

20th Annual Robert D. D'Ambrosia Lectureship & Research Day



(L-R) Chief Residents: Charles Hansen MD, Matthew Darlow MD, Marc Schatz MD, and Jestin Williams MD

Saturday, June 22, 2024

LSUHSC School of Medicine

Center for Advanced Learning and Simulation (CALs)

North Prieur Street | New Orleans, LA 70112

The Lectureship and Research is named in honor of

Robert D. D'Ambrosia, M.D.



This annual lecture and department chairmanship has been established to honor Dr. D'Ambrosia's service to the LSU Health Department of Orthopaedic Surgery. In his 30+-year as the Department Chair, he exemplified leadership and humanity while training and mentoring more than 100 graduates. We are very grateful for Dr. D's contributions to LSU and to the department. Now in its 19th year, we continue to honor his legacy through the annual Robert D. D'Ambrosia Lectureship & Research Day.

AGENDA

7:30 am – 8:30 am

Breakfast and Poster Viewing

Posters will be displayed outside the lecture hall near the food service

8:30 am – 8:40 am

Introduction: Vinod Dasa, MD, Director of Orthopaedic Research

8:45 am – 9:05 am

Chief Resident Presentations

Marc Schatz MD

Early weightbearing after surgically treated ankle fractures

Matthew Darlow MD

Back Pain in Adolescent Idiopathic Scoliosis: Frequency and Risk Factors

Charles W. Hansen MD

Medicaid patients undergoing total joint arthroplasty at lower volume hospitals by lower volume surgeons associated with poorer outcomes

Jestin Williams MD

To CT scan or Not to CT scan?

9:10 am – 9:30 am

Faculty Speaker: Neil Johannsen PhD

Robert and Patricia Hines Endowed Professor, LSU Kinesiology

Research in High-performance Athletes

9:30 am – 9:45 am

International Speaker: Otto Guillermo Spiegel Herrera MD

Universidad Francisco Marroquín, Guatemala

Variation of gluteus maximus insertion in the proximal femur.

9:45 am – 10:30 am

Exhibits Open, Poster Viewing

AGENDA

10:30 am – 11:25 am

Student and Fellow Presentations

Matthew Bratton (L3)

Bromelain as a Source of Debridement for Infected Orthopaedic Implants

Christian Kerut (L4)

Probability of Occult Ankle Fracture Based on Radiograph-Measured Swelling

Davis Martin (L4)

Insights into the Health of the Quadriceps from the Articularis Genu of Patients with Osteoarthritis

Ryan Schroeder (L4)

Comparing ACDF Outcomes by Cervical Spine Level: A Single Center Retrospective Cohort Study

Collin Toups (L3)

Targeting arthralgia in knee osteoarthritis via non-psychoactive cannabinoid mechanisms

Thuc Truong (L3)

Chronic Osteomyelitis Predictors with Pattern of Care and Health Services

Sylvia Culpepper (Student Research Fellow)

Macrophage Induced Senescence in Osteoprogenitor Cells: Pro- and Anti-inflammatory Effects on Bone Regeneration

Srikanth Mudiganty MD (CHNOLA Fellow)

Trochleoplasty in Patellofemoral instability: current concepts

AGENDA

11:30 am – 11:50 am

Keynote Presentation: Alexander R. Vaccaro, M.D., Ph.D., M.B.A.

Spinal Trauma Current Controversies and Clinical Challenges



Dr. Vaccaro graduated Summa Cum Laude from Boston College in 1983 with a B.S. in Biology. He received his M.D. degree from Georgetown University School of Medicine where he was promoted with “Distinction.” He earned membership in the Alpha Omega Alpha (AOA) Honor Society and graduated with honors in 1987.

He completed a year of Surgical Internship at Cedars-Sinai Medical Center in Los Angeles, CA followed by Orthopaedic Surgery Residency at Thomas Jefferson University, where he graduated in 1992. Dr. Vaccaro completed a Spine Fellowship at the University of San Diego, CA. He earned a PhD in 2007 in the field of Spinal Trauma.

Dr. Vaccaro is the Richard H. Rothman Professor and Chairman, Department of Orthopaedic Surgery and Professor of Neurosurgery at Thomas Jefferson University in Philadelphia, Pennsylvania. He was the recipient of the Leon Wiltse award given for excellence in leadership and clinical research for spine care by the North American Spine Society (NASS) and is the past President of Cervical Spine Research Society (CSRS), the American Spinal Injury Association, The Philadelphia Orthopaedic Society, and the Association for Collaborative Spine Research.

He has over 1,000 peer-reviewed and 220 non-peer reviewed publications. He has published over 380 book chapters and is the editor of over 65 textbooks and co-editor of OKU-Spine I and editor of OKU-8.

Dr. Vaccaro is the President of Rothman Institute, Chairman of the department of Orthopaedic Surgery, Co-Director of the Regional Spinal Cord Injury Center of the Delaware Valley, and Co-Director of the Spine Fellowship program at Thomas Jefferson University Hospital where he instructs current fellows and residents in the diagnosis and treatment of various spinal problems and disorders.

Congratulations on Your Fellowships, Chiefs!

Early Weightbearing After Surgically Treated Ankle Fractures



Marc Schatz MD

Introduction: Ankle fractures are some of the most common orthopedic injuries and often are treated operatively. Historically, the majority of ankle fractures have been treated with a prolonged period of non-weightbearing status after surgery to allow for adequate healing and to prevent complications. This study looks to evaluate the safety of early weightbearing in operatively treated ankle fracture.

Methods: A total of 277 patients with ankle fractures who underwent open reduction internal fixation (ORIF) by a single surgeon were retrospectively reviewed. Weightbearing was allowed on average at 6 weeks, but in some patients occurred as early as 2 weeks. Early weight bearing was defined as weightbearing by 6 weeks. Patients were followed at regular post-operative intervals to evaluate for wound healing, fracture union, and return to daily activities.

Results: There were 53 (22%) trimalleolar, 63 (26%) bimalleolar, and 120 (50%) bimalleolar equivalent fractures. There were a total of 10 (4.2%) superficial infections, 3 (1.2%) deep infections that required surgical debridement, and only 1 (.4%) nonunion. These numbers are consistent with those described in prior literature. There was no significant difference in the rate of complications between the early versus delayed weightbearing groups $p=.97$.

Conclusion: This study suggests that early weightbearing after ankle fracture ORIF does not increase risk of complication and can be safely incorporated into rehabilitation protocols.

To CT-scan or Not to CT-scan?



Justin Williams MD

Introduction: Pedicle screws are safe implants used for various spinal deformities in the pediatric population. Several studies have evaluated variations in pedicle anatomy, parameters to detect pedicle breach, and the need for postoperative computerized tomography (CT) scan to confirm screw placement. Some have opined that if the screws at one level cross on a posterior-anterior (PA) radiograph, there must be a medial pedicle breach.

Methods: The purpose of this report is to review an example of spine fusion and instrumentation in a male patient with Scheuermann's Kyphosis.

Results: Relatively long pedicle screws were used, and postoperative radiographs showed screws crossing the midline at several levels. We ordered a CT scan that demonstrated several screw tips crossing midline without breaching the medial cortex.

Conclusion: Long pedicle screws are not necessarily mal-positioned if they cross the midline, especially if a far-lateral entry site has been used.

Medicaid Patients Undergoing Total Joint Arthroplasty at Lower Volume Hospitals by Lower Volume Surgeons Associated with Poorer Outcomes



Charles Hansen MD

Introduction: Medicaid insurance coverage amongst total hip (THA) and knee arthroplasty (TKA) patients has been associated with worse postoperative outcomes compared with non-Medicaid patients. Surgeons and hospitals with lower annual total joint arthroplasty (TJA) volume have also been associated with worse outcomes. This study sought to characterize the associations between Medicaid insurance status, surgeon case volume, and hospital case volume, and assess rates of postoperative complications compared with other payer types.

Methods: The Premier Database was queried for all adult patients who underwent primary TJA from 2016-2019. Patients were divided based on their insurance status: Medicaid vs. non-Medicaid. The distribution of annual hospital and surgeon case volume was assessed for each cohort. Multivariate analyses were performed accounting for patient demographics, comorbidities, surgeon volume, and hospital volume to assess the 90-day risk of postoperative complications by insurance status.

Results: Overall, 986,230 TJA patients were identified. Of these, 44,370 (4.50%) had Medicaid. In total, 46.4% of Medicaid patients undergoing TJA were treated by surgeons performing <100 TJA cases annually compared to 34.4% of non-Medicaid patients. Furthermore, Medicaid patients were more likely to undergo TJA at lower volume hospitals performing <500 cases annually compared to non-Medicaid patients (50.8% vs. 35.5%). After accounting for differences amongst the two cohorts, Medicaid patients remained at increased risk for postoperative deep venous thrombosis (adjusted odds ratio [aOR] 1.16, $p=0.031$), pulmonary embolism (aOR 1.39, $p<0.001$), periprosthetic joint infection (aOR 1.35, $p<0.001$), and 90-day readmission (aOR 1.25, $p<0.001$).

Conclusion: Medicaid patients were more likely to undergo TJA by lower volume surgeons at lower volume hospitals and had higher rates of postoperative complications compared to non-Medicaid patients. Future research should assess socioeconomic status, insurance, and postoperative outcomes in this vulnerable patient population seeking arthroplasty care.

Back Pain in Adolescent Idiopathic Scoliosis: Frequency and Risk Factors



Matthew Darlow MD

Introduction: Although back pain is commonly reported in patients with adolescent idiopathic scoliosis (AIS), factors that influence the presence and severity of back pain in AIS, including curve-specific variables, have not been well studied. This study aims to describe the prevalence and severity of back pain in AIS patients and determine the extent to which patient characteristics, including curve-specific factors, are associated with a higher risk of back pain in AIS.

Methods: The study was a retrospective medical records review of adolescents (aged 10-17 years) diagnosed with AIS between 01/01/2018 and 12/31/2021 at an academic tertiary children's hospital. Patients with previous spine surgery were excluded. Variables collected included demographics (age, sex, race, insurance), Lenke classification, major coronal curve, back pain-related information, Risser stage, vitamin D levels, post-diagnosis brace utilization, physical therapy or chiropractic treatment, and surgery.

Results: A total of 891 AIS patients were included in the analysis. The sample was predominantly female (73.3%) and insured by Medicaid (57.8) with a mean age of 12.8 years. The mean major coronal curve was 26.3 degrees. Most patients had Lenke type 1 (47%) and type 5 (41%) curves. Nearly half of patients reported back pain (48.5%) with average pain severity in the low-to-moderate range (4.7) on FACES pain scale (0-10). Among those who reported back pain, 63.2% specified a location with the majority reporting pain in the lumbar region (56%) and, less commonly, in the thoracic (39%) and scapular (8%) regions. Lumbar pain was associated with significantly higher pain intensity ($p=0.033$). Additionally, the location of pain reported was associated with location of major coronal curve ($p<0.0001$). No association was observed between pain presence and vitamin D deficiency ($p=0.571$, $n=175$), major coronal curve magnitude ($p=0.999$), Lenke curve type ($p=0.577$), and sex ($p=0.069$). Older patients, those insured by Medicaid, and those with higher Risser scores were more likely to report pain scores ($p=0.001$ for all).

Conclusion: Nearly half (48%) of newly diagnosed AIS patients experience back pain which is higher than the prevalence of 33% seen in the general adolescent population. Pain was more prevalent among patients over the age of 13, with heavier body weight, and those insured by Medicaid. Pain was most commonly reported in the lumbar region, especially among patients with lumbar curves. This information can be helpful in counseling AIS patients, though further investigations are needed, especially to determine the underlying causes of back pain in AIS and to elucidate the discrepancy in pain between patients with Medicaid and commercial insurance.

Student & Fellow Presentations

Bromelain as a Source of Debridement for Infected Orthopaedic Implants

Introduction: The growth of biofilms on orthopedic implants is of major surgical concern, with infection rates estimated to be up to 2 percent for all orthopedic procedures. Currently, manual scrubbing accompanied with a saline wash is the most common method of eradication. However, enzymatic debridement has emerged as an alternative option. Bromelain is an enzyme derived from pineapple stem and has been previously used in several studies as a method of biofilm dissolution. In addition to its intrinsic antimicrobial properties, bromelain is capable of hydrolyzing the complex carbohydrate shell of EPS and destabilizing the biofilm. As a result, we hypothesized that bromelain may be used for the debridement of infected orthopaedic implants.

Methods: In our study, 10mm x 3.5mm surgical grade cortical bone screws were incubated in methicillin resistant *Staphylococcus aureus* (MRSA) inoculated broth for 120 hours with 10% fetal bovine serum (FBS). Treatment groups were exposed to low dose bromelain solution (200 µg/mL), high dose bromelain solution (1mg/mL), or bromelain powder (3 U/mg) for 20 minutes. The screws were then either rinsed with 1X phosphate buffer saline (PBS) or briefly scrubbed for thirty seconds prior to rinsing. The screws were then stained with 0.25% crystal violet (CV) dye for 25 minutes to determine the amount of biofilm remaining. The stained biofilm was removed from the screws using 33% acetic acid. Resultant effluents were analyzed by optical density (OD) read at 600nm. Optical density means were compared between each treatment group and respective controls with Student's t-test. The percent of biofilm dissolution was determined using absolute OD values in the following formula: % BD = $[(\text{OD Control} - \text{OD Treated}) / \text{OD Control}] \times 100$.

Results: Six screws were used for each group. The average optical densities of the low dose bromelain solution (0.104 ± 0.047) was no different compared to controls ($p=0.345$). The average optical densities of low dose + scrub bromelain solution (0.068 ± 0.020) and high dose + scrub solution (0.045 ± 0.014) were significantly different from their respective controls ($p=0.012$; $p=0.001$). The average optical densities for screws in the high dose treatment group (0.056 ± 0.012), powder (0.041 ± 0.010), and powder + scrub (0.032 ± 0.005) were also significantly different than their respective controls ($p=0.003$; $p=0.001$; $p < 0.0001$). The powder + scrub treatment resulted in 91% biofilm dissolution.

Discussion: Based on our work, bromelain is a promising alternative option for the debridement of infected orthopedic implants. However, an increased sample size is needed to more accurately assess the reliability of our results. In addition, further investigation is required to assess how different concentrations and exposure times may affect the percent biofilm dissolution. In the future, this experiment should be replicated in vivo to determine if treating infected implants with high dose bromelain yields any toxic side effects to the surrounding tissue.

Significance/Clinical relevance: Bromelain enzymatic debridement has the potential to be used as an alternative option to effectively treat infected orthopaedic implants and reduce the risk of further revision surgeries.



Matthew Bratton (L3)

Probability of Occult Ankle Fracture Based on Radiograph-Measured Swelling

Introduction: Several children every year present to the emergency department (ED) with a traumatic ankle injury. It is our experience that about 1/2 of these patients have X-rays not showing a fracture. About 1/4 of those patients with a “normal” X-ray subsequently reveal a fracture on follow-up X-ray a few weeks later. Clinically, patients are assessed on initial ED visit as to weight bearing or nonweight bearing on the injured ankle. If non-weight bearing, physicians often likely presume an occult fracture and will cast the patient. Traditionally, ankle swelling has not been used clinically to predict occult fractures. We set out to compare the likelihood of an occult fracture using swelling, weightbearings status, and the combination of both.

Methods: The study was a retrospective chart review. After obtaining IRB approval (#5179), using Children’s Hospital New Orleans data base, ED presentations for suspected lateral malleolus injury were pulled from a 1-year span (2021-2022). Soft tissue ankle swelling measurements were measured, as well as whether the patient was weight bearing or non-weight bearing. Fisher’s Exact test was used to calculate the sensitivity and specificity of each parameter. A computer model (Exact Logistic Regression) used both clinical parameters as well as just ankle swelling to predict probability of an occult fracture.

Results: 61 children presented with ankle injury, of which 32 had negative initial x-rays. Of these 32, 8 (25%) had an occult fracture on follow-up X-ray. Non-weight bearing had sensitivity (75%) and specificity (58%) for occult fracture detection ($p = 0.220$), and for ankle swelling ($p < 0.0001$) with sensitivity and specificity variable based on ankle mm.

Discussion: From this small retrospective study, it appears that X-ray measurement of ankle swelling is highly predictive of an occult ankle fracture. The addition of patient weight bearing / non-weight bearing may add to its predictive power; however, our sample size was not large enough to determine its statistical significance.

Significance/Clinical relevance: Current practice uses weight-bearing status to predict occult fractures, often leading to unnecessary casting; our study demonstrates the significance of ankle swelling and should be utilized more often in a clinical setting to predict occult fractures



Christian Kerut (L4)

Insights into the Health of the Quadriceps from the Articularis Genu of Patients with Osteoarthritis

Introduction: Knee osteoarthritis (kOA) disability involves cartilage degeneration, painful inflammation, and stiffening fibrosis of the joint as a whole, resulting in debilitation of the articular musculature, such as the quadriceps femoris (QF). The vastus medialis oblique (VMO) of the QF is particularly sensitive to severe kOA and functional limitations. Another joint muscle, the articularis genu (AG), runs continuous to the vastus intermedius into the knee and can be sampled as part of the residual tissue excised during total knee arthroplasty (TKA). For this reason, the AG can be used to evaluate features of kOA-attributable myopenia relative to, for example, the muscle-derived paracrine secretome in synovial fluid (SF). Such a link could help develop SF analytics pre-TKA to inform individualized peri-operative strategies for muscular conditioning or rehabilitation. However, the AG must first be solidly confirmed as a surrogate for the disease status of the QF. Previous studies indicate similarities in myofiber type distribution and size between the AG and vastus lateralis relative to kOA-induced deficits in range of motion. This comparative study expands on the structural and gene expression changes related to the size, distribution, and specification of myofibers and endomysial fibrosis in AG and VMO sets of end-stage kOA patients.



Davis Martin (L4)

Methods: Sets of AG and VMO were collected from 19 kOA patients during TKA. Equivalent portions from each muscle were fixed or cryopreserved for histology or RNA isolation, respectively. Fixed muscles were processed for serial paraffin sectioning and stained by picosirius (PS) technique for collagen or indirect co-immunofluorescence(IIF) labeling of myosin heavy chain (MHC) 7, 2A, and 2X, corresponding to myofiber type (T) 1 (slow), 2a (fast), and 2a/x hybrids (super-fast/inefficient). Three 200x photomicrographs were captured per sample by confocal(Olympus) using excitation at 592nm for PS and 488, 592, and 633nm for myofiber IIF. Slidebook™ (3i) software assisted morphometry of collagen and myofiber tags was used to segment and measure fibrosis or myofiber types and cross-sectional area (CSA). Samples were homogenized, RNA isolated, and cDNA synthesized (Superscript IV; Thermo) for qPCR array (Biorad) with a Lightcycler 480 (Roche) to measure gene expression related to T1 (Myh7, Mef2c) T2a (Myh2, Pgc1α), and T2x (Myh1) myofibers; hypertrophy (Igf1); atrophy (Trim63, Fbxo32); and fibrosis (Ctgf, Tgfβ1). Prism 10.1.2 (GraphPad) was used for correlation analyses using Spearman's rho (R) with $\alpha=0.05$.

Results: The AG and VMO displayed high association in the distribution of T1 or T2a ($R=0.70$; $p=0.001$) and T2a/x ($R=0.89$; $p<0.0001$) isoforms, validated by moderate correlations in genes driving specification and transition of T1: Myh7 ($R=0.86$, $p<0.0001$) and Mef2c ($R=0.50$; $p=0.070$) T2a: Myh2 ($R=0.53$, $p=.042$); and T2a/x: Myh1 ($R=0.52$, $p=0.048$), all of which displayed an expression trend relative to fiber type percentages in both muscles. The size of T2a fibers was consistent between the muscles ($R=0.78$, $p<0.0001$) and significantly smaller than the CSA of T1 fibers. Higher Igf1 values corresponded to larger CSA of T1 and T2a fibers and were associated between muscles ($R=0.74$; $p=0.002$). Conversely high expression of Trim63 indicated severity of atrophy and correlated between the muscles ($R=0.79$, $p=0.0003$). Lastly, the severity of endomysial fibrosis was moderately comparable between muscles ($R=0.51$, $p=0.030$), in agreement with the number of Tgfβ1 transcripts ($R=0.56$, $p=0.031$).

Discussion: This comparative study unveils a novel finding-AG myopenia from kOA mirrors measures that indicate disuse of the VMO. These include the presence of typically rare T2a/x hybrid myofibers, compensatory hypertrophy, preferential atrophy of fast twitch fibers, and abnormal thickening of the endomysium with fibrous deposits. This discovery paves the way for future assessment of structural changes in the otherwise discarded parts AG in relation to the levels of muscle-derived drivers of disuse-mediated myopenia of the QF in SF.

Significance/Clinical relevance: Establishing the AG as a surrogate for the QF status in kOA marks a significant advancement in developing objective and individualized assessment tools for the condition of the articular musculature before TKA that will impact peri-operative physical therapy and further improve surgical outcomes.

Comparing ACDF Outcomes by Cervical Spine Level: A Single Center Retrospective Cohort Study

Introduction: Anterior cervical discectomy and fusion (ACDF) is a common treatment for cervical radiculopathy and myelopathy associated with complications including postoperative dysphagia. Previous research has suggested a relationship between complications and level involvement, however there is limited direct comparison of post-operative outcomes in upper cervical spine fusions (UCF) versus middle to lower cervical spine fusions (MLCF). This study aims to compare the overall outcomes of UCF (defined as fusions involving C3-C4 disc space) with MLCF (defined as the remainder of the cervical spine). Due to the more complex anatomy and indirect data suggesting increased rates of dysphagia after UCF, the authors hypothesized increased rates of complications following UCF compared to MLCF.

METHODS: A retrospective chart review of 835 patients who underwent ACDF from 2012 to 2022 was conducted with patients classified as either upper cervical fusion (UCF), defined as inclusion of C3-4 disc-space, or middle-lower cervical fusion (MLCF), defined as lacking C3-4 disc-space. Demographic characteristics were compared using either χ^2 tests or Fisher exact tests. Clinical characteristics were compared in univariable analysis using either χ^2 tests, linear-mixed effects models, or generalized linear-mixed models depending on their distribution. Characteristics including demographics, number of levels fused, spinal cord signal change, and neurological diagnosis were included in the multivariable models to minimize confounding.

Results: A total of 835 patients were included in the current analysis, comprising 562 in the MLCF group and 281 in the UCF group. The median follow-up time was 211 days for UCF and 200 days for MLCF. UCF led to a 1.5-day longer length of stay (LOS) compared to MLCF in both univariable (1.5 vs. 3.1, $p < 0.0001$) and multivariable analysis [2.3 days (95% CI: 1.8, 3.0) vs. 3.3 days (2.6, 4.2), $p < 0.0001$]. MLCF patients reported improvement or resolution in their symptoms more often than UCF patients [0.43 (95% CI: 0.30, 0.62) and 0.46 (95% CI: 0.30, 0.70)]. There was no significant difference observed in rates of major complications or revision surgeries. However, there was a significantly higher rate of minor complications, specifically dysphagia, in the UCF group both on univariate and multivariable analysis, respectively [1.72 (95% CI: 1.18, 2.49) and 1.66 (95% CI: 1.08, 2.56)].

Discussion: To our knowledge this study is the first to directly investigate the link between cervical fusion level and post-operative outcomes. UCF patients had increased rates of post-operative dysphagia, longer LOS, and were less likely to report an improvement in neurological symptoms post-operatively when compared to MLCF patients both before and after controlling for demographic differences, number of levels fused, presence of spinal cord signal change on pre-operative radiographs, and type of neurological symptoms. Future prospective studies are needed to confirm these findings.

Significance/Clinical relevance: UCF may be associated with increased likelihood of post-operative dysphagia, longer LOS, increased likelihood of non-home discharge from hospital and a lower likelihood of improvement in neurological symptoms compared to MLCF.



Ryan Schroeder (L4)

Targeting Arthralgia in Knee Osteoarthritis via Non-psychoactive Cannabinoid Mechanisms

Introduction: Non-surgical management of painful knee osteoarthritis (KOA) involves NSAIDs, corticosteroids, and opioids, which provide short-term relief and may worsen disease progression. Hence, our overarching goal is to evaluate novel, targeted analgesics that also provide effective, longer lasting anti-inflammatory relief for KOA. Activation of the polymodal transient receptor potential vanilloid 1 (TRPV1) cation channel can cause nociceptive arthralgia. TRPV1 is expressed in articular sensory afferents and some neuroendocrine-like synoviocytes. External or endogenous ligands, such as capsaicin and hydroxyeicosatetraenoic acid derivatives, can bind TRPV1 to trigger the release of calcitonin gene-related peptide (CGRP) that contributes to neurogenic inflammation. Endocannabinoids anandamide (AEA) and 2-arachidonoylglycerol (2-AG), and exogenous cannabidiol (CBD) share chemical features that can activate and, after prolonged activity, desensitize TRPV1 by interacting with its capsaicin-binding pocket, as well as mildly trigger anti-inflammatory cascades through cross-interaction with the cannabinoid 2 receptor (CB2R). CBD analogs such as JWH133 have been developed to have a 200-fold higher binding affinity for CB2R than conventional CBD. Before testing the analgesic and anti-inflammatory effects of such analogs in KOA-attributable arthralgia and inflammation, it is crucial to identify responders to treatment from a diverse KOA patient population. This study aims to identify the differential distribution of CB2R and activated TRPV1 in the synovial tissues and fluid of KOA patients grouped by reported pain.



Collin Toups (L3)

Methods: Specimens were collected from 40 patients with end-stage KOA. The patients were divided into two groups of 20 individuals each based on their KOOS pain scores. The first group reported the lowest pain scores, while the second group reported the highest pain scores. Synovial tissue and

fluid were collected during total knee arthroplasty, preserved, and banked. Formalin-fixed synovial tissues were processed for paraffin sectioning and staining by H&E and for detection of TRPV1 and CB2R by indirect immunofluorescence. H&E sections were evaluated microscopically for synovitis and scored. Distribution of TRPV1 and CB2R relative to synovial tissue layer and area were calculated using Slidebook™ (3i) software-assisted morphometry of confocal photomicrographs. Synovial fluid was cleared, digested, and analyzed for CGRP by sandwich ELISA (Cusabio®). Prism (Graphpad) software was used to compare groups or correlate by Student's t or Spearman rho with $\alpha=0.05$.

Results: Compared to the low pain group, patients reporting high pain presented with higher inflammation based on synovitis scores ($p \leq 0.0002$) and a higher percentage of synovial TRPV1 ($p \leq 0.0004$) with correspondingly high concentrations of CGRP ($p=0.0547$) in synovial fluid. Patients reporting low pain had a significantly higher distribution of CB2R than the high pain group ($p \leq 0.0001$) and altogether, CB2R expression inversely correlated with synovitis severity ($R = -0.51$; $p \leq 0.0001$).

Discussion: Increased TRPV1 expression in the synovium of patients reporting high pain could be used to predict patient responsiveness to intra-articular supplementation with CB2R-specific analogs like JWH133 in the comodulation of arthralgia and inflammation. The lower expression of CB2R in patients reporting high pain may indicate internalization due to ligand deficiency or tolerance following chronic upregulation. It can be predicted that a more significant expression of CB2R may indicate higher endocannabinoid production, which would allow for increased TRPV1 crosstalk and, thus, greater desensitization in the patients reporting low pain.

Significance/Clinical relevance: Patient-centric co-targeting of CB2R and TRPV1 by local delivery of higher affinity CBD analogs can provide a safe but potent alternative to alleviate painful inflammatory arthropathy.

Chronic Osteomyelitis Predictors with Pattern of Care and Health Services

Introduction: Chronic osteomyelitis is an infection of the bone presenting at a point in time after an acute injury or trauma. The infection may occur due to a multitude of reasons, but a couple would be open wounds or biofilms created by pathogens on implanted hardware. Commensal staphylococci are the most common cause of osteomyelitis. Management of chronic osteomyelitis can either be surgical with irrigation and debridement, a course of antibiotics ranging from four to six weeks, or a combination of both. Chronic osteomyelitis can complicate the healing process, but also place a burden on the patient if there is a need for multiple operations and daily antibiotic treatments. The study aims to look at varying comorbidities, treatment plans, and social determinants of health for associations with chronic infection. Doing so will help improve the care and management of bone infection cases.



Thuc Truong (L3)

Methods: (IRB #5170) This is a retrospective cohort study of patients that have been diagnosed with chronic osteomyelitis. The study covers 27 electronic medical records, from Epic, of patients at University Medical Center in New Orleans. The study includes patients that are aged 18 or over, have chronic osteomyelitis of the extremity long bone, hind foot, or bony pelvis diagnosis, and diagnoses between 2016 and 2022. Data being abstracted from the charts include, but not limited to, social determinants of health and outcomes of medical and surgical treatments.

Results: The average age of abstracted from the charts is 44.5 years old with charts being 2/3 male and 1/3 female. 55.56% of the charts indicated were African American and the other 44.44% were White. Most of the charts, 85%, had antibiotics and surgery treatment, while the rest were only treated with antibiotics. 3 of the 4 charts receiving only antibiotic treatment, the orthopedic team did not see a need for surgical treatment and noted that antibiotic treatment yielded good progress. Only 6 of 27 charts were not prescribed long term IV antibiotics. There were 4 charts indicating IV drug use with 1 not prescribed long term IV treatment. The other 5 not on IV responded well to initial oral antibiotics and infectious disease consult not recommending IV treatment. There were 6 charts with a recurrence of chronic osteomyelitis. However, 83.33% of the patients who had a recurrence of chronic osteomyelitis were prescribed long term IV antibiotics. Additionally, the patients with recurrence, 33% only had antibiotics and no surgery as treatment.

Discussion: From the charts abstracted, the most common method in treating chronic osteomyelitis was to have a combination of antibiotic and surgical treatment. Additionally, observed was the common practice of a prolonged course of antibiotic treatment through IV. However, it was interesting to note that most of the recurrence had been prescribed with 6 weeks of antibiotics. When increasing the number of charts abstracted, it may be of merit to see the percentage of patients not prescribed a course of IV antibiotics developing a recurrence of chronic osteomyelitis. The data collection is still ongoing and a definitive conclusion cannot be made at this time.

Significance/Clinical relevance: If the aims of the project are reached, a new approach to managing osteomyelitis may allow to better treat and manage patients without relying on an extended period of antibiotics.

Macrophage Induced Senescence in Osteoprogenitor Cells: Pro- and Anti-inflammatory Effects on Bone Regeneration

Introduction: Macrophages are essential to coordinating mammalian tissue regeneration¹. In the dynamic bone microenvironment, macrophages exist as dual-natured entities, adopting pro-inflammatory (M1) or anti-inflammatory (M2) phenotypes in response to specific conditions. M1 macrophages, activated by IFN γ and LPS, release cytokines and ROS that induce cellular senescence, hindering the regenerative function of osteoprogenitor cells (OPs)². In contrast, macrophages, induced by IL-13, can play a reparative role, suggesting their protective effect against tissue damage due to inflammation^{2,3}. The distinction between these phenotypes is crucial in the context of healing and regeneration across the entire human body. Mice, mirroring human regenerative abilities, offer an applicable model to study these effects and are able to regenerate the distal half of the digit tip, known as the third phalangeal element (P3). This regenerative capability contrasts with the response to amputations proximal to this point (P2), where regeneration fails, resulting in a cartilaginous callus without bone growth beyond the amputation plane and subsequent dermal scar formation⁴. The underlying reasons for this disparity in healing outcomes between amputations mice, or union or non-union fractures in humans, raise questions about whether the differences are attributable to intrinsic qualities of OPs or to the environmental factors influencing the healing process. This study aims to explore how OPs respond to the senescence-inducing effects of macrophage-derived factors, considering the potential influence of macrophage phenotypes on the regenerative process. If differences in P2 and P3 cell regeneration capabilities are caused by their intrinsic characteristics, we hypothesize that P2 cells will demonstrate increased senescence in response to stimulation with macrophage-conditioned media.



Sylvia Culpepper
Research Fellow

Methods: OPs were isolated from P2 and P3 mouse digits and cultured. To measure stress resistance, P3 and P2 cells were placed in 24 well plates with different variations of macrophage conditioned media. To make macrophage conditioned media bone marrow macrophages are treated with different stimulants, IFN/LPS (M1), IL-13 (M2), or no treatment (M0) for 24 hours. The media was washed off and OPs were collected 24 hours later for SA- β Gal senescent staining.

Results: P3 OPs exhibited significantly increased senescence when exposed to the untreated macrophages (M0) and IFN/LPS treated (M1) conditions, compared to P2 cells, which showed no significant change in senescence levels. M2-conditioned media exerted a seemingly protective effect, with no observed difference in senescence between P2 and P3 cells.

Discussion: Our findings contradict our hypothesis and suggest that extrinsic factors are what affect the regenerative properties of P2 and P3 cells. P3 cells showing increased senescence convey the complexity of the bone microenvironment, particularly in how macrophage-derived factors modulate cellular senescence differently in OPs derived from different locations of mouse digits. M2-conditioned media, which did not differentiate between P2 and P3 cells in terms of senescence, highlights the potential of anti-inflammatory macrophages in mitigating regeneration and promoting tissue repair. Overall, these findings indicate that certain OPs exhibit resistance or vulnerability to inflammatory environments. Furthermore, they suggest that in vivo injuries capable of regenerating these inflammatory conditions may vary across different regions, potentially due to differences in secretory factors and other regional characteristics.

Significance/Clinical relevance: This study could provide valuable insights into the optimization of bone repair and regeneration strategies by modulating the macrophage microenvironment.

Poster Presentations

Trochleoplasty in Patellofemoral Instability: Current Concepts

Purpose: Trochlear dysplasia is a significant anatomical and biomechanical risk factor for recurrent patella instability. Trochleoplasty is a surgical procedure that has been described to manage patients with high grade trochlea dysplasia leading to recurrent patella instability. This review aims to describe the current evidence on indications, types of Trochleoplasty, surgical techniques as well as clinical outcomes of Trochleoplasty.



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Recent findings: Three types of Trochleoplasty that have been described include lateral facet elevation, recession wedge and sulcus deepening Trochleoplasty. The modified Bereiter 'thin flap' is the most common type of sulcus deepening procedure which is being performed in recent years compared to the Dejour 'thick flap' technique. A recent advancement is the arthroscopic deepening trochleoplasty, which is an arthroscopic variant of the Bereiter technique. In contrast to historical literature, recent studies have reported significant improvement in patient reported outcome measures (PROMs), improved patellofemoral stability and elevated levels of patient satisfaction.

Summary: Sulcus deepening Trochleoplasty is a proven technique for management of patients with High grade Trochlear dysplasia associated with patellofemoral instability. It is associated with lower re-dislocation incidence, minimal complication rates, improved clinical outcomes and good patient satisfaction scores. Surgeons managing patellofemoral instability patients should be well versed with the indications and technique of Trochleoplasty.

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