OREF NEW YORK REGION
RESIDENT RESEARCH SYMPOSIUM
Thursday, October 22, 2020

Hospital for Special Surgery
Virtual Resident Research Symposium

Hosted by:

Bryan T. Kelly, MD
Surgeon-in-Chief and Medical Director
Department of Orthopedic Surgery
Hospital for Special Surgery

and

Mathias Bostrom, MD
Chief, Adult Reconstruction and Joint Replacement Service
Hospital for Special Surgery

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About OREF:
The Orthopaedic Research and Education Foundation (OREF) was founded in 1955 to ensure an expanding base of knowledge and effective, evidence-based treatment protocols for orthopaedic surgeons to continually improve patient care. Since its founding, OREF has funded nearly $150 million in research and educational grants and awards that benefit all of orthopaedics. For more information about OREF grants and awards, please visit www.oref.org. Follow OREF on its Facebook page (OREFtoday) and on Twitter (@OREFtoday).

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RESIDENT RESEARCH SYMPOSIUM
SUMMARY AGENDA
Thursday, October 22, 2020

6:30 a.m. – 6:35 a.m.	**Welcome and Introductions** Mathias Bostrom, MD Chief, Adult Reconstruction and Joint Replacement Service Hospital for Special Surgery
6:35 a.m. – 6:38 a.m.	**OREF Welcome** Lee Grossman Chief Executive Officer Orthopaedic Research and Education Foundation
6:38 a.m. – 7:12 a.m.	**Session I – Resident Research Presentations & Discussion** **Co-Moderators: Mathias Bostrom, MD and Scott Rodeo, MD**
7:12 a.m. – 7:22 a.m.	**Break**
7:22 a.m. – 8:00 a.m.	**Session II – Resident Research Presentations & Discussion** **Co-Moderators: Mathias Bostrom, MD and Scott Rodeo, MD**
8:00 a.m. – 8:10 a.m.	**Break**
8:10 a.m. – 8:42 a.m.	**Session III – Resident Research Presentations & Discussion** **Co-Moderators: Mathias Bostrom, MD and Scott Rodeo, MD**
8:42 a.m. – 8:52 a.m.	***Break***
8:52 a.m. – 9:24 a.m.	**Keynote Address** Francis Y. Lee, MD, PhD, honMBA Wayne O. Southwick Professor of Orthopaedics and Rehabilitation with Tenure; Biomedical Engineering; Graduate School of Arts and Sciences; Pathology Yale University School of Medicine
9:24 a.m. – 9:40 a.m.	**Awards Presentation and Closing Remarks** **Mathias Bostrom, MD**

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KEYNOTE SPEAKER

Francis Y. Lee MD, PhD, honMBA

Wayne O. Southwick Professor of Orthopaedics and Rehabilitation with Tenure;
Biomedical Engineering; Graduate School of Arts and Sciences; Pathology
Yale University School of Medicine

Francis Y. Lee, MD, PhD is a professor with clinical expertise in metastatic bone cancers, bone & soft tissue tumors, and pediatric orthopaedic surgery at Yale New Haven Hospital in Stamford, Connecticut, and Yale New Haven Hospital in New Haven, Connecticut. He completed his Musculoskeletal Fellowship at the MGH/Boston Children's Hospital, Pediatric Orthopaedics at the Hospital for Sick Children, and Research Fellowship under Dr. Thomas Einhorn at Mount Sinai Hospital. He is one of a handful of orthopaedic surgeons with several NIH R01 research grants and conducts translational research in the field of bone regeneration, inflammation, and infection. He has served, or is currently serving, as NIH Skeletal Biology and Skeletal Regeneration (SBSR) Study Section Chair, AAOS Research Development Committee Chair, Musculoskeletal Tumor Society Research Committee Chair, and Orthopaedic Research and Education Foundation (OREF) Grant Committee Chair.
;
According to Dr. Lee, OREF is the most impactful organization that opened a door to develop him as an orthopaedic surgeon scholar. He followed a classic pathway of obtaining an OREF Resident Research Grant (1995) during residency. He subsequently received an OREF Research Grant (2004), OREF Career Development Award (2006-2009), Department ofDefense Grant (2000-2014), MTF Grant (2005; 2006-2009), and several NIH R01 Grants (2007-2024). It is a great privilege for Dr. Lee to share his failures and successes with aspiring young orthopaedic resident scholars at the Hospital for Special Surgery, the birthplace of the orthopaedic surgeon scholar incubator program and numerous innovations. He expresses deep gratitude to the Hospital for Special Surgery and OREF to provide a platform to share research passions among orthopaedic trainees despite interruptions caused by the Covid-19 pandemic.

Judges

James Iatridis, PhD
Mount Sinai at Icahn School of Medicine

Han Jo Kim, MD
Hospital for Special Surgery

Philipp Leucht, MD, PhD
New York University Langone Health

William Levine, MD, FAOA
Columbia University

Benedict Nwachukwu, MD, MBA
Hospital for Special Surgery

Moderators

Mathias Bostrom, MD
Hospital for Special Surgery

Scott Rodeo, MD
Hospital for Special Surgery

OREF New York Region Resident Research Symposium
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6:30 a.m. – 6:35 a.m.	**Welcome and Introductions** Mathias P. Bostrom, MD Chief, Adult Reconstruction and Joint Replacement Service Hospital for Special Surgery
6:35 a.m. – 6:38 a.m.	**OREF Welcome** Lee Grossman Chief Executive Officer Orthopaedic Research and Education Foundation
	Session I – Resident Research Presentations & Discussion **Co-Moderators: Mathias Bostrom, MD and Scott Rodeo, MD**
6:38 a.m. – 6:42 a.m.	*Peripheral Blood and Synovial Fluid Metatranscriptomics for PJI Diagnosis: A Prospective Investigation* Karan Goswami, MD, Rothman Institute at Thomas Jefferson University
6:42 a.m. – 6:46 a.m.	*In Vitro Analysis of Anti-Biofilm Effect of Intraoperative Irrigation Solutions Against MSSA Biofilm* Ajay Premkumar, MD, Hospital for Special Surgery
6:46 a.m. – 6:50 a.m.	*Local Antibiotic Delivery via Calcium Sulfate for Orthopaedic Infections* Daniel Driscoll, MD, Hospital for Special Surgery
6:50 a.m. – 6:54 a.m.	*Synovial Fluid Cytokine Profile at the Time of Arthroscopy Predicts Intermediate-Term Functional Outcomes* Matthew T. Kingery, MD, New York University Langone
6:54 a.m. – 6:58 a.m.	*Assessment of the Composition and Biologic Activity of Platelet Rich Plasma and its Relationship to Clinical Outcomes in Patients with Knee Osteoarthritis* Bijan Dehghani, MD, University of Pennsylvania
6:58 a.m. – 7:02 a.m.	*Early Osteoarthritis After Transient Neonatal Brachial Plexus Palsy in a Mouse Model* Lynn Ann Forrester, MD, Columbia University Medical Center/New York Presbyterian Hospital
7:02 a.m. – 7:12 a.m.	**Question and Answers**
7:12 a.m. – 7:22 a.m.	**Break**

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Session II – Resident Research Presentations & Discussion
Co-Moderators: Mathias Bostrom, MD and Scott Rodeo, MD

7:22 a.m. – 7:26 a.m.	*Increased 90 Day Mortality and Morbidity in Recovering Elective Arthroplasty Patients During the 2019 Coronavirus Pandemic in New York City* Megan Mizera, MD, Montefiore Medical Center
7:26 a.m. – 7:30 a.m.	*One Year Radiographs are Not Necessary After Treatment of Developmental Dysplasia of the Hip* Ajay C. Kanakamedala, MD, New York University Langone
7:30 a.m. – 7:34 a.m.	*Improved Compartment Balancing Using a Robotic Assisted Total Knee Arthroplasty* Michael Held, MD, New York Presbyterian – Columbia University
7:34 a.m. – 7:38 a.m.	*Outcomes of Avascular Necrosis (AVN) of the Femoral Head in Sickle Cell Disease (SCD)* Vanessa Charubhumi, MD, Montefiore Medical Center
7:38 a.m. – 7:42 a.m.	*A Simple Hip Spine Classification for Total Hip Replacement—A Large Multi-Center Series* Ameer Elbuluk, MD, Hospital for Special Surgery
7:42 a.m. – 7:46 a.m.	*The Influence of Glenoid Version on Posterior Shoulder Instability: A Cadaveric Study* James Levins, MD, Brown University
7:46 a.m. – 7:50 a.m.	*Risk Factors for Low Patient Reported Outcomes After Total Knee Arthroplasty in a Predominantly Black and Hispanic Cohort* Will Walsh, MD, Montefiore Medical Center/Albert Einstein COM
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Session III – Resident Research Presentations & Discussion
Co-Moderators: Mathias Bostrom, MD and Scott Rodeo, MD

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8:14 a.m. – 8:18 a.m.	*Effect of the COVID-19 Pandemic and Public Health Ordinances on Orthopaedic Trauma Presenting to the Emergency Room in a New York City Health System* Anthony Christiano, MD, Mount Sinai Health System
8:18 a.m. – 8:22 a.m.	*Multi-Agent Chemotherapy for Surgically Treated Soft Tissue Sarcomas Arising from Bone is Not Associated with Improved Survival Compared to Surgery Alone: A Propensity-Matched, National Cancer Database Cohort Study* Courtney Toombs, MD, Yale University

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Session III – Resident Research Presentations & Discussion (cont'd)
Co-Moderators: Mathias Bostrom, MD and Scott Rodeo, MD

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Daniel Buchalter, MD, New York University Langone

8:26 a.m. – 8:30 a.m. *Preoperative Weakness and Longer Symptom Duration Predict Prolonged Opioid Use in Patients Undergoing Anterior Cervical Discectomy and Fusion*
Jeffrey Henstenburg, MD, Thomas Jefferson University

8:30 a.m. – 8:34 a.m. *Surgical Lumbar Degenerative Patients with Postoperative Depression Report Worse Postoperative Satisfaction*
Bo Zhang, MD, Johns Hopkins University

8:34 a.m. – 8:38 a.m. *A Short Course of Dehydroepiadrosterone is Associated with Accelerated Fracture Healing in a Translational Murine Fracture Model*
David Kirby, MD, New York University Langone

8:38 a.m. – 8:42 a.m. **Question and Answers**

8:42 a.m. – 8:52 a.m. **Break**

8:52 a.m. – 9:24 a.m. **Keynote Address**
Francis Y. Lee, MD, PhD, honMBA
Wayne O. Southwick Professor of Orthopaedics and Rehabilitation with Tenure; Biomedical Engineering; Graduate School of Arts and Sciences; Pathology
Yale University School of Medicine

9:24 a.m. – 9:40 a.m. **Awards Presentation and Closing Remarks**

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Peripheral Blood and Synovial Fluid Metatranscriptomics for PJI Diagnosis: A Prospective Investigation

Karan Goswami, MD
Rothman Institute at Thomas Jefferson University

Purpose: To evaluate the utility of RNA metatrancriptomics in diagnosing PJI and predicting antibiotic resistance.

Significance: While DNA sequencing technologies can detect the presence of microbes in a clinical sample, it is unknown whether the signal represents dead or live organisms. Metatranscriptomics (RNA sequencing) can detect transcriptionally "active" organisms and map expressed genes to functional pathways of interest (e.g. antibiotic resistance).

Methods: Synovial fluid and peripheral blood samples were prospectively collected from 20 patients undergoing revision TJA and 10 undergoing primary TJA. Following microbial RNA extraction and host analyte subtraction, metatranscriptomic sequencing was performed. Principle Coordinates Analysis (PCoA) and Partial Least Squares-Discriminant Analysis were utilized to ordinate metatranscriptomic profiles, using the 2018 definition of PJI as the gold-standard.

Results: Blinded PCoA modeling revealed accurate and distinct clustering of samples into infected, aseptic, and primary joint cohorts based on transcriptomic profile, both in synovial fluid and blood. Differential metatranscriptomic signatures for infected versus noninfected cohorts enabled us to train machine learning algorithms to 84.9% predictive accuracy for infection. Antibiotic resistance genes were expressed with high concordance to conventional antibiotic sensitivity data.

Conclusion: Our findings highlight the potential of metatranscriptomics for infection diagnosis

In Vitro Analysis of Anti-Biofilm Effect of Intraoperative Irrigation Solutions Against MSSA Biofilm

Ajay Premkumar, MD
Hospital for Special Surgery

Purpose: To evaluate the in-vitro effect of commercially available intraoperative antibacterial solutions against biofilm-based *Methicllin-sensitive Staphylococcus aureus (MSSA)* grown on plastic, cement and porous titanium.

Significance: Very few studies compare the efficacy of the diverse array of intraoperative irrigant solutions currently in use against biofilm.

Methods: MSSA biofilm was grown for 24 and 72 hours on plastic well-plates, polymethylmethacrylate beads (Simplex P; Stryker) and grit-blasted Ti-6Al-4V acetabular screw caps (G7; Zimmer-Biomet). Antibacterial solutions included: isotonic saline, vancomycin (1mg/mL), polymyxin-bacitracin (500,000 U/L – 50,000 U/L, respectively), povidone-iodine 0.3%, povidone-iodine 10%, a 1:1 combination of povidone iodine 10% & 4% hydrogen peroxide, Irrisept® (Irrimax), Prontosan® (B.Braun), and Bactisure® (Zimmer-Biomet). 24 hour and 72 hour Xen36 biofilms were exposed to antibacterial solutions for 3 minutes to reproduce intraoperative conditions. Experiments were performed in triplicate and repeated at least once. A three-fold log reduction in CFU counts versus controls was considered as a measure of solution efficacy.

Results: Povidone-iodine 10% and povidone-iodine + peroxide were the most consistently effective solutions for MSSA biofilm dispersal on several orthopaedic surfaces.

Conclusion: Commercial antibacterial solutions vary significantly in their efficacy against MSSA biofilm. Efficacy globally decreased as biofilm maturity increased. Increased solution cost did not confer increased efficacy.

Local Antibiotic Delivery via Calcium Sulfate for Orthopaedic Infections

Daniel Driscoll, MD
Hospital for Special Surgery

Purpose: This study compared the elution characteristics of vancomycin, dalbavancin, cefazolin, tobramycin, amikacin, minocycline, meropenem and fosfomycin antibiotics from synthetic calcium sulfate ($CaSO_4$) beads**.**

Significance: There is increasing interest in the use of absorbable $CaSO_4$ material for local antibiotic delivery in orthopaedic infections. Evidence to guide antibiotic selection and dosing within this material is of immediate clinical relevance.

Methods: 4.8mm $CaSO_4$ beads were created with 2.5%-5% of each antibiotic by weight and placed in phosphate buffered saline. Eluent solution was harvested at eight timepoints from 1 hour to 28 days. Antibiotic concentration at each time point was measured using high performance liquid chromatography. Elution rates were compared to the minimum inhibitory concentration (MIC) for *S. Aureus, E. Coli, and A. Baumannii*

Results: Vancomycin, dalbavancin, cefazolin and minocycline had elution rates greater than *S. Aureus* MIC for at least 7 days. Additionally, minocycline demonstrated elution rates greater than the *E. Coli* MIC for 7 days and greater than the *A. Baumannii* MIC for 28 days.

Conclusions: Vancomycin, dalbavancin, minocycline and cefazolin eluted concentrations were sufficient to achieve *S. aureus* bacterial inhibition for 7 days. Minocycline and meropenem had sustained elution rates above MIC values for tested gram-negative bacteria at 48 hours.

Synovial Fluid Cytokine Profile at the Time of Arthroscopy Predicts Intermediate-Term Functional Outcomes

Matthew T. Kingery, MD
New York University Langone

Purpose/Significance: The intra-articular immune response following knee injuries plays a role in the onset and progression of post-traumatic osteoarthritis. The purpose of this study was to evaluate the prognostic utility of synovial fluid cytokines measured at the time of surgery to predict intermediate-term functional outcomes.

Methods: In this prospective cohort study of patients undergoing arthroscopic knee surgery, synovial fluid was aspirated immediately prior to surgical incision. The concentrations of 10 cytokines were analyzed using immunoassay. Principal component regression was used to create a model to predict Lysholm score 5 years postoperatively. Hierarchical clustering was performed to identify groups of patients with similar inflammatory phenotypes.

Results: 26 patients (mean age 40.33$\pm$16.40 years) were included (mean follow-up duration 6.69$\pm$0.72 years). A model consisting of two principal components explained 52.03% of the variance in intermediate-term Lysholm score. Clustering resulted in three patient clusters based on the principal components. Despite no baseline differences in Lysholm score, Cluster 3 demonstrated significantly greater intermediate-term Lysholm score compared to Cluster 2 (94.33 versus 76.09, [5.96,30.52], p=0.006) and Cluster 1 (52.33, [24.09,59.91], p=0.003).

Conclusion: The concentrations of select synovial fluid cytokines at the time of knee arthroscopy can explain half of the variance in intermediate-term functional outcomes.

Assessment of the Composition and Biologic Activity of Platelet Rich Plasma and its Relationship to Clinical Outcomes in Patients with Knee Osteoarthritis

Bijan Dehghani, MD
University of Pennsylvania

Purpose: We evaluated the composition and biological activity of platelet-rich-plasma (PRP); further correlating our findings to clinical outcomes in patients receiving intra-articular injections for knee osteoarthritis (OA).

Significance: Recent studies suggest positive clinical outcomes associated with PRP administration to treat knee OA. However, results remain inconclusive because of variability in PRP preparations and limited information regarding the biological activity of PRP.

Method: 51 patients with mild-moderate knee OA were enrolled in this study. Patients reported outcome measures were obtained for clinical correlation. Aliquots of PRP and whole blood from the same patients were collected to evaluate composition and biologic activity, using a co-culture system. Total RNA from cells was extracted for RNAseq, Nanostring, and RTqPCR analysis.

Results: We collected 4.07 ± 01.05 mL of PRP and injected 3.24 ± 0.85 mL intra-articular. We identified "good" (N=17) and "poor" responders (N=15) using PROMs. RNAseq analyses revealed PRP-dependent changes in the TNFa-induced modulation of multiple genes, including CXCL7 and CCL5.

Conclusion: We integrated clinical data with genomic approaches to evaluate how variability in the composition and activity of PRP may influence outcomes in patients with knee OA. We uncovered subsets of genes differentially modulated by co-treatment of PRP with TNFa.

Early Osteoarthritis After Transient Neonatal Brachial Plexus Palsy in a Mouse Model

Lynn Ann Forrester, MD
Columbia University Medical Center/
New York Presbyterian Hospital

Purpose/Significance: Most children with neonatal brachial plexus palsy (NBPP) recover function of the injured extremity. However, the long-term risk of osteoarthritis in this population is unknown. Our hypothesis was that mice with transient NBPP would develop early osteoarthritis.

Methods: NBPP mice received biweekly injections of botulinum toxin A (BtxA) into the left shoulder to induce shoulder paralysis from 0 to 4 weeks old, and then recovered through 24 or 40 weeks old. Right shoulders in NBPP mice were injected with saline, and a separate group of mice served as controls. Mice were evaluated for changes in gait, and mouse shoulders were evaluated using bone morphometry, histomorphometry, and gene expression.

Results: NBPP mice initially exhibited abnormal gait compared to controls, but no differences in gait were seen at 24 weeks. MicroCT analysis showed BtxA shoulders had less cortical bone volume, and abnormal trabeculae compared to controls. Histomorphometry demonstrated BtxA shoulders had higher osteoarthritis scores compared to controls. BtxA shoulders also had lower Dkk1 and BMP2 expression, and higher Col10A1 and BGLAP expression, suggestive of osteoarthritis.

Conclusion: This study shows that mice with transient NBPP develop early osteoarthritis and suggests that children who experience early recovery from NBPP may have increased risk of developing early osteoarthritis.

Increased 90 Day Mortality and Morbidity in Recovering Elective Arthroplasty Patients During the 2019 Coronavirus Pandemic in New York City

Megan Mizera, MD
Montefiore Medical Center

Purpose: We hypothesize patients who underwent primary arthroplasty in close proximity to the COVID-19 pandemic had increased 90-day mortality and morbidity.

Significance: Assess the impact of the COVID-19 pandemic on recovering primary arthroplasty patients to better understand the risks of resuming elective procedures.

Methods: We performed a retrospective cohort study including primary arthroplasty patients that underwent surgery between December 1, 2019 and March 16, 2020 at a single arthroplasty department and compared to patients during the same time period in 2019. Cohorts were compared using Wilcoxon Sum Rank test and categorical variables were compared using chi-squared test.

Results: Sample size for the 2020 and 2019 cohort included 359 and 410, respectively. There was no difference in baseline characteristics. The 2020 cohort had statistically significant higher rates of Pneumonia (2.8% vs 0.7%, p=0.03), readmission rate (9.5% vs. 5.4%, p=0.03), pulmonary embolism (1.7% vs 0.2%, p=0.04) and 90-day mortality (1.1% vs 0%, p=0.03).

Conclusion: This study demonstrates patients who underwent primary arthroplasty procedures in proximity to the COVID-19 pandemic experienced a statistically significant increase in 90-day mortality and morbidity. As elective procedures resume in the setting of the ongoing pandemic, providers and patients should be aware of these increased risks.

One Year Radiographs Are Not Necessary After Treatment of Developmental Dysplasia of the Hip

Ajay C. Kanakamedala, MD
New York University Langone

Purpose: To determine whether point of care ultrasound (POCUS) during Pavlik harness treatment of developmental dysplasia of the hip (DDH) can predict acetabular development. It was hypothesized that the degree of dysplasia on POCUS would correlate with acetabular index at final follow-up.

Significance: Routine radiographs at 12 months of age after successful Pavlik harness treatment may no longer be necessary given the growing availability and accuracy of POCUS.

Methods: A retrospective review was performed, and α angle, β angle, and acetabular coverage were measured on POCUS at initial presentation, Pavlik discontinuation, and a third visit for patients with DDH treated successfully with the Pavlik method. Acetabular index was measured on a plain anteroposterior pelvis radiograph obtained at a minimum age of 12 months.

Results: 72 patients were included in the final analysis. α angle, β angle, and acetabular coverage at initial presentation were significantly correlated with the acetabular index at final radiographic follow-up ($p<0.001$). Patients with worsening degrees of DDH based on stability on sonographic testing had higher acetabular indices at final radiographic follow-up ($p<0.05$).

Conclusion: The degree of dysplasia on the initial POCUS may be used to predict who requires closer radiographic follow-up within the first 2 years of life.

Improved Compartment Balancing Using a Robotic-Assisted Total Knee Arthroplasty

Michael Held, MD
New York Presbyterian – Columbia University

Purpose: The purpose of this study is to determine if robotic-assisted TKA (RA-TKA) results in improved intra-compartmental ligament balance compared to conventional jig-based instrumentation (CM-TKA). We hypothesized that RA-TKA would result in improved intra-compartmental balance.

Significance: RA-TKA was developed to improve accuracy and outcomes in TKA. One important determinant of TKA success is a well-balanced knee throughout the range of motion. Therefore, we investigated whether RA-TKA could improve intra-compartmental balancing in TKA.

Methods: This retrospective study included two cohorts: CM-TKA (n=49) and RA-TKA (n=37). Intra-compartment loads were measured following final implant implantation in extension (10°), mid-flexion (45°), and full flexion (90°), using an intraoperative compartment pressure sensor.

Results: There was no difference between medial and lateral compartment loads in extension, mid-flexion, and full flexion for the between cohorts. The percentage of knees with high load compartment pressure in flexion (>40 lbs) by the conclusion of the surgery was significantly greater for the conventional (18%) versus the robotic-TKA cohort (3%, p=0.025). The percentage of unbalanced knees (>20 lbs differential between medial and lateral compartments) in flexion was significantly greater in the conventional (24%) versus robotic-TKA cohort (5%, p=0.018).

Conclusions: RA-TKA resulted in improved intraoperative compartment balancing, particularly in flexion, versus CM-TKA.

Outcomes of Avascular Necrosis (AVN) of the Femoral Head in Sickle Cell Disease (SCD)

Vanessa Charubhumi, MD
Montefiore Medical Center

Purpose: Describe clinical and radiographic outcomes of patients with femoral head AVN due to SCD treated with core decompression (CD), CD+BMAC or observation.

Significance: Femoral head AVN is a common complication of SCD.

Methods: 278 AVN hips in 178 SCD patients, 44% female, mean age 26.4years, between 2006-2018 were evaluated. Demographics, surgical and clinical parameters were recorded. Ficat score was used to assess AVN stage.

Results: 234 non-operative hips, 17 CD hips, and 25 CD+BMAC hips were followed for 5.91years. Age at diagnosis, BMI, and number of symptomatic hips were different between groups. 29.4% CD cases, 16% CD+BMAC and 18% observation cases progressed to total hip arthroplasty (THA). Ficat stage progressed in 16% non-operative, 44% CD and 27% CD+BMAC cases. For cases treated with CD or CD+BMAC, female gender ($p=0.046$), age at surgery ($p=0.006$), and pre-operative femoral head collapse ($p=0.032$) increased the risk for THA, whereas a higher dose of Hydroxyurea ($p=0.009$) decreased that risk. For cases treated with observation alone, female gender ($p=0.019$) and pre-operative femoral head collapse ($p=0.002$) increased the risk for THA. Pain and ambulatory status at follow-up were similar between groups.

Conclusion: CD+/-BMAC did not achieve clinical improvement or prevented radiographic progression compared to non-operative treatment.

A Simple Hip-Spine Classification for Total Hip Replacement— A Large Multi-Center Series

Ameer Elbuluk, MD
Hospital for Special Surgery

Purpose: This study outlines a simplified preoperative approach and surgical execution according to a novel Hip-Spine Classification for evaluation and appropriate care of a "hip-spine" THA candidate.

Significance: Altered biomechanics of the dynamic hip-pelvis-spine kinetic chain during movement in patients with concomitant hip and spine pathology is being increasingly recognized as a factor contributing to higher complication rates following THA.

Methods: This was a prospective multi-center series of 3,777 consecutive patients undergoing THA by three surgeons from January 2014 to December 2019. Patients were categorized as: 1 – normal spinal alignment, 2 – flatback deformity; A – normal spinal mobility, B – stiff spine, and subsequent spinopelvic measurements were performed for each patient.

Results: 2,081 patients met inclusion criteria. 70 patients had spinal fusions. 51 (73%) patients had 1-2 levels fused and 19 (27%) patients had 3+ levels fused. Dual mobility was used in 211 patients. Survivorship free of dislocation to 5 years was 99.2%, with a 0.8% dislocation rate.

Conclusion: This is the largest clinical series in the literature evaluating the hip-spine relationship and guiding appropriate treatment. Patients with spinal stiffness and/or deformity can remain candidates for THA provided that they are appropriately managed both pre- and intra-operatively using the Hip-Spine Classification.

The Influence of Glenoid Version on Posterior Shoulder Instability: A Cadaveric Study

James Levins, MD
Brown University

Purpose: Identify a critical degree of glenoid retroversion associated with failure after soft tissue repair.

Significance: Increased glenoid retroversion is associated with posterior glenohumeral instability and is a proposed risk factor for failure after repair. The degree of retroversion associated with recurrent instability has not been identified.

Methodology: Peak resistance to posterior humeral translation at 0° to 30° of retroversion was measured for 8 shoulders using a robotic arm. A posterior labral tear was created and repaired; identical testing parameters were performed pre- and post-repair. The Holm-test was used to calculate adjusted p-values; statistical significance at $p<0.05$.

Results: 1° increase in retroversion correlated with a 3.5% decreased resistance to translation. Dislocation with an intact labrum occurred at mean 22.7° (15-30°) of retroversion. The percent change resistance force decreased 41% at 25° of retroversion after labral cut, notably greater than the percent decrease at 0-15° of retroversion (2.7-6.5%) but lacked statistical difference. Compared to the intact state at 0°, resistance decreased 45% and 81.4% after labral repair at 20° and 25° of retroversion ($p<0.04$).

Discussion: Labral repair in patients with >20° of retroversion may be subjected to a relatively greater percentage of force than those with neutral version.

Risk Factors for Low Patient Reported Outcomes After Total Knee Arthroplasty in A Predominantly Black and Hispanic Cohort

Will Walsh, MD
Montefiore Medical Center/Albert Einstein COM

Purpose: There is no difference in improvement of joint pain or function of daily living (FDL) between White, Hispanic and Black patients after total knee arthroplasty (TKA).

Significance: Previous studies report that Black and Hispanic patients present with worse pain and function, are less likely to undergo arthroplasty, and are more likely to undergo arthroplasty at a low-volume hospital.

Methods: We retrospectively analyzed prospective joint registry data between June 2016 and March 2019. Preoperative and one-year postoperative KOOS pain and FDL scores were compared between White, Black and Hispanic cohorts. Patients who did not report their race/ ethnicity or complete the survey were excluded.

Results: 1330 patients were included for analyses. There were 199 White, 535 Black and 596 Hispanic patients. Hispanic and Black patients were more likely to have multiple comorbidities, higher BMI, be from low socioeconomic neighborhood, greater musculoskeletal disease burden and lower preoperative scores. All three ethnicities had equal change in scores from preoperative to postoperative time course however on multivariate analysis, Hispanic patients continued to have lower pain scores

Conclusion: While all three groups experienced substantial clinical benefit from TKA, minority patients present with greater number of comorbidities, lower socioeconomic status, more severe pain, and greater musculoskeletal disease burden.

Injury Patterns in Victims of Intimate Partner Violence (IPV)

Jordan Lebovic, MD
New York University Langone

Purpose: To identify injury patterns seen in victims of intimate partner violence (IPV).

Significance: One in three women experience IPV and this prevalence is rising during the COVID pandemic. Only 2.5-15% of victims report these incidents to an authority. Orthopedic surgeons can play a critical role in improving early diagnosis.

Methods: Imaging characteristics were analyzed in radiological studies of 688 patients reporting IPV at a domestic violence prevention program.

Results: 300 injuries were identified in 189 patients of which 166 (88%) were women. IPV was reported as the mechanism of injury in 30% (56/189) of victims at the time of imaging.

Hand injuries were the most common injuries (89/300;30%); 45 were fractures (45/89;51%) and the distal phalanges were the most frequently fractured (14/45;31%). Foot injuries were the most common lower extremity injuries (50/154;33%); 40/103 were fractures (40%) and the metatarsals were the most frequently fractured (23/103;22%). Repetitive injuries in the same location were identified in 33 victims of which 15 were in the foot and ankle.

Conclusion: Attention should be paid to young woman with hand fractures and those with repeated episodes of foot and ankle fractures. Screening for domestic abuse should be offered to these patients.

Effect of the COVID-19 Pandemic and Public Health Ordinances on Orthopaedic Trauma Presenting to the Emergency Room in a New York City Health System

Anthony Christiano, MD
Mount Sinai Health System

Purpose: To identify changes in the amount and type of orthopaedic trauma presenting to a NYC health system during the COVID-19 pandemic.

Significance: During additional waves of COVID-19, health systems should allocate resources for a decrease in orthopaedic trauma with maintained hip and thigh trauma.

Methods: Diagnosis codes of trauma visits within our health system during the pandemic time period, March-May 2020, were reviewed for orthopaedic trauma. The total number of visits and visits for each anatomic area during the pandemic time period were compared to the prior year, March-May 2019. A Bonferroni correction was applied and all analyses utilized a significance value of $p<0.005$ (SPSS v24, IBM).

Results: Orthopaedic trauma visits decreased from 2,016 in March-May 2019 to 884 in March-May 2020 ($p<0.0005$). There was a significant decrease in foot/ankle trauma ($p<0.0005$) during the pandemic. There was no significant difference in the proportion of elbow/forearm ($p=0.613$), hand/finger ($p=0.775$), knee/lower leg ($p=0.838$), shoulder/upper arm ($p=0.036$), or spine/pelvis ($p=0.180$) trauma. There was a significant increase in the proportion of hip/thigh trauma during the pandemic ($p<0.0005$).

Conclusion: During the COVID-19 pandemic there was a significant decrease in orthopaedic trauma visits with a proportional increase in hip/thigh trauma.

Multi-Agent Chemotherapy for SurgicallyTreated Soft Tissue Sarcomas Arising from Bone is Not Associated with Improved Survival Compared to Surgery Alone: A Propensity-Matched, National Cancer Database Cohort Study

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Yale University

Significance: Soft tissue sarcomas arising from bone (STSB) are rare cancers with unestablished treatment protocols. Surgery comprises the current standard of care.

Purpose: To determine whether adjunctive MAC is associated with a survival benefit over surgery alone in STSB. To identify decision-making factors and histology-specific responses to treatment.

Methods: The National Cancer Database was queried from 2004-2014 for adults with primary malignant bone sarcomas who underwent surgery. Primary bone sarcomas (osteosarcoma) were excluded. Categorical variables were assessed using Chi-squared and Mann-Whitney tests. A multiple logistic regression was used to assess odds of receiving MAC.

A 1:1 algorithm was used for propensity score matching. Survival was analyzed with Kaplan-Meier curves with log-rank tests. Subgroup analysis compared histology-specific survival. Significance was set at $p<0.001$.

Results: 1,979 STSB were identified. 548 received surgery without chemotherapy, while 354 received adjunctive MAC. Patients receiving MAC were younger and more likely to have high-grade and axial lesions than controls. Age and tumor grade were the only independent predictors of MAC treatment. 5-year survival probability was 26% among controls compared to 23% in the MAC group.

Conclusion: Adjunctive MAC STSB treatment is not associated with increased survival and may pose unnecessary risk. Follow-up prospective studies are needed.

Systemic Glucose-Insulin-Potassium Reduces Skeletal Muscle Injury and Pain in a Murine Ischemia-Reperfusion Model

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Purpose: The purpose of this study is to evaluate if Glucose-Insulin-Potassium (GIK) can protect against skeletal muscle ischemia-reperfusion (IR) in a murine tourniquet model.

Significance: GIK is protective against myocardial IR injury, however its role in reducing skeletal muscle IR injury is unknown.

Methods: 20 C57BL/6 mice (10 GIK, 10 control) were subjected to a 2.5-hour unilateral hindlimb tourniquet. Upon tourniquet placement, a control or GIK osmotic pump infusion was started at 16 µL/hr (control: 0.9% normal saline; GIK: 50 U/L insulin, 80 mEq/L KCl, pH 4.5). 24 hours after tourniquet removal, tourniqueted and non-tourniqueted gastrocnemius muscles were stained with triphenyltetrazolium chloride (TTC) to evaluate muscle viability, bilateral peroneal muscles were harvested for gene expression, and pain scores were calculated using a validated murine ethogram.

Results: In tourniqueted limbs, GIK significantly reduced skeletal muscle death by TTC stain ($p=0.006$), gene expression markers of cell death (CASP3, $p<0.001$), and gene expression markers of inflammation (NOS2, $p<0.001$; IGF1, $p=0.007$; IL1β, $p=0.002$; TNFα, $p=0.012$). Additionally, GIK led to a significant reduction in IR-related pain ($p=0.003$).

Conclusion: GIK protects against tourniquet-induced skeletal muscle IR injury by reducing post-ischemia inflammation. Human studies are required to confirm GIK's utility in both elective and traumatic orthopedic settings.

Preoperative Weakness and Longer Symptom Duration Predict Prolonged Opioid Use in Patients Undergoing Anterior Cervical Discectomy and Fusion

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Purpose: To identify preoperative weakness as a risk factor for prolonged postoperative opioid use in patients undergoing ACDF.

Significance: Opioids play an important role in reducing post-operative pain, however, with growing rates of opioid dependence globally, identification of risk factors for prolonged used will allow clinicians to improve patient care.

Methods: 483 patients who underwent ACDF were reviewed retrospectively. Opioid prescription data was collected from our state Prescription Drug Monitoring Program. Prolonged opioid use was defined as more than one post-operative opioid prescription. Multivariate logistic regression analysis, Kaplan-Meyer curves and log-rank test was used to compare the time of last opioid use in preoperative and non-preoperative weak patients from index surgery.

Results: Regression analysis showed patients with preoperative weakness (OR=3.03; CI=1.71,5.37; $p<0.001$), preoperative opioid tolerance (OR=25.32; CI=7.04,87.21; $p<0.001$), and current smokers (OR=2.78; CI=1.61,4.81; $p<0.001$) are more likely to have prolonged opioid use. There was a 5% increased likelihood of prolonged postoperative opioid use for each month of symptoms (OR=1.05; CI=1.01, 1.10; $p=0.042$). Patients with preoperative weakness were prescribed opioids longer compared to those patients without preoperative weakness ($p=0.014$).

Conclusion: Preoperative weakness along with longer duration of symptoms, pre-operative opioid tolerance and current smoking status prolong opioid use after ACDF.

Surgical Lumbar Degenerative Patients with Postoperative Depression Report Worse Postoperative Satisfaction

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Purpose: We sought to assess the association between preoperative and postoperative mental health status with postoperative satisfaction in lumbar degenerative spine surgery patients.

Significance: Poor preoperative mental health has been shown to negatively affect postoperative satisfaction among spine surgery patients, but there is limited evidence on the impact of postoperative mental health on satisfaction.

Methods: We included adult patients undergoing spine surgery for lumbar degenerative conditions. We assessed mental health preoperatively and 12-months postoperatively and evaluated associations between mental health and postoperative satisfaction with univariate and multivariable logistic regression.

Results: Among 183 patients, depression was present in 27% preoperatively and 29% postoperatively, and anxiety in 50% preoperatively and 31% postoperatively. 19% reported postoperative dissatisfaction. In adjusted analysis, odds of dissatisfaction were increased in those with mild postoperative depression (aOR = 6.1; p=0.03) and moderate or severe postoperative depression (aOR = 7.5; p=0.03).

Conclusion: Following lumbar degenerative surgery, patients with postoperative depression, irrespective of anxiety or preoperative depression, have significantly higher odds of dissatisfaction. These results emphasize the importance of postoperative screening and treatment of depression in spine patients with dissatisfaction.

A Short Course of Dehydroepiadrosterone is Associated with Accelerated Fracture Healing in a Translational Murine Fracture Model

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Purpose: The aim of this study is to assess the impact of a short course of DHEA on fracture healing in the setting of a translational fracture model. We
hypothesize that DHEA will improve fracture healing.

Significance: Dehydroepiandrosterone (DHEA) is a metabolic intermediate in the biosynthesis of androgens and estrogens and is associated with increased bone mineral density and elevated systemic levels of IGF-1.

Methodology: Mid-diaphyseal femur fractures were created in 10 12-week-old and 10 60-week-old C57BL/6 mice, stabilized with a retrograde intramedullary pin placement. Half of the mice from each group were supplemented with 5 mg/kg/day DHEA. Micro-computerized tomography (micro-CT) was performed at 2 weeks to assess callus morphology and mineral density. Histomorphometry of representative pentachrome stained sections was performed to new bone formation.

Results: Micro-CT demonstrates that DHEA significantly increases callus bone volume, bone volume/tissue volume (BV/TV), bone surface, and mineral density in aged mice, and significantly increases callus BV/TV, trabecular number, and mineral density in young mice. Histomorphometry demonstrates that DHEA significantly increases new bone formation in aged and young mice without affecting callus cartilage formation.

Conclusion: Our study shows a positive effect of DHEA on the fracture healing process, suggesting that oral supplementation could be beneficial for fracture repair.

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