); Submitted on: 04/11/2023
Christopher	McAndrew	MAOA Program Committee Member Submitted on: 06/07/2023 AFIX: Paid consultant Osteocentric: Other financial or material support
Scott	McCarty	(This individual reported nothing to disclose); Submitted on: 06/03/2023
Mitchell	McClain	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Elle	McCormick	(This individual reported nothing to disclose); Submitted on: 02/09/2023
Jeremy	McCormick	Submitted on: 06/22/2022 American Orthopaedic Foot and Ankle Society: Board or committee member Foot and Ankle International: Editorial or governing board Midwest Stone Institute: Research support Stryker: IP royalties; Paid consultant; Paid presenter or speaker; Research support Techniques in Foot and Ankle Surgery: Editorial or governing board Wright Medical Technology, Inc.: Other financial or material support; Paid presenter or speaker
Steele	McCulley	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Patrick	McCulloch	Submitted on: 05/15/2023 Arthrex, Inc: Paid consultant; Research support Journal of Knee Surgery: Editorial or governing board Orthobullets.com: Editorial or governing board Smith & Nephew: Research support
Matthew	McIlrath	(This individual reported nothing to disclose); Submitted on: 09/13/2021
Amy	McIntosh	Submitted on: 10/17/2022 Nuvasive: Paid presenter or speaker
Jeffrey	McLaughlin	Submitted on: 07/23/2022 Biomet: IP royalties; Paid consultant; Paid presenter or speaker; Research support Mid America Orthopedic Society Program committee: Board or committee member
John	McLaughlin	Submitted on: 03/22/2024 Smith & Nephew: Paid consultant Zimmer: Paid consultant
Alexander	Mclawhorn	Submitted on: 10/10/2022 HSS Journal: Editorial or governing board
Brandon	McMaster	(This individual reported nothing to disclose); Submitted on: 06/09/2023
Colin	McNamara	(This individual reported nothing to disclose); Submitted on: 06/02/2023
Ryan	McNassor	(This individual reported nothing to disclose); Submitted on: 10/11/2022
Matthew	Meade	(This individual reported nothing to disclose); Submitted on: 05/30/2022

First Name	Last Name	Disclosure
Simon	Mears	Submitted on: 04/06/2023 Delta Ortho LLC: Stock or stock Options Fragility Fracture Network: Board or committee member Journal of the American Geriatrics Society: Editorial or governing board SAGE: Editorial or governing board
Daniel	Meeker	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Kasey	Meeks	(This individual reported nothing to disclose); Submitted on: 01/20/2022
Mark	Megerian	(This individual reported nothing to disclose); Submitted on: 12/17/2022
Charles	Mehlman	Submitted on: 10/09/2023 Amazon On-line Publishing: Publishing royalties, financial or material support Denver Children's Hospital Visiting Professorship: Board or committee member Dyna Med Mobility: Stock or stock Options Journal of Bone and Joint Surgery - American: Editorial or governing board Journal of Children's Orthopaedics (EPOS): Editorial or governing board Journal of Orthopaedic Trauma: Editorial or governing board Journal of Pediatric Orthopedics: Editorial or governing board Michigan State University Visiting Professorship: Board or committee member Oakstone Med Pub: IP royalties Oakstone Medical Publishing: Publishing royalties, financial or material support Ortho Pediatrics: Unpaid consultant Saunders/Mosby-Elsevier: Editorial or governing board Spine: Editorial or governing board U.S. News and World Report Pediatric Orthopaedic Working Group: Board or committee member Vanderbilt University Visiting Professorship: Board or committee member Wolters Kluwer Health - Lippincott Williams & Wilkins: Editorial or governing board
Nabil	Mehta	(This individual reported nothing to disclose); Submitted on: 04/23/2022
Alfonso	Mejia	Submitted on: 07/13/2022 AAOS: Board or committee member Acumed, LLC: Research support Arthrex, Inc: Research support Smith & Nephew: Research support Synthes: Research support Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Jason	Meldau	(This individual reported nothing to disclose); Submitted on: 05/28/2022

First Name	Last Name	Disclosure
R. Michael	Meneghini	Submitted on: 05/12/2022 American Association of Hip and Knee Surgeons: Board or committee member DJ Orthopaedics: IP royalties; Paid consultant Emovi: Stock or stock Options Hip Society: Board or committee member International Congress for Joint Reconstruction: Board or committee member Journal of Arthroplasty: Editorial or governing board KCI: Paid consultant Kinamed: IP royalties; Paid consultant Knee Society: Board or committee member Orthopedics Today: Editorial or governing board Osteoremedies: IP royalties; Paid consultant PeekMed: Stock or stock Options
Erik	Mersereau	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Nathan	Mesko	Submitted on: 04/11/2023 Bone Support: Paid consultant Musculoskeletal Tumor Society: Board or committee member ONKOS Surgical: Paid consultant; Paid presenter or speaker Stryker: Paid consultant; Paid presenter or speaker
Fabien	Meta	(This individual reported nothing to disclose); Submitted on: 10/09/2022
Andrew	Meyer	(This individual reported nothing to disclose); Submitted on: 06/03/2021
Jacob	Meyer	(This individual reported nothing to disclose); Submitted on: 03/29/2023

First Name	Last Name	Disclosure
William	Mihalko	Submitted on: 05/24/2023 AAHKS: Research support AAOS: Board or committee member Aesculap/B.Braun: IP royalties; Paid consultant; Paid presenter or speaker American Association of Hip and Knee Surgeons: Board or committee member American Society for Testing Materials International: Board or committee member Campbell Foundation: Board or committee member Food and Drug Administration: Research support Hip Society: Board or committee member International Society for Technology in Arthroplasty: Board or committee member Journal of Arthroplasty: Editorial or governing board Journal of Orthopaedic Research: Editorial or governing board Knee Society: Board or committee member Medacta: Research support Medtronic: Stock or stock Options Orthopaedic Research Society: Board or committee member Orthopedic Clinics of North America: Editorial or governing board Pacira Biosciences, Inc: Paid presenter or speaker Pacira Inc: Paid consultant Saunders/Mosby-Elsevier: Publishing royalties, financial or material support The Journal of Long Term Effects of Medical Implants: Editorial or governing board
Aleksander	Mika	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Todd	Milbrandt	Submitted on: 10/07/2022 AAOS: Board or committee member Broadwater: Other financial or material support Medtronic: Paid consultant Orthopediatrics: Paid consultant Pediatric Orthopaedic Society of North America: Board or committee member Scoliosis Research Society: Board or committee member Viking Scientific: Stock or stock Options Zimmer: Paid consultant
Andrew	Miller	(This individual reported nothing to disclose); Submitted on: 05/17/2023
Aspen	Miller	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Benjamin	Miller	Submitted on: 09/02/2022 AAOS: Board or committee member Journal of Bone and Joint Surgery - American: Editorial or governing board Musculoskeletal Tumor Society: Board or committee member
Eric	Milliron	(This individual reported nothing to disclose); Submitted on: 06/06/2022

First Name	Last Name	Disclosure
Andrew	Mills	Submitted on: 12/09/2023 Medtronic: Stock or stock Options
Anthony	Milto	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Ali	Mohamed	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Zuhair	Mohammed	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Robert	Molloy	Submitted on: 10/25/2022 American Association of Hip and Knee Surgeons: Board or committee member Stryker: Paid consultant; Paid presenter or speaker; Research support Zimmer: Research support
Amit	Momaya	Submitted on: 10/07/2022 Arthrex, Inc: Paid consultant Arthroscopy: Editorial or governing board Fidia Pharma USA: Paid consultant Miach Orthopaedics: Paid consultant Reparel: Unpaid consultant
Grace	Monroe	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Chance	Moore	(This individual reported nothing to disclose); Submitted on: 05/28/2023
Drew	Moore	Submitted on: 06/06/2022 Stryker: Research support Zimmer: Research support
Thomas	Moran	(This individual reported nothing to disclose); Submitted on: 05/28/2023
Tucker	Morey	(This individual reported nothing to disclose); Submitted on: 05/26/2023
Joseph	Morgan	(This individual reported nothing to disclose); Submitted on: 01/05/2024
Vince	Morgan	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Matthew	Mormino	Submitted on: 10/06/2022 Journal of the American Academy of Orthopaedic SurgeonsJournal of Surgical Education: Editorial or governing board Mid America Orthopaedic Association: Board or committee member
Samuel	Mormino	(This individual reported nothing to disclose); Submitted on: 01/11/2024
Mark	Morrey	Submitted on: 10/06/2022 Elsevier: Publishing royalties, financial or material support
J. Craig	Morrison	Submitted on: 05/31/2023 American Association of Hip and Knee Surgeons: Board or committee member Biomet: Research support DePuy, A Johnson & Johnson Company: Paid consultant; Paid presenter or speaker; Research support Exactech, Inc: Research support HealthTrust: Paid consultant
Samuel	Mosiman	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Edwin	Mouhawasse	(This individual reported nothing to disclose); Submitted on: 06/02/2023

First Name	Last Name	Disclosure
Varatharaj	Mounasamy	Submitted on: 04/26/2022 AAOS: Board or committee member European journal of orthopedic surgery and traumatology: Editorial or governing board
Samuel	Mounce	(This individual reported nothing to disclose); Submitted on: 10/24/2023
Vasilios	Moutzouros	(This individual reported nothing to disclose); Submitted on: 01/21/2023
Hassan	Mouzaihem	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Andrew	Moyal	(This individual reported nothing to disclose); Submitted on: 05/29/2023
Daniel	Moyer	(This individual reported nothing to disclose); Submitted on: 05/29/2023
Stephanie	Muh	Submitted on: 10/05/2022 AAOS: Board or committee member American Orthopaedic Association: Board or committee member American Shoulder and Elbow Surgeons: Board or committee member DePuy, A Johnson & Johnson Company: Paid consultant Exactech, Inc: Paid consultant; Research support Journal of Shoulder and Elbow Surgery: Editorial or governing board Smith & Nephew: Research support
Kellen	Mulford	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Hillary	Mulvey	(This individual reported nothing to disclose); Submitted on: 03/22/2024
Christopher	Muncie	(This individual reported nothing to disclose); Submitted on: 04/15/2023
Vikas	Munjal	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Sudarsan	Murali	(This individual reported nothing to disclose); Submitted on: 07/16/2022
Muturi	Muriuki	(This individual reported nothing to disclose); Submitted on: 05/22/2023
Jeff	Murphy	Submitted on: 06/12/2023 Campbell Foundation: Paid consultant DJ Orthopaedics: Paid consultant Medtronic: Employee (the content of the activity is not related to the business lines or products of their employer/company); Stock or stock Options
Meredith	Murphy	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Taylor	Murray	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Trevor	Murray	Submitted on: 08/12/2022 Biomet: Paid consultant Prichard Medical: Paid consultant Stryker: Research support Zimmer: Paid consultant
Amog	Mysore	(This individual reported nothing to disclose); Submitted on: 04/04/2023
Christopher	Nagelli	(This individual reported nothing to disclose); Submitted on: 05/17/2023
Nikhil	Nair	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Denis	Nam	Submitted on: 09/20/2022 KCI: Paid consultant; Research support Stryker: Paid consultant Zimmer: Research support

First Name	Last Name	Disclosure
Joshua	Napora	Submitted on: 05/20/2023 A-fix: Stock or stock Options Bone Solutions: Paid consultant Smith & Nephew: Paid consultant Stryker: Research support
Ahmad	Nassr	Submitted on: 10/26/2022 American Orthopaedic Association: Board or committee member AO Spine: Research support Cervical Spine Research Society: Board or committee member Lumbar spine research society: Board or committee member Pfizer: Research support Premia Spine: Research support Scoliosis Research Society: Board or committee member Techniques in Orthopedics: Editorial or governing board
Victoria	Nedder	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Gregory	Neely	Submitted on: 01/09/2024 American Orthopaedic Foot and Ankle Society: Board or committee member
Colin	Neitzke	(This individual reported nothing to disclose); Submitted on: 11/29/2023
James	Nepola	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Julio	Nerys-Figueroa	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Fong	Nham	(This individual reported nothing to disclose); Submitted on: 04/10/2023
Tyler	Nicholson	(This individual reported nothing to disclose); Submitted on: 05/24/2023
Micah	Nieboer	(This individual reported nothing to disclose); Submitted on: 05/22/2022
Schuyler	Nissen	(This individual reported nothing to disclose); Submitted on: 11/13/2023
Nicolas	Noiseux	Submitted on: 04/27/2023 DePuy, A Johnson & Johnson Company: Research support MicroPort: Research support Smith & Nephew: Research support Zimmer: Paid consultant
Charles	Nolte	(This individual reported nothing to disclose); Submitted on: 10/31/2023
Brent	Norris	Submitted on: 10/24/2022 AAOS: Board or committee member Acumed, LLC: Paid consultant AONA: Research support COTA: Research support DePuy, A Johnson & Johnson Company: Paid consultant Mid America Orthopaedic Association: Board or committee member Norris Surgical, LLC: Stock or stock Options ORI, LLC: Stock or stock Options Springer: Editorial or governing board Wishbone Medical: Paid consultant Wishbone Medical Stock: Stock or stock Options

First Name	Last Name	Disclosure
Clayton	Nuelle	Submitted on: 07/19/2023 AAOS: Board or committee member American Orthopaedic Society for Sports Medicine: Board or committee member AO Foundation: Other financial or material support Arthrex, Inc: Paid presenter or speaker Arthroscopy: Editorial or governing board; Publishing royalties, financial or material support Arthroscopy Association of North America: Board or committee member Guidepoint Consulting: Paid consultant Vericel, Inc.: Paid presenter or speaker
Julia	Nuelle	Submitted on: 05/31/2023 AAOS: Board or committee member American Orthopaedic Association: Board or committee member American Society for Surgery of the Hand: Board or committee member Arthrex, Inc: Paid presenter or speaker Arthroscopy: Editorial or governing board Arthroscopy Association of North America: Board or committee member Musculoskeletal Transplant Foundation: Research support Society of Military Orthopaedic Surgeons: Board or committee member Trimed: Paid presenter or speaker
Lukas	Nystrom	Submitted on: 04/10/2023 Musculoskeletal Tumor Society: Board or committee member Onkos Surgical, Inc.: Paid consultant
George	Ochenjele	Submitted on: 09/26/2022 Journal of Bone and Joint Surgery - American: Editorial or governing board Journal of Orthopaedic Trauma: Editorial or governing board Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board Southeastern Fracture Consortium: Board or committee member
Shawn	O'Driscoll	Submitted on: 05/30/2023 Acumed, LLC: IP royalties; Research support; Unpaid consultant Aircast(DJ): IP royalties Stryker: IP royalties; Paid consultant; Paid presenter or speaker; Research support
Jacob	Oeding	Submitted on: 10/21/2023 Kaliber.ai: Paid consultant
William	Oetojo	(This individual reported nothing to disclose); Submitted on: 05/23/2022
Feyikemi	Ogunfuwa	(This individual reported nothing to disclose); Submitted on: 06/21/2023
Ayobami	Ogunsola	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Kelechi	Okoroha	Submitted on: 05/11/2022 Arthrex, Inc: Paid consultant Smith & Nephew: Paid consultant
Shawn	Okpara	(This individual reported nothing to disclose); Submitted on: 06/23/2023
Lasun	Oladeji	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Victoria	Oladipo	(This individual reported nothing to disclose); Submitted on: 06/02/2022

First Name	Last Name	Disclosure
Catherine	Olinger	Submitted on: 08/01/2022 Globus Medical: Paid presenter or speaker Proprio: Paid consultant
Adrian	Olson	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Olivia	O'Reilly	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Mark	Orland	(This individual reported nothing to disclose); Submitted on: 06/14/2022
Cedric	Ortiguera	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Douglas	Osmon	(This individual reported nothing to disclose); Submitted on: 05/19/2022
Chukwuemeka	Osondu	(This individual reported nothing to disclose); Submitted on: 10/17/2022
Erik	Otterberg	Submitted on: 02/16/2022 Arthritis Foundation: Board or committee member Mid America Orthopedic Association: Board or committee member
Aaron	Owen	(This individual reported nothing to disclose); Submitted on: 11/01/2022
Precious	Oyem	(This individual reported nothing to disclose); Submitted on: 04/10/2023
Benjamin	Packard	(This individual reported nothing to disclose); Submitted on: 12/04/2023
Saiswarnesh	Padmanabhan	(This individual reported nothing to disclose); Submitted on: 04/10/2023
Mark	Pagnano	Submitted on: 07/31/2022 DePuy, A Johnson & Johnson Company: IP royalties Hip Society: Board or committee member Knee Society: Board or committee member Stryker: IP royalties Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Lucas	Paladino	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Andrew	Paliobeis	(This individual reported nothing to disclose); Submitted on: 02/21/2024
Xuankang	Pan	(This individual reported nothing to disclose); Submitted on: 05/30/2022
Vinod	Panchbhavi	Submitted on: 07/15/2023 AAOS: Board or committee member American Orthopaedic Foot and Ankle Society: Board or committee member Foot and Ankle InternationalTechniques in Foot & Ankle SurgeryOrthopedia.com: Editorial or governing board Stryker: Paid presenter or speaker Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Amit	Parekh	(This individual reported nothing to disclose); Submitted on: 12/01/2023
Amrit	Parihar	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Kwan	Park	Submitted on: 06/01/2022 Journal of Bone and Joint Surgery - British: Editorial or governing board Smith & Nephew: Paid consultant
John	Parker	(This individual reported nothing to disclose); Submitted on: 10/27/2023
Ali	Parsa	(This individual reported nothing to disclose); Submitted on: 06/12/2023

First Name	Last Name	Disclosure
Javad	Parvizi	Submitted on: 05/30/2023 3M: Research support Acumed, LLC: Stock or stock Options Aesculap: Research support Alphaeon: Stock or stock Options AO Spine: Research support Becton Dickenson: IP royalties; Paid consultant Biomet: Research support Cardinal Health: Paid consultant Cempra: Research support CeramTec: Research support Ceribell: Stock or stock Options Coracoid: Stock or stock Options Corentec: IP royalties; Paid consultant Datatrace: Publishing royalties, financial or material support DePuy: Research support Elsevier: Publishing royalties, financial or material support Elute: Stock or stock Options Ethicon: Paid consultant Hip Innovation Technology: Stock or stock Options Illuminus: Stock or stock Options Integra: Research support Intellijoint: Stock or stock Options Jaypee Publishers: Publishing royalties, financial or material support KCI / 3M (Acelity): Paid consultant Lima: Research support MicroGenDx: Paid consultant
Ignacio	Pasqualini	(This individual reported nothing to disclose); Submitted on: 10/08/2022
Akshar	Patel	(This individual reported nothing to disclose); Submitted on: 10/13/2022

First Name	Last Name	Disclosure
Alpesh	Patel	Submitted on: 06/05/2023 Alphatec Spine: IP royalties; Paid consultant Amedica: IP royalties; Paid consultant; Stock or stock Options American Orthopaedic Association: Board or committee member Cervical Spine Research Society: Board or committee member Cytonics: Stock or stock Options DePuy, A Johnson & Johnson Company: Paid consultant EndoLuxe: Stock or stock Options Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board; Publishing royalties, financial or material support Kuros Biosciences: Paid consultant Nocimed: Stock or stock Options North American Spine Society: Board or committee member Nuvasive: IP royalties; Paid consultant nView Medical Inc: Stock or stock Options Spine BioPharma: Stock or stock Options Springer: Publishing royalties, financial or material support Surgical Neurology International: Editorial or governing board Tissue Differentiation Intelligence: Stock or stock Options Wolters Kluwer Health - Lippincott Williams & Wilkins: Editorial or governing board Zimmer: Paid consultant
Arpan	Patel	(This individual reported nothing to disclose); Submitted on: 05/19/2022
Rohan	Patel	(This individual reported nothing to disclose); Submitted on: 06/16/2023
Sohum	Patel	(This individual reported nothing to disclose); Submitted on: 05/23/2022
Michael	Patetta	(This individual reported nothing to disclose); Submitted on: 10/13/2022
Nihar	Pathare	(This individual reported nothing to disclose); Submitted on: 11/12/2023
Manish	Pathuri	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Cole	Patrick	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Brendan	Patterson	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Ryan	Pattyn	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Avinash	Patwardhan	Submitted on: 06/01/2022 3spine: Research support; Stock or stock Options DePuy, A Johnson & Johnson Company: Research support Medtronic: Research support Orthofix, Inc.: Paid consultant; Research support Stryker: Research support
Kyle	Paul	(This individual reported nothing to disclose); Submitted on: 04/10/2023
Katelyn	Paulsen	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Michael	Peabody	Submitted on: 04/30/2022 American Board of Orthopaedic Surgery, Inc.: Board or committee member
Lindsey	Peng	(This individual reported nothing to disclose); Submitted on: 10/27/2023
Dmitry	Peresada	(This individual reported nothing to disclose); Submitted on: 05/29/2022
Kevin	Perry	Submitted on: 11/28/2022 DePuy, A Johnson & Johnson Company: Paid consultant
Sabrina	Pescatore	(This individual reported nothing to disclose); Submitted on: 10/21/2023
Blaire	Peterson	(This individual reported nothing to disclose); Submitted on: 11/29/2023

First Name	Last Name	Disclosure
Cole	Phelps	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Rachel	Phillips	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Seth	Phillips	Submitted on: 12/01/2023 Johnson & Johnson: Paid presenter or speaker
Andrew	Pierce	(This individual reported nothing to disclose); Submitted on: 05/17/2023
Jennifer	Pierce	(This individual reported nothing to disclose); Submitted on: 05/27/2022
Jim	Pierrepont	Submitted on: 07/04/2023 Corin U.S.A.: Employee (the content of the activity is not related to the business lines or products of their employer/company; the content of the accredited activity is limited to basic science research, such as preclinical research and drug discovery, or the methodologies of research, and they do not make care recommendations); Stock or stock Options
Sarah	Pierrie	Submitted on: 09/25/2023 Orthopaedic Trauma Association: Board or committee member Stryker: Other financial or material support
Zachariah	Pinter	(This individual reported nothing to disclose); Submitted on: 05/05/2023
Molly	Piper	(This individual reported nothing to disclose); Submitted on: 11/21/2023
Frank	Piscitani	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Nicolas	Piuzzi	Submitted on: 05/30/2023 American Association of Hip and Knee Surgeons: Board or committee member ISCT: Board or committee member Journal of Hip Surgery: Editorial or governing board Journal of Knee Surgery: Editorial or governing board Orthopaedic Research Society: Board or committee member Osteal Therapeutics: Research support Peptilogics: Research support RegenLab: Research support Signature Orthopaedics: Research support Stryker: Paid consultant Zimmer: Research support
Mark	Plantz	(This individual reported nothing to disclose); Submitted on: 05/23/2022
Sarah	Poirier	(This individual reported nothing to disclose); Submitted on: 05/27/2023
Gregory	Polkowski	Submitted on: 05/01/2023 American Association of Hip and Knee Surgeons: Board or committee member DJ Orthopaedics: IP royalties; Paid consultant
Michael	Polmear	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Brent	Ponce	Submitted on: 06/02/2022 American Orthopaedic Association: Board or committee member Help Lightning: Stock or stock Options Orthopedic Designs North America Inc.: Paid consultant Smith & Nephew: Paid consultant Stryker: IP royalties; Paid consultant; Paid presenter or speaker
Ajay	Potluri	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Keshav	Poudel	(This individual reported nothing to disclose); Submitted on: 04/28/2023
Srihari	Prahad	(This individual reported nothing to disclose); Submitted on: 10/06/2022

First Name	Last Name	Disclosure
Brittaney	Pratt	(This individual reported nothing to disclose); Submitted on: 05/27/2023
Michael	Prayson	(This individual reported nothing to disclose); Submitted on: 01/09/2024
Haley	Prough	(This individual reported nothing to disclose); Submitted on: 06/13/2023
Bonhomme	Prud'homme	Submitted on: 08/29/2023 AAOS: Board or committee member American Society for Surgery of the Hand: Board or committee member Arthrex, Inc: Research support Integra: Research support West Virginia Medical Political Action Committee , Chairman: Board or committee member West Virginia Orthopaedic Society Exec. Committee: Board or committee member West Virginia State Medical Association: Board or committee member
Andrew	Pugely	Submitted on: 10/14/2022 AAOS: Board or committee member Clinical Orthopaedics and Related Research: Editorial or governing board Globus Medical: IP royalties; Paid consultant Medtronic: Other financial or material support; Paid consultant North American Spine Society: Board or committee member Spine: Editorial or governing board United Health Care: Paid consultant
Nicolas	Pulos	Submitted on: 12/22/2022 Trimed: Paid presenter or speaker
Andrew	Pumford	(This individual reported nothing to disclose); Submitted on: 10/22/2023
Nihal	Punjabi	(This individual reported nothing to disclose); Submitted on: 05/10/2022
Andrew	Qi	(This individual reported nothing to disclose); Submitted on: 06/12/2023
Jonathan	Quade	Submitted on: 02/02/2022 Smith & Nephew: Paid consultant
Matthew	Quinn	(This individual reported nothing to disclose); Submitted on: 04/30/2023
Julia	Quirion	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Dashaun	Ragland	(This individual reported nothing to disclose); Submitted on: 04/14/2023
Roman	Rahmani	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Rajiv	Rajani	Submitted on: 10/06/2022 AAOS: Board or committee member American Orthopaedic Association: Board or committee member Bonesupport: Unpaid consultant Cerasorb: Research support Daiichi Sankyo: Paid consultant Musculoskeletal Tumor Society: Board or committee member
Rebecca	Rajfer	Submitted on: 07/09/2023 KLRM, LLC: Other financial or material support
Yazdan	Raji	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Wendy	Ramalingam	Submitted on: 04/07/2023 Pediatric Orthopaedic Society of North America: Board or committee member
Pradip	Ramamurti	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Michael	Ramos	(This individual reported nothing to disclose); Submitted on: 12/01/2023

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Jeffrey	Randall	Submitted on: 11/13/2022 Johnson & Johnson: Stock or stock Options Stryker: Stock or stock Options
Ryan	Rauck	Submitted on: 08/15/2023 Arthrex, Inc: Paid consultant
Varun	Ravi	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Anna	Redden	(This individual reported nothing to disclose); Submitted on: 06/04/2022
Esha	Reddy	(This individual reported nothing to disclose); Submitted on: 02/21/2024
Sai	Reddy	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Harold	Rees	Submitted on: 10/21/2023 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member Arthroplasty Today: Editorial or governing board Journal of Arthroplasty: Editorial or governing board Orthopedics: Editorial or governing board PLOS one: Editorial or governing board
Jeffrey	Reeves	Submitted on: 01/11/2024 Think Surgical, Inc: Paid consultant
Christina	Regan	Submitted on: 05/22/2023 Stryker: Stock or stock Options
Lisa	Reider	(This individual reported nothing to disclose); Submitted on: 06/02/2022
Anna	Reinholz	(This individual reported nothing to disclose); Submitted on: 05/25/2023
Hallie	Remer	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Weiping	Ren	(This individual reported nothing to disclose); Submitted on: 05/25/2022
Thomas	Revak	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Nicolas	Revelt	(This individual reported nothing to disclose); Submitted on: 06/14/2023
Peter	Rhee	Submitted on: 06/05/2023 American Association for Hand Surgery: Board or committee member American Society for Surgery of the Hand: Board or committee member
Alexander	Richards	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Jarod	Richards	(This individual reported nothing to disclose); Submitted on: 04/18/2023
David	Richardson	Submitted on: 12/29/2023 AAOS: Board or committee member Extremity Medical: IP royalties Saunders/Mosby-Elsevier: Publishing royalties, financial or material support
Carlos	Rivera-Peraza	(This individual reported nothing to disclose); Submitted on: 01/09/2024
Marco	Rizzo	Submitted on: 12/14/2022 American Society for Surgery of the Hand: Board or committee member
Heather	Roberts	(This individual reported nothing to disclose); Submitted on: 06/03/2023
Augusto	Roca	(This individual reported nothing to disclose); Submitted on: 06/14/2022
Matthew	Rode	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Jacquelyn	Roggenbuck	(This individual reported nothing to disclose); Submitted on: 05/26/2023
Cooper	Root	(This individual reported nothing to disclose); Submitted on: 12/07/2023

First Name	Last Name	Disclosure
Peter	Rose	Submitted on: 10/06/2022 International Society of Limb Salvage (ISOLS): Board or committee member Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board Sacral Tumor Study Group: Board or committee member
Peter	Rose	Submitted on: 10/22/2023 International Society of Limb Salvage (ISOLS): Board or committee member Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board Sacral Tumor Study Group: Board or committee member
Christian	Rosenow	(This individual reported nothing to disclose); Submitted on: 10/28/2022
Phillip	Ross	(This individual reported nothing to disclose); Submitted on: 02/28/2023
Howard	Routman	Submitted on: 10/06/2022 3M: Paid consultant American Shoulder and Elbow Surgeons: Board or committee member Exactech, Inc: IP royalties; Paid consultant; Paid presenter or speaker; Research support; Stock or stock Options
Pouria	Rouzrokh	(This individual reported nothing to disclose); Submitted on: 06/02/2022
Kylee	Rucinski	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Pedro	Rullán	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Robert	Runner	(This individual reported nothing to disclose); Submitted on: 07/13/2022
Benjamin	Russell	Submitted on: 06/01/2022 Astra-Zeneca: Stock or stock Options
Michael	Russell	(This individual reported nothing to disclose); Submitted on: 04/30/2022
Robert	Rutz	(This individual reported nothing to disclose); Submitted on: 07/03/2023
Sarah	Ryan	(This individual reported nothing to disclose); Submitted on: 06/06/2023
Daniel	Ryssman	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Vani	Sabesan	Submitted on: 07/04/2022 Exactech, Inc: Research support Florida Orthopaedic Society: Board or committee member ISTA: Board or committee member Journal of Shoulder and Elbow Surgery: Editorial or governing board Orthofix, Inc.: Research support Pacira: Paid presenter or speaker
Andre	Sabet	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Michael	Sacchetti	Submitted on: 06/05/2023 Pfizer: Stock or stock Options
John	Saczawa	(This individual reported nothing to disclose); Submitted on: 02/21/2024
Comron	Saifi	Submitted on: 10/07/2022 Acquisition of Vertera Inc. by NuVasive' Shares: Stock or stock Options Alphatec Spine: Stock or stock Options Nuvasive: Paid consultant Restor3d: Stock or stock Options
Michael	Salata	Submitted on: 05/17/2022 Stryker: Paid consultant

First Name	Last Name	Disclosure
Dane	Salazar	Submitted on: 05/24/2022 American Orthopaedic Association: Board or committee member Tornier: Paid consultant Zimmer: Paid consultant
Harold	Salmons	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Senthil	Sambandam	(This individual reported nothing to disclose); Submitted on: 04/25/2022
Douglas	Sammer	(This individual reported nothing to disclose); Submitted on: 02/02/2024
Joaquin	Sanchez-Sotelo	Submitted on: 11/10/2023 Acumed, LLC: Paid consultant American Shoulder and Elbow Surgeons: Board or committee member Elsevier: Publishing royalties, financial or material support Exactech, Inc: Paid consultant Journal of Shoulder and Elbow Surgery: Editorial or governing board; Publishing royalties, financial or material support Orthobullets: Stock or stock Options Oxford University Press: Publishing royalties, financial or material support Precision OS: Stock or stock Options PSI: Stock or stock Options Stryker: IP royalties; Paid presenter or speaker; Research support
Alexander	Sanders	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Ryan	Sanii	(This individual reported nothing to disclose); Submitted on: 04/18/2023
Srivani	Sanikommu	(This individual reported nothing to disclose); Submitted on: 06/06/2023
Matthew Turne	Sankey	(This individual reported nothing to disclose); Submitted on: 06/06/2022
Adrian	Santana	(This individual reported nothing to disclose); Submitted on: 06/04/2023
Nikolas	Sarac	(This individual reported nothing to disclose); Submitted on: 04/26/2023
Mohamed-Ali (	Sareini	(This individual reported nothing to disclose); Submitted on: 04/29/2022
Daniel	Saris	Submitted on: 10/13/2022 Cartilage: Editorial or governing board JRF: Research support NewClip: Paid consultant
Abdus	Sattar	(This individual reported nothing to disclose); Submitted on: 06/04/2023
Domonik	Saul	(This individual reported nothing to disclose); Submitted on: 04/28/2023

First Name	Last Name	Disclosure
Arjun	Saxena	Submitted on: 06/02/2023 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member American Board of Orthopaedic Surgery, Inc.: Board or committee member Corin U.S.A.: Paid consultant Eastern Orthopaedic Association: Board or committee member Halyard: Research support Journal of Arthroplasty: Editorial or governing board Journal of Bone and Joint Surgery - American: Editorial or governing board Journal of Surgical Orthopaedic Advances: Editorial or governing board Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board Parvizi Surgical Innovations: Stock or stock Options United Orthopaedics: Research support
Mila	Scheinberg	(This individual reported nothing to disclose); Submitted on: 05/29/2022
Samuel	Schick	(This individual reported nothing to disclose); Submitted on: 05/26/2022
Anna	Schildmeyer	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Daniel	Schmitt	Submitted on: 06/22/2022 HipInsight: Paid consultant
Bradley	Schoch	Submitted on: 04/29/2022 Exactech, Inc: IP royalties; Paid consultant Innomed: IP royalties Responsive Arthroscopy: IP royalties; Paid consultant
Beth	Schueler	Submitted on: 06/03/2022 CAMPEP: Board or committee member
Herbert	Schwartz	Submitted on: 06/27/2022 American Board of Orthopaedic Surgery, Inc.: Board or committee member Musculoskeletal Transplant Foundation: Other financial or material support
Kyle	Schweser	Submitted on: 04/12/2023 AAOS: Board or committee member AO North America: Board or committee member Arthrex, Inc: Research support ODi: IP royalties Orthopaedic Trauma Association: Board or committee member
Jacob	Scott	(This individual reported nothing to disclose); Submitted on: 04/11/2023

First Name	Last Name	Disclosure
Peter	Sculco	Submitted on: 10/09/2022 DePuy, A Johnson & Johnson Company: Paid consultant; Paid presenter or speaker EOS Imaging: Paid consultant; Paid presenter or speaker Intellijoint Surgical: Paid consultant; Paid presenter or speaker; Stock or stock Options Intelljoint Surgical: Research support Lima Corporate: Paid consultant Parvizi Surgical Innovation: Stock or stock Options Zimmer: Paid consultant
Arjun	Sebastian	Arjun Sebastian, MD, FAAOS Submitted on: 05/31/2023 Cerapedics: Paid consultant; Paid presenter or speaker CTL Amedica: IP royalties DePuy, A Johnson & Johnson Company: Paid consultant Jaypee Publishers: IP royalties
Sara	Seegert	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Abhijit	Seetharam	(This individual reported nothing to disclose); Submitted on: 05/13/2022
Courtney	Seffker	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Jeremy	Seidt	(This individual reported nothing to disclose); Submitted on: 11/30/2023
Ali	Seifi	Submitted on: 11/16/2022 Chiesi: Paid presenter or speaker HiccAway: IP royalties
S. Andrew	Sems	Submitted on: 06/01/2023 Zimmer: IP royalties; Paid consultant
Philip	Serbin	(This individual reported nothing to disclose); Submitted on: 04/20/2022
Joseph	Serino	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Stefano	Serpelloni	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Joseph	Seta	Submitted on: 11/30/2023 Eli Lilly: Employee (family member)
Michael	Seward	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Michael	Shaffer	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Aakash	Shah	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Ashish	Shah	Submitted on: 05/31/2022 American Orthopaedic Foot and Ankle Society: Board or committee member
Chirag	Shah	Submitted on: 04/10/2023 American Brachytherapy Society: Board or committee member ASTRO: Board or committee member Brachytherapy: Editorial or governing board Impedimed: Paid consultant PreludeDX: Paid consultant; Research support Varian: Research support Videra Surgical: Paid consultant
Nihar	Shah	(This individual reported nothing to disclose); Submitted on: 02/02/2022
Ronit	Shah	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Sapan	Shah	(This individual reported nothing to disclose); Submitted on: 06/14/2022
Hania	Shahzad	(This individual reported nothing to disclose); Submitted on: 10/07/2022

First Name	Last Name	Disclosure
Kaitlyn	Shank	Submitted on: 12/01/2023 Moximed, Inc.: Paid consultant
Chris	Sharp	(This individual reported nothing to disclose); Submitted on: 05/18/2023
William	Shaughnessy	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Alexander	Shin	Submitted on: 04/29/2023 Integra Life Sciences: Paid consultant Mayo Medical Ventures: IP royalties Techniques in Hand and Upper Extremity Surgery: Editorial or governing board Trimed: IP royalties
Krishin	Shivdasani	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Justin	Siebler	Submitted on: 08/17/2023 AONA Trauma Faculty: Board or committee member MAOA: Board or committee member
Eric	Siegel	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Rafael	Sierra	Submitted on: 05/06/2022 American Association of Hip and Knee Surgeons: Board or committee member Anchor study group: Board or committee member Biomet: Paid consultant; Paid presenter or speaker Cytori: Research support DePuy, A Johnson & Johnson Company: Research support Journal of Arthroplasty: Editorial or governing board Knee Society: Board or committee member Link Orthopaedics: IP royalties; Paid consultant Muller Foundation: Board or committee member Orthalign: IP royalties; Research support Orthoalign: Paid consultant; Stock or stock Options Springer: Publishing royalties, financial or material support Stryker, Biomet: Research support Think: Paid consultant Zimmer: IP royalties; Research support
Breana	Siljander	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Xavier	Simcock	(This individual reported nothing to disclose); Submitted on: 06/08/2023
Karissa	Simon	(This individual reported nothing to disclose); Submitted on: 02/10/2023
Stefanie	Simpson	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Aaron	Singh	(This individual reported nothing to disclose); Submitted on: 11/16/2022
Margaret	Sinkler	(This individual reported nothing to disclose); Submitted on: 10/08/2022
Nandini	Siva	(This individual reported nothing to disclose); Submitted on: 06/30/2023
Mary	Skalitzky	(This individual reported nothing to disclose); Submitted on: 05/30/2022
Anthony	Sleiman	(This individual reported nothing to disclose); Submitted on: 12/04/2023
Anne	Smartt	(This individual reported nothing to disclose); Submitted on: 06/13/2023
Austin	Smith	(This individual reported nothing to disclose); Submitted on: 04/24/2023
John-Rudolph	Smith	(This individual reported nothing to disclose); Submitted on: 06/03/2022
Kira	Smith	(This individual reported nothing to disclose); Submitted on: 05/27/2023
Langan	Smith	(This individual reported nothing to disclose); Submitted on: 05/27/2022

First Name	Last Name	Disclosure
Matthew	Smith	Submitted on: 10/23/2023 American Shoulder and Elbow Surgeons: Board or committee member Current Orthopedic Practice: Editorial or governing board DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant; Paid presenter or speaker Ignite Orthopedics: IP royalties; Stock or stock Options
Nolan	Smith	(This individual reported nothing to disclose); Submitted on: 05/28/2023
Patrick	Smith	Submitted on: 04/24/2023 American Orthopaedic Society for Sports Medicine: Board or committee member Arthrex, Inc: IP royalties; Paid consultant; Paid presenter or speaker; Research support Arthroscopy Association of North America: Board or committee member Associate Editor- Journal of Knee Surgery: Editorial or governing board Spinal Simplicity: Stock or stock Options
Richard	Smith	(This individual reported nothing to disclose); Submitted on: 07/06/2023
Shelby	Smith	(This individual reported nothing to disclose); Submitted on: 06/03/2023
Walter	Smith	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Kevin	Sonn	Submitted on: 10/23/2023 DJO Surgical: Paid presenter or speaker
John	Sontich	Submitted on: 09/19/2022 Stryker: IP royalties; Paid consultant; Paid presenter or speaker
Anshum	Sood	(This individual reported nothing to disclose); Submitted on: 06/15/2022
Dane	Sorensen	(This individual reported nothing to disclose); Submitted on: 01/22/2024
Amy	Speeckaert	Submitted on: 05/03/2022 Johnson & Johnson: Paid presenter or speaker
David	Spence	Submitted on: 06/05/2022 Elsevier: Publishing royalties, financial or material support Orthopediatrics: Research support Pediatric Orthopaedic Society of North America: Board or committee member
John	Sperling	Submitted on: 10/08/2022 Innomed: IP royalties Journal of Shoulder and Elbow Surgery: Editorial or governing board RA: Stock or stock Options Responsive Arthroscopy: IP royalties SLACK Incorporated: Editorial or governing board Zimmer: IP royalties; Paid consultant

First Name	Last Name	Disclosure
Clay	Spitler	Submitted on: 10/07/2022 AAOS: Board or committee member AO North America: Board or committee member AO Trauma: Paid presenter or speaker Delfi Medical Innovations: Other financial or material support DePuy, A Johnson & Johnson Company: Paid consultant Invibio: Paid consultant Journal of Bone and Joint Surgery - American: Editorial or governing board KCI: Paid consultant Orthopaedic Trauma Association: Board or committee member ROM 3 Rehab LLC: Stock or stock Options Stryker: Research support Synthes: Research support
Scott	Sporer	Submitted on: 10/14/2022 American Joint Replacement Regisity: Board or committee member DJO Surgical: IP royalties; Paid consultant Journal of Arthroplasty: Editorial or governing board Knee Society: Board or committee member Osteoremedies: IP royalties; Paid consultant SLACK Incorporated: Publishing royalties, financial or material support Zimmer: IP royalties
Shafic	Sraj	Submitted on: 10/17/2023 Global Nerve Foundation: Board or committee member WV medical Journal: Editorial or governing board WV orthopaedic society: Board or committee member WV State Medical Association: Board or committee member
Mathangi	Sridharan	(This individual reported nothing to disclose); Submitted on: 06/06/2023
Mukund	Srinivas	(This individual reported nothing to disclose); Submitted on: 05/26/2023
Jeffrey	Stambough	Submitted on: 12/07/2022 American Association of Hip and Knee Surgeons: Board or committee member American Joint Replacement Registry (AJRR): Board or committee member CurveBeam: Paid presenter or speaker Journal of Arthroplasty: Editorial or governing board Medacta: Paid consultant Signature Orthopaedics: IP royalties Smith & Nephew: Other financial or material support; Paid consultant
Thomas	Stanila	(This individual reported nothing to disclose); Submitted on: 05/11/2023

First Name	Last Name	Disclosure
James	Stannard	Submitted on: 04/14/2023 American Orthopaedic Association: Board or committee member AO Foundation: Board or committee member AO North America: Board or committee member Arthrex, Inc: Paid consultant; Research support DePuy, A Johnson & Johnson Company: Paid consultant Journal of Knee Surgery: Editorial or governing board Mid-America Orthopaedic Association: Board or committee member National Institutes of Health (NIAMS & NICHD): Research support Orthopedic Designs North America: Paid consultant Smith & Nephew: Paid consultant Thieme: Publishing royalties, financial or material support U.S. Department of Defense: Research support
Anthony	Stans	(This individual reported nothing to disclose); Submitted on: 06/07/2022
Michael	Stefl	(This individual reported nothing to disclose); Submitted on: 06/20/2023
Samuel	Stegelmann	(This individual reported nothing to disclose); Submitted on: 06/07/2022
Richard	Steiner	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Andrew	Stevens	(This individual reported nothing to disclose); Submitted on: 07/02/2023
Kali	Stevens	(This individual reported nothing to disclose); Submitted on: 10/09/2022
Sasha	Stine	(This individual reported nothing to disclose); Submitted on: 02/21/2024
Andrea	Stitgen	(This individual reported nothing to disclose); Submitted on: 09/19/2023
Michael	Stojanovic	(This individual reported nothing to disclose); Submitted on: 10/31/2022
Jason	Strelzow	Submitted on: 10/07/2022 Acumed, LLC: Paid consultant; Paid presenter or speaker American Society for Surgery of the Hand: Board or committee member BoneSupport: Paid consultant; Paid presenter or speaker Journal of Bone and Joint Surgery - American: Editorial or governing board Journal of Hand Surgery - American: Editorial or governing board Orthopaedic Trauma Association: Board or committee member OrthoXel: Paid consultant Stryker: Other financial or material support
Benjamin	Stronach	Submitted on: 03/01/2022 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member DJ Orthopaedics: Paid consultant; Paid presenter or speaker Johnson & Johnson: Paid consultant Joint Development LLC: Stock or stock Options Journal of Bone and Joint Surgery - British: Editorial or governing board MiCare Path: IP royalties Sawbones/Pacific Research Laboratories: IP royalties Tightline Development LLC: IP royalties
John	Strony	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Michael	Stuart	Submitted on: 12/30/2022 Americal Journal of Sports Medicine: Editorial or governing board Arthrex, Inc: IP royalties; Paid consultant; Research support
Alvin	Su	(This individual reported nothing to disclose); Submitted on: 05/29/2022

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Juan	Suarez	Submitted on: 06/01/2022 Arthoplasty Today: Editorial or governing board Corin U.S.A.: IP royalties DePuy, A Johnson & Johnson Company: Paid presenter or speaker
Yehyun	Suh	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Mikaela	Sullivan	(This individual reported nothing to disclose); Submitted on: 08/11/2022
Thomas	Sullivan	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Anna	Sumpter	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Peter	Surace	(This individual reported nothing to disclose); Submitted on: 04/25/2023
Peter	Swiatek	(This individual reported nothing to disclose); Submitted on: 04/26/2022
Thomas	Swiderski	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Steven	Swinehart	(This individual reported nothing to disclose); Submitted on: 05/15/2022
Julio Castillo	Tafur	(This individual reported nothing to disclose); Submitted on: 06/21/2023
Adam	Tagliero	(This individual reported nothing to disclose); Submitted on: 10/10/2022
Julian	Takagi-Stewart	(This individual reported nothing to disclose); Submitted on: 05/21/2023
Jennifer	Tangtiphaiboontana	Submitted on: 04/22/2023 Stryker: Paid consultant
Jason	Tank	(This individual reported nothing to disclose); Submitted on: 06/27/2022
Allison	Tanner	(This individual reported nothing to disclose); Submitted on: 06/02/2023
Francesca	Taraballi	(This individual reported nothing to disclose); Submitted on: 06/03/2022
Majd	Tarabichi	(This individual reported nothing to disclose); Submitted on: 06/23/2023
Armin	Tarakemeh	(This individual reported nothing to disclose); Submitted on: 06/01/2022
John	Taras	Submitted on: 05/22/2023 Union Surgical, LLC: Stock or stock Options
Jordan	Tasse	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Michael	Taunton	Submitted on: 05/02/2022 AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member Enovis: IP royalties; Paid consultant Journal of Arthroplasty: Editorial or governing board Mid America Orthopedic Association: Board or committee member ONKOS: Paid consultant
Jason	Tegethoff	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Jason	Teplensky	(This individual reported nothing to disclose); Submitted on: 02/27/2024
David	Teytelbaum	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Prabin	Thapa	(This individual reported nothing to disclose); Submitted on: 06/02/2023
Steven	Theiss	(This individual reported nothing to disclose); Submitted on: 12/01/2023
Janeen	Thomas	(This individual reported nothing to disclose); Submitted on: 06/12/2023
Austen	Thompson	(This individual reported nothing to disclose); Submitted on: 06/05/2023
David	Thornberg	(This individual reported nothing to disclose); Submitted on: 06/01/2023

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Quin	Throckmorton	Submitted on: 09/23/2023 AAOS: Board or committee member Acta Experientia Orthopaedica: Editorial or governing board American Shoulder and Elbow Surgeons: Board or committee member ASES Foundation: Board or committee member Exactech, Inc: IP royalties; Stock or stock Options Gilead: Stock or stock Options OrthoInfo: Editorial or governing board Osteocentrics: Paid consultant Pacira: Paid presenter or speaker Responsive Arthroscopy: IP royalties; Stock or stock Options Saunders/Mosby-Elsevier: Publishing royalties, financial or material support Shoulder JAM: Stock or stock Options Zimmer: IP royalties; Paid consultant
Thomas	Throckmorton	Submitted on: 10/07/2022 AAOS: Board or committee member Acta Experientia Orthopaedica: Editorial or governing board American Shoulder and Elbow Surgeons: Board or committee member ASES Foundation: Board or committee member Exactech, Inc: IP royalties; Stock or stock Options Gilead: Stock or stock Options OrthoInfo: Editorial or governing board Osteocentrics: Paid consultant Pacira: Paid presenter or speaker Responsive Arthroscopy: IP royalties; Stock or stock Options Saunders/Mosby-Elsevier: Publishing royalties, financial or material support Shoulder JAM: Stock or stock Options Zimmer: IP royalties; Paid consultant
Sowmayanaray	Thuppal	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Joshua	Tidd	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Madeline	Tiee	(This individual reported nothing to disclose); Submitted on: 06/06/2023
Mikel	Tihista	(This individual reported nothing to disclose); Submitted on: 06/27/2023
Matthew	Tille	(This individual reported nothing to disclose); Submitted on: 12/02/2023
Julia	Todderud	(This individual reported nothing to disclose); Submitted on: 06/04/2023
John	Tokish	Submitted on: 07/17/2023 Arthrex, Inc: IP royalties; Paid consultant; Paid presenter or speaker Arthroscopy Association of North America: Board or committee member Journal of Shoulder and Elbow Surgery: Editorial or governing board; Publishing royalties, financial or material support Orthopedics Today: Editorial or governing board
Reid	Tompkins	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Paul	Tornetta	Submitted on: 06/02/2023 Journal of Orthopaedic Trauma: Editorial or governing board Smith & Nephew: IP royalties Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

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Sarah	Townsley	(This individual reported nothing to disclose); Submitted on: 06/02/2023
Dana	Tran	(This individual reported nothing to disclose); Submitted on: 05/30/2023
M. Bryant	Transtrum	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Delano	Trenchfield	(This individual reported nothing to disclose); Submitted on: 04/03/2023
Taylor	Trentadue	(This individual reported nothing to disclose); Submitted on: 12/09/2023
Robert	Trousdale	Submitted on: 05/21/2022 American Association of Hip and Knee Surgeons: Board or committee member DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant Hip Society: Board or committee member Journal of Arthroplasty: Editorial or governing board Knee Society: Board or committee member
Luke	Troyer	(This individual reported nothing to disclose); Submitted on: 05/28/2023
Joyee	Tseng	(This individual reported nothing to disclose); Submitted on: 03/29/2023
Despina	Tsitlakidou	(This individual reported nothing to disclose); Submitted on: 06/04/2023
Oguz	Turan	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Amr	Turkmani	(This individual reported nothing to disclose); Submitted on: 05/31/2023
Alexander	Turner	(This individual reported nothing to disclose); Submitted on: 06/09/2023
Norman	Turner	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Heather	Vallier	Submitted on: 04/06/2023 Evellere Group: Paid consultant Journal of Orthopaedic Trauma: Editorial or governing board Orthopaedic Trauma Association: Board or committee member
Matthew G.	Van Engen	(This individual reported nothing to disclose); Submitted on: 11/29/2023
Julio	Vandama	(This individual reported nothing to disclose); Submitted on: 05/30/2023
Sandy	Vang	(This individual reported nothing to disclose); Submitted on: 04/27/2023
Cayen	VanLaere	MAOA staff (This individual reported nothing to disclose); Submitted on: 03/28/2023
Kevin	Varner	Submitted on: 05/30/2023 CONMED Linvatec: IP royalties In2Bone: IP royalties; Paid consultant; Stock or stock Options
Arya	Varthi	(This individual reported nothing to disclose); Submitted on: 12/09/2022
Neal	Vasireddi	(This individual reported nothing to disclose); Submitted on: 06/30/2022
Nikhil	Vasireddi	(This individual reported nothing to disclose); Submitted on: 04/03/2023
Matt	Vassar	Submitted on: 06/06/2022 BMC Medical Research Methodology: Editorial or governing board
Zachary	Vaupel	Submitted on: 06/28/2022 Anderson Medical: Paid consultant NewClip Technics: IP royalties
Sree	Vemu	(This individual reported nothing to disclose); Submitted on: 06/21/2023
Nikit	Venishetty	(This individual reported nothing to disclose); Submitted on: 06/01/2022
Martijn	Verhoeven	(This individual reported nothing to disclose); Submitted on: 05/26/2022
Garrhett	Via	(This individual reported nothing to disclose); Submitted on: 06/28/2023

First Name	Last Name	Disclosure
Jonathan	Vigdorchik	Submitted on: 06/29/2023 American Association of Hip and Knee Surgeons: Board or committee member Aware: Stock or stock Options Corin U.S.A.: IP royalties; Stock or stock Options DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant Intellijoint Surgical: Paid consultant; Stock or stock Options Journal of Bone and Joint Surgery - British: Editorial or governing board Motion Insights: Stock or stock Options Ortho AI: Stock or stock Options Polaris: Stock or stock Options Stryker: Paid consultant
Gayathri	Vijayakumar	This individual reported nothing to disclose); Submitted on: 01/11/2023
Arjun	Vohra	Submitted on: 05/08/2023 Ascension Health: Employee (The content of the activity is not related to the business lines or products of their employer/company; The content of the accredited activity is limited to basic science research, such as pre-clinical research and drug discovery, or the methodologies of research, and they do not make care recommendations.) AstraZeneca: Stock or stock Options Banner Health: Employee (The content of the activity is not related to the business lines or products of their employer/company; The content of the accredited activity is limited to basic science research, such as pre-clinical research and drug discovery, or the methodologies of research, and they do not make care recommendations.) Johnson & Johnson: Stock or stock Options Pfizer: Stock or stock Options
Elan	Volchenko	(This individual reported nothing to disclose); Submitted on: 06/27/2022
James	Voos	Submitted on: 05/31/2023 Arthrex, Inc: Paid consultant DePuy, A Johnson & Johnson Company: Paid consultant
Bryan	Vopat	Submitted on: 02/10/2023 Altior: Stock or stock Options American Orthopaedic Foot and Ankle Society: Board or committee member Artelon: Paid consultant Carbon 22: Stock or stock Options Spinal Simplicity: Stock or stock Options
Lisa	Vopat	Submitted on: 06/27/2022 Altior: Stock or stock Options American Orthopaedic Foot and Ankle Society: Board or committee member Artelon: Paid consultant Carbon 22: Stock or stock Options Ortho Bullets: Stock or stock Options Spinal Simplicity: Stock or stock Options
Matthew	Vopat	(This individual reported nothing to disclose); Submitted on: 06/22/2022
Thuc	Vu	(This individual reported nothing to disclose); Submitted on: 06/12/2023

First Name	Last Name	Disclosure
Elizabeth	Wacker	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Susan	Wager	(This individual reported nothing to disclose); Submitted on: 12/15/2022
Eric	Wagner	Submitted on: 04/16/2023 Acumed, LLC: Paid consultant Biomet: Paid consultant Konica Minolta: Research support Osteoremedies: Paid consultant Stryker: Paid consultant
Lianne	Wagner	(This individual reported nothing to disclose); Submitted on: 02/04/2024
Emily	Wagstrom	Submitted on: 08/22/2023 Stryker: Paid consultant
Brian	Wahlig	(This individual reported nothing to disclose); Submitted on: 10/27/2022
Jacob	Walz	(This individual reported nothing to disclose); Submitted on: 02/23/2024
Allen	Wang	(This individual reported nothing to disclose); Submitted on: 06/03/2022
Christopher	Warne	(This individual reported nothing to disclose); Submitted on: 05/24/2023
Lucian	Warth	Submitted on: 04/28/2023 American Association of Hip and Knee Surgeons: Board or committee member DJO: Paid consultant Link Orthopaedics: Paid consultant Medacta: Paid consultant OsteoRemedies: Paid consultant
Kareem	Wasef	(This individual reported nothing to disclose); Submitted on: 04/30/2023
John Tracy	Watson	Submitted on: 05/03/2023 AAOS: Board or committee member Arthrex, Inc: IP royalties Bioventus: Paid consultant Nuvasive: IP royalties; Paid presenter or speaker Orthopaedic Trauma Association: Board or committee member Smith & Nephew: Paid consultant; Paid presenter or speaker Zimmer: Paid presenter or speaker
Martin	Weaver	(This individual reported nothing to disclose); Submitted on: 06/05/2023
Bradley	Weiner	Submitted on: 03/29/2023 AAOS: Board or committee member AOA: Board or committee member North American Spine Society: Board or committee member SpineThe Spine Journal: Editorial or governing board
Joseph	Weiner	(This individual reported nothing to disclose); Submitted on: 04/22/2023
Matthew	Weintraub	(This individual reported nothing to disclose); Submitted on: 10/06/2022
William	Weiss	Submitted on: 06/23/2022 Arthroscopy: Editorial or governing board Arthroscopy Association of North America: Board or committee member Bone & Joint 360: Editorial Board: Editorial or governing board Canadian Orthopaedic Association: Board or committee member
Clayton	Welsh	(This individual reported nothing to disclose); Submitted on: 12/11/2023
Kirk	Welsh	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Doris	Wenger	(This individual reported nothing to disclose); Submitted on: 06/12/2023

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Glenn	Wera	Submitted on: 11/11/2023 AAOS: Board or committee member Association of Bone and Joint Surgeons: Board or committee member Clinical Orthopaedics and Related Research: Editorial or governing board Mid America Orthopaedic Association: Board or committee member Smith & Nephew: Paid consultant
Michael	Wesolowski	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Robert	Westermann	Submitted on: 12/05/2022 AJSM: Editorial or governing board American Orthopaedic Society for Sports Medicine: Board or committee member Arthroscopy: Editorial or governing board Arthroscopy Association of North America: Board or committee member CONMED Linvatec: Paid consultant Responsive Arthroscopy: Paid consultant Smith & Nephew: Paid consultant; Research support
Robert	Wetzel	Submitted on: 01/11/2023 Advance Medical: Paid consultant Biocomposites, Inc: Paid consultant Bone Solutions, Inc: Paid consultant; Stock or stock Options Innomed: IP royalties Paragon 28: Paid consultant Royal Biologics: IP royalties; Paid consultant Smith & Nephew: IP royalties; Paid consultant Stryker: Paid consultant; Stock or stock Options
Ryan	White	(This individual reported nothing to disclose); Submitted on: 04/17/2023
Keith	Whitlock	(This individual reported nothing to disclose); Submitted on: 06/21/2023
J. Michael	Wiater	Submitted on: 08/30/2023 American Shoulder and Elbow Surgeons: Board or committee member Catalyst OrthoScience LLC: Paid consultant; Stock or stock Options Coracoid Solutions, LLC: Stock or stock Options DePuy, A Johnson & Johnson Company: Paid consultant Ignite Orthopedics: Stock or stock Options Ignite Orthopedics, LLC: IP royalties Innomed: IP royalties Journal of Shoulder and Elbow Surgery: Editorial or governing board Seminars in Arthroplasty: JSES: Editorial or governing board Smith & Nephew: IP royalties Zimmer: Research support
Joshua	Wiener	Submitted on: 01/09/2024 (This individual reported nothing to disclose)
Michael	Willey	Submitted on: 04/04/2023 Excere Inc.: Research support
Tyler	William	(This individual reported nothing to disclose); Submitted on: 06/02/2023
Joel	Williams	(This individual reported nothing to disclose); Submitted on: 06/04/2022
Marshall	Williams	(This individual reported nothing to disclose); Submitted on: 06/03/2022
Tyler	Williamson	(This individual reported nothing to disclose); Submitted on: 06/02/2023
Ayana	Wilson	(This individual reported nothing to disclose); Submitted on: 06/26/2023

First Name	Last Name	Disclosure
Jacob	Wilson	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Seth	Wilson	(This individual reported nothing to disclose); Submitted on: 05/30/2023
John	Wilson Stout	(This individual reported nothing to disclose); Submitted on: 06/15/2022
Austin	Wininger	(This individual reported nothing to disclose); Submitted on: 05/16/2022
Ethan	Winter	(This individual reported nothing to disclose); Submitted on: 10/04/2023
Robert	Wojahn	(This individual reported nothing to disclose); Submitted on: 01/07/2024
Bartosz	Wojewnik	Submitted on: 11/10/2022 Lumbar Spine Research Society: Board or committee member
Brian	Wolf	Submitted on: 05/05/2023 American Orthopaedic Association: Board or committee member American Orthopaedic Society for Sports Medicine: Board or committee member CONMED Linvatec: IP royalties; Paid consultant; Paid presenter or speaker Mid America Orthopaedic Association: Board or committee member Orthopaedic Journal of Sports Medicine: Editorial or governing board
Megan	Wolf	Submitted on: 04/07/2023 MAZOR Surgical Technologies: Stock or stock Options Medtronic: Employee (family member); Stock or stock Options
David	Woodard	(This individual reported nothing to disclose); Submitted on: 04/14/2023
Grant	Woods	(This individual reported nothing to disclose); Submitted on: 02/12/2024
Amy	Wozniak	(This individual reported nothing to disclose); Submitted on: 05/27/2022
Breydan	Wright	(This individual reported nothing to disclose); Submitted on: 05/25/2023
Kitty	Wu	(This individual reported nothing to disclose); Submitted on: 07/02/2022
Cody	Wyles	(This individual reported nothing to disclose); Submitted on: 08/13/2023
Robert	Wysocki	Submitted on: 06/29/2022 American Society for Surgery of the Hand: Board or committee member
James	Xu	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Madhusudhan	Yakkanti	Submitted on: 05/29/2023 Synthes- Received honororium for participation as a table instructor in a shoulder course sponsored by Synthes: Other financial or material support
Anel	Yakupovich	(This individual reported nothing to disclose); Submitted on: 06/13/2023
Jae	Yang	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Matthew	Yeager	(This individual reported nothing to disclose); Submitted on: 02/06/2024
Joseph	Young	(This individual reported nothing to disclose); Submitted on: 05/29/2023
Sean	Young	(This individual reported nothing to disclose); Submitted on: 06/13/2022
William	Young	(This individual reported nothing to disclose); Submitted on: 06/01/2023
Austin	Yu	(This individual reported nothing to disclose); Submitted on: 04/19/2023
Kristin	Yu	(This individual reported nothing to disclose); Submitted on: 10/07/2022
Lifeng	Yu	(This individual reported nothing to disclose); Submitted on: 12/01/2023
Brandon	Yuan	Submitted on: 05/02/2022 AAOS: Board or committee member DePuy, A Johnson & Johnson Company: Paid consultant Mid America Orthopaedic Association: Board or committee member Stryker: Paid consultant

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Brandon	Yuan	Submitted on: 10/23/2023 AAOS: Board or committee member DePuy, A Johnson & Johnson Company: Paid consultant Orthopaedic Trauma Association: Board or committee member Stryker: Paid consultant
Aroob	Zaheer	(This individual reported nothing to disclose); Submitted on: 10/20/2023
Angelica	Zambrano	(This individual reported nothing to disclose); Submitted on: 05/31/2022
Chao	Zhang	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Douglas	Zhang	(This individual reported nothing to disclose); Submitted on: 10/06/2022
Kevin	Zhu	(This individual reported nothing to disclose); Submitted on: 10/16/2023