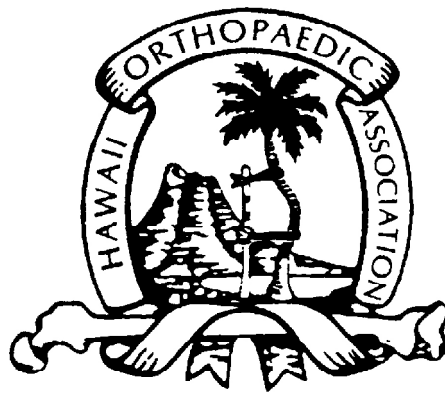


*32nd Annual  
Combined Orthopaedic  
Spring Symposium*



*April 7-8, 2017*

*Hawaii Prince Hotel - Honolulu*

## Welcome from HOA President

*Aloha & Welcome to the 32nd Annual Combined Orthopaedic Spring Symposium! Months of effort have gone into planning this signature event, at which attendees can learn about the latest advances in orthopaedic surgery from nationally renowned experts in their fields. The symposium provides a constructive forum for discussions among HOA members, residents, medical students and allied health professionals from across our state. It also features the research being conducted by University of Hawaii and Tripler Army Medical Center residents. And, it provides HOA members with a wonderful opportunity to network with fellow specialists during the sessions and at the awards banquet. This is truly a great opportunity to gain knowledge and earn CME credit, participate in discussions and catch-up with our local orthopaedic ohana over the course of just a few days. Mahalo for joining us!*

**Wei Chin Chen, MD**  
**HOA President & Symposium Chair**

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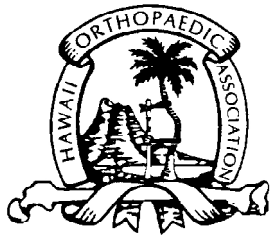
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## HOA Membership Information

Contact HOA Executive Director Cathy Iwai at 808-673-0234 or [cathy.iwai@hawaiiintel.net](mailto:cathy.iwai@hawaiiintel.net) if you are interested in becoming a member of the Hawaii Orthopaedic Association.



Hawaii Orthopaedic Association  
P.O. Box 61207  
Honolulu, HI 96839  
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## Americans with Disability Act (ADA)

Participants with special needs should contact Cathy Iwai at 808-630-1586 or [cathy.iwai@hawaiiintel.net](mailto:cathy.iwai@hawaiiintel.net) to discuss desired accommodation(s).

## General Objectives

This conference is intended for physicians and other health care professionals. By the end of the course, the participant will be able to:

- ◆ Identify current advances in orthopedic practice.
- ◆ Apply advances to community practice.

## CME Credits

In support of improving patient care, Hawai'i Pacific Health is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), 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 16.0 *AMA PRA Category 1 Credit (s)*™. Physicians should claim only credit commensurate with the extent of their participation in this activity.

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 relevant relationships with commercial companies pertaining to this activity.

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

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## Disclosure Information

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:

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Julius Bishop, MD/Innomed/Globus Medical/Synthes/Depuy

Alex Sweet, MD/Zimmer/Ortho Development

Steven Wilding, MD

Alex Shin, MD/TriMed Orthopedics

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Nicholas Foeger, MD

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Hank Chambers, MD/Orthopediatrics Corp/3D4 Medical

Christina Wu, MS III

Adam Groth, MD

Joshua Dworkin, MD

Zack Johnson, MD

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Aaron Vaslow, MD

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Chris Belyea, MD, MBA, CPT

Jae You, MD/Ortho Development

### Relationship

None

Royalty/Consultant/Educator

Consultant

None

Royalty

None

None

None

None

Consultant

None

None

None

Consultant

None

None

None

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None

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None

None

None

Royalty/Consultant

None

Consultant

### Planning Committee Member

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Wei Chin Chen, MD

Jason Kaneshige, MD

Emily Shin, MD

Joseph Vicardapine, MD/Radlink/Depuy

Cass Nakasone, MD/Ortho Development/Zimmer Biomet/Medtronic

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None

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None

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## Best Resident Paper Awards

**Richardson Awards:** The *Richardson Fund* was established in 1982 to honor the memory of B. Allen Richardson, MD. Dr. Richardson was one of the first Board-Certified Orthopaedic Surgeons in Honolulu, where he practiced for nearly 30 years. He was an active member of the teaching staff of the University of Hawaii Orthopaedic Residency Training Program from its inception in the mid-1960s, and was a staunch supporter for the creation of the John A. Burns School of Medicine. The proceeds of the *Richardson Fund* are used to award first, second and third place prizes for the best resident papers presented at the Annual Combined Orthopaedic Spring Symposium.

**Shriners Award:** The Shriners Award is presented annually and was established to honor an orthopaedic resident who has completed a rotation at the Shriners Hospital for Children in Honolulu. Residents present their completed papers to medical staff and allied health professionals at the Shriners Hospital's patient care conference. The paper must be written to meet standards for publishing in clinical publications.

## Acknowledgements

*Thank you for the Support of all of Our Exhibitors...*

All Island Surgical	Mid Pac Medical
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*Special Thanks to...*

Laura Abby Reed & Amy Thomas @ Hawaii Pacific Health  
Shriners Hospital for Children - Honolulu  
Tripler Army Medical Center Orthopaedic Residency Program  
University of Hawaii Orthopaedic Residency Program

*...and a Big Mahalo to...*

HOA Executive Director Cathy Iwai for all of your work  
in overseeing another successful year!

## 32nd Annual Combined Orthopaedic Spring Symposium

Friday, April 7, 2017

- 6:00 Registration / Continental Breakfast / Exhibits
- 6:30 Welcome & Opening Remarks - WeiChin Chen, MD
- 6:45 Introduction of Julius Bishop - Kanu Okike, MD  
Julius Bishop, MD - *Tips and Tricks for Optimizing Resident Education*
- 7:30 Alex Sweet, MD - *Orthopaedic Injuries in Hawaii Shark Attack Victims*  
Steven Wilding, MD - *Are Surgical Skills Under-Emphasized in Disaster Response Literature?*
- 7:45 Kanu Okike, MD - *Single-Blind vs. Double-Blind Peer Review in the Setting of Author Prestige*
- 8:30 Break & Visit Exhibits
- 8:45 Introduction of Alex Shin - Emily Shin, MD  
Alex Shin MD - *Current Concepts of Treatment of Scaphoid Nonunions*
- 9:30 Mariya Opanova, MD - *Anatomic Relationship Between the Dorsal Intercarpal Ligament and Scaphoid Ridge*  
Kevin Krul, MD - *Should Arthroscopic Treatment of Occult Dorsal Wrist Ganglions be the Gold Standard?*  
Nicholas Foeger, MD - *The Effects of Aging and Diabetes Mellitus on Hand Somatosensation*  
Megan Kuba, MD - *Anatomic Anterior Proximal Ulnar Angle Differences Based on Arm Position and a Case Report of its Use*
- 10:00 Break & Visit Exhibits
- 10:15 AAOS Representative Talk on MACRA/MIPS - William Shaffer, MD
- 11:00 Introduction to Rahul Banerjee - Jason Kaneshige, MD  
Rahul Banerjee, MD - *Periprosthetic Femur Fractures*
- 11:45 James Deal, MD - *The Incidence of Lumbar Disc Herniation in Military Helicopter Pilots vs. Matched Controls Over a 10-Year Period*  
Greg Lause, MD - *The Impact of Implant Density on Curve Correction for Large Stiff Idiopathic Curves*
- 12:00 Lunch
- 12:15 HMSA Insurance Talk - Mark Mugiishi, MD
- 1:00 Introduction to Hank Chambers - Byron Izuka, MD  
Hank Chambers, MD - *Treatment of ACLs and OCDs in Children and Adolescents*
- 1:45 Byron Izuka, MD & Christina Wu MS III - *Use of Live Video Recordings in the Outpatient Setting: A Study Update and Final Results*
- 2:15 Break & Visit Exhibits
- 2:30 Introduction to Adam Groth - WeiChin Chen, MD  
Adam Groth, MD - *Total Ankle Arthroplasty: A Lateral Approach*
- 3:30 Joshua Dworkin, MD - *Occupational Outcomes of the Modified Broström Procedure: A Retrospective Review*  
Zack Johnson, MD - *Comparison of MR Imaging and Stress Radiographs in the Evaluation of Chronic Lateral Ankle Instability*
- 3:45 Break & Visit Exhibits
- 4:00 Alex Shin, MD - *Distal Radius Fractures: A Personal Journey Over 20 Years*
- 4:45 Rahul Banerjee, MD - *Orthopedic Trauma Tips*
- 5:15 Adjournment & Reception to follow

**32nd Annual Combined Orthopaedic Spring Symposium**  
Saturday, April 8, 2017

- 6:00 Registration / Continental Breakfast / Exhibits
- 6:30 Appreciation for Guest Speakers
- 6:45 Julius Bishop, MD - *Tibial Plateau Fractures: Best Practices for 2017*
- 7:15 Rahul Banerjee, MD - *Acetabular Fractures in the Elderly*
- 8:00 Break & Visit Exhibits
- 8:15 Shawn Brugman, MD - *Rotator Cuff Repairs in Active Patients 40 Years and Younger*  
Robert Turner, MD - *Return to Duty After Multiligamentous Knee Injuries Active Duty Members*  
Liang Zhou, MD - *A Comparison of 'On-Track' and 'Off-Track' Assessment With Clinical Failure in a 13-year Follow-Up of Open vs. Arthroscopic Shoulder Stabilizations*  
Mitchell Harris, MD - *Prospective Evaluation of Acute ACL Reconstructions Using Patellar Tendon Autografts*  
Aaron Vaslow, MD - *Smoking: A Prognostic Indicator for Bankart Repair*
- 9:00 Introduction to Cass Nakasone - Joe Vicardapine, MD  
Cass Nakasone, MD - Joint Arthroplasty Talk
- 9:45 Chris Belyea, MD - *Early Outcomes of Total Hip Arthroplasty in an Adolescent Population*  
Jae You, MD - *Addressing Large Tibial Osseous Defects in Primary TKA Using Trabecular Metal Cones*
- 10:15 Hank Chambers, MD - *PRiSM: Pediatric Research in Sports Medicine*
- 11:00 Adam Groth, MD - *Osteobiologics in Foot and Ankle Reconstruction*
- 11:30 Alex Shin, MD - *Adult Traumatic Brachial Plexus Injuries: An Overview of Concepts and Treatment Options*
- 12:15 Lunch
- 1:00 Julius Bishop, MD - *The Syndesmosis: Not as Simple as You Thought*
- 1:45 Hank Chambers, MD - *Cerebral Palsy: A View From Both Sides*
- 2:30 Adam Groth, MD - *Barefoot Running: Myths and Controversies*
- 3:15 Adjournment & Banquet to follow

# GUEST SPEAKERS

## **Rahul Banerjee, MD, FACS**

- \* Orthopaedic Trauma Surgeon
- \* Acute Orthopaedic Care Specialist, LLC/EmCare
- \* Plano, TX

## **Julius A. Bishop, MD**

- \* Department of Orthopedic Surgery
- \* Stanford University School of Medicine
- \* Stanford Medicien Outpatient Center
- \* Redwood City, CA

## **Hank Chambers, MD**

- \* Pediatric Orthopedic Surgeon
- \* Professor of Clinical Orthopedic Surgery
- \* University of California,, San Diego
- \* David Sutherland Director of Cerebral Palsy Research
- \* Director of 360 Sports Medicine
- \* Rady Children's Hospital
- \* San Diego, CA

## **Adam Groth, MD**

- \* Associate Professor Clinica, Department of Orthopaedics
- \* Division of Foot & Ankle Surgery
- \* The Ohio State University
- \* Columbus, OH

## **Alexander Y. Shin, MD**

- \* Professor Of Orthopaedic Surgery
- \* Professor of Neurosurgery
- \* Department of Orthopedic Surgery
- \* Division of Hand and Microvascular Surgery
- \* Mayo Clinic
- \* Rochester, MN

## **William Shaffer, MD**

- \* Medical Director
- \* American Academy of Orthopedic Surgeons
- \* Washington D.C.

###

## Tips and Tricks for Optimizing Resident Education

Julius Bishop, MD

Abstract available upon request

###



## Orthopaedic Injuries in Hawaii Shark Attack Victims

Sweet, R. Opanova, M. Murray, P. Moroz, P.

**OBJECTIVE:** To review of all shark attacks in the state of Hawaii for the past 10 years (7/1/06 to 7/1/16). The aim was to explore the severity and types of injuries associated with the native shark population of Hawaii.

**METHODS:** This study involves a case series consisting of a retrospective medical chart review of patients with a shark related injury. Patient names were obtained from the Hawaii shark incidents list at <http://dlnr.hawaii.gov/sharks/shark-incidents/incidents-list/> and patient's charts found by the name and age, at the treating medical center. The names of the victims that are withheld from the public website will be obtained directly from the Division of Aquatic Resources. Inclusion criteria was any patient who presented with a shark related injury. There were no exclusion criteria, all listed shark attack patients were included.

**RESULTS:** We have IRB approval for Queens Hospital but are still awaiting final approval from the Western IRB to access Maui Memorial, Kaiser, and HPH hospital records. The addition of these hospital records will greatly strengthen our study.

**DISCUSSION:** Not yet finalized

**CONCLUSION:** Not yet finalized.

###

## Are Surgical Skills Under- Emphasized in the Literature on Medical Response to Disasters? A Survey and Critical Analysis of the Literature with an Emphasis on Low-Resourced Populations

Steven R. Wilding, MD, Tripler Army Medical Center, Department of Surgery.  
Nicholas W. Moroz, BAS, University of Guelph, Guelph, Ontario, Canada  
Paul J. Moroz, MD, MSc, FRCSC, University of Hawaii.

**INTRODUCTION:** The literature on the medical response to disasters appears to under-emphasize the importance of surgical skills while emphasizing the importance of infection control, or water and food security. It is also recognized that the acute phase of any disaster requires immediate or almost immediate surgery for life and limb threatening surgical injuries, especially in low- and middle-income countries (LMIC).

**METHODS:** The same advanced Boolean search strategy was applied to five different search engines on Feb 10, 2017 intending to demonstrate what percentage of published papers on the medical response to disasters included references to surgical procedures. The terms “(disaster OR disaster response) AND (medical aid OR medical response OR humanitarian aid) AND (surgery OR surgical skills OR surgical procedure) AND (developing country OR austere environment OR low resource environment OR third world)” was applied and the number of articles at each stage of the search was analysed. The final surgical articles were then reviewed for relevance.

**RESULTS:** On average only 6.4% of papers published dealing with the medical response to disasters anywhere in the world have within them the terms “surgery”, or “surgical skills” or “surgical procedure”. In LMIC populations this figure drops to 0.2%.

**DISCUSSION/CONCLUSIONS:** Injuries requiring surgery to save life or limb are very common in disaster situations, especially earthquakes, yet <10% of the disaster literature discuss surgical issues. Less than 1% of articles discuss disaster-related surgical capacity in developing countries, where many disasters occur. Most surgical papers published discuss the impact of foreign surgical teams, which often take at least 4 days to arrive, too late for many surgical injuries. The apparent gap in surgical preparedness for disaster medical response deserves more study, including review of local surgical assets to address the acute phase of disasters that cannot be addressed by foreign medical teams.

###

## Single-Blind vs. Double-Blind Peer Review in the Setting of Author Prestige

Kanu Okike MD MPH, Kevin T. Hug MD, Mininder S. Kocher MD MPH, Seth S. Leopold MD

**BACKGROUND:** Most medical journals practice single-blind review, in which authors' identities are known to reviewers, but concerns have been raised that this approach could lead to bias, particularly favoring highly-regarded authors and institutions.

**METHODS:** We conducted a randomized controlled experimental study of single- versus double-blind review at *Clinical Orthopaedics and Related Research*, a prominent orthopaedic journal which utilizes both forms of peer review. Two hundred fifty-six reviewers were randomized to receive single- or double-blinded versions of an otherwise identical fabricated test manuscript which, in the single-blinded form, was putatively written by prestigious authors. One hundred nineteen participants completed the review and were included in the analysis. The primary outcome was recommendation of acceptance or rejection. Secondary outcomes were the number of errors detected and the scores given to the study's methods and other categories usually solicited by *CORR*.

**RESULTS:** Reviewers were more likely to recommend acceptance when the highly-regarded authors' names and institutions were visible than when they were blinded (87% versus 68%, RR 1.28, 95% CI 1.06-1.39,  $p=0.017$ ). Reviewers awarded higher methods scores to the manuscript when the highly-regarded authors' names and institutions were visible than when they were blinded, despite the methods sections being otherwise identical (mean score  $6.97\pm 2.10$  vs  $6.05\pm 2.08$ , mean difference 0.92, 95% CI 0.15-1.68,  $p=0.019$ ). There was no difference in the number of errors detected between the manuscript versions.

**CONCLUSIONS:** Reviewers were more likely to recommend publication of a manuscript if they believed it was authored by highly-regarded authors from prominent institutions than if they did not know the authors' names or study sites.

###

## Current Concepts of Treatment of Scaphoid Nonunions

Alex Shin MD

Abstract available upon request

###

## Scapholunate Instability, Anatomic Study

Opanova, M, Foeger, N, Dupaix, J and Medoff, R

**OBJECTIVE:** Explore the anatomic relationship of the dorsal scaphotriquetral (ST) ligament and the scapholunate (SL) interosseous ligaments. Suggest that these dorsal structures have a key role in guiding the capitate via a direct cam effect during wrist movement.

**METHODS:** Cadaver wrists were dissected using a dorsal approach, and the superficial retinaculum, extensor tendons and synovial tissue over the dorsal capsule reflected. An incision was made along the distal margin of the dorsal intercarpal ligament, leaving its radial attachment on the scaphoid and its ulnar attachment on the triquetrum intact. The scaphoid, triquetrum, and lunate were dissected en bloc and from a volar perspective, attachments between the dorsal scapholunate interosseous ligament and the dorsal scaphotriquetral ligament were photographed and measured.

**RESULTS:** Total of 5 cadaver wrists were dissected, 2 female and 3 male. One of the male specimens had a disrupted scapholunate ligament and was excluded from the study. The average age of the cadavers was 73 years. Digital calipers were used to get 3 measurements for each dimension, the table below represents the average for each specimen.

**DISCUSSION:** During our dissection we visualized the dorsal structures of the proximal carpal row in particular the ST ligament, the dorsal ridge of the scaphoid and the dorsal part of the SL ligament. These structures appear to provide a significant amount of support to the capitate and are likely to contribute to the motion of the capitate during wrist flexion and extension. Dividing the ST ligament during the dorsal approach to the wrist may destabilize this mechanical support and contribute to wrist instability seen in SL injuries. One major limitation to our study is the limited number of specimens as well as the relative older age of the cadavers. Another limitation is the relative difficulty of measuring soft tissues using calipers. We attempted to minimize this by having only one person measure the specimens and repeat those measurements 3 times. Further studies are necessary to determine the mechanical role of the ST ligament and the scaphoid ridge in directing capitate motion.

**CONCLUSION:** Scapholunate instability is a complex problem that can result in prolonged morbidity and permanent impairment of function. Addressing SL instability surgically is complex and not always successful. One aspect that may contribute is the incomplete restoration of the dorsal structures which could play an important role in directing capitate movement. In particular disrupting the ST ligament attachment and failing to repair it could result in alteration of normal wrist biomechanics. Further studies are necessary to clarify the importance of the dorsal structures but we suggest that preserving the ST ligament when possible may help with restoring normal wrist biomechanics and avoiding future instability.

###

## Should Arthroscopic Treatment of Occult Dorsal Wrist Ganglions be the Gold Standard?

Major Kevin P. Krul, M.D.; Lieutenant Colonel Rey D. Gumboc M.D.  
Tripler Army Medical Center Department of Orthopaedics

**INTRODUCTION:** Originally described in 1999 through open exploration, occult dorsal wrist ganglions are one of the multiple causes of dorsal wrist pain over the scapholunate interval. With the increased availability of MRI, the diagnosis is becoming more common and presents a challenge to both the generalist and the specialty trained hand surgeon.

**METHODS:** A retrospective review was conducted using an automated search of electronic patient medical records from March 2012 through March 2015 for patients who underwent wrist arthroscopy for occult dorsal wrist ganglions. Patients were excluded who had other primary diagnoses, or who had radiographic evidence of scapholunate instability.

**RESULTS:** 20 operative cases met the inclusion criteria in 19 patients. All patients had dorsal and radial sided wrist pain, and MRI's that demonstrated the occult ganglion. Of these 20 cases, 14 (70%) had instability noted from the midcarpal row. The grades of instability ranged from Geissler 1-3. In 12 of the 14 cases of instability, (85%) the surgical plan was changed to address the scapholunate instability.

**DISCUSSION:** While numerous studies have evaluated the prevalence of scapholunate instability with dorsal wrist ganglions, this is the first to report on instability in occult dorsal wrist ganglions. In contrast to non-occult ganglions, where the association with scapholunate instability has ranged from 0-16%, our incidence in occult ganglions is much higher. Due to the difficulty in assessing low grade and pre-dynamic scapholunate instability in the open surgery for an occult ganglion, there is a strong recommendation for primary arthroscopic treatment.

###

## Effects of Aging and Diabetes Mellitus on Hand Somatosensation

Nicholas Foeger, MD, PhD; Edward Chan, MD; Robert Atkinson, MD

Functional use and protective sensation in the hand are critical to maintaining independence for the elderly patient. Previous studies have suggested that a natural decline in both motor and somatosensory hand function occurs with aging. Importantly, these decrements correlate not only with other somatosensory parameters including vibration thresholds and pain/temperature sensation, but also with a decline in motor and functional performance of the hand. Reductions in hand somatosensation, therefore, herald the reduced ability for elderly patients to live autonomously. Somatosensory deficits are also a component of diabetic polyneuropathy. A multifactorial disease, diabetes is a modern medical epidemic that disproportionately affects the elderly and patients of Pacific Island descent. The interplay between natural aging and diabetes in the decline of fingertip sensation, however, remains unclear. Additionally, a paucity of data exists for elderly patients of Pacific Island descent as a majority of studies were conducted on homogeneously Caucasian patient populations from either Europe or North America. We conducted a cross-sectional cohort study, therefore, to characterize the interplay between the effects of physiologic aging and diabetes on hand somatosensation.

Research subjects are elderly patients (aged 60-89), with and without diabetes, recruited from the practice of Dr. Robert Atkinson. Patients were excluded if they had a history of any hand condition that specifically contains a neuropathic component or a history of any previous surgery on their hands which could conceivably result in nerve injury. Static and moving two-point discrimination, as well as Semmes-Weinstein monofilament sensation were determined for all ten digits by certified hand therapists and demographic data for each patient were recorded. Patients with diabetes mellitus were queried regarding their most recent HgbA1c value. Continued collection of patient data remains ongoing.

###

## Anatomic Anterior Proximal Ulnar Angle Differences Based on Arm Position and A Case Report of Its Use

Megan H.M. Kuba, MD, Byron H. Izuka, MD, Ian G. Hasegawa, MD

**PURPOSE:** The goals of this study are three-fold: (i) describe a novel angle, the “anatomic anterior proximal ulna angle” (aAPUA), for detecting and quantifying proximal ulnar malalignment in the sagittal plane, (ii) determine if the aAPUA is altered by differing positions of the arm during radiographic examination, and (iii) to demonstrate its use in a case report.

**METHODS:** The aAPUA is measured on a true lateral radiograph of the elbow. The first line connects a point from the most anterior/proximal tip of the olecranon to a point at the tip of the coronoid process. The second line connects a mid-metaphyseal point to a mid-diaphyseal point of the proximal ulna. Four cadaveric specimens were radiographically examined and the aAPUA measured and compared in 10 different positions: a true lateral view of the elbow and at 10°, 20° and 30° each of relative shoulder adduction, external rotation and internal rotation.

**RESULTS:** The aAPUA ranged from 22-32° on a true lateral view of the elbow. With increasing degrees of relative shoulder rotation the angle did change though no consistent pattern was seen for any direction of rotation tested.

**CONCLUSION:** The aAPUA defines the sagittal alignment of the proximal ulna and is best determined on a true lateral view as even small changes in position of the arm may alter the angle. Comparison films to the contralateral normal elbow should be made to determine the exact angle for each individual patient.

**SIGNIFICANCE:** The aAPUA was used to detect and quantify a subtle residual proximal ulnar malalignment of a Monteggia fracture-dislocation that previously underwent surgical correction with seemingly appropriate reduction. This information aided both the surgical planning prior to and the intraoperative assessment during the revision surgery. The aAPUA should be a part of the orthopaedic surgeon’s armamentarium when assessing the sagittal alignment of the proximal ulna.

###



AAOS Representative Talk on MACRA/MIPS

William Shaffer, MD

Notes available upon request

###

## Periprosthetic Femur Fractures

Rahul Banerjee, MD

Abstract available upon request

###

## The Incidence of Lumbar Disc Herniation in Military Helicopter Pilots Versus Matched Controls Over a 10 Year Period

Knox Jeffrey B<sup>1</sup>, Deal J Banks Jr<sup>1</sup>, Knox Jennifer A<sup>2</sup>

<sup>1</sup>Tripler Army Medical Center  
Department of Orthopaedic Surgery  
Honolulu, Hawaii

<sup>2</sup> 25<sup>th</sup> Combat Aviation Brigade  
Wheeler Army Airfield, Hawaii

**INTRODUCTION:** Lumbar disc herniation (LDH) represents a common injury among young active individuals and a significant cause of missed duty hours and limited duty. Little is known about the relative risk of lumbar disc herniation among military rotary winged aviators and which, if any, of these individuals carry a higher risk of herniation.

**METHODOLOGY:** A query was made using the Defense Medical Epidemiology Database (DMED) which includes all patient encounters for the US Military over a ten year period. The ICD-9 code for LDH was used to identify appropriate patients. Incidence rates were calculated for patients with the occupation of helicopter pilot and stratified by age, gender, and branch of service. These results were compared to matched controls using a Poisson regression analysis. Then, data from a seventeen year period was evaluated to establish long term trends.

**DISCUSSION & CONCLUSION:** We identified 1,218 cases of LDH among 141,383 person-years among helicopter pilots with a 1.22-fold higher incidence versus non-pilots. This increased risk remained significant among pilots over 30 years old and among Army helicopter pilots after controlling for other variables. Male pilots had higher overall rates of LDH than female pilots but this was not significant after controlling for other variables. Long term data revealed a 2.6-fold increase in incidence since 1997. Our study represents the largest study of LDH in pilots available in the literature. We identified higher rates among older pilots and those in the Army. This information will allow targeted prevention strategies and further investigation to potential aircraft-specific causes of increased risk in Army pilots.

###

## Impact of Implant Density on Curve Correction for Large Stiff Idiopathic Scoliosis Curves

Gregory E. Lausé, MD<sup>1</sup>, J. Matthew Cage, DO<sup>1,2,3</sup>, Connor Delman, BS<sup>2</sup>, David M Prior, MD<sup>2,3</sup>, Rolando Roberto, MD<sup>2,3</sup>, Yashar I, MD<sup>2,3</sup>, Munish Gupta, MD<sup>4</sup>, Eric Klineberg, MD<sup>2,3</sup>

1. Tripler Army Medical Center,
2. University of California, Davis Medical Center,
3. Shriners Hospital for Children, Northern California,
4. Washington University Orthopaedics

Despite significant improvements in posterior spinal instrumentation over the past two decades, there is controversy regarding the optimal implant density for correction of idiopathic scoliosis curves from 40°-70°. <sup>1,2,3</sup> For large curves > 70° there is even less literature to guide the treating surgeon. The purpose of our investigation is to determine optimal implant density for stiff idiopathic scoliosis curves greater than 70° who have undergone an anterior release and posterior spinal instrumentation and fusion.

A retrospective review was performed at a single center for patients with juvenile and adolescent idiopathic scoliosis who received an anterior release (either open thoracotomy or video assisted thoracoscopic surgery (VATS)) and posterior spinal fusion between the years 2006 and 2014. All patients had a major structural curves greater than 70° on standing radiographs with less than 50% correction on pre-operative bending radiographs. Post-operative radiographs from 1, 3, 6 months, 1 year and final follow up were reviewed. The data was then divided into two groups based upon a previously established cutoff number for implant density (Low Implant Density (LID) < 1.54, High Implant Density (HID) > 1.54).<sup>3</sup>

Twenty-seven patients met the inclusion criteria and were enrolled into the study. There was no difference between the groups regarding age at time of surgery, pre-operative major structural Cobb angle (LID 94.2° vs HID 86.5°, p = 0.14), curve flexibility (LID 23.4% vs HID 22.3%, p = 0.84) and pre-operative kyphosis (LID 37.2° vs HID 31.7°, p = 0.5). At final follow up (mean 37 months, range 12 m - 74 m) the major curve correction in the coronal plane was 76% in LID and 82% in HID (p = 0.04). In the LID group the thoracic kyphosis decreased from 37.2° preoperatively to 33° at final follow up (p = 0.6), while in the HID group the pre-operative thoracic kyphosis increased from 31.7° to 39° at final follow up (p = 0.04).

Controversy still exists over optimal implant density for smaller idiopathic curves, however, we found improved coronal cobb angle and thoracic kyphosis associated with higher implant density in large (>70°), stiff (<50% flexibility) idiopathic curves with concomitant anterior release and posterior spinal instrumentation and fusion. Higher implant density may be required in these large stiff curves for optimal surgical correction, and to maintain that correction overtime.

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HMSA Insurance Talk

Mark Mugiishi, MD

Notes available upon request

###

Treatment of ACLs and OCDs in Children and Adolescents

Hank Chambers, MD

Abstract available upon request

###

Use of Live Video Recordings in the Outpatient Setting: A Study Update and  
Final Results

Byron Izuka, MD & Christina Wu MS III

Abstract available upon request

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## Total Ankle Arthroplasty: A Lateral Approach

Adam Groth, MD

Abstract available upon request

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## Occupational Outcomes of the Modified Broström Procedure: A Retrospective Review

Joshua Dworkin, MD

**BACKGROUND:** Ankle sprains are common injuries and typically treated conservatively. Chronic ankle instability, however, may require surgery when non-operative measures fail. The purpose of this study was to evaluate the clinical outcomes of the modified Broström procedure in an active duty population.

**METHODS:** A retrospective study was performed of active duty patients who underwent modified Broström at our facility from January 2010 through April 2014 by a single surgeon. The electronic medical record and Army E-profile database were reviewed for each patient to determine whether they were able to return to active duty, and if they had any permanent post-operative lower extremity activity restrictions.

**RESULTS:** 127 patients who met the inclusion criteria underwent modified Broström during the study period. 26.8% (34/127) underwent military separation following their operation. 23 of those patients were found to be unfit for reasons related to their ankle, while another 11 patients required military separation for reasons unrelated to their ankle. 73.2% (93/127) were able to remain on active duty after undergoing a Broström procedure. Of those patients who were able to remain on active duty, 40.9% (38/93) required activity modifications and 59.1% (55/93) were able to return to full duty.

**CONCLUSION:** Chronic ankle instability in active duty patients can be severely limiting. The modified Broström can provide significant improvement in symptoms and allow patients to remain on active duty. In our high demand population, approximately 73% of patients were able to remain on active duty after their injury and subsequent surgery. 60% of these patients returned to their previous level of duty without any physical restrictions.

###

## Comparison of MR Imaging and Stress Radiographs in the Evaluation of Chronic Lateral Ankle Instability

CPT Zackary Johnson, MD; LTC Paul Ryan, MD

**BACKGROUND:** Injuries of the ankle account for approximately 10% of patient encounters at primary care practices and emergency departments, and the majority of these encounters involve injury to the lateral ankle ligaments. In those patients who develop chronic instability, clinicians often obtain magnetic resonance imaging (MRI) as part of the evaluation prior to surgical referral. The purpose of this study is to analyze the diagnostic efficacy of MRI in the diagnosis of chronic lateral ankle instability. Our hypothesis was that magnetic resonance imaging is not a specific diagnostic tool in the evaluation of chronic lateral ankle instability.

**MATERIALS & METHODS:** A retrospective chart review of one hundred and eighty-seven consecutive patients (one hundred and ninety ankles) was performed. Inclusion criteria for the study group required a primary complaint of instability which required surgical repair or reconstruction, a documented clinical evaluation consistent with instability, stress radiographs, and MRI. Stress radiographs and clinical examinations for the study group and a control group were reviewed independently by both a musculoskeletal radiologist and a board certified orthopaedic foot and ankle surgeon. Predictive values in terms of sensitivity, specificity and prevalence were performed.

**RESULTS:** One hundred and twelve patients (115 ankles) were identified who underwent a surgical reconstruction of their lateral ligaments with a history, physical examination, and stress radiographs consistent with lateral ankle instability. All of these patients were evaluated with MRI during their pre-operative evaluation. A control group was selected consisting of seventy-five patients seen in the foot and ankle clinic with a diagnosis other than lateral ankle instability. All patients in the control group were required to have had a MRI. Thirty-seven of the patients in the control group had stress radiographs performed in the clinic to rule out instability as part of their evaluation and this allowed for an evaluation of the efficacy of stress radiographs in addition to MRI. Stress radiographs were commonly performed on patients with diagnoses associated with instability such as osteochondral defects of the talus or peroneal tendon tears. Statistical analysis was performed utilizing predictive values from sensitivity, specificity and prevalence. The sensitivity, specificity, positive and negative predictive values in regards to MRI in the evaluation of patients found to have clinical lateral ankle instability and those who did not were found to have statistical significance. Sensitivity of MRI was found to be 82.6%, specificity was 53.3%, negative predictive value (NPV) of 66.66%, and positive predictive value (PPV) of 73%. Since thirty-seven patients in the control group also had stress radiographs, a sub analysis was performed to identify the same values with stress radiographs. Sensitivity, specificity, NPV, PPV was 66%, 97%, NPV 48%, and PPV 98.7% respectively. The overall accuracy of MRI within this study was found to be 71% and for stress radiographs to be 74%.

**CONCLUSION:** This study demonstrated that MRI has high sensitivity but low specificity in the evaluation of clinical ankle instability. While MRI has value as a screening tool for concomitant ankle pathology, it should not be considered diagnostic in 48 terms of lateral ankle instability.

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## Distal Radius Fractures: A Personal Journey Over 20 Years

Alex Shin, MD

Abstract available upon request

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Orthopedic Trauma Tips

Rahul Banerjee, MD

Abstract available upon request

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## Tibial Plateau Fractures: Best Practices for 2017

Julius Bishop, MD

Abstract available upon request

###

## Acetabular Fractures in the Elderly

Rahul Banerjee, MD

Abstract available upon request

###

## Arthroscopic Rotator Cuff Repair in Active Duty Patients 40 Years or Younger

Brugman SC, Bottoni C  
Tripler Army Medical Center

**INTRODUCTION:** Arthroscopic treatment of rotator cuff repairs (RCR) has been shown to be a successful treatment modality in both and older population. Limited case series have demonstrated good results in patients less than 40 years old. To date, there have been no studies reporting on a young active population with rotator cuff repair.

**METHODS:** Retrospective review was performed of all primary RCR at a single institution from Jan 2011 to Jan 2015. Patients were excluded if they were older than 40 years at time of surgery or had a history of any previous shoulder surgery prior to the RCR. Preoperative demographics and magnetic resonance imaging (MRI) were analyzed. Operative reports were reviewed for intraoperative findings, concomitant procedures and fixation used. Clinic notes were used to track return to duty (RTD), revision surgery, pain scores, range of motion (ROM), mental health (MH) visits (3 or more visits up to 12 months post-op), and if the patient was unable to return to work or physical activity at a pre-injury level. Student T-Test was utilized for statistical analysis.

**RESULTS:** 56 shoulders in 55 patients (1 bilateral) were identified that met inclusion and exclusion criteria. Average age was 34.6 year (22.1-40.9). The majority of patients were male (n=51). Patient's military grade distribution showed 7 E5 and below, 33 E6-E9 and 16 officers. MRI demonstrated High-grade partial or full thickness tears in 27 patients, partial tear versus tendinopathy in 23 patients and no specific cuff disease in 6 patients. The most common concomitant procedures were subacromial decompression (41) and distal clavicle excision (16). Median preoperative pain was 5 (SD: 2.4) versus 1 (SD:2.0) ( $p<0.001$ ). ROM was similar between pre and post-operative values. Revision surgery rate was 23.6% (13/55). The return to duty rate was 72.7% (40/55). Medical board for shoulder disability occurred in 19.6% (11/55). 13 patients had revision surgery: 5 patients had a revision rotator cuff repair, 5 patients had biceps tenodesis, 1 distal clavicle excision (DCE), 1 arthroscopic lysis of adhesions, and 1 MUA. Of those that had revision surgery 4/13 were eventually medically retired (at least in part) for shoulder pathology. There were 22 patients who had consistent MH visits during convalescence. Those who failed to RTD were more likely to have mental health visits during their recovery (12/15 vs 10/40,  $p<0.0001$ ). When all patients with consistent MH visits at any time were eliminated 30/33 returned to active duty, the remaining 3 were medically retired 1 with associated scapular dyskinesis (LTN injury from IED), the remaining two for persistent pre-operative symptoms. Pre-operative MRI: Of the 27 pts with full thickness or high-grade partial thickness tears 5 were medically retired, and 4 required revision surgery. The 29 patients with partial thickness, tendinopathy or no specific cuff pathology had 9 revision surgeries, and 6 were medically retired. Those with full thickness or high grade partial tears on pre-op MRI were less likely to have revision surgery than those with partial or no tears, although this was not statistically significant ( $p=0.089$ ). When analyzed by rank it was found that enlisted soldiers of any grade had lower return to duty (24/37) vs officers (15/16) ( $p=0.014$ ).

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**DISCUSSION:** Overall, this group of patients represents largest cohort of young active duty patients undergoing arthroscopic rotator cuff repair. Patients generally had good preoperative ROM which was maintained in the post-operative period. Pain symptoms significantly improved. The failure to return to work was much lower than that seen in the civilian literature. There does appear to be an association with patients' military grade as well as mental health visits within the recovery period. Presence of a full thickness tear trended towards fewer revision surgeries, although this was not statistically significant.

**CONCLUSION:** Rotator cuff surgery in high demand young active patients has a high success rate of 72.7%. A multidisciplinary approach may be needed for patients with a concomitant mental health diagnosis to improve patient outcomes. Patients maintained their ROM and had significant improvement in shoulder pain.

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## Return to Duty after Multiligamentous Knee Reconstructions in Active Duty Service Members

Robert Turner, CPT, MD; Alicia Unangst, CPT, DO; Kevin Krul, MAJ, MD; Andrew Pike, LTC, MD; Craig Bottoni, MD

**INTRODUCTION:** Traumatic knee dislocations and associated multiligamentous knee injuries, while uncommon, are a disabling problem. They are also commonly associated with other injuries. Reconstruction and rehabilitation can therefore be a challenge, especially in cases of associated neurovascular injury. These injuries present a unique challenge to active duty service members as many rely on a stable and functional knee to perform their duties. There is one outcome study published to date on these injuries in active duty service members. The purpose of this study is to analyze the rate of return to full duty after multiligamentous knee reconstructions in active duty service members treated at a single facility.

**METHODS:** A total of 48 patients were identified in a retrospective medical chart review that met inclusion criteria (Active Duty service member with a primary multiligamentous knee reconstruction). The majority of these patients were male, in the Army, and underwent a two-ligament reconstruction. The primary outcome was determination of return to duty, defined as full duty without restrictions, limitations, or a profile. This was determined by statements made in the medical chart. Those who did not return to full duty were categorized as limited duty, medically separated, or having ended their time in service prior to returning to full duty.

**RESULTS:** Overall approximately 37.5% of the patients returned to full duty. Those undergoing a two-ligament reconstruction had a better chance of returning to duty compared to those in the three-ligament group ( $p=0.03$ ). There was no difference in time to return to duty between the two- and three-ligament groups.

**CONCLUSIONS:** Multiligamentous knee injuries requiring reconstruction are disabling and, based on these findings, there is greater than a 60% chance that after such an injury an individual will fail to return to full duty in their service. With this goal in mind, there may be an advantage to requiring a two-ligament reconstruction versus a three-ligament reconstruction.

## A Comparison of 'On-Track' and 'Off-Track' Assessment With Clinical Failure in a 13-Year Follow Up of Open vs. Arthroscopic Shoulder Stabilization

Liang Zhou MD

**INTRODUCTION:** Glenoid and humeral bone loss has recently been proposed as a major contributing factor to the success of arthroscopic stabilization for anterior shoulder instability. Several studies have suggested critical threshold values of glenohumeral bone loss, above which greater rates of failure following arthroscopic stabilization are reported. Magnetic Resonance Imaging (MRI) has been described to accurately quantify glenoid and humeral bone loss. The MRI calculation of the glenoid bone deficit in comparison to the Hill-Sachs lesion, a concept known as the glenoid track, has never been applied to a cohort of patients prospectively randomized to either open or arthroscopic stabilization. We performed a retrospective evaluation of perioperative MRI studies to calculate the glenoid track in patients randomized to arthroscopic and open repair with a minimum 13-year follow-up. We hypothesize that an 3 off-track3 shoulder predisposes to higher rates of recurrent instability in both treatment groups.

**METHODS:** Three independent observers reviewed the perioperative imaging studies of 61 consecutive patients prospectively randomized to either open or arthroscopic shoulder stabilization between 2001 and 2002, to designate the shoulders as either 3 on-track3 or 3 off-track3 using established criteria. Using a digital PACS system, glenoid bone loss was quantified on sagittal cuts using a perfect-circle technique, while Hill-Sachs lesions were measured on axial cuts. As previously published, an 3 off-track3 lesion was defined as one in which the calculated glenoid track was greater than the size of the Hill-Sachs lesion. Two fellowship-trained musculoskeletal radiologists and an orthopaedic surgery resident reviewed and calculated the data independently. These results were then correlated to clinical results at minimum 13-year follow-up. Clinical failure was defined as either any recurrent dislocation post-operatively or persistent subjective instability.

**RESULTS:** Sixty of 61 patients were contacted for clinical follow-up (1 deceased), and 56 of these patients (93%) had perioperative MRIs available for review. The mean age at surgery was 24.6 years (range 19-42 years), and the mean follow-up was 14 years (range 13-15 years). The average glenoid bone loss was 8.5% (range 0-30.3%), the average Hill-Sachs lesion measured 12.9 mm (range 0-29.8 mm), and the average biceps angle was 152 degrees (range 112-227 degrees). No statistically significant differences were found between groups of clinical failures and successes (p-values 0.54, 0.78, and 0.67, respectively). Inter-observer reliability for glenoid track status was calculated to be 0.92. Eight of the 56 patients (14%) demonstrated a shoulder that was deemed 3 off-track." Four of these patients were treated arthroscopically, 4 were treated open. There were only 2 clinical failures among the off-track group (1 arthroscopic, 1 open).

**DISCUSSION & CONCLUSION:** Using established methods to calculate bone loss and measure the glenoid track in a young, athletic population, the presence of an 3 off-track3 lesion was not predicative of recurrent instability following either arthroscopic or open shoulder stabilization surgery at 13-year follow-up.

###

## Prospective Evaluation of Acute ACL Reconstructions Using Patellar Tendon Autograft

CPT Mitchell C. Harris MD, CPT Jay B. Cook MD, CPT Adam C. Hines MD, COL Kenneth Lindell MD, CMD (Ret) Douglas J. Rowles MD, Steven H. Shaha PhD, COL (Ret) John M. Tokish MD, LTC (Ret) Craig R. Bottoni MD

**INTRODUCTION:** There is a common belief that surgical reconstruction of an acutely torn anterior cruciate ligament (ACL) should be delayed for at least three weeks due to the high risk of post-operative motion loss (arthrofibrosis) and suboptimal clinical results. The null hypothesis of this study was that there is no difference in post-operative range of motion or stability compared to the contralateral knee following ACL reconstructions performed acutely using a patellar tendon autograft.

**METHODS:** Patients (>18 yrs) who presented within 10 days of an ACL tear, irrespective of the condition or preoperative range of motion of the injured knee, were reconstructed using autograft patellar tendon. Previous knee surgery on the index extremity and a multi-ligamentous injury were exclusionary criteria. A standard surgical technique and postoperative rehabilitation were employed and were identical for all patients. Postoperative evaluations were performed by an independent physical therapist, blinded to the operative side. Post-operative assessments included active range of motion measurements using a goniometer and KT-1000 testing. Subjective outcomes were assessed using the International Knee Documentation Committee (IKDC) and Knee Injury and Osteoarthritis Outcome (KOOS) scores.

**RESULTS:** Twenty-five consecutive patients were enrolled who met the inclusion criteria. The average age was 28.0 years (range 20-48) and 19 were males. The time from injury to surgery averaged 4.5 days (range 1-8). Average follow up was 9 months and range of motion was regained at an average of 4.4 months (range 1-9). Two meniscal repairs and two microfractures were performed concomitantly, and one repeat surgery was performed for resection of symptomatic bone overgrowth at the tibial tunnel. There was no loss of active extension or flexion > 2° compared to the contralateral side in any patient. There was no difference greater than 1mm on KT-1000 testing. The mean improvement in IKDC and KOOS scores from pre-operative assessment were 43 and 33 points, respectively, at a mean of 13 months follow-up.

**DISCUSSION & CONCLUSION:** Excellent clinical results can be achieved following ACL reconstructions performed acutely after injury using autograft patellar tendon. Although we do not advocate that all reconstructions should be performed acutely, we found that early ACL reconstructions do not result in loss of motion or suboptimal clinical results as long as a rehabilitation protocol emphasizing extension and early range of motion is employed.

## Tobacco Use as a Risk Factor for Failure of Bankart Repairs for Shoulder Instability in Active Duty Military Population.

Aaron S. Vaslow, Kevin Krull, James Shaha<sup>1</sup>, Craig Bottoni<sup>1</sup>  
<sup>1</sup> Tripler Army Medical Center, Honolulu, HI

**INTRODUCTION:** No prior study has investigated smoking as an independent risk factor for failure of anterior Bankart repair either arthroscopic or open. While smoking has been implicated in outcomes across multiple disciplines, its application and risk in soft tissue shoulder procedures is lacking.

**PURPOSE:** To evaluate the effect of smoking on outcomes in anterior shoulder stabilization.

**METHODS:** We retrospectively reviewed 72 consecutive anterior instability patients (73 shoulders) who underwent isolated anterior arthroscopic labral repair at a single military institution by 1 of 3 sports medicine fellowship-trained orthopedic surgeons. Data were collected on demographics, the Western Ontario Shoulder Instability (WOSI) score, Single Assessment Numeric Evaluation (SANE) score, and failure rates. Failure was defined as recurrent dislocation.

**RESULTS:** The mean age at surgery was 26.3 years (range, 20-42 years), and the mean follow-up was 48.3 months (range, 23-58 months). Our patient cohort used tobacco products with a prevalence of over 39.7% (29/73) at the time of surgery. Within the cohort, a total of 9 primary Bankart repairs failed, 7 of which were in patients using tobacco at the time of surgery. Surgery in current tobacco users failed at a rate of 17.2% (7/29) versus 9.1% (2/44) in non-tobacco users ( $p=.035$ ). The WOSI and SANE scores were lower in the tobacco than in the non-tobacco group however these failed to achieve statistical significance.

**DISCUSSION:** Bankart repairs failed at a higher rate in patients who were smokers. While there appears to be a trend toward lower outcome scores in tobacco users of primary arthroscopic Bankart repairs multiple factors may play a role. Further study is needed including the outcomes in conjunction with pre-operative symptoms and bone loss.

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Joint Arthroplasty Talk

Cass Nakasone, MD

Abstract available upon request

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## Wrist Arthroscopy for the Treatment of Scaphoid Lunate Predynamic Instability and Return to Duty

Christopher Belyea, Kevin Krul, Emily Shin, Rey Gumboc

Undertook a retrospective cohort review of wrist arthroscopic electrothermal shrinkage surgery for of Scaphoidlunate (SL) ligament for treatment of SL dynamic instability done in active duty military patients at Tripler Army Medical Center. With minimum of two year follow up analyzed the rate of return to full duty.

###

## Addressing Large Tibial Osseous Defects in Primary TKA Using Trabecular Metal Cones

Jae You MD

**BACKGROUND:** Tibial osseous defects can present a serious challenge in primary total knee arthroplasty. We describe a new technique of using porous tantalum metal cones along with primary arthroplasty implants to address large tibial osseous defects in primary total knee arthroplasty and analyze the short term results.

**KEY WORDS:** total knee arthroplasty, tibial defect, trabecular metal cone

**METHODS:** We analyzed 14 cases (12 patients) of primary total knee arthroplasty using trabecular metal cone augmentation for tibial bony defects. Clinical results were evaluated using Knee Society Scores, pre and postoperative knee range of motion as well as serial radiographs.

**RESULTS:** At an average of 2.5-year follow-up all 14 knees and functioning implants and stable metaphyseal cones with radiographic evidence of osteointegration. At a minimum follow up of 1 year, no patient had signs of osteolysis, instability, infection, or systemic complications. All 13 patients had excellent results with an average Knee Society Score of 96.2. Knee flexion improved an average of 12.1 degrees and extension improved to neutral in all patients.

**CONCLUSION:** Primary total knee arthroplasty with trabecular metal cone augmentation produced excellent results for the minimum 1 year follow up and should be considered as an effective method to address large tibial osseous defects in primary total knee arthroplasty.

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Symposium Abstracts - Saturday, April 8

PRiSM: Pediatric Research in Sports Medicine

Hank Chambers, MD

Abstract available upon request

###



Symposium Abstracts - Saturday, April 8

Osteobiologics in Foot and Ankle Reconstruction

Adam Groth, MD

Abstract available upon request

###

# Adult Traumatic Brachial Plexus Injuries: An Overview of Concepts and Treatment Options

Alex Shin, MD

Abstract available upon request

###

Symposium Abstracts - Saturday, April 8

## The Syndesmosis: Not as Simple as You Thought

Julius Bishop, MD

Abstract available upon request

###

## Cerebral Palsy: A View From Both Sides

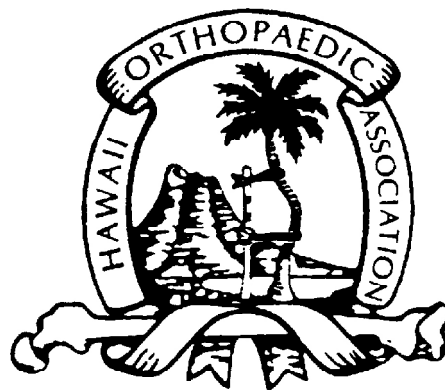
Hank Chambers, MD

Abstract available upon request

## Barefoot Running: Myths and Controversies

Adam Groth, MD

Abstract available upon request



*Mahalo for attending the  
32nd Annual Combined Orthopaedic Spring Symposium!*