

35th Annual Combined Orthopaedic Spring Symposium

April 16 - 17, 2021

Virtual Meeting





Welcome from the HOA President

Aloha! It is an honor to welcome you to the 35th Annual Combined Orthopaedic Spring Symposium. Although our members cannot meet in person this year, we have lined up a great virtual program.

The conference will bring together world experts, local talent, residents, medical students, and allied health professionals. You will hear 28 original orthopedic research projects done by teams from the University of Hawai'i and Tripler Army Medical Center. Panel discussions will feature local experts in their fields. Our didactic presentations will come from leaders in the specialties of Joint Replacement and Sports Medicine.

During breaks, our exhibitors will give presentations featuring some of the latest technologies in orthopedics.

We hope you can join us to support our students and residents, get a little smarter, earn a lot of CME, and continue the 35 year tradition of the Hawaii Orthopedic Association Combined Orthopedic Spring Symposium.

We thank all of our members and exhibitors without whom, this event would not be possible.

Jonathan Pellett, MD
HOA President

2020-2021 HOA Officers

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35th Annual Hawai'i Orthopaedic Association Combined Spring Symposium

April 16-17, 2021

Zoom

Honolulu, Hawai'i

CONFERENCE INFORMATION

GENERAL OBJECTIVES:

By the end of the course, the participant will be able to:

1. Identify diagnostic and treatment options available.
2. Improve patient care through application of accepted guidelines.
3. Review discussing diagnostic and therapeutic guidelines to clinical care and enhance patient care by coordination of resources.

CONTINUING EDUCATION:



In support of improving patient care, this activity has been planned and implemented by Hawai'i Pacific Health and the Hawai'i Orthopaedic Association. Hawai'i Pacific Health is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

Hawai'i Pacific Health designates this live activity for a maximum of 8.5 *AMA PRA Category 1 Credits™* for physicians. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Hawai'i Pacific Health designates this live activity for 8.5 contact hours for nurses. Nurses should only claim credit commensurate with the extent of their participation in the activity.

TO RECEIVE CE:

Please note that in order to receive continuing education credits for this offering, you must:

- Claim credit commensurate with the extent of your participation in the activity.
- Complete and submit the evaluation survey that will be emailed to you within one week of the offering.
- Speakers cannot claim credit for their own presentations.
- Your CE certificate will be immediately available to you upon completion of your evaluation.

DISCLOSURE INFORMATION:

Per CE requirements, a disclosure report is included below listing any relationships that faculty, planning committee members, and others may have with a commercial interest. A commercial interest is any entity producing, marketing, re-selling, or distributing health care goods or services consumed by, or

used on patients. The planners and presenters of this event have reported no relevant relationships with any commercial companies pertaining to this activity.

The following Faculty and Planning Committee Members have reported relationships with companies whose products or services (may) pertain to the subject matter of this meeting:

<u>Faculty</u>	<u>Relationship</u>
Maveric Abella, BS	None
Ryan J. Bickley, MD	None
Sean Chan, BS	None
Christian Cruz, MD	None
James DeJesus IV, BS	None
CPT Nemesis Hazim Liriano, MD	None
CPT Zackary A. Johnson, MD	None
CPT Gregory E. Lausé, MS, MD	None
John P. Livingstone, MD	None
Elizabeth Matzkin, MS, MD	Salary: <i>Arthrex, Inc.</i> Consultant: <i>DePuy</i> Research Support: <i>Zimmer</i>
Makoa Mau	None
Kyle K. Obana, BA	None
Vera Ong, BS	None
Jonathan Pellett, MD	None
Julian Rimm, MS	Consultant: <i>Ortho Development, Inc.</i>
Sean Saito, BS	None
Brandan Sakka, BS	None
Victoria Scala, MD	None
CPT Maggie Scribner, MD	None
Dylan Singh, BS	None
Eric L. Smith, MD, FAOA, FAAOS, FAAHKS	Consultant: <i>DePuy/Conformis</i> Speaker: <i>Felexion Therapeutics</i>
CPT Joshua W. Sy, DO	None
Trent Tamate, MD	None
Tyler Thorne, BA	None
CPT Alicia M. Unangst, DO	None
Aaron S. Vaslow, MD	None
CPT Connor B. Venrick, MD	None
CPT Jeffrey L. Wake, DO, ATC	None
Anne R. Wright, MD	None
Connor L. Zale, MD	None
Ruixue Zhang, BS	None
<u>Planning Committee Members</u>	
Amy Thomas, MSN, APRN, FNP	None
Jonathan Pellett, MD	None
Paul Ryan, MD	None
Kyle A. Mitsunaga, MD	None

Please direct any questions you may have regarding your evaluation or CE certificate to the HPH Continuing Education Department at hphcontinuingeduc@hawaiiipacifichealth.org.

Thank you to the Continuing Education (CE) Sponsor:



CREATING A HEALTHIER HAWAII



35th Annual Combined Orthopaedic Spring Symposium
April 16, 2021 – 10:30 a.m. to 4:00 p.m.
Virtual Meeting

Zoom Links	
Main Conference	https://zoom.us/j/98088037412?pwd=VklRVdTdyTEg5SEdoQSt2WGZsMnVTdz09 Meeting ID: 980 8803 7412 / Passcode: HOA2021
Exhibit Room	https://us02web.zoom.us/j/87021482424?pwd=d1pDQVlDQ1dVbk8wckZRMHhVSVUzQT09 Meeting ID: 870 2148 2424 / Passcode: HOA

PROGRAM AGENDA

10:30-11:00 a.m.	Exhibit Room Open
Main Conference	https://zoom.us/j/98088037412?pwd=VklRVdTdyTEg5SEdoQSt2WGZsMnVTdz09 Meeting ID: 980 8803 7412 / Passcode: HOA2021
11:00 – 11:15 a.m.	Welcome - Dr. Jonathan Pellett, President, HOA
11:15 – 11:30 a.m.	Board of Councilors - Dr. Jonathan Pellett, President, HOA
11:30 a.m. – 12:15 p.m.	Optimizing ACL Reconstruction in 2021 (Especially for the Female Athlete) Elizabeth G. Matzkin, MD, FAAOS Surgical Director, Women's Musculoskeletal Health Chief of Women's Sports Medicine Associate Professor, Harvard Medical School
12:15 – 12:45 p.m. 12:15-12:25 p.m. 12:25-12:35 p.m. 12:35-12:45 p.m.	Resident / Medical Student Presentations (Sports) Kyle Obana - <i>Targeting Rule Implementation Decreases Neck Injuries in High School Football: A National Injury Surveillance Study</i> Ryan Bickley - <i>Kung Fu Fighting - An Epidemiological Study of Martial Arts Injuries in Patients Presenting to US Emergency Rooms</i> Christian Cruz - <i>Comparison of the Bone-Tendon-Autograft Anterior Cruciate Ligament Reconstruction: A Matched Cohort Analysis to Bone-Tendon-Bone Autograft</i>
12:45 – 1:15 p.m.	Exhibit Room Open
Main Conference	https://zoom.us/j/98088037412?pwd=VklRVdTdyTEg5SEdoQSt2WGZsMnVTdz09 Meeting ID: 980 8803 7412 / Passcode: HOA2021
1:15 – 1:45 p.m. 1:15-1:25 p.m. 1:25-1:35 p.m. 1:35-1:45 p.m.	Resident / Medical Student Presentations (Foot) Alicia Unangst - <i>Return to Run After Halux Valgus Correction</i> Gregory Lause - <i>Ankle Arthrodesis within the Active Duty Population</i> Connor Zale - <i>Traumatic Lesser Metatarsal Fractures in a Military Population</i>

<p>1:45 - 2:15 p.m. 1:45-1:55 p.m. 1:55-2:05 p.m. 2:05-2:15 p.m.</p>	<p>Resident / Medical Student Presentations (Joints) Maveric Abella - <i>The Influence of an In-Person or Telehealth Pre-Operative Appointment on Patient Outcomes and Clinic Operations</i> Sean Chan - <i>Did COVID-19 affect PROMs following hip and knee replacement?</i> James DeJesus - <i>Improved Hip Symmetry with an Adjustable Fluoroscopic Grid During Total Hip Arthroplasty</i></p>
<p>2:15 – 3:00 p.m.</p>	<p>Modifying Risk in TJA Eric L. Smith, MD, FAOA Chief of Arthroplasty Department of Orthopaedics, New England Baptist Hospital Associate Professor, Tufts University School of Medicine</p>
<p>3:00 – 3:30 p.m. 3:00-3:10 p.m. 3:10-3:20 p.m. 3:20-3:30 p.m.</p>	<p>Resident / Medical Student Presentations (Joints) Julian Rimm - <i>Gap Balance versus Measured Resection Technique in Total Knee Arthroplasty with Fixed Femoral Cut of 6° Valgus</i> Vera Ong - <i>Time from End of Surgery Until Discharge Following Total Knee Arthroplasty: Implications for Same Day Discharge</i> Sean Saito - <i>Prevalence of Contralateral Osteoarthritis in Unilateral Arthroplasty Patients and the Influence of Ethnicity</i></p>
<p>3:30-3:40 p.m.</p>	<p>Closing Remarks - Dr. Jonathan Pellett, President, HOA</p>
<p>3:40-4:20 p.m.</p>	<p>Exhibit Room Open</p>



35th Annual Combined Orthopaedic Spring Symposium
April 17, 2021 – 7:45 a.m. to 1:00 p.m.
Virtual Meeting

Zoom Links	
Main Conference	https://zoom.us/j/98088037412?pwd=VklRVTdYtEg5SEdoQSt2WGZsMnVTdz09 Meeting ID: 980 8803 7412 / Passcode: HOA2021
Exhibit Room	https://us02web.zoom.us/j/87021482424?pwd=d1pDQVJlQ1dVbk8wckZRMHV5VUzQT09 Meeting ID: 870 2148 2424 / Passcode: HOA

PROGRAM AGENDA

Main Conference	https://zoom.us/j/98088037412?pwd=VklRVTdYtEg5SEdoQSt2WGZsMnVTdz09 Meeting ID: 980 8803 7412 / Passcode: HOA2021
7:45 a.m.	Welcome - Dr. Jonathan Pellett, President, HOA
8:00 – 8:45 a.m.	Sex and Sports Elizabeth G. Matzkin, MD, FAAOS Surgical Director, Women's Musculoskeletal Health Chief of Women's Sports Medicine Associate Professor, Harvard Medical School
8:45 – 9:15 a.m.	Resident / Medical Student Presentations (Sports)
8:45-8:55 a.m.	Zackary Johnson - <i>Reconstruction of Chronic Pectoralis Major Ruptures Using Grafts: A Systematic Review and Meta-analysis of Results</i>
8:55-9:05 a.m.	Joshua Sy - <i>Supscapularis split versus takedown in Latarjet Procedures in the Military</i>
9:05-9:15 a.m.	Jeffrey Wake - <i>Surgical Management of Subcritical Bone Loss: Bankart versus Latarjet</i>
9:15 - 10:00 a.m.	Resident / Medical Student Presentations (Other)
9:15-9:25 a.m.	Anne Wright - <i>When Do Patients Return to Driving After Outpatient Foot and Ankle Surgery?</i>
9:25-9:35 a.m.	Connor Venrick - <i>Orthopaedic Post-Surgical Opioid Prescribing Guidelines: Short Term Success</i>
9:35-9:45 a.m.	Aaron Vaslow - <i>Comparing Outcomes for Different Techniques of Clavicle ORIF</i>
9:45-9:55 a.m.	Maggie Scribner - <i>Continuous Intravenous Ketamine for Pain Control after Tibial or Femoral Osteotomy Abstract</i>
10:00 - 10:30 a.m.	Exhibit Room Open

Main Conference	https://zoom.us/j/98088037412?pwd=VklRVTDyTEg5SEdoQSt2WGZsMnVTdz09 Meeting ID: 980 8803 7412 / Passcode: HOA2021
10:30 - 11:15 a.m.	Value-Based Health Care in Total Joint Arthroplasty: The New England Baptist Experience <i>Eric L. Smith, MD, FAOA</i> Chief of Arthroplasty Department of Orthopaedics, New England Baptist Hospital Associate Professor, Tufts University School of Medicine
11:15 a.m. – 11:45 a.m. 11:15-11:25 a.m. 11:25-11:35 a.m. 11:35-11:45 a.m.	Resident / Medical Student Presentations (Total Joint) Nemesis Hazim-Liriano - <i>Double Level Osteotomy for Severe Genu Varum: an Alternative to Total Knee Arthroplasty</i> Brandan Sakka - <i>Feasibility of Outpatient Discharge In Single-Stage Bilateral Unicompartmental Knee Arthroplasty</i> Victoria Scala - <i>Effect of Patellar Resurfacing on Clinical Outcomes in Total Knee Arthroplasty Using Ultracongruent Inserts</i>
11:45 a.m. - 12:15 p.m. 11:45-11:55 a.m. 11:55 a.m.-12:05 p.m. 12:05-12:15 p.m.	Resident / Medical Student Presentations (Total Joint) Dylan Singh - <i>The Influence of Patellar Erosion on Knee Range of Motion Following Unicompartmental Knee Arthroplasty</i> Trent Tamate - <i>The Effect of Mental Health on Early Postoperative Outcomes in Total Hip Arthroplasty</i> Tyler Thorne - <i>Racial and Ethnic Disparities in Utilization Rate and Perioperative Outcomes after Knee and Hip Arthroplasty</i>
12:15 - 12:45 p.m. 12:15-12:25 p.m. 12:25-12:35 p.m. 12:35-12:45 p.m.	Resident / Medical Student Presentations (Total Joint) Makoa Mau - <i>A Comparison Between Unilateral Unicompartmental Knee Arthroplasty (UKA) and Total Knee Arthroplasty (TKA) Patient and Clinical Reported Outcomes</i> Ruixue (Rae) Zhang - <i>Radiographic Assessment of Two Short Femoral Stems Used During Total Hip Arthroplasty Via Direct Anterior Approach</i> John Livingstone - <i>A Cadaveric Study Measuring Femoral Nerve Tension during Anterior Total Hip Arthroplasty Approach</i>
12:45	Closing Remarks Dr. Jonathan Pellett, President, HOA



Thank you to the exhibitors:

Akamai Medical – Hemoblast
 Ron Hillock, MD – Experience with Hemoblast
 Avanos
 Axogen Inc.
 BLOXR Solutions
 Checkpoint Surgical
 Ferring (Euflexxa)
 MTF Biologics
 Orthopediatrics
 OsteoNovus

Exhibitor Schedule:

Friday, April 16, 2021

10:30 - 11:00 a.m. 10:30-10:40 a.m. 10:40-10:50 a.m. 10:50-11:00 a.m.	Exhibits - Dr. Kyle Mitsunaga Moderator Ferring (Euflexxa) Akamai Medical – Hemoblast Ron Hillock, MD – Experience with Hemoblast
12:45 – 1:15 p.m. 12:45-12:55 p.m. 12:55-1:05 p.m. 1:05-1:15 p.m.	Exhibits - Dr. Kyle Mitsunaga Moderator MTF Biologics BLOXR Solutions Checkpoint Surgical
3:40 – 4:00 p.m. 3:40-3:50 p.m. 3:50-4:00 p.m. 4:00-4:10 p.m. 4:10-4:20 p.m.	Exhibits - Dr. Kyle Mitsunaga Moderator Orthopediatrics Avanos OsteoNovus Axogen Inc.

Saturday, April 17, 2021

10:00 – 10:30 a.m. 10:00-10:10 a.m. 10:10-10:20 a.m.	Exhibits - Dr. Kyle Mitsunaga Moderator MTF Biologics Avanos
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35th Annual Combined Orthopaedic Spring Symposium

RESIDENT ABSTRACTS

Tripler Army Medical Center

University of Hawaii



Ryan Bickley, MD

ABSTRACT TITLE: Kung Fu Fighting - An Epidemiological Study of Martial Arts Injuries in Patients Presenting to US Emergency Rooms

INTRODUCTION

With the advent of mixed martial arts (MMA) growing in popularity since the early 2000s, with notable publicized promotions such as Ultimate Fighting Championship (UFC) and K-1 Pride Fighting Championship, there has been a described increase in martial arts participation internationally. The term MMA generally describes the hybridization of multiple combat disciplines including but not limited to: karate, judo, jiu-jitsu, wrestling, taekwondo, boxing, kickboxing, and muay thai. With increased participation in MMA and martial arts of various disciplines, differing physical demands are placed on participants than are observed with traditional sports given the complex interdisciplinary demands. Due to the physical nature of combat sports, there are expected resultant injuries associated with participation. The purpose of this study is to report the incidence and characteristics of injuries seen from various martial art disciplines in order to educate participants and providers alike about risks assumed with participating in martial arts.

METHODS

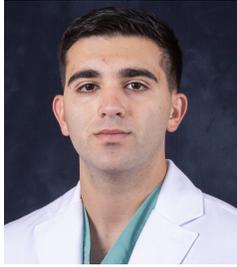
The National Electronic Injury Surveillance System (NEISS) database was queried for martial arts-related injuries from 2010-2019. Cases were examined and data including patient age and gender, injury type and location, hospital disposition, and type of martial arts practiced were extracted.

RESULTS

A total of 8,447 injuries were recorded, leading to a national estimate of 310,143 martial-arts related injuries over the 10 year period of 2010-2019 (95% CI 239,063-381,223). The most common types of injuries were strains/sprains (n=2,385, 28.2%), fractures (n=1,577, 18.7%), and contusions/abrasions (n=1,348, 16.0%). There were 260 dislocations, with shoulder dislocations being most common (n=96, 36.9%). Lower extremities were affected more frequently than upper extremities (n=3,093, 36.6% versus n=2,402, 28.4%), with the knee being the single most common location of injury (n=817, 9.7%). Males more commonly sustained fractures (19.6% versus 17.4%, p=0.03) and dislocations (3.4% versus 2.4%, p=0.01) when compared to females. Ankle injuries were more common in females than males (10.4% versus 6.0%, p<0.001). Only 2.2% of patients required admission to the hospital. Risk factors for admission included patients >35 years of age and male sex.

DISCUSSION and CONCLUSION

Martial arts injuries are a significant source of musculoskeletal injuries among patients presenting to US emergency rooms, as popularity for the sport increases. Market research estimates that 18.1 million Americans practiced some form of martial arts in 2010, and of those 8.7 million were kids [Simmons Market Research]. Young adults are especially at risk, with an average patient age of 23.2 and most frequent patient age of 13. Lower extremity injuries are seen most frequently, with patients rarely requiring hospital admission. Although injury patterns differ from other popular contact sports such as American football or rugby, injury incidence is comparable. With participation in martial arts increasing alongside popularity of the sport, it is important for participants and treating providers to understand these injury patterns. Using this information, both providers and participants may be better equipped to make educated decisions on injury prevention and treatment.



Christian Cruz, MD

ABSTRACT TITLE: Comparison of the Bone-Tendon-Autograft Anterior Cruciate Ligament Reconstruction: A Matched Cohort Analysis to Bone-Tendon-Bone Autograft

INTRODUCTION

While multiple graft options are available for use in anterior cruciate ligament (ACL) reconstruction, bone-tendon-bone (BTB) and hamstring tendon autografts remain the most commonly used autografts. Excellent results have been achieved with BTB ACL reconstruction, however it is not without morbidity. BTB ACLR is associated with increased post-operative anterior knee pain, pain with kneeling, and has the risk of intra and post-operative patella fracture. Additionally, Graft-tunnel mismatch is problematic and often results in a bone plug recession or protrusion from the tibial tunnel, leading to inadequate osseous fixation. Given the disadvantages of the BTB, an alternative to the BTB graft is the Bone-Tendon-Autograft (BTA) based ACL reconstruction which has been developed at this institution. This technique utilizes a single bone plug from the tibial tubercle in order to mitigate the disadvantages of the BTB technique. We hypothesize that anterior cruciate ligament reconstruction with BTA autograft will provide non-inferior clinical results and failure rates when compared to BTB autograft, with a lower incidence of knee pain, patella fracture and pain with kneeling.

MATERIALS AND METHODS

A consecutive series of 52 patients treated with BTA ACL reconstruction between June 2016 and April of 2018 were retrospectively identified. To differentiate this graft from a traditional BTB, we have coined the term "BTA". The middle third of the patellar tendon is used with a typical width of 10-11 mm. A standard tibial tubercle bone plug is harvested. The length of the patellar tendon and graft construct is then measured. If the tendon is >45 mm and the construct at least 70 mm, then we proceed with the BTA technique. At the inferior pole of the patella, electrocautery is used to harvest the tendon from the patella. In the comparison cohort, 50 patients from a comparison age matched cohort of patients who had undergone BTB ACL reconstruction were identified from the same time frame. Patients identified as eligible for the study were contacted and 4 online questionnaires were administered to assess functional outcomes: the Lysholm knee scoring scale, International knee documentation committee scale (IKDC), and a visual analog scale (VAS) for pain, anterior knee pain, kneeling pain, graft integrity, and knee stability. The primary outcome was ACL graft failure requiring revision surgery.

RESULTS

A total of 52 patients with an average age of 27.0 +/- 6.0 years underwent a BTA ACL reconstruction and a matched cohort of 50 patients with an average age of 29.3 +/- 7.1 years underwent a BTB ACL reconstruction during a similar timeframe. At average follow-up of 2.4 years (29.3 months) after surgery, there were two re-ruptures in the BTA cohort (4.0%) compared to two re-ruptures in the BTB cohort (4.0%). In the BTA cohort, 9 (18%) patients reported anterior knee pain compared to 19 in the BTB cohort (38%) which was statistically significant ($p=0.04$). A total of 11 (22%) patients report pain or pressure with kneeling in the BTA cohort. In the BTB cohort, 24 patients (48%) reported pain or pressure with kneeling which was a statistically significant difference ($p=0.006$). There was no statistical difference in SANE, VAS, and Lysholm scores.

DISCUSSION

Our study demonstrates that the Bone-Tendon-Autograft (BTA) anterior cruciate ligament reconstruction leads to similarly low rates of ACL graft failure requiring revision surgery, along with significantly decreased anterior knee pain and kneeling pain when compared to a Bone-Tendon-Bone (BTB) cohort. Additionally, the potential complications of graft-tunnel mismatch are eliminated with the BTA ACLR technique.



Nemesis Hazim, Connor Venrick, Aaron Vaslow, Craig Bottoni

ABSTRACT TITLE: Double level osteotomy for severe genu varum: an alternative to Total Knee Arthroplasty

BACKGROUND

We present a case in which a patient with 24 degrees of varus angulation and complete loss of medial joint space with lateral subluxation of the tibia underwent a distal femoral opening osteotomy in concomitance with a medial closing wedge tibial osteotomy to preserve the joint line. A systematic review of the literature was also performed to assess the outcomes of this procedure, as it is an uncommon approach to osteoarthritis management.

METHODS

Prisma guidelines were followed to perform a systematic review of the literature. Two independent researchers searched Pubmed for articles in which the title included the keywords of interest. Only articles written in English which involved patients greater than 19 years old were included. A comprehensive list of studies which met our inclusion criteria was retrieved and reviewed.

RESULTS

We report our surgical technique and outcomes, as well as a meta-analysis of the current literature.

CONCLUSIONS

The results of our study suggest that double level osteotomy is a valuable procedure for joint preservation in patients with large varus deformity. This is an uncommon technique to preserve joint line anatomy and avoid joint obliquity in young and active patients who have no bone wear or instability and therefore are not yet candidates for total knee arthroplasty.



Zack Johnson, MD

ABSTRACT TITLE: Reconstruction of Chronic Pectoralis Major Ruptures Using Grafts: A Systematic Review and Meta-analysis of Results

BACKGROUND

While recent studies encourage operative management of pectoralis major tendon ruptures, available data on reconstruction is limited with no comparative studies.

OBJECTIVES

The purpose of this study is to compare reconstruction to primary repairs of chronic ruptures without graft augmentation. A secondary comparison of outcomes between allograft and autograft is also performed.

METHODS

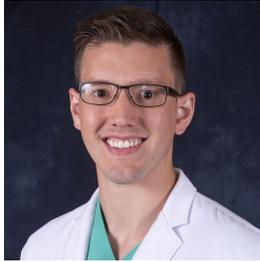
In accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, a systematic review of the literature was completed by use of MEDLINE and Google Scholar databases. Criteria for inclusion were peer-reviewed studies, with English translation, reporting outcomes of reconstruction of distal pectoralis muscle tears with sufficient delineation from patients managed differently. The MINORS (Methodological Index for Non-Randomized Studies) and National Institute for Health and Clinical Excellence (NICE) quality assessment tool was used to assess the quality of the existing literature. Meta-analysis of outcomes was completed. Significance was set at $P < .05$.

RESULTS

A total of 16 articles, covering a total of 82 patients, met inclusion criteria for review. No studies reported use of both allograft and autograft within the same study. All patients were male, with an average age of 29.5 years. Reconstruction was significantly superior to primary repair with respective functional outcome scores of 3.38 and 2.72 ($P=0.048$). There was no significant difference in outcome between the allograft and autograft.

CONCLUSIONS

Reconstruction with graft augmentation has significantly superior results to primary repair of chronic pectoralis major tendon ruptures. There was no significant difference in outcome between autograft and allograft tissue.



CPT Gregory E. Lausé, MD / CO-AUTHOR'S NAME: COL Paul M. Ryan, MD

ABSTRACT TITLE: Ankle Arthrodesis within the Active Duty Population

INSTITUTION WHERE THE STUDY/PROCEDURE TOOK PLACE: Tripler Army Medical Center, Honolulu HI

INTRODUCTION

Ankle and foot injuries are a major cause of Active Duty (AD) service members' time lost from training and combat operations. Unlike the hip or knee, the leading cause of ankle arthritis is post-traumatic; with tibiotalar arthrodesis serving as the traditional treatment in the setting end-stage arthritis. To date, ankle arthrodesis outcomes within the military have not been reviewed. Therefore, it is of great interest to evaluate the outcomes of ankle arthrodesis and the ability for the service member to return to duty following arthrodesis for end-stage ankle arthrodesis.

METHODS

A retrospective review of radiographic and clinical data was completed on consecutive AD patients with diagnosis of tibiotalar arthrodesis from January 2008-2018 to determine pre- and post-operative changes in pain and function and ability to maintain active duty status.

RESULTS

Twelve AD military patients were identified using CPT codes. One patient was excluded due to undergoing a bilateral below the knee amputation within one year of ankle arthrodesis due to severe neuropathic foot pain following a blast injury. Eleven patients were included, 10 males and 1 female with an average age of 38.4 years (range, 29-46). The majority of patients were senior enlisted (8), while two were officers and one junior enlisted. Six underwent open fusions, and 5 underwent an arthroscopic fusion with one arthroscopic and one open patient requiring an open revision at 17 and 20 months respectively for arthrodesis nonunion. Average surgical time was 205 minutes arthroscopic group and 226 minutes for the open group ($P= 0.5$). There were no recorded surgical site infections, wound complications or deep vein thrombosis. At one year, the VAS pain score decreased from an average of 4.67 preoperatively to 3.42 ($P= 0.03$). This downward trend continued with an average VAS pain score of 2.8 at two years ($P= 0.02$). Regarding military retention, eight patients (73%) were on AD with a P2 profile for an alternative run event at one year follow-up. At two years, three patients (27%) had underwent a medical evaluation board, three patients completed their service obligation and separated (27%), three patients remained on AD until retirement (27%) and two currently still serve on AD

(18%). Only one patient was able to return to full AD without a profile within one year. Average time from surgery until military separation was 18 months.

DISCUSSION and CONCLUSION

Post-traumatic ankle arthritis has a high prevalence within the military population, but to our knowledge, the present series represents the first review of ankle arthrodesis within the active military population. This study highlights the clinical course for service members with end-stage ankle arthritis. At one year follow-up, 73% remained on AD with a medical profile. Although patients had a significant relief of pain, the majority of patients separated from the military within 18 months of their operation. This finding is likely confounded by the fact that most patients were senior enlisted non-commissioned officers within 2 years of their retirement date. Only three patients required medical evaluation board for their ankle following surgery (27%). Overall, with this data, we can provide insight into the medical accession and retention standards for military personnel. A arthrodesis improves VAS pain scores, and can be compatible with military service.



JOHN LIVINGSTONE, MD

ABSTRACT TITLE: A cadaveric study measuring femoral nerve tension during anterior total hip arthroplasty approach

BACKGROUND

Femoral nerve palsy is a rare but devastating complication of anterior total hip arthroplasty. Its etiology is still unknown but several studies have suggested that anterior acetabular retractors may place the femoral nerve at increased risk.

QUESTIONS/PURPOSES

The purpose of this study was to determine when the femoral nerve is under tension during anterior total hip arthroplasty. This study hypothesized that hip extension and traction places tension on the femoral nerve, offering an additional explanation for the development of femoral nerve palsy.

PATIENTS AND METHODS

Five cadavers and six femoral nerves were utilized for this study. A spring device was secured across the transected femoral nerve as the hip was extended and pulled into traction with and without retractor placement. The change in spring length was used to determine femoral nerve tension.

Results: The average spring length changed +8.83mm with hip extension and +3.73mm with traction. Placement of the anterior acetabular retractor changed the average spring length by -0.7mm during traction and placement of the femoral retractor changed the average spring length by -1.15mm during extension.

Conclusions: Femoral nerve tension was greatest with hip extension followed by traction. Acetabular and femoral retractor placement decreased average femoral nerve tension in both traction and hip extension. This may be due to medialization of the femoral nerve by the retractors, reducing the overall distance traveled, and thereby reducing tension. Previous studies have found femoral nerve pressure to be greatest during anterior acetabular retractor placement. It is likely that both pressure and tension contribute to femoral nerve palsy in anterior total hip arthroplasty.

Clinical Relevance: Careful retractor placement, staying safely on anterior acetabular bone, and efficient femoral preparation to decrease time under hip extension and traction may help to minimize the risk of femoral nerve palsy.

Keywords: femoral, nerve, tension, anterior, THA, retractor

INTRODUCTION

Femoral nerve palsy is an uncommon but devastating complication of anterior total hip arthroplasties. Studies have estimated the incidence to range from 0.21-1.1% [1, 2]. Despite this low incidence, nerve palsy is the most common reason for medical litigation for total hip arthroplasty[2, 5]. The etiology of femoral nerve palsy during anterior total hip arthroplasty is still unknown but several studies have suggested that anterior acetabular retractors may place the femoral nerve at an increased risk of being damaged. A study published in 2000 measured femoral nerve pressure with an electronic pressure transducer placed adjacent to the femoral nerve. This study demonstrated that in-vivo pressure around the femoral nerve increased significantly when the anterior acetabular retractor was placed during an anterior total hip arthroplasty. A significant increase in pressure was only found with anterior acetabular retractor placement and was not noted to change significantly during the rest of the procedure[6]. Another study from 2018 measured motor evoked potentials (MEPs) during direct anterior total hip arthroplasty and found that MEPs decreased to 54% of their preoperative amplitude when the anterior acetabular retractor was placed[3]. Lastly, a cadaveric study from 2019 found that the anterior acetabular retractor was closest to the femoral nerve when placed in the 90° orientation along the acetabulum[7]. These papers suggest that the anterior acetabular retractor places the femoral nerve at risk due to its proximity to the nerve, increased pressure around the nerve, and associated decrease in MEPs.

The hypothesis of this study was that extension of the hip during anterior total hip arthroplasty would lead to significant tension on the femoral nerve, similar to how hip flexion and knee extension can conversely affect the sciatic nerve[4]. With the femoral nerve running anteriorly over the brim of the pelvis, extension of the hip would intuitively tension the nerve during femoral preparation and may be another cause of femoral nerve palsy. It was hypothesized that both retractor placement and femur traction would increase femoral nerve tension as well.

MATERIALS AND METHODS

Five fresh lower extremity cadavers were utilized for this study. The specimens were transected at various levels ranging from L1 to L3. A total of six femoral nerves were dissected from these five specimens.

The direct anterior (modified Hueter) approach was used to perform the proximal femur osteotomy as if an anterior total hip arthroplasty was going to be completed. The femoral nerve was identified through the ilioinguinal approach. The nerve was tracked distally as it crossed over the anterior brim of the pelvis (see Figure 1). A spring device was created to measure the tension placed on the femoral nerve. This device consisted of a clear acrylic tube, 9.4mm in diameter and about 70mm in length, with a thin 6mm diameter extension spring placed within the tube. The tube was then capped on either end with washers so that the spring would not fall out of the tube during testing. A 0-vicryl suture was tied to both ends of the spring and exited the tube through the central holes of the washers (See Figure 2). The femoral nerve was

transected about 3cm proximal to the anterior brim of the pelvis and the spring device was secured to both ends of the transected nerve proximal and distal to the spring device with the free ends of the suture. The device was pre-tensioned so that the spring was in some extension before manipulation (See Figure 3). The device was also ensured to be proximal to the anterior rim of the pelvis so that it would lie flat along the iliopsoas muscle. The length of the spring was measured with digital calipers in five different settings. The length of this spring was used as a proxy to estimate changes femoral nerve tension. The first setting was when the hip was in a neutral position while supine on the table with no retractors placed within the anterior total hip incision. The second setting was when axial traction was applied through the foot with the hip in a neutral position. The third setting was when axial traction was applied through the foot and the anterior acetabular retractors were placed to adequately visualize the acetabulum. During the first specimen exposure, 8kg of axial traction was required for adequate visualization of the acetabulum. This amount of axial traction was utilized for the remaining specimens for consistency. The fourth setting was when the hip was extended and externally rotated so that the cut end of the proximal femur could be adequately visualized. The fifth and final setting was when the hip was extended and externally rotated and the femoral retractor was placed around the posteromedial femur for femoral visualization. The foot was wrapped in a self-adherent elastic wrap and a mechanical spring scale was attached to the foot so a consistent amount of traction could be obtained with each specimen. Extension of the hip was obtained by placing the specimen on the edge of a table and supporting the contralateral leg on a mayo stand while the dissected leg was lowered into extension off of the table (See Figure 4).

Figure 1



Figure 2



Figure 3

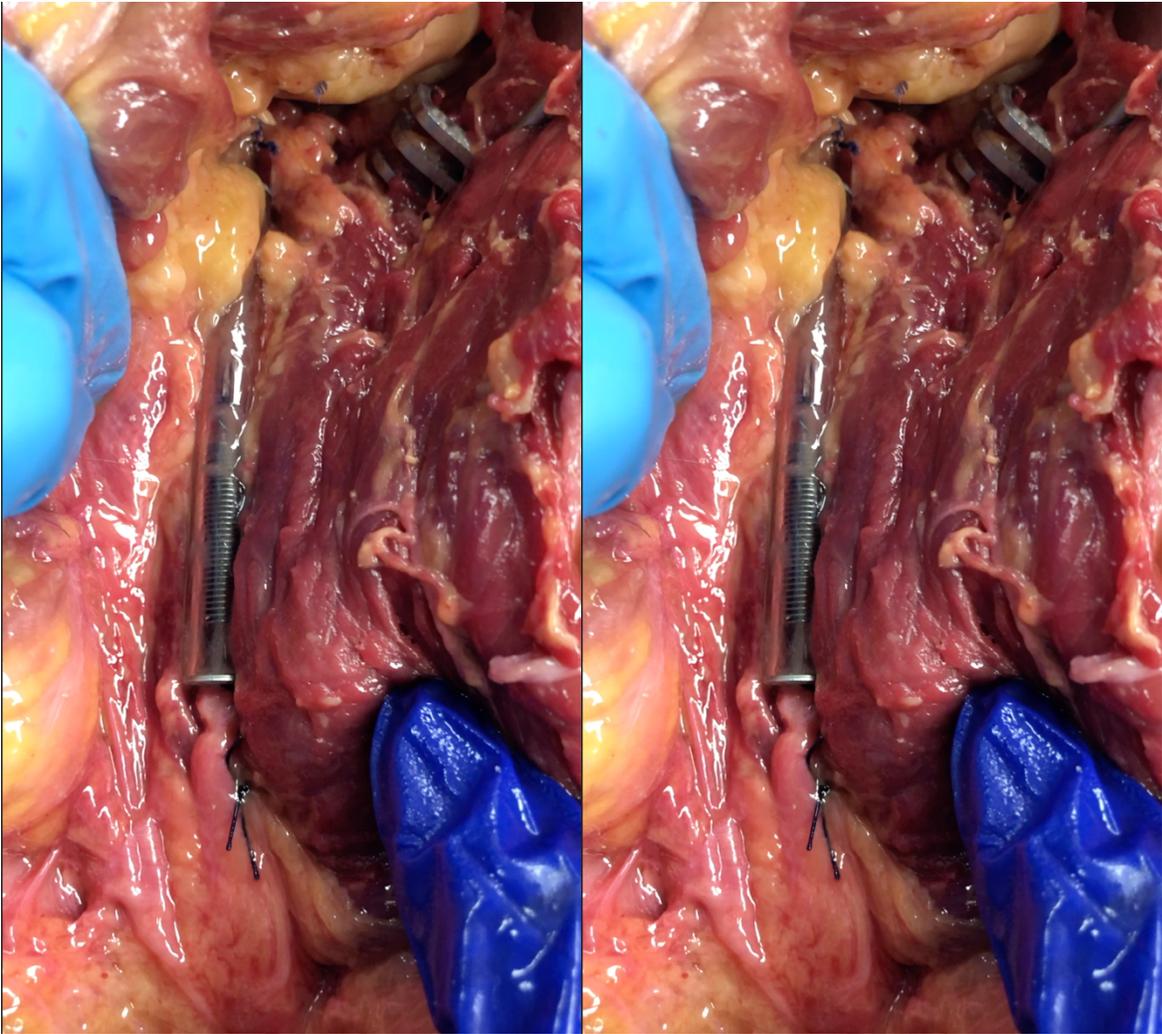


Figure 4



RESULTS

A total of six femoral nerves from five cadaveric specimens were analyzed in this study. Specimens 4L and 4R were from the same cadaveric specimen with 4L representing the left femoral nerve and 4R representing the right femoral nerve. Traction was noted to increase spring length in all but one specimen where it had no effect. The average change in spring length after traction was +3.73mm. Placement of the anterior acetabular retractor after traction was applied was noted to decrease spring length in all but one specimen where it was noted to lengthen slightly by 0.3mm. The average change in spring length with the placement of the anterior acetabular retractor after traction was -0.7mm. Extension increased spring length in all specimens by an average of +8.83mm. The placement of the femoral retractor while in extension decreased spring length in four of six specimens with an average change in spring length of -1.15mm. See Tables 1-2 and Figure 5 for results.

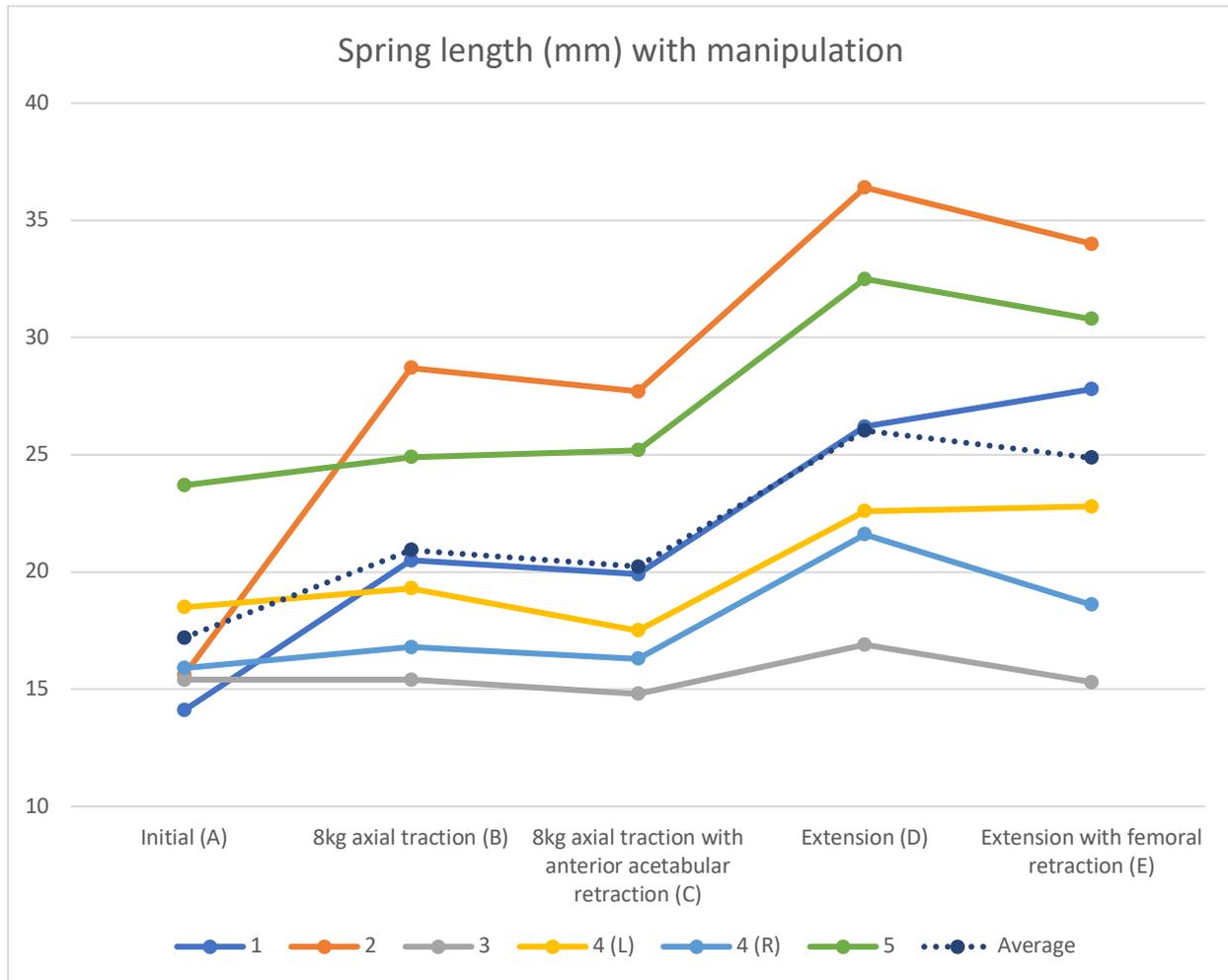
Table 1: Spring length (mm) with traction, extension, and/or placement of retractors

Specimen	Initial (A)	Traction (B)	Traction with anterior acetabular retraction (C)	Extension (D)	Extension with femoral retraction (E)
1	14.1	20.5	19.9	26.2	27.8
2	15.6	28.7	27.7	36.4	34.0
3	15.4	15.4	14.8	16.9	15.3
4 (L)	18.5	19.3	17.5	22.6	22.8
4 (R)	15.9	16.8	16.3	21.6	18.6
5	23.7	24.9	25.2	32.5	30.8
Average:	17.2	20.9	20.2	26.0	24.9

Table 2: Difference in spring length (mm) with traction, extension, and/or placement of retractors

Specimen	B-A	C-B	D-A	E-D
1	6.4	-0.6	12.1	1.6
2	13.1	-1	20.8	-2.4
3	0	-0.6	1.5	-1.6
4 (L)	0.8	-1.8	4.1	0.2
4 (R)	0.9	-0.5	5.7	-3
5	1.2	0.3	8.8	-1.7
Average:	3.73	-0.7	8.83	-1.15

Figure 5



DISCUSSION

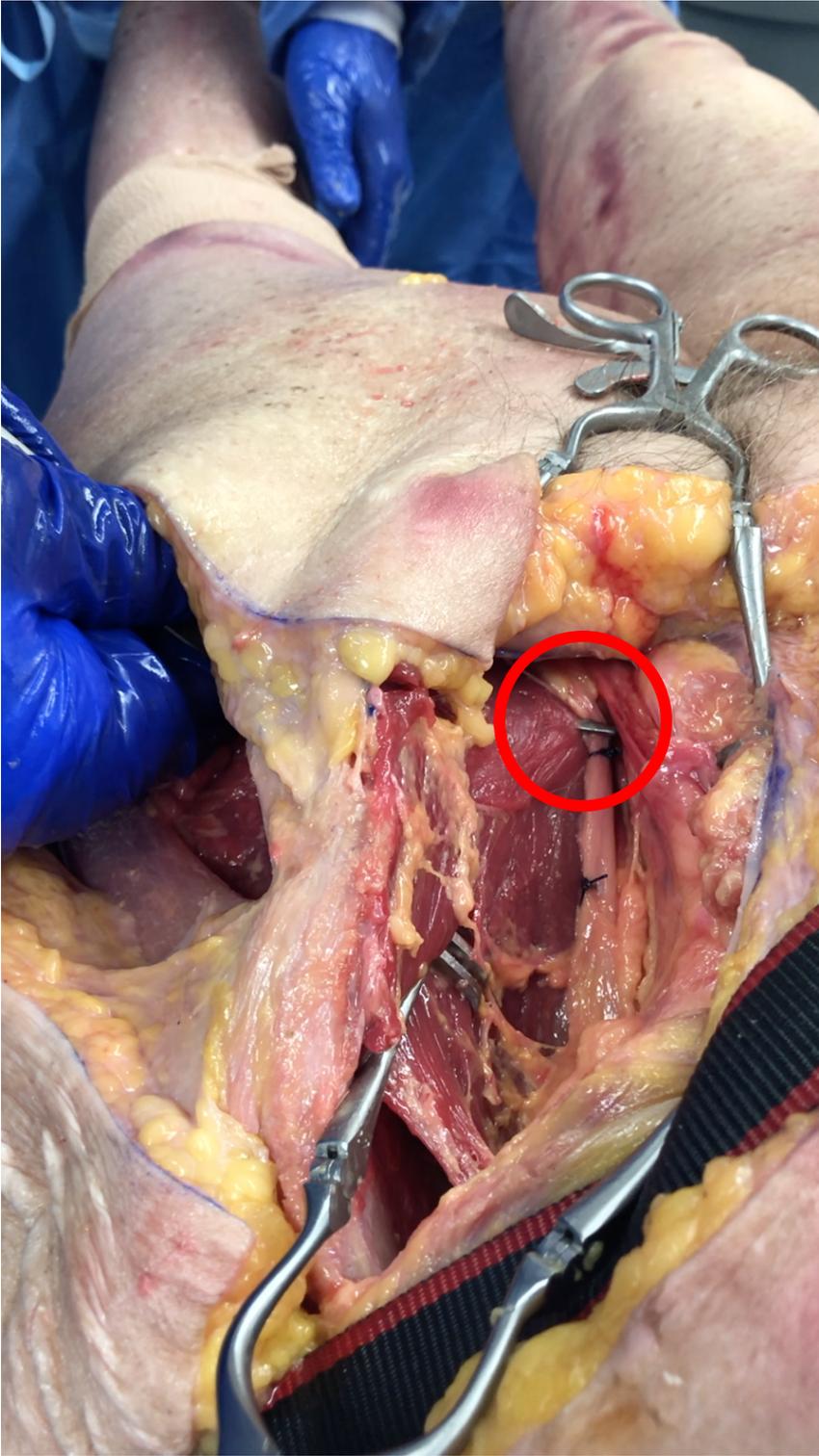
Our study found that femoral nerve tension as measured by spring length was greatest while the hip was in extension during femoral preparation and that anterior acetabular retractors decreased femoral nerve tension. This is in contrast to a previous study which found that pressure around the femoral nerve increased most when the anterior acetabular retractors were placed. This study utilized an electronic pressure transducer to measure the pressure around the femoral nerve throughout an anterior total hip arthroplasty. The electronic pressure transducer was placed adjacent to the nerve while an anterior total hip arthroplasty was performed through a Watson-Jones anterolateral approach. This study did not find a significant change in pressure when the femur was prepared or during any other part of the surgery[6]. This difference in findings is likely due to the fact that our study measured tension and the previous study measured pressure. They estimated pressure on the femoral nerve by placing the pressure transducer adjacent to the nerve. During hip extension or traction, the femoral nerve likely does not experience any increase in pressure because it is not in a confined space

that would significantly decrease in volume with positional changes. If the pressure transducer was placed directly between the femoral nerve and the anterior brim of the pelvis, there may have been an increased pressure reading during hip extension as the femoral nerve was tensioned over the pressure transducer and the anterior brim of the pelvis. This was not likely done, however, since positioning the pressure transducer so intimately along the femoral nerve would likely place the femoral nerve at greater risk for damage or nerve palsy.

In the study by Ishimatsu, the use of MEPs also provided information in regard to the in-vivo function of the femoral nerve when anterior acetabular retractors were placed. This study noted that MEPs decreased to 54% of their preoperative amplitude when anterior acetabular retractors were placed. Unfortunately, MEPs were not measured during any other parts of the anterior total hip arthroplasty so it is unknown if MEPs decreased during hip extension or traction[3]. This study was also completed with the patient supine without the use of a traction table.

Our study demonstrated that on average, placement of retractors during both hip extension and traction decreased spring length. We also found that hip extension and traction increased spring length, with the former having the greatest effect. This implies that femoral nerve tension was increased with extension and traction and decreased with retractor placement. We expected nerve tension to increase with retractor placement since it has been shown to decrease MEPs and increase pressure adjacent to the nerve. One explanation for this finding is based on the anatomy of the femoral nerve. The femoral nerve naturally runs in a more lateral position over the iliopsoas muscle as it crosses over the anterior brim of the pelvis. When the anterior acetabular and femoral retractors were placed, the femoral nerve was noted to move medially as the retractor was brought up to visualize the acetabulum or the femur. It is possible that by moving the nerve more medially it can then take a more direct and shorter path, reducing the tension on the nerve. One cannot conclude, however, that extension and traction are more likely to lead to a femoral nerve palsy than anterior acetabular retractor placement. Nerve palsies may occur through either compression or tension of the nerve. Both of these forces may be responsible for a femoral nerve palsy with anterior acetabular retractors placing the most pressure on the nerve while extension and traction create the most tension. Similar to the study by Yoshino et. al, we also noted the close proximity of the anterior acetabular retractors to the femoral nerve[7]. We noted that if the retractor doesn't stay on bone, it could easily puncture through the iliopsoas and be placed directly on the femoral nerve (See Figure 6).

Figure 6



The purpose of creating the spring device used for this study was to have a direct measurement of the tension of the femoral nerve rather than an indirect measurement of pressure seen in the study by Slater et. al[6]. We initially attempted to visualize the tension of the femoral nerve by placing two sutures in the femoral nerve and measuring the distance between these sutures as the leg was pulled into traction or extension with and without retractors. The distance between the sutures did not change with these maneuvers. This implied that the femoral nerve was likely experiencing tension but its elasticity was not visually appreciated. An analogy to this would be how a steel cable can be under significant tension but there is no appreciable change in its length. By transecting the femoral nerve and securing our spring device between its cut ends, the tension can be more easily visualized. There are several limitations to the use of the spring device, however. First, the device needed to be placed so that it wouldn't limit or alter the normal path of the femoral nerve. This was theoretically accomplished by keeping the device small and placing it over the iliopsoas before the femoral nerve crosses over the anterior brim of the pelvis. This would allow the nerve to glide and stretch in an anatomic position over the anterior brim of the pelvis. Second, the spring length needed to be measured from outside of the acrylic tubing which meant that the calipers had to be visually compared to the spring itself rather than by making direct physical contact with the spring. It would be ideal if the spring itself could make contact with the calipers for more accurate measurement but the acrylic tube around the spring was needed to decrease any friction that the spring may have encountered if it was placed directly into the soft tissues and to prevent debris from building up within the spring which would have prevented it from compressing fully. The spring was pre-tensioned in its initial position to remove any slack from the femoral nerve prior to applying traction, extension, and/or retractors. The amount of pre-tensioning was not consistent amongst specimens but this should not affect the results of this study since the change in length of a spring is linearly related to the force applied based on Hooke's law. The springs were never noted to deform and were kept well within their elastic region with testing.

There are other limitations to our study as well. The anterior acetabular and femoral retractors were placed in similar positions in every specimen but the amount of force applied to the retractor was not controlled. The force applied to the retractor was kept to a minimum by only pulling on the retractor enough for adequate visualization of the acetabulum or femur. This was felt to be acceptable since this is a realistic amount of force that would be used during an actual anterior total hip arthroplasty. This study was also limited by a small number of specimens.

Future studies are needed to evaluate the effects of extension and traction on the femoral nerve. Another study measuring MEPs throughout the entire anterior total hip arthroplasty rather than just before and after anterior acetabular retractor placement may provide further insight into the effects of positioning on the femoral nerve.

CONCLUSION

This study demonstrated that femoral nerve tension as measured by spring length increases with hip extension during anterior total hip arthroplasty. Tension on the nerve was also increased during axial traction but to a lesser extent. The tension on the femoral nerve was noted to decrease when both anterior acetabular and femoral retractors were placed. This may

be due to the medialization of the femoral nerve which may decrease its overall length traveled, thereby reducing its tension. The findings of this study in combination with previous studies suggest that the femoral nerve likely experiences maximum compressive forces with anterior acetabular retractor placement and maximum tension during hip extension and traction. Both of these forces may contribute to femoral nerve palsies in anterior total hip arthroplasty. Unfortunately, hip extension, traction, and retractor placement are all necessary components of a safe and successful anterior total hip arthroplasty with current total hip arthroplasty technology. Therefore, careful retractor placement, staying safely on anterior acetabular bone, and efficient femoral preparation to decrease time under hip extension and traction may help to minimize the risk of femoral nerve palsy.

1. Fleischman AN, Rothman RH, Parvizi J. Femoral Nerve Palsy Following Total Hip Arthroplasty: Incidence and Course of Recovery. *J Arthroplasty*. 2018;33:1194-1199. Available at: <https://doi.org/10.1016/j.arth.2017.10.050>.
2. Hoshino C, Koga D, Koyano G, Yamauchi Y, Sakai T, Okawa A, Jinno T. Femoral nerve palsy following primary total hip arthroplasty with the direct anterior approach. *PLoS One*. 2019;14:1-12.
3. Ishimatsu T, Kinoshita K, Nishio J, Tanaka J, Ishii S, Yamamoto T. Motor-evoked potential analysis of femoral nerve status during the direct anterior approach for total hip arthroplasty. *J Bone Jt Surg - Am Vol*. 2018;100:572-577.
4. Letournel E, Judet R. *Fractures of the Acetabulum*. (Elson RA, ed.). Berlin, Heidelberg: Springer Berlin Heidelberg; 1981. Available at: <http://link.springer.com/10.1007/978-3-662-02325-9> [Accessed January 19, 2021].
5. Samuel LT, Sultan AA, Rabin JM, Surace PA, Yao B, Moskal JT, Mont MA. Medical Malpractice Litigation Following Primary Total Joint Arthroplasty: A Comprehensive, Nationwide Analysis of the Past Decade. *J Arthroplasty*. 2019;34:S102-S107. Available at: <https://doi.org/10.1016/j.arth.2019.02.066>.
6. Slater N, Singh R, Senasinghe N, Gore R, Goroszeniuk T, James D. Pressure monitoring of the femoral nerve during total hip replacement: An explanation for iatrogenic palsy. *J R Coll Surg Edinb*. 2000;45:231-233.
7. Yoshino K, Nakamura J, Hagiwara S, Suzuki T, Kawasaki Y, Ohtori S. Anatomical Implications Regarding Femoral Nerve Palsy During a Direct Anterior Approach to Total Hip Arthroplasty. *J Bone Jt Surg*. 2020;102:137-142. Available at: <http://journals.lww.com/10.2106/JBJS.19.00667>.

FIGURE LEGEND

Figure 1: Exposure of the left femoral nerve through the ilioinguinal approach. A direct anterior (modified Hueter) approach was used to perform a left proximal femur osteotomy. Two sutures were placed through the intact femoral nerve for identification.

Figure 2: Spring device consisting of a thin spring inside a clear acrylic tube with washers on either end of the tube. The spring is tied to 0-vicryl suture on either end.

Figure 3: The spring device is secured to either end of the transected femoral nerve. The left photo demonstrates the initial position without retractor placement, extension, or traction. Note that the spring is pre-tensioned and is not in its resting state. The right photo demonstrates traction without retractor placement. Orientation: medial left, proximal up.

Figure 4: The specimen can be seen here with the hip in extension and external rotation with the femoral retractor in place. The specimen was positioned on the edge of the table with the contralateral leg on a mayo stand. A ratcheting strap was used to secure the specimen to the table.

Figure 5: A graphical representation of spring length (mm) changing with traction, extension, and/or retractor placement

Figure 6: This photo demonstrates how the anterior acetabular retractor, circled in red, can be mistakenly placed directly over the femoral nerve if the retractor is not kept on the acetabulum.



Victoria Scala, MD, MS, Samantha Andrews, PhD, ATC, Kristin Mathews, MS, ATC, Krystin Wong, BA, Cass Nakasone, MD

ABSTRACT TITLE: Effect of Patellar Resurfacing on Clinical Outcomes in Total Knee Arthroplasty Using Ultracongruent Inserts

INTRODUCTION

Previous research has reported increased patellofemoral (PF) pressure following total knee arthroplasty (TKA) with the use of an ultracongruent (UC) polyethylene tibial insert. Resurfacing the patella, also shown to increase PF stress, with an UC insert may result in detrimental clinical outcomes caused by significant PF pressure, especially during knee flexion. Therefore, the purpose of this study was to compare clinical outcomes following UC TKA between patients with a resurfaced or non-resurfaced patella.

METHODS

In this prospective study of 80 patients (102 knees) with a minimum six-month follow up, UC TKA with patella resurfacing (34 patients, 43 knees) were compared to UC TKA without patella resurfacing (46 patients, 59 knees). The determination for patella resurfacing was made based on the last digit of the medical record number being even or odd. Knee flexion and clinical outcome scores were collected preoperatively and at six weeks and six months postoperatively.

RESULTS

At six-weeks postoperatively, unresurfaced patellae had higher Knee Society (KSS) Function ($P=0.046$) and Knee Osteoarthritis Outcome Score, Joint Replacement (KOOS JR) scores ($P=0.038$), but there was no difference in other outcome scores. More patients with unresurfaced patellae had knee flexion $<100^\circ$ at six weeks postoperatively ($P=0.006$) but the need for knee manipulation at six weeks did not reach statistical significance ($P=0.077$). Patella resurfacing did not influence six-month knee flexion, clinical outcome scores, nor patient satisfaction.

CONCLUSION

Resurfacing the patella in a TKA with UC insert does not result in poor clinical outcomes that would have been predicted by prior cadaver studies.



Maggie Scribner, MD

ABSTRACT TITLE: Continuous Intravenous Ketamine for Pain Control after Tibial or Femoral Osteotomy Abstract

PURPOSE

This case series is to evaluate the potential of continuous intravenous ketamine administration to control pain and reduce opioid requirements after high tibial osteotomies and distal femoral osteotomies.

METHODS

We examined the average post-operative Numerical Rating Scale (NRS) pain intensity score from admission to the PACU through 8AM of the first post-operative day (POD1) of four patients who underwent HTO or DFO. Pain scores were analyzed as the time weighted sum of pain intensity differences using the trapezoidal rule of the curve resulting in an area under the curve (AUC) [AUC = $((h_1+h_2)/2)*d$, $h_1/2$ = successive pain scores, d = difference in time between successive pain scores in minutes].

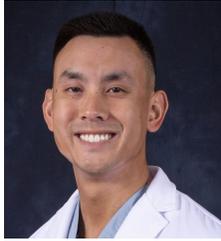
RESULTS

Patient A had an AUC of 2828 over 1180 minutes with an average pain score of 2.4/10. Patient B had an AUC of 1418 over 1285 minutes with an average pain score of 1.1/10. Patient C had an AUC of 4217 over 1155 minutes with an average pain score of 3.7/10. Patient D had an AUC of 4498 over 1030 minutes with an average pain score of 4.4/10. All were able to go home on post-operative day 1.

CONCLUSIONS

This novel perioperative pain pathway including multiple non-opioid pain adjuncts, appropriate regional anesthesia, and a low-dose ketamine infusion is an effective method for pain management in knee periarticular osteotomies.

LEVEL OF EVIDENCE: Level 4; Case Series.



Joshua W. Sy DO, Christian A. Cruz MD, William E. Daner MD, Craig R. Bottoni MD, Kyong S. Min MD

ABSTRACT TITLE: Supscapularis split versus takedown in Latarjet Procedures in the Military

INTRODUCTION

Anterior glenohumeral shoulder instability has been reported to have an increased incidence in military populations compared to the general population. The job demands of military personnel predispose them to initial glenohumeral instability events and recurrence. Patients with anterior shoulder dislocation at ages younger than 20 have a 90% rate of recurrence, and the majority of the military population is between the ages of 18-32. Of these military individuals, 13.8% of patients required more than one surgery or were medically discharged following shoulder dislocation repair at 2 to 7 years. Additionally, as high as 90% of patients had glenoid (shoulder) bone loss, and of those 18.9% had critical bone loss with glenoid bone loss greater than 13.5% reported to lead to worsened patient related outcomes with clinical significance. The Latarjet procedure is a surgery that is used to treat recurrent shoulder instability, including dislocations or subluxations caused by glenoid bone loss with reported good to excellent results. There are varying techniques to perform a Latarjet, including splitting the subscapularis versus taking it down during the approach. The purpose of this study is to evaluate the outcomes of the subscapularis split versus takedown in Latarjet procedures in an active duty cohort.

METHODS

We performed a retrospective review of a consecutive series of 29 active duty military patients who underwent a Latarjet procedure between 2013 and 2016 at a single military medical center. All cases were performed by fellowship trained sports medicine and shoulder and elbow orthopaedic surgeons. Patients were included if they had recurrent anterior shoulder instability after failing a course of non-operative management. Data on patient demographics and active duty status were reviewed as well as operative technique utilized. Clinical evaluation at follow-up included range of motion at last documented physical therapy session, rate of redislocation, time to pass first physical fitness test postoperatively, and changes in SANE, WOSI, and ASES scores.

RESULTS

23 of 29 patients who received open Latarjet surgery with congruent arc technique were able to be contacted for follow up at an average of 3.6 years (2.1-6.5 years) from date of surgery. All 23 patients were males that were active duty at time of surgery from all branches of the military with multiple dislocations after a traumatic event. Average age of first dislocation was 22.5 years of age (14-43 years of age) and all patients received an open Latarjet surgery with congruent arc technique. Intraoperatively, 11 patients had subscapularis split and 12 patients had subscapularis takedown. There was no statistically significant differences in range of motion, rates of redislocation, time to pass first physical fitness test postoperatively, or changes in SANE, ASES, or WOSI scores when comparing pre and postoperative evaluation. Both groups had 2 patients each who received a permanent profile due to their shoulder and did not successfully complete a physical fitness test postoperatively.

DISCUSSION/CONCLUSION

We demonstrate that in an active duty military population, subscapularis split versus takedown in Latarjet procedures offers no statistically significant differences in postoperative range of motion, rates of redislocation, time to pass first physical fitness test postoperatively, or changes in SANE, ASES, or WOSI scores. At minimum 2 year follow up, our patients maintained a high level of functional demand and had a low attrition rate from active duty status regardless of surgical technique.



Trent Tamate, MD

ABSTRACT TITLE: The Effect of Mental Health on Early Postoperative Outcomes in Total Hip Arthroplasty

BACKGROUND

Psychiatric conditions remain underdiagnosed, and as a result, their true influence on total joint arthroplasty has been difficult to assess. Therefore, the purpose of this study was to investigate the relationship between overall mental health and outcomes in the early post-operative period following unilateral total hip arthroplasty (THA).

METHODS

This is a retrospective review of 89 patients who underwent primary elective unilateral THA. Data collection involved diagnosis of depression or anxiety, opioid consumption in MME, LOS, disposition, and outcome scores to include HOOS JR, PROMIS GPH and GMH. Pre-operative GMH and post-operative outcomes were compared using Pearson correlation coefficient, independent t-tests, Pearsons' Chi-Square test, and univariate logistic regression.

RESULTS

No difference was seen in MME consumption, LOS or disposition when comparing patients above and below the 25% quartile for pre-operative GMH. Those in the $\leq 25\%$ quartile for pre-operative GMH demonstrated a greater improvement in GMH at 6 weeks post-operatively (8.9 vs 2.3, $p < 0.001$), though their overall GMH and GPH scores remained lower (48.3 vs 55.2, $p < 0.001$; 45.9 vs 49.8, $p = 0.01$, respectively). When comparing patients with and without depression/anxiety, no difference was seen in any of the outcomes measured.

CONCLUSION

Lower baseline mental health may be a predictor for worse overall patient-reported outcomes following THA. However, these patients can still attain significant benefits without the risks of higher opioid use or altered hospital course. Any lingering disparities in physical or mental health are likely due to underlying psychological distress rather than differences in hip function.



Alicia Unangst

ABSTRACT TITLE: Return to run after Halux Valgus correction

BACKGROUND

Hallux valgus affects 23 -36% in general populations. The purpose of this study was to evaluate return to run following either a modified Lapidus procedure or a metatarsal osteotomy. We hypothesized that there would be no difference in the ability to return to running.

METHODS

A Retrospective review of a consecutive series of patients at a single institution with surgical correction was performed. 51 patients were identified. 35 were treated with a metatarsal shaft osteotomy and 16 with a modified Lapidus.

RESULTS

No difference was found between the cohorts in terms of age, sex, or pre- operative hallux valgus angle (HVA). 27/35 (77%) with metatarsal shaft osteotomy were able to return to running versus 13/16 (81%) with modified Lapidus. There was no significant difference in the ability to return to running between cohorts ($p=1.00$). Conclusion: Our study showed no statistical difference for the modified Lapidus versus metatarsal osteotomies relative to return to running.



Aaron Vaslow, MD

ABSTRACT TITLE: Comparing Outcomes for Different Techniques of Clavicle ORIF

INTRODUCTION

Symptomatic hardware frequently leads to reoperation for hardware removal after ORIF of clavicle. Military service members carry heavy back packs of 40lbs or more, which is thought to contribute to a higher rate of hardware removal than the civilian population. Various methods of fixation are thought to mitigate the risk of subsequent surgery, but to our knowledge no studies making a direct comparison exist.

METHODS

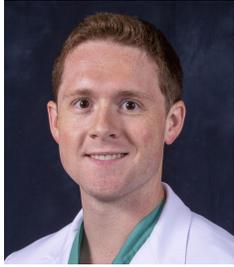
We performed a retrospective review of 274 patients who underwent operative fixation of a clavicle fracture at our facility. Our primary outcome was the rate of hardware removal for each fixation techniques with a secondary outcome of time to removal. The outcomes Active Duty Service members were compared to other patients eligible for care at our facility.

RESULTS

We expect to report lower rates of hardware removal in patients who underwent intramedullary fixation of the clavicle and no difference between anterior, superior or dual plating. Other complications will not be different either.

DISCUSSION

This study represents the largest cohort of patients undergoing intramedullary clavicle fixation reported in the literature.



Connor B. Venrick, MD; Ryan J. Bickley, MD; Christopher M. Belyea MD, MBA; Paul M. Ryan, MD; Craig R. Bottoni, MD; Kevin P. Krul, MD

ABSTRACT TITLE: Orthopaedic Post-Surgical Opioid Prescribing Guidelines: Short Term Success

INTRODUCTION

Many post-surgical patients become addicted to opioid medications as a result of attempting to manage their post-operative pain and this has been recognized and dubbed an “Opioid Epidemic.” Recently the American College of Surgeons released preliminary prescribing guidance in an attempt to mitigate this problem in the United States. Unfortunately very little guidance was developed for the majority of orthopaedic surgical procedures. With much of the opioid prescribing being done by trainees or midlevels, guidance and training has been indicated as a possible intervention to decrease the amount of opioids prescribed. We sought to develop and implement opioid prescribing guidelines within our institution and examine changes in prescribing practice after such an implementation.

METHODS

We performed an institutional quality improvement project at a tertiary referral center with the goal of examining past opioid prescribing trends and defining best practices in terms of initial opioid quantity and number of refills. We aim to study how the implementation of these best practices has affected change on the actual prescribing of opioids to patients undergoing orthopaedic surgery.

Utilizing an electronic database, the most commonly performed outpatient orthopaedic surgeries were first defined. Next, an expert panel convened, consisting of Attending Staff Surgeons in the subspecialties of Foot and Ankle, Joints, Hand, Spine, Sports, and Trauma. Provider and patient education were then given in the form of verbal discussions as to the new standard operating procedure for quantity of opioid medication prescribed. Handouts were also provided to both patients and providers reiterating this information. Implementation of these guidelines occurred in January 2020.

Electronic medical records were then retrospectively reviewed for both the pre guideline and post guideline periods.

RESULTS

A total of 889 surgeries and corresponding opioid regimens were identified fitting our inclusion criteria for the retrospective analysis. Surgeries included Brostrom procedures, ankle fracture open reduction and internal fixation, ankle arthroscopy, Achilles tendon repairs, and hallux valgus correction from Foot and Ankle; carpal tunnel releases, distal radius fracture open reduction and internal fixation, cubital tunnel releases, wrist ganglion cyst excisions, and scaphoid fracture open reduction and internal fixation from Hand; and knee arthroscopy and shoulder arthroscopy from Sports.

After implementation of these guidelines and increased surgeon and patient education, there was a statistically significant decrease in the average number of prescribed opioids during the post-operative period.

DISCUSSION/CONCLUSION:

Patients within the military healthcare system are not immune to America's opioid crisis. It is especially important as providers to the nation's Service Members that we do not contribute to opioid addiction and potentially reduce our readiness for national defense. Implementation of department-wide guidelines requires buy-in from multiple stakeholders within the department and the hospital at large. Guideline implementation can decrease the number of prescribed opioids across the entire course of the postoperative period. While further study is needed on the feasibility of widespread implementation and long term outcomes, guideline implementation has an immediate and significant short term effect.



Jeffery Wake

ABSTRACT TITLE: Surgical Management of Subcritical Bone Loss: Bankart versus Latarjet

BACKGROUND

The glenohumeral joint is the most dislocated joint in the body, and surgical treatment is recommended in the young, male, contact athlete. The arthroscopic Bankart repair is considered the first-line surgical treatment for glenohumeral instability; however, with “critical” glenoid bone loss of greater than 25%, a bony procedure is often performed. Shaha et al defined the subcritical bone loss as bone loss greater than 13.5%. The purpose of this study compare the surgical results of the Bankart Repair versus the Latarjet in the treatment of subcritical bone loss. The null hypothesis is that there is no difference in patient reported outcomes between the Bankart Repair and the Latarjet in the treatment of anterior shoulder instability with subcritical bone loss.

STUDY DESIGN

Retrospective Cohort Study; Level of Evidence III

METHODS

Subjects were consecutive patients with glenoid bone loss between 10-20%, who underwent an isolated anterior arthroscopic labral repair or an open Latarjet at a single military institution. Data were collected on demographics, the Western Ontario Shoulder Instability (WOSI) score, Single Assessment Numeric Evaluation (SANE) score, and failure rates. The average bone loss across the groups were calculated.

RESULTS

The Bankart Group consisted 26 shoulders in 26 patients with an average age of 26.6 years (SD: 5.2) and bone loss of 15.1% (3.5). The Latarjet Group consisted of 20 shoulders in 19 patients with an average age of 26.5 years (SD: 4.9) and bone loss of 16.0% (SD: 2.4). There was no statistical difference between groups ($p>0.05$).

For the Bankart Group, there were 4 failures (15.4%) and the Latarjet Group had 2 failures (10.0%).

The average WOSI for the Bankart Group was 729 (570) and the Latarjet was 775 (499); while the average SANE for the Bankart Group was 59.8 (29.4) and the Latarjet Group was 76.05

(19.7). There was no statistical difference in WOSI ($p=0.824$); however, there was a statistical difference in the SANE ($p=0.049$).

CONCLUSION

In active, male, military patients with 10%-20% anterior glenoid bone loss, both the arthroscopic Bankart and the open Latarjet demonstrate a WOSI score outside the standard for a clinically acceptable outcome; however, the open Latarjet demonstrated statistically higher SANE score.



Anne Wright MD, Matt Burnham MD, Christian Kikuchi MD, Kyle Obana BA, Kyle Chun MD

ABSTRACT TITLE: When Do Patients Return to Driving After Outpatient Foot and Ankle Surgery?

INTRODUCTION

Counseling patients regarding when to return to driving following a foot and ankle procedure can be difficult, and six to nine weeks is often recommended based on brake reaction times quoted in the literature. However, it is the patient that ultimately decides when they are strong enough and mobile enough to operate a vehicle. The purpose of this study is to determine when patients actually return to driving following outpatient foot and ankle surgery, what influences their decision, and if there were any adverse events, such as an accident or ticket.

METHODS

Thirty-seven patients who underwent an outpatient foot and ankle procedure by a single orthopedic surgeon in an outpatient surgery center between September 2016 and December 2017 were retrospectively recruited for this study. Of the thirty-seven patients recruited, seventeen met inclusion criteria and participated in a telephone survey. All patients underwent an open reduction internal fixation, arthrodesis, or soft tissue procedure requiring a lower extremity splint.

RESULTS

Of the patients surveyed, 100% drove a motor vehicle as their primary mode of transportation. Approximately 60% recalled having a discussion with the surgeon regarding when to resume driving, and of these 57% recalled the surgeon recommending return to driving after fourteen weeks. All patients surveyed recalled returning to driving at some point between one and twelve weeks, with 23.5% returning at four weeks and 23.5% returning at ten weeks.

CONCLUSION

This study suggests that despite surgeons' recommendations, patients are returning to driving sooner than traditionally recommended. This may indicate that the surgeon's advice regarding when to return to driving is not as influential as a patient's own self-assessment of their readiness to operate a vehicle after outpatient foot and ankle surgery.



Connor Zale MD¹, Melanie Cusi BS² and Paul Ryan MD¹

ABSTRACT TITLE: Traumatic Lesser Metatarsal Fractures in a Military Population

Introduction

Metatarsal fractures are a commonly encountered musculoskeletal condition. The recommended treatment is dependent upon the independent fracture pattern encountered. The purpose of this study is to observe outcomes for traumatic metatarsal fractures in a military population.

Methods

All lesser metatarsal fractures in adult patients 18 years and older were included. Patient demographics treatment type, associated injuries were recorded from the electronic medical record. Rate of return to active duty, requirement for additional surgeries, complications, ability to run the 2-mile physical fitness test and presence of permanent profile were reviewed.

Results

Thirty-eight fractures involving active-duty service members were included. The mean age was 27.2 ± 7.8 (19-48). Twenty-eight fractures were initially treated non-operatively. One non-operative case was converted to operative management. One operative fracture underwent revision surgery. 79% were able to return to running. 8 patients with metatarsal fractures were medically discharged from military duty. Five of the patients discharged were treated operatively.

Conclusion

Overall rate of returning to running was 89% among non-operative patients and 50% for operatively treated patients. Medical discharge rate was 50% for operative cases and 10.7% for non-operative cases. Occupational outcomes presented in this study may help surgeons and patients in their shared decision-making process.

Keywords: Metatarsal, Military, Lesser Metatarsal, Return to Duty, Return to Run



35th Annual Combined Orthopaedic Spring Symposium

MEDICAL STUDENT ABSTRACTS

Maveric Abella

Abstract Title: The Influence of an In-Person or Telehealth Pre-Operative Appointment on Patient Outcomes and Clinic Operations

Objectives

Preoperative patient education classes (PEC) for total joint arthroplasty have been shown to improve patient outcomes and to help patients understand the expectations and post-operative self-care following TJA. However, due to the COVID-19 pandemic, the current study site has transitioned its in-person PEC to a telehealth (TH) appointment to minimize in-person interactions. The purpose of this study was to compare arthroplasty patient outcomes and early post-operative complications and clinic phone calls between a preoperative PEC and a shortened TH class.

Methods

This retrospective review included 387 patients (497 joints) having undergone either total hip (THA), total knee (TKA) or unicompartmental knee (UKA) arthroplasty, of which 232 patients attended an in-person PECs prior to COVID and 155 patients having received a pre-operative TH phone call during COVID. Data collected included patient demographics, length of stay and post-operative follow-up calls, emergency room visits, hospital readmissions and complications. Joint specific independent t-tests and chi-square were performed to compare in-person and TH groups.

Conclusion

Likely due to COVID pandemic influence, the TH group was significantly younger in the UKA patients and had a lower body mass index and were more frequently male in the TKA group compared to the in-person group. Patient reported outcomes were only significantly different in the TKA group, with KOOS JR and PROMIS Global Physical Health being significantly higher in the TH group compared to in-person group. Length of stay was significantly lower in all unilateral arthroplasty groups, likely due to the introduction of an ambulatory surgical center and the patient desire to spend very little time in the hospital during COVID. There was no significant difference in length of stay for bilateral arthroplasty patients. Calls within 90-days increased significantly for THA ($p=0.003$) and UKA ($p=0.039$), while approaching significance in TKA ($p=0.088$). 90-day emergency room visits, however, significantly decreased for TKA patients ($p=0.039$). There were no significant differences in post-operative complications. The increase in clinic phone calls could increase the burden on staff and physicians for addressing patient concerns. While there did not appear to be a difference in the reason for the patient calls, the majority of calls in the TH group referenced wound care and symptom relief questions. Therefore, extra time could be spent on the TH appointment covering such topics, as the TH appointment is likely a feasible option as standard of care following the pandemic.

Co-authors: Krystin Wong, BA, Samantha Andrews, PhD, ATC, Kristin Mathews, MS, ATC, Cass Nakasone, MD

Sean Chan

Abstract Title: Did COVID-19 affect PROMs following hip and knee replacement?

Background

COVID-19 has caused significant changes to the practice of Orthopedics, drastically reducing overall caseloads and increasing use of telehealth services. The pandemic has restricted physical activity and options for socializing, potentially worsening patient's physical and mental health. The effect of such physical and social restrictions on patient reported outcomes (PROs) following joint arthroplasty is unknown. Therefore, the purpose of this study was to compare PROs following joint arthroplasty both before and during the pandemic following the resumption of surgery in a community hospital.

Methods

These data were collected as part of an ongoing prospective study of patients undergoing total hip (THA), total knee (TKA), or unicompartmental knee (UKA) arthroplasties. Patients were included in data analysis if the patient completed the HOOS/KOOS Jr. and the PROMIS (Global Physical Health – GPH; Global Mental Health – GMH) both pre- and postoperatively. Data were collected from March 2019 to October 2019 (n=267) and March 2020 to October 2020 (n=162). No procedural or perioperative management changes of patients were made during both time periods. Joint-specific independent t-tests were performed for patient demographics and PROs before and during the pandemic. Chi-square tests were used for categorical variables and Pearson correlations were performed to determine trends over the course of the pandemic.

Results

Prior to surgery, TKA patients had higher KOOS Jr and GPH score during the pandemic compared to patients prior (p=0.004 and p=0.003, respectively). No other significant pre-operative differences were noted for UKA or THA groups. Post-operatively, no significant differences were present in six week PRO scores or in the change from pre- to six week post-operative scores for TKA, THA or UKA. However, post-operative GPH (r=-0.326, p=0.027) and GMH (r=-0.430, p=0.003) in UKA patients were negatively correlated with time (beyond restart) indicating a declining trend in post-operative overall health as the pandemic continued.

Conclusion

The higher pre-operative PROs in TKA patients during the pandemic could have indicated that healthier, more confident patients with higher function felt safe to undergo surgery. The pandemic did not appear to affect PRO scores following surgery for TKA and THA patients. However, the decline in post-operative GPH and GMH for UKA as the pandemic continued may reflect the negative impact mandated restrictions on physical and social activities have on patient's sense of wellbeing. Surgeons should be aware of the potential impact of pandemic restrictions on patient's sense of wellbeing.

James DeJesus

Abstract Title: Improved Hip Symmetry with an Adjustable Fluoroscopic Grid During Total Hip Arthroplasty

Objective

The use of intraoperative fluoroscopy (IF) is common with direct anterior total hip arthroplasty (THA), however image distortion in IF may limit its usefulness. The supplementation of IF with an adjustable grid (AG) may provide consistently better accuracy in component placement. Therefore, the purpose of this study was to compare the accuracy, consistency, and surgical efficiency between IF only and AG supplementation.

Methods

Two cohorts were retrospectively evaluated, including 573 IF only patients and 211 AG patients having undergone unilateral THA between 2011 and 2018. Post-THA radiographic assessment was performed to evaluate the accuracy of component placement, with target placements for global hip offset (GHO) and leg length differences (LLD) under 10mm and acetabular cup abduction of 45° (± 10). Accuracy and surgical efficiency were evaluated between groups and over time.

Results

The AG group had a significant greater percentage of components placed within the target zone compared to IF only for GHO (99.5%, 92.7%, $p < 0.001$), LLD (99.1%, 96.5%, $p = 0.039$) and abduction (99.5%, 96.3%, $p = 0.009$), with no difference in fluoroscopic time ($p = 0.973$). Over time, accuracy was significantly different in IF group for GHO ($p = 0.008$) and abduction ($p = 0.002$) and trended toward significance for LLD ($p = 0.055$). There were no significant differences over time for the AG group.

Conclusion

The addition of an AG to IF significantly increased the accuracy of component placement during direct anterior THA. These results were consistent over two years of use and did not decrease surgical efficiency.

Co-authors

Scott Nishioka, BA, Samantha Andrews, PhD, ATC, Kristin Mathews, MS, ATC, Cass Nakasone, MD

Acknowledgements

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Makoa Mau, BS, Krystin Wong, BA, Dylan Lawton, BS, Samantha Andrews, PhD, ATC, Kristin Mathews, MS, ATC, Cass Nakasone, MD

Abstract Title: A Comparison Between Unilateral Unicompartmental Knee Arthroplasty (UKA) and Total Knee Arthroplasty (TKA) Patient and Clinical Reported Outcomes

Background

Previous research commonly encourages the use of unicompartmental knee arthroplasty (UKA) over total knee arthroplasty (TKA), as it is a less invasive technique leading to a faster recovery. However, patient reported outcomes and functional recovery have rarely been evaluated within the first post-operative year. Therefore, the purpose of this study was to compare functional recovery within one year and improvement in patient reported outcomes at three months and one year between unilateral UKA and TKA patients.

Methods

This prospective review included 167 patients that have undergone unilateral UKA (N=71) or TKA (N=96). Knee Society Knee (KSK) and Function (KSF) were collected prior to and at one year post-arthroplasty and patient reported outcomes (KOOS JR) were collected prior to and at three months and at one year post-arthroplasty. Parametric statistical tests were performed to evaluate differences between UKA and TKA patient demographics and outcomes. One year post-operative outcomes were compared with a pre-operative controlled univariate analysis, while a repeated measures analysis evaluated changes in KOOS Jr outcomes over time.

Results

Patient demographics were not significantly different aside from UKA patients being more frequently male (UKA=53.5%; TKA=38.5%; $p=0.039$). Pre-operatively, KOOS Jr scores were significantly higher in UKA patients (53.8 ± 10.4) compared to TKA (48.7 ± 12.6 ; $p=0.006$), with no differences in KSK ($p=0.414$) or KSF ($p=0.351$). Post-operatively, three month KOOS Jr score was significantly higher in UKA patients (72.0 ± 11.6) compared to TKA (66.1 ± 12.2 ; $p=0.002$) but was not significantly different at one year ($p=0.442$). One year post-operatively, KSF was significantly higher in UKA patients (76.6 ± 17.9) compared to TKA (70.8 ± 17.4 ; $p=0.038$), with no significant difference in KSK ($p=0.854$). Over time, KOOS JR significantly increased for both UKA and TKA patients ($p<0.001$) but there was no interaction for procedure ($p=0.252$). While the improvement in KSK was similar between UKA and TKA patients from pre- to one year post-operation, UKA patients had significantly greater improvement in KSF (19.6 ± 20.6) compared to TKA (10.8 ± 22.3 ; $p=0.001$).

Conclusion

While no difference was found in the recovery of KSK between UKA and TKA patients, KSF had a greater improvement in UKA patients. These improvements, however, were not translated into improvements in patient reported outcomes, as the increase in KOOS JR was similar between UKA and TKA groups and could indicate a difference in patient expectations following surgery.

Acknowledgements: The authors would like to thank the clinical staff of the Straub Bone and Joint Medical Center, and the study participants who made this study possible.

Kyle K. Obana, John D. Mueller, Bryan M. Saltzman, T. Sean Lynch, Robert L. Parisien, Christopher S. Ahmad, David P. Trofa

Abstract Title: Targeting Rule Implementation Decreases Neck Injuries in High School Football: A National Injury Surveillance Study

Background

Neck injuries in football are attributed to helmet-to-helmet contact with youth players being at greatest risk. In 2014 the National Federation of State High School Associations (NFHS) implemented rules defining illegal contact against a defenseless player above the shoulders to reduce head and neck injuries in football players. This study evaluates whether rule implementation decreased rates of high school football neck injuries presenting to the emergency department (ED) pre-rule implementation (2009-2013) to post-rule implementation (2015-2019).

Methods

Data were queried from the National Electronic Injury Surveillance System for high school football players 14 to 18 years old diagnosed with a neck injury from January 1, 2009 to December 31, 2019. Narratives in the data were reviewed for mechanism of injury, setting, loss of consciousness (LOC), and type of injury.

Results

Between 2009 and 2019, an estimated 47,577 high school football neck injuries were diagnosed in EDs across the United States. 52.0% of neck injuries were sustained during competition compared to 48.0% during practice. A statistically significant ($P=0.004$) decrease in neck injuries was realized from pre-rule implementation to post-rule implementation with yearly averages of 5,278 and 3,481, respectively. Helmet-to-helmet neck injuries significantly ($P=0.04$) decreased from pre- to post-rule implementation with averages of 851 and 508, respectively. Neck injuries sustained via other mechanisms were not affected by the 2014 rule implementation.

Conclusion

This study is the first to identify a decrease in overall and helmet-to-helmet related neck injuries diagnosed in the ED following the 2014 NFHS targeting rule implementation. These findings highlight the importance and efficacy of rule implementation in reducing sports-related neck injuries.

Vera Ong

Abstract Title: Time from End of Surgery Until Discharge Following Total Knee Arthroplasty: Implications for Same Day Discharge

Background:

Total knee arthroplasty (TKA) has been removed from the Centers for Medicare Services inpatient only list and is now eligible for outpatient reimbursement rates. The vast majority, however, of TKAs are still performed in community hospital settings. This change has inadvertently placed financial pressure on surgeons to consider lower cost outpatient ambulatory surgery centers (ASC). Many ASCs have limited hours of operation and it is important for surgeons considering transitioning to an ASC to understand the time needed to discharge patients following surgery. Therefore, the purpose of this study was to evaluate the average time required for same day discharge following unilateral TKA to determine how late in the day surgeries can be performed in an ASC with limited hours of operation.

Methods:

A retrospective review of patients who successfully achieved same day discharge from a high-volume community hospital following TKA was conducted. Patient demographics, time of surgical procedure and time of actual discharge from the hospital following surgical closure were recorded. Descriptive statistics were created for patient demographics and surgical variables, including mean and standard deviations. Independent t-tests were performed to compare time to discharge between patients having an incision time prior to and after noon.

Results:

Overall, 27 patients achieved same day discharge and were included for analysis. Of those patients, 19 (70.4%) were male and eight (29.6%) were female, with an age of 64.5 ± 10.3 years and 65.1 ± 6.1 years, respectively ($p=0.880$). The average surgical time from incision to application of dressings was 67.7 ± 18.0 minutes (range: 43-127 minutes) and the average time required for discharge following the end of surgery was 374.9 ± 77.7 minutes (range: 187-537 minutes). Of the 27 patients, 22 patients started surgery prior to noon, with 18 patients finishing surgery prior to noon. The time required for discharge was significantly longer for patients ending surgery prior to noon (401.9 ± 67.1 minutes) compared to finishing after noon (320.7 ± 71.4 minutes) ($p=0.008$). Only five patients (18.5%) started surgery prior to 9:30am, indicating that the majority of patients in the current study were not the first or second surgical case of the day. Discharge times ranged from 2:00pm to 8:00pm, with 21 patients (77.8%) being discharged after 5:00pm.

Conclusions:

Patients require approximately five to seven hours following elective unilateral TKA to discharge from a high volume community hospital. Surgeons considering transitioning TKA cases to an ASC should appreciate this potential time requirement when scheduling cases at an ASC which may have limited operational hours. Average times required for discharge from a particular ASC should be studied to understand how to maximize efficient use of such facilities.

Julian Rimm, MS, Krystin Wong, BA, Samantha Andrews, PhD, ATC, Kristin Mathews, MS, ATC, Cass Nakasone, MD

Abstract Title: Gap Balance versus Measured Resection Technique in Total Knee Arthroplasty with Fixed Femoral Cut of 6° Valgus

Objective

Restoration of near-neutral mechanical axis (MA) is a hallmark of successful total knee arthroplasty (TKA) and has been shown to reduce alignment related early implant failures. Measured resection (MR) and gap balancing (GB) are two soft tissue balancing techniques implemented in TKA, however it is still debated which method is superior in restoring MA. Therefore, the purpose of this study was to compare MR and GB during TKA while utilizing a fixed distal femoral cut of 6° valgus.

Methods

A total of 148 patients (203 knees) underwent primary TKA by a single surgeon, including 109 MR knees and 94 GB knees. Pre- and six-week post-operative mechanical axis was measured on weight bearing, anteroposterior radiographs, with neutral mechanical axis considered $0^{\circ} \pm 3^{\circ}$. At six-week follow up, the Knee Society Knee Score and Function Score, knee flexion and the KOOS JR patient survey were collected. Additional data collected included patient demographics and surgical time. Non-parametric tests were performed to determine difference between GB and MR groups.

Conclusion

Age and body mass index were not significantly different between implant groups, however, GB had a greater percentage of male patients ($p=0.033$). Pre-operatively, mechanical axis was significantly more varus in the GB group ($-5.9^{\circ} \pm 8.9^{\circ}$) than the MR group ($-2.7^{\circ} \pm 9.7^{\circ}$) ($p=0.020$). Post-operatively, no significant difference in mechanical axis was noted between the GB ($0.23^{\circ} \pm 2.8^{\circ}$) and MR groups ($0.39^{\circ} \pm 2.9^{\circ}$) ($p=0.958$), with 76 (80.9%) and 83 (76.1%) of GB and MR knees classified as neutral ($p=0.702$). Surgical time was significantly longer in the unilateral MR group (66.2 ± 15.2 minutes) compared to the GB group (60.5 ± 9.5 minutes) ($p=0.047$) but no difference was noted in bilateral procedures ($p=0.851$). There was also no significant difference in post-operative clinical outcomes (Knee Score, $p=0.920$; Function Score, $p=0.652$), knee flexion ($p=0.142$) or KOOS JR scores ($p=0.416$). With no difference in post-operative mechanical alignment or clinical/patient reported outcomes, both surgical methods represent equivalent options for surgeons trying to decide on a primary implant system for TKA.

Julian Rimm, MS, Krystin Wong, BA, Samantha Andrews, PhD, ATC, Kristin Mathews, MS, ATC, Cass Nakasone, MD

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Sean Saito, B.S., Dylan Lawton, B.S., Samantha Andrews, PhD, ATC, Kristin Mathews, MS, ATC, Cass Nakasone, MD

Abstract Title: Prevalence of contralateral osteoarthritis in unilateral arthroplasty patients and the influence of ethnicity

Objective

Previous literature has cited that approximately one-third of patient have contralateral osteoarthritis (OA) at first clinical presentation for unilateral joint pain and dysfunction. However, this is primarily evaluated in a Caucasian population and may not be generalizable to other ethnicities. Therefore, the purpose of the current study was to evaluate the prevalence of radiographic evidence for OA in the contralateral joint of patients undergoing unilateral total knee (TKA), unicompartmental knee (UKA) or total hip (THA) arthroplasty and determine the influence of patient characteristics and ethnicity on the presence of contralateral OA.

Methods

This retrospective chart review included 2312 subjects having undergone unilateral arthroplasties (332 UKAs, 933 TKAs and 1047 THAs). Patient demographics were collected, including age, body mass index, gender and ethnicity. Ethnicity was reported as Asian, White, Native Hawaiian/Pacific Islander (NH/PI) or Other (not reported). The presence of contralateral OA was determined from the radiographic report corresponding to the clinic visit in which the determination was made for primary arthroplasty. Criteria for the presence of OA included joint space narrowing, osteophyte formation and mild to severe joint degeneration. Contralateral surgery within the study period was also collected. Parametric statistical analyses were performed to determine differences between groups. For significant variables, multivariate analyses were completed for each arthroplasty group to determine the influence on the presence of contralateral OA, presented as odds ratios (OR) and 95% confidence intervals (CI).

Results

Overall, contralateral OA was present in 86.7% of UKA patients, 90.4% of TKA patients, and 70.4% of THA patients. Additionally, hip OA was present in 41.6% of UKA patients and 59.5% of TKA patients. No significant main effect for ethnicity was determined for the prevalence of contralateral OA in UKA patients (Asian: 85.4%, White: 90.5%, NH/PI: 86.4%; p-value: 0.709) or TKA patients (Asian: 90.9%, White: 87.2%, NH/PI: 94.2%; p-value: 0.091) but a significant main effect was present among THA patients (Asian: 66.5%, White: 74.6%, NH/PI: 74.1%; p-value: 0.037). In the multivariate analysis for each arthroplasty, contralateral OA in UKA patients had no significant contributors, TKA contributors were age (OR:1.066, CI: 1.039-1.093; p<0.001) and body mass index (OR: 1.146, CI: 1.093-1.201; p<0.001) and THA contributors were age (OR: 1.043, CI: 1.029-1.056; p<0.001), male gender (OR: 1.894, CI: 1.424-2.519; p<0.001) and Caucasian ethnicity (reference Asian) (OR: 1.537, CI: 1.140-2.071; p=0.005). The influence of race could be in part due to the lower percentage of Asian males (39.9%) undergoing THA compared to White males (53.8%). Finally, while no difference was noted in TKA and THA patients, Caucasians had a significantly greater percentage of patients undergo contralateral UKA surgery (13.1%) compared to Asian (3.8%), NH/PI (4.5%) and Other (0.0%) (p=0.016). While

the influence of race was not highly significant in the presence of contralateral OA, the prevalence is much higher than previously reported in literature and should be evaluated prior to undergoing unilateral arthroplasty.

Brandan Sakka, BS, Dylan Lawton, BS, Samantha Andrews, PhD, ATC, Kristin Mathews, MS, ATC, Cass Nakasone, MD

Abstract Title: FEASIBILITY OF OUTPATIENT DISCHARGE IN SINGLE-STAGE BILATERAL UNICOMPARTMENTAL KNEE ARTHROPLASTY

Objective:

Single-stage bilateral unicompartmental knee arthroplasty (SSBUKA) has shown good postoperative function at a lower cost than staged bilateral procedures, without an increase in complications, but is differentiated for reimbursement purposes. Due to this, favor lies with the staged procedure to best achieve outpatient discharge. A rapid discharge protocol has been developed at the current study site and outpatient discharge for the unilateral procedure exceeds 97%. However, the feasibility of outpatient discharge following SSBUKA remains unclear. Therefore, the purpose of this study was to determine the success of achieving outpatient (<24hr) discharge following SSBUKA in an unselected patient cohort and identify patient variables associated with unsuccessful outpatient discharge.

Methods:

A retrospective chart review was completed for 104 patients having undergone SSBUKA. Data collection included patient demographics, discharge status, and disposition location. Independent t-tests (continuous) and Chi-squared tests (categorical) determined differences between outpatient vs inpatient discharge groups, and home vs other disposition groups. Multivariable regression was used to assess variables associated with discharge status and location.

Conclusion:

Overall, 96 (92.3%) patients achieved outpatient discharge, while 8 (7.7%) required an inpatient admission. Although no differences were observed in patient demographics, patients requiring inpatient admission were more likely to require a pre-operative assistive device (62.5% vs 25.0%, $p=0.037$) and live alone (37.5% vs 8.3%, $p=0.033$) compared to patients who successfully achieved outpatient discharge. For those achieving outpatient discharge, only 63.5% were discharged directly home, with living alone significantly increasing the risk (OR 5.800, $p=0.038$) for requiring an acute care facility prior to transition home. Achieving true outpatient discharge is only modestly feasible for most SSBUKA patients, as a significant percentage required discharged to an acute care facility. While it is likely multifactorial, living alone increased the likelihood of both inpatient admission and need for an acute inpatient care facility following surgery.

Dylan Singh BS, Samantha Andrews PhD ATC, Dylan Lawton BS, Cass Nakasone MD

Abstract Title: The Influence of Patellar Erosion on Knee Range of Motion Following Unicompartmental Knee Arthroplasty

Abstract

Background

The presence of significant patellofemoral (PF) arthritis remains controversial regarding indications for unicompartmental knee arthroplasty (UKA), as this has previously been shown to negatively influence post-operative knee range of motion (ROM) and function. Therefore, the purpose of this study was to determine if the extent of PF arthritis impacted post-UKA knee range of motion.

Methods

This retrospective review evaluated 323 unilateral and bilateral UKA patients (418 knees) from 2015 to 2019, with a minimum of 6-month follow-up required. Patients were grouped by PF arthritis, including mild PF arthritis (Group 1), extensive PF arthritis (Group 2) and PF arthritis with lateral compartment bone on bone contact (Group 3). Group differences were evaluated with Kruskal-Wallis or Chi-Square tests for continuous and categorical variables, respectively. Univariate logistic regressions were performed to determine influential variables for post-operative knee flexion $\leq 120^\circ$, with significant variables further evaluated in a multivariate logistic regression and presented as odds ratios (OR) and 95% confidence intervals (CI).

Results

Group totals were: 266 knees in Group 1, 101 knees in Group 2 and 51 knees in Group 3. Pre-operative flexion was significantly lower in Group 3 ($p=0.010$), with 17.6% of patients having flexion $\leq 120^\circ$. Post-operatively, flexion was significantly lower in Group 3 ($119.1^\circ \pm 8.4^\circ$, $p=0.003$), with 19.6% patients having flexion $\leq 120^\circ$ compared to 9.8% and 8.9% in Groups 1 and 2, respectively. Post-operative Knee Society Function score was not significantly different between the groups ($p=0.223$). Group was not a significant contributor to post-operative flexion, however, age (OR:1.089, CI:1.036-1.144; $p=0.001$), body mass index (OR:1.082, CI:1.006-1.163; $p=0.034$) and pre-operative flexion (OR:0.949, CI:0.921-0.978; $p=0.001$) were significant.

Conclusions

As PF arthritis did not appear to directly contribute to post-operative knee flexion or function, UKA may be considered with patients presenting with significant PF arthritis.

Tyler Thorne, Samantha Andrews, Scott Nishioka, Cass Nakasone

Abstract Title: Racial and Ethnic Disparities in Utilization Rate and Perioperative Outcomes after Knee and Hip Arthroplasty

Objective

Previous racial disparity evaluations of total hip (THA), total knee (TKA), and unicompartmental knee arthroplasties (UKA) have focused on black and white populations. The current study reports the utilization and perioperative complications in Hawaii's population of majority Asians, with subpopulations of Whites, Native Hawaiian/Pacific-Islander (NHPI) and Blacks.

Methods

Data were retrospectively collected from 3304 arthroplasties performed from 2011 to 2019 and compared across four major ethnic groups.

Results

Racial groups included 1789 (52.2%) Asians, 1164 (34%) Whites, 320 (9.3%) NHPI and 31 (0.9%) Blacks. Medicare was the most common insurance type for Asians (66.2%) and Whites (54.2%), while private insurance was most common for NHPI (49.4%) and Blacks (54.8%). Asians had the 2nd highest percentage of patients living in urban zip codes (Asian: 84.7%, Whites: 69%, NHPI: 69.8%, Black: 87.1% $p<0.001$), were significantly older (Asian: 69.7; White: 66.7; NHPI: 64.0; Black: 59.7; $p<0.001$), had significantly lower body mass index (Asian: 27.9; White: 28.8; NHPI: 33.0; Black: 34.3; $p<0.001$) and had the greatest percentage of patients with impaired fasting glucose (Asian: 46.8%; Whites: 26.2%; NHPI: 46.6%; Black: 40.0%; $p<0.001$). Normalized to total Hawaii population and racial percentage, compared to Asians, Whites were more likely to have a higher economic status while NHPI were more likely to have lower status (Odds Ratio (OR) White: 0.695, 95% Confidence Interval (CI):0.576-0.837, $p<0.001$; OR NHPI: 1.456, CI: 1.117-1.898, $p=0.005$). From 2011 to 2019, male arthroplasty utilization rates increased 0.14 (Asian), 0.07 (White) and 0.24 (NHPI) arthroplasties per 1000 persons and female utilization rates changed 0.08 (Asian), -0.01 (White) and 0.14 (NHPI) arthroplasties per 1000 persons. Compared to Asians, Whites more often underwent THA compared to TKA/UKA (OR: 1.755, CI: 1.532-2.009; $p<0.001$). Compared to Asians, Whites and NHPI more often underwent TKA over UKA (White: OR: 1.499, CI: 1.204-1.866; NHPI: OR: 2.013, CI: 1.402-2.887; $p<0.001$). From 2012-2015 Asians utilization rates of TKA ranged from 53.8%- 62.4% but dropped to 30.9%-37.9% following the introduction of the UKA procedure in 2016 which was utilized in 27.6%-32.7% of patients from 2016 to 2019. After controlling for bilateral procedures, only NHPI had a lower risk of transfusion compared to Asians (OR: 0.478, CI: 0.266-0.860; $p=0.014$). Only Whites had increased risk of wound or systemic complications compared to Asians (OR: 2.086, CI: 1.242-3.503, $p=0.005$). No complications were associated with urban vs rural living area, while a higher risk of transfusion was associated lower socioeconomic status (OR: 1.541; CI 1.155-2.055, $p=0.003$). There was no difference between racial groups and length of stay in unilateral knee replacements but Whites had increased length of stay at 2.66 days compared to Asians at 2.19 days ($p=0.005$) following bilateral procedures.

Discussion

Minority racial groups in Hawaii have equal utilization of joint arthroplasty and, despite rural living status, lower socioeconomic status, and greater comorbidities, had no increased rates of peri-operative complications. While these results contradict previous research, the utilization rates present in the current study suggest adequate patient access to healthcare across the State and sufficient protocols to avoid post-operative complications.

Ruixue Zhang

Abstract Title: RADIOGRAPHIC ASSESSMENT OF TWO SHORT FEMORAL STEMS USED DURING TOTAL HIP ARTHROPLASTY VIA DIRECT ANTERIOR APPROACH

Objective

The use of short femoral stems in total hip arthroplasty (THA) has been increasing due to the popularity of less invasive surgical procedures. Compared to the longer, standard stem, short stems preserve more bone and facilitate insertion thru a direct anterior approach (DAA). However, different short stems can lead to various outcomes including malalignment and peri-operative complications. Therefore, the purpose of this study was to compare component placement accuracy and peri-operative complications between two short femoral stem designs.

Methods

This study retrospectively evaluated 189 patients (212 hips) having received the Fitmore (Fitmore® Hip Stem, Zimmer Biomet, Warsaw, IN) and 177 patients (211 hips) having received the Tribute (Ovation Tribute® Hip Stem, Ortho Development, Draper, UT) short femoral stems. All arthroplasties were performed via the DAA. Radiographic assessment included pre-operative and six-week post-operative weight bearing anteroposterior bilateral hip radiographs to determine hip offset (HO), leg length difference (LLD), subsidence and femoral component angle (FCA). Standard, previously reported measurement techniques were performed, with a HO and LLD greater than 6mm considered clinical significant. Additionally, a measured FCA beyond -3° , indicating a more medially angled stem, was classified as varus malalignment. Intraoperative and early post-operative fractures were collected as well. Parametric statistical tests were performed to evaluate differences between implant groups. A univariate logistic regression was used to determine individual outcomes based on stem implant and were presented as odds ratios (OR) and 95% confidence intervals (CI).

Results

No significant group differences were present in patient demographics or pre-operative alignment. Post-operatively, the Tribute group had significantly higher HO (4.43 ± 3.2) compared to the Fitmore group (3.64 ± 3.6) ($p=0.002$) but there was no significant difference in LLD ($p=0.136$) or subsidence ($p=0.445$). Patients in the Tribute group were more likely to have a $HO>6\text{mm}$ (OR:2.176, CI: 1.323-3.578; $p=0.002$) but were less likely to have a varus FCA (OR: 0.328; CI: 0.209-0.515; $p<0.001$). A total of four fractures occurred, including one post-operative fracture (0.5%) in the Fitmore group and one intraoperative (0.5%) and two post-operative fractures (0.9%) in the Tribute group ($p=0.509$). Stem design did not increase the risk for overall fracture ($p=0.337$).

Conclusions

Although the incidence of fracture were similar between the two implants, there were differences in the post-operative radiographic assessment. The more accurate HO in the Fitmore group was likely due to the number of implant variations available to the surgeon, allowing for

more precise establishment of symmetrical HOs. However, the curved design of the Fitmore was more likely to result in varus malalignment (39.3% vs 17.7%). While this may seem like large clinical difference, the absence of early fracture may suggest that post-operative malalignment, within reason, may not increase the risk of fracture, making either of these implant designs appropriate during direct anterior THA.

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