Welcome from HOA President

Welcome to the 28th Annual Combined Orthopaedic Spring Symposium. This event provides a great opportunity for the orthopaedic community throughout Hawaii to learn about the latest advances in orthopaedic surgery and to network with fellow specialists. The symposium will provide an outstanding forum for discussions among HOA members, residents, medical students and allied health professionals from across our state. It also provides University of Hawaii and Tripler Army Medical Center residents the opportunity to present and discuss their research. Our social program includes the Allen B. Richardson Memorial Golf Tournament on Thursday afternoon, a cocktail reception on Friday afternoon and the awards banquet Saturday evening. The bottom line is that this symposium is a great opportunity to gain knowledge, participate in discussions and catch-up with our local orthopaedic ohana. Much thanks to Cathy Iwai for all of her assistance with the coordination of this meeting. Here's hoping you have a wonderful time!

Byron Izuka, M.D.

HOA Membership Information

Contact HOA Executive Director Cathy Iwai at 808-630-1586 or cathy.iwai@hawaiiantel.net if you are interested in becoming a member of the Hawaii Orthopaedic Association.

Hawaii Orthopaedic Association
P.O. Box 61207
Honolulu, HI 96839
Fax: 808-536-4141.

Americans with Disability Act (ADA)

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

2013 HOA Officers

President
Byron Izuka, MD

Vice-President
Elizabeth Ignacio, MD

Secretary/Treasurer
Arabella Leet, MD

Immediate Past President
Joseph Orchowski, MD

Board of Councilors
Linda Rasmussen, MD

Executive Director
Cathy Iwai
Learning Objectives
The goal of the Symposium is to maintain, develop, and increase the knowledge and professional performance of health care providers in the evaluation and treatment of patients with musculoskeletal conditions and the systems approach to musculoskeletal health care delivery through personal professional development education and clinical and basic science research. At the conclusion of this educational activity, participants will be able to:

1. Identify current advances in order to provide state of the art care to individuals with orthopedic conditions.
2. Understand current clinical and basic science research that is being performed in Hawaii.
3. Understand recent changes in healthcare reform and how they may impact the practice of orthopedics.

CME Credits
This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the Hawaii Consortium for CME and Hawaii Orthopaedic Association. The Hawaii Consortium for CME is accredited by the ACCME to provide continuing medical education to physicians. The Hawaii Consortium for CME designates this educational activity for a maximum of 10.75 AMA PRA Category 1 Credit(s)™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Disclosure Declaration
The following have no relevant financial relationships with any commercial interest:

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The following have relevant financial relationships to disclose:

| Jorge L. Orbay, MD      | Skeletal Dynamics LLC – Stock Shareholder |
| David L. Skaggs, MD     | OREF paid to Columbia University – Grant/Research Support |
|                         | Biomet, Medtronic, Beachbody, LLC – Consultant |
|                         | Biomet, Medtronic, Stryker – Speakers’ Bureau |
|                         | POSNA, Growing Spine Study Group, SRS, |
|                         | Growing Spine Foundation – Advisory Committee/Board |
|                         | Medtronic, Biomet – Royalties |
| Kelly Vince, MD         | Zimmer - Consultant |
| Kristy Weber, MD        | Wolters-Kluwer Publishing Royalties of $521 in 2012 for a masters text on tumor surgery (Co-Editor) – Other Financial or Material Support |

This Symposium is jointly sponsored by HOA and The Hawaii Consortium for Continuing Medical Education.
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...

Aloha Care Medtronic
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Biomet Hawaii OsteoMed LLC
DePuy Synthes Joint Reconstruction Sanofi Biosurgery
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InVision Imaging Wright Medical Technology
Medshape/Integra Zimmer

Special Thanks to...

Shriners Hospital for Children Orthopaedic Residency Program
Tripler Army Medical Center Orthopaedic Residency Program
University of Hawaii Orthopaedic Residency Program

...and a Big Mahalo to...

HOA Executive Director Cathy Iwai, the glue that holds our organization together.

Thank you for all of your work and for another successful year!
28th Annual Combined Orthopaedic Spring Symposium
Friday, April 26, 2013

7:00  Registration, continental breakfast, exhibits
7:30  Opening remarks & announcements - Byron Izuka, MD
7:45  AAOS Update - Peter Mandell, MD
8:15  The Role of Orthopaedic Evidence in the National Quality Movement - Kristy Weber, MD
8:45  ACL Reconstruction in the Skeletally Immature Patient - J. Lee Pace, MD
9:15  Return to an Active Lifestyle Following Osteochondral Allograft Transplantation of the Knee
      - CPT James Shaha, MD
9:30  The Utility of CT Arthrograms in Evaluating Osteochondral Allograft Transplants of the Distal Femur
      - CPT Jay Cook, MD
9:45  Increased Rates of Posterior Shoulder Instability in Young Active Patients - CPT Adam Hines, MD
10:00 Discussion - J. Lee Pace, MD
10:10 Break / PLEASE VISIT EXHIBITS
11:00 Perilous Pitfalls in Pediatric Trauma - David Skaggs, MD
11:30 Outcomes of Immediate Long Arm Cast Versus Double Sugar Tong Splinting of Acute Pediatric
      Distal Radius and Both Bone Forearm Fractures - CPT Jeffrey Levy, MD
11:45 One Visit, One Splint: Patient and Parent Satisfaction After Treatment for Pediatric
      Distal Radius Buckle Fractures - Megan Kuba, MD
12:00 Short Leg Casting for Isolated Fractures of the Pediatric Tibial Shaft - Drew Brown, MD
12:15 Septic Arthritis of the Shoulder in a Pediatric Population - CPT Kelly Fitzpatrick, MD
12:30 Discussion - David Skaggs, MD
12:40 Lunch / Quickbooks Update - Joseph Varcadipane, MD / HOA Advocacy - Byron Izuka, MD
      / PLEASE VISIT EXHIBITS
12:45 End

2:00  Why Not Work For a Hospital? - David Skaggs, MD
2:10  Arthroplasty Endgame: When There Are Very Few Pieces Left on the Board - Kelly Vince, MD
2:40  Early Aseptic Failure in Total Knee Arthroplasty Using Uncemented Trabecular Metal Tibial Components
      - Joseph Varcadipane, MD
2:55  Anterior to Posterior Pelvic Radiographs for Measuring Anteverision in Pelvic Acetabular Components
      - Bryan Armitage, MD
3:10  A Novel Approach to Pre-Total Knee Arthroplasty Alignment and Surgical Decisions - Samantha Andrews
3:25  Discussion - Kelly Vince, MD
3:35  End
3:45  Welcome Reception in Hotel Foyer
28th Annual Combined Orthopaedic Spring Symposium  
Saturday, April 27, 2013

7:00  Registration/Continental Breakfast/Exhibits
7:30  Affordable Care Act in 2013 and Beyond - Peter Mandell, MD
8:00  Metastatic Bone Disease: The Bench & the Bedside - Kristy Weber, MD
8:30  Mobile Computing as a Tool in Orthopaedic Residency Training - Joseph Varcadipane, MD
8:45  Surgical Salvage of Failed XLIF - Kim Driftmier, MD
9:00  Clinical Outcome Following Single Level Cervical Disk Arthroplasty in a Military Population - CPT Matthew Cage, MD
9:15  Discussion - Joseph Orchowski, MD
9:25  Break / PLEASE VISIT EXHIBITS
10:00 Update in Distal Radius Fractures - Jorge Orbay, MD
10:30 Arthroscopic Treatment of FAI - J. Lee Pace, MD
11:00 Return to Military Duty After Mini-Open Arthroscopic Assisted Treatment of FAI in an Active Duty Military Population - CPT Justin Ernat, MD
11:15 Mental Health Medication Use Correlated With Poor Outcomes After Femoroacetabular Impingement Syndrome - CPT Daniel Song, MD
11:30 Discussion - J. Lee Pace, MD
11:40 Lunch / BOC Update - Linda Rasmussen, MD / PLEASE VISIT EXHIBITS
12:30 Improving Outcomes and Lowering Costs in the Treatment of Scoliosis - David Skaggs, MD
1:00  Pediatric Access to Care - A Look at Orthopaedic Access in Hawaii - Megan Kuba, MD
1:15  The Effects of Restraint Type on Pattern of Spine Injury in Children - CPT Dana Hensley, MD
1:30  Discussion - David Skaggs, MD
1:40  The State of Revision TKA: The Unwitting Conspiracies That Hold Us Back - Kelly Vince, MD
2:10  Periarticular Raft Constructs and Fracture Stability in Split-Depression Tibial Plateau Fractures - Bryan Armitage, MD
2:25  Progression of Knee Adduction Moment After Total Knee Arthroplasty - Samantha Andrews
2:40  Discussion - Kelly Vince, MD
2:50  Closing Statements - Byron Izuka, MD
3:00  End

6:00  Banquet in the Hawaii Prince Hotel's Captain's Room
GUEST SPEAKERS

Peter Mandell, MD
* General Orthopaedic Practice on the San Francisco Peninsula since 1975
* Assistant Clinical Professor of Orthopaedic Surgery, University of California, San Francisco

Jorge Orbay, MD
* Founder & Medical Director, The Miami Hand and Upper Extremity Institute
* Clinical Associate Professor of Orthopedic Surgery, Herbert Wertheim School of Medicine, Florida International University, Miami

J. Lee Pace, MD
* Director, Pediatric Sports Medicine Program, Children's Hospital Los Angeles
* Assistant Professor, Department of Orthopaedic Surgery, University of Southern California Keck School of Medicine

David Skaggs, MD
* Chief of Orthopaedic Surgery & Director of Spine Surgery, Children's Hospital Los Angeles
* Professor with Tenure, Department of Orthopaedic Surgery, University of Southern California Keck School of Medicine

Kelly Vince, MD
* Consultant Orthopedic Surgeon, Department of Orthopaedic Surgery, Whangarei Regional Hospital, Whangarei, New Zealand
* Founding Editor, American Journal of Knee Surgery

Kristy Weber, MD
* Vice Chair of Faculty Affairs & Chief of the Division of Orthopaedic Oncology Department of Orthopaedics University of Pennsylvania
* Director, Sarcoma Program Abramson Cancer Center University of Pennsylvania

###
AAOS Update

Peter Mandell, MD

Major initiatives for 2013
- New Headquarters Building
- Dues increase
- Professional Compliance Program
- Medicare Administrative Contractor and Recovery Audit Contractor activities

Council on Advocacy activities
- Medical Liability Reform
- Coding Coverage and Reimbursement
- Political Action Cmte

Council on Research and Quality activities
- Appropriate Use Criteria
- Clinical Practice Guidelines

Council on Education Activities

Communications Cabinet activities

###
The Role of Orthopaedic Evidence in the National Quality Movement

Kristy Weber, MD

A) Sources of Compiled Orthopaedic Evidence
   1. Professional societies
   2. Government (AHRQ)
   3. Insurance companies
   4. Other

B) State of the Orthopaedic Evidence
   1. Eminence vs Evidence
   2. Journal article trends

C) Brief overview of AAOS Quality Efforts
   1. Evidence-based Clinical Practice Guidelines
   2. Technology Overviews
   3. Performance Measures (via PCPI)
   4. American Joint Replacement Registry
   5. Appropriate Use Criteria: Filling in the Guidelines Evidence Gap

D) Role of Guidelines in Orthopaedic Practice
   Must be user-friendly
   Credible
   Patient-focused
   One of many tools to make decisions

E) Role of Appropriate Use Criteria in Orthopaedic Practice
   Rationale
   Orthopedics is in the spotlight for high volume/high cost procedures
   High level evidence or sufficiently detailed data often not available
   Examples of value-based insurance delivery
   Large variations in care/escalation of numbers of specific procedures (Dartmouth)
   Appropriate vs inappropriate use
   Disparities in care

Definition
   AUC specify when it is appropriate to perform a procedure/service
   Physicians must decide when to use/not use a procedure despite lack of evidence
   Largely guideline-based along with clinical scenarios
   Evaluate relative risks/benefits of a procedure/service for a specific indication
   “Reasonable to do”

(continued on next page)
The Role of Orthopaedic Evidence in the National Quality Movement

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Methods
RAND/UCLA Method with modified Delphi process
Combines best evidence with collective judgment of experts to develop a statement re/appropriateness of performing a procedure based on patient sx, medical history, test results
3 panels
Writing Group – develops vignettes/scenarios (need volunteers)
Review Group
Technical Rating Panel (minimize bias)

Ranking of Indications
7-9: Appropriate procedure for specific indication
4-6: Uncertain/unclear if appropriate for specific indication
1-3: Inappropriate test for specific indication

Benefits
Provide clear and public demonstration of how ortho community works for pts
Give AAOS a stronger voice with payers and healthcare purchasers
May result in guaranteed reimbursement and reduced paperwork for those who practice in accordance with these criteria

F) Third Party Interests in Orthopaedic Evidence and Quality
1. Purchasor/payer groups
   Interests align with patients
   Little data available
   International data suggests high variability
   US practice driven by technology, marketing, reimbursement vs outcomes/continuous feedback
   *Example: 2008 vs 2010 reimbursement of fixation for intertroc/subtroc fx fixation
   Geographic variation
   CPT codes

2. PQRI Measures Applicable to Orthopedics
   Clinical and Administrative measures

3. Orthopaedic Quality Institute (2011)
   *Rationale – AAOS is behind in quality arena, lack of true partnership with govt/payors/etc
   *Goal: Identify opportunities/barriers to improving quality care
   Build the bench of liaisons to National Quality organizations from orthopaedics

###
ACL Reconstruction in the Skeletally Immature Patient

J. Lee Pace, MD

ACL injuries in skeletally immature patients is controversial and it is common to wait until cessation of growth to perform ACL reconstruction.

Historically, children have been braced with or without return to activity. Natural history studies have shown poor outcomes for non-operative treatment in this age group with high rates of meniscus tears, chondral damage and early radiographic signs of arthritis.

A major concern for surgical reconstruction is growth disturbance which has been documented in the literature.

New treatment algorithms and surgical techniques exist that allow for early reconstruction with minimal risk of growth disturbance, while at the same time providing great outcomes and early return to play.

###
Return to an Athletic Lifestyle
Following Osteochondral Allograft Transplantation of the Knee

James S Shaha, MD; Jay B Cook, MD; Douglas Rowles, MD; Craig Bottoni, MD; Steven Shaha, Ph.D, DBA; John Tokish, MD

INTRODUCTION: Large chondral defects continue to pose a challenge to the active patient. While many studies report improvements in pain and activities of daily living after surgical treatment of these injuries, recent systematic reviews have noted a lack of data on return to an active, athletic lifestyle following this procedure. More recently, treatment of these large lesions with allograft osteoarticular transplants (allograft OATS) has reported promising results in returning patients to some previous activities. However, no study has reported on the durability of this return in a setting where it is an occupational requirement with patient-based outcomes. The United States Active Duty Military represents such a population, as physical fitness standards and daily participation in mandatory physical training is an occupational necessity. Any medical condition resulting in an inability to participate in this training or to meet physical standards is not long tolerated and ultimately risks a military career. Such a population, therefore, may be the most robust test of “return to activity” and surgical optimization, as patients must return to fitness to return to full duty, and once returned, generally cannot self-limit their activities. The purpose of this study was to evaluate the outcomes of allograft OATS treatment of large chondral defects in the knee, with emphasis on return to activity/duty as an outcome measure.

METHODS: A retrospective review was performed on 38 consecutive allograft OATS procedures performed at a single military institution by 4 sports medicine fellowship trained orthopaedic surgeons. All patients were active duty at the time of the index operation, and data was collected on demographics, return to duty, the Knee Injury and Osteoarthritis Outcome Score, and ultimate effect on military duty. Success was defined as ability to return to preinjury military occupation specialty with no duty-limiting restrictions.

RESULTS: The overall return to full duty was 28.9% (11/38). An additional 28.9% (11/38) were able to return to limited activity with permanent duty modifications. Forty-two percent (16/38) were unable to return to military activity due to their operative knee. When analyzed for return to sport, only 5.3% (2/38) of patients were able to return to their preinjury level. Eleven patients underwent concomitant procedures. The return to full activity in isolated allograft OATS was 33.3% (9/27) with 22.3% (6/27) return to limited activity and 44.4% (12/27) unable to return to activity. In this subset, 7.4% (2/27) were able to return to a preinjury level of sport. Knee Injury and Osteoarthritis Outcome Scores were significantly higher in the full activity group when compared to the limited and no activity groups (p<0.01). Branch of service was a significant predictor of outcome with Marines and Navy service members more likely to return to full activity. A military occupation specialty of combat arms was also a significant predictor of a poor outcome. No patient required treatment for failed graft incorporation or graft malposition.
CONCLUSIONS: Osteochondral allograft transplantation for the treatment of large chondral defects in the knee met with disappointing results in an active duty population, and was even less reliable in returning this population to preinjury sport levels. Branch of service and occupation type predicted return to duty, but other traditional predictors of outcome such as rank and years of service did not. Presence of concomitant procedures did not have an effect on outcome with respect to activity or sport level.

SUMMARY SENTENCE: Osteochondral allograft transplantation was ineffective at returning an active duty population to duty or sport participation.
The Utility of CT Arthrograms in Evaluating Osteochondral Allograft Transplants of the Distal Femur

Cook JB, Shaha JS, Tokish JM, Rowles DJ, Shaha SH, Bottoni CR

INTRODUCTION: Osteochondral allograft transplantation surgery (OATS) is one of many proposed treatments for osteochondral defects of various etiologies. Usually this procedure is reserved for larger, deeper lesions. Some studies have shown promising results, even in an athletic population. However, the results in military populations have been less optimistic. As surgeons, there is a need to understand if a technical shortcoming has contributed to the lack of success of a procedure. Evaluating the healing process after an OATS can be challenging, as there is a need to visualize the articular surface, subchondral bone, and cancellous bone simultaneously. Multiple imaging modalities can be utilized for this, and the surgeon must weigh the benefits and costs of each. We assessed the utility of computed tomography (CT) arthrogram in evaluating OATS postoperatively and correlated it with clinical outcomes.

METHODS: A retrospective review was performed on 38 consecutive OATS patients performed at a single military institution. From these, eighteen consecutive patients were identified who had obtained a CT arthrogram postoperatively to evaluate healing. All 18 surgeries were performed by a single, sports-medicine fellowship trained surgeon. All patients were active duty at the time of the index operation, and data was collected on demographics and return to duty. Success was defined as ability to return to preinjury military occupation specialty with no duty-limiting restrictions. Additionally, the CT arthrograms were evaluated for articular congruity and bony incorporation. These radiographic findings were then correlated with clinical outcomes.

RESULTS: Eighteen consecutive patients were identified. The average age was 30.9 years, all were active duty males, and the average time of follow up was 4.3 years. The patients had CT arthrograms performed at an average of 165.6 days postoperatively. Only 3/18 (16.7%) patients returned to full, unrestricted duty. Seven of 18 (39.9%) were unable to remain in the military. CT arthrograms revealed a smooth, flush articular cartilage in 8/18 (44.4%) while the remaining 10 exhibited a single small fissure without obvious defect. Additionally, complete bony integration was noted in 8/18 (44.4%) patients; 9/18 (50.0%) had a small defect or cyst <2mm in diameter; while the last patient had a defect larger than 2mm but did not encompass the entire graft. Neither articular congruity, nor bony integration was predictive of functional outcome. There was no association between articular congruity and bony incorporation.

DISCUSSION/CONCLUSION: CT arthrogram, like MRI, can accurately assess cartilage congruity while better evaluating bony integration in the early postoperative stage. In this regard, it can be a valuable tool for postoperative evaluation of an allograft osteochondral transplant. However, neither cartilage congruity nor bony integration necessarily holds prognostic value for our young, active duty, military population. While results of this procedure in literature have not shown equivalent outcomes between military and civilian populations, this study hints that outcomes are not necessarily tied to surgical technique.
Increased Rate of Posterior Instability in Young Active Patients

Cook, JB; Song, DJ; Hines, AC; Bottoni, CR; Rowles, DJ; Tokish, JM.

**INTRODUCTION:** Posterior shoulder instability is a significant source of disability in a young athletic population. While it is less common than its anterior counterpart, posterior instability can be more subtle in its presentation and difficult to diagnose. Older studies have reported that posterior instability makes up 2 – 5% of all shoulder instability. A recent study reported an increased rate (10.3%) of posterior shoulder instability in a military cadet population, and our experience has been that posterior and combined instability is even higher in active duty soldiers who have certain physical fitness occupational requirements. The purpose of this study is to report the incidence of shoulder instability procedures stratified by primary direction in a largely active duty military population over a one-year period.

**METHODS:** A retrospective review was conducted at an active Military Treatment Facility (MTF) with three sports medicine fellowship trained orthopaedic surgeons over a one-year period. After receiving Institutional Review Board approval, a review of the operative case logs in the hospital system, as well as an audit of the individual surgeons’ log books were performed to identify all patients who underwent operative intervention for shoulder instability between 1 July 2010 and 30 June 2011. All medical records were reviewed for each patient. Patients were categorized by their direction of instability and stabilization: isolated anterior, isolated posterior, or combined (anterior & posterior or multidirectional). Magnetic Resonance Imaging (MRI) findings were correlated with arthroscopic findings for accuracy.

**RESULTS:** Ninety consecutive patients underwent operative intervention for shoulder instability during the one-year period. There were 87 males and 3 females with a mean age of 25.8 years of age. There were 53 (58.9%) patients with isolated anterior instability, 21 (23.3%) patients with isolated posterior instability, and 16 (17.8%) patients with mixed instability that involved both an anterior and a posterior component. Overall MRI findings accurately correlated with arthroscopic findings in 64/88 (72.7%) of patients. Accuracy was significantly decreased in the mixed group (4/16, 25.0%). MRI’s read by a musculoskeletal radiologist were significantly more likely to be accurate (84.4% vs. 58.1%, p<0.001). Overall, MRI’s performed with gadolinium contrast were not more accurate than those performed without (71.4% vs. 72.0%, p>0.05).

**DISCUSSION/CONCLUSION:** Isolated posterior instability was significantly more common (23%) than has been previously reported in the literature (p<0.01). This increased incidence may be secondary to the young active military population who are involved in mandatory physical training where push-up and pull-ups are an occupational requirement. Furthermore, combined instability was also found to be higher than previously suspected (17.8%). In fact, only 59% of operatively stabilized shoulders in this population were isolated anterior. These findings suggest that surgeons whose practices involve young, highly active patients should maintain a high index of suspicion for both posterior and combined instability.
Perilous Pitfalls in Pediatric Trauma

David Skaggs, MD

Pediatric fracture patterns can be different from adults, and easy to not recognize the fracture or their sequelae if one does not know what to look for.

Various physeal injuries, occult fractures, developmental variants, and red flags requiring urgent treatment in children are discussed.

In addition, new studies on access to care will be shared.
Outcomes of Immediate Long Arm Casting Versus Double Sugar Tong Splinting of Acute Pediatric Distal Radius and Both Bone Forearm Fractures

LTC Jeffrey A. Levy, DO; CPT Justin Ernat, MD; CPT Daniel Song, MD; Steven H. Shaha, Ph.D, DBA

**INTRODUCTION OR OBJECTIVE:** Immobilization after reduction of distal radius and both bone forearm fractures in pediatric patients has traditionally been either a cast or a splint. However, placing a well molded long arm cast (LAC) can be a challenging procedure that requires experience and skill while applying a double sugar tong splint (DSTS) is easier and may result in equivalent results. The purpose of this study was to determine whether DSTSs are as effective as LACs in immobilizing and maintaining post reduction alignment of distal third radius and both bone forearm fractures in children.

**METHODS:** Prospective randomized controlled trial comparing DSTSs and LACs for immobilization of reduced distal radius and both bone forearm fractures in children age 4-12. Consecutive pediatric patients meeting inclusion criteria were enrolled and randomized to one of the immobilization devices. Patients were followed until immobilization was discontinued with regular fracture clinic follow-ups as well as AP and lateral radiographs. The DSTS and the bivalved/spaced LAC were overwrapped at the 1 week follow-up. The device could be changed to a short arm cast at the 4 or 6 week mark. Radiographs were evaluated for loss of reduction requiring re-manipulation as well as overall alignment. The primary outcome was maintenance of fracture reduction by radiographic evaluation, using a difference of 5 degrees sagittal angulation difference between the two devices.

**RESULTS:** A total of 71 patients were enrolled with 34 receiving a DSTS and 37 receiving a LAC. The mean age was 8.7 years and 60 percent were boys. There were no differences between the groups regarding age, gender, fracture type or anesthesia type. The two groups did not differ with respect to initial fracture angulation, post-reduction angulation, change of sagittal alignment at any point during the study, or fracture angulation at the time of cast removal. The patients were followed for an average of 8 weeks post-reduction. Criteria for re-manipulation were met in 5 of the 34 DSTS and 10 of the 37 LACs. Re-manipulations were performed in 1 of the DSTS and 3 of the LACs.

**DISCUSSION:** Distal radius and both-bone forearm fractures are some of the most common fractures in the pediatric population. Our study found no difference in re-manipulation or significant loss of reduction at any time period using either a LAC or DSTS.

**CONCLUSION:** Use of a DSTS is as efficacious in maintaining fracture reduction in these pediatric fractures as a LAC and should be considered as an acceptable alternative.

###
One Visit, One Splint: Patient and Parent Satisfaction After Treatment for Pediatric Distal Radius Buckle Fractures

Byron Izuka, MD; Megan Kuba, MD; Krister Freese, MD

OBJECTIVE: The purpose of this study is to determine if the treatment of pediatric buckle fractures of the distal radius, with a removable splint and no further physician follow-up or imaging after the initial visit, is a safe and cost-effective therapeutic protocol.

METHODS: This study will include all consecutive patients seen by a single practicing pediatric orthopaedic surgeon (principle investigator, Dr. Byron Izuka) with a diagnosis of distal radius buckle fracture, treated with a removable wrist brace. It is Dr. Izuka’s current standard of practice to treat all of these injuries in this fashion and to give no scheduled follow-up appointment or take any post-treatment radiographs. This case series will consist of 2 parts:

A. Part 1 is a retrospective review of records to identify all patients during May – October 2012 seen by Dr. Izuka and diagnosed with a buckle fracture of the distal radius. Those patients treated with a removable wrist splint will be included in the study. Currently, 43 patients have been identified with this diagnosis. Patient demographics and injury data will be ascertained from the medical record during this retrospective review.

B. Part 2 will consist of a telephone call to the parents of the identified patients to perform a short questionnaire regarding the post-treatment status of their child as well as the parent’s feelings regarding the received treatment. A letter explaining the purpose of the study and the consent process will be mailed to parents prior to the call.

RESULTS: In progress.

DISCUSSION: In progress.

CONCLUSION: In progress.
Short Leg Casting for Isolated Fractures of the Pediatric Tibial Shaft

Drew J. Brown IV, MD

INTRODUCTION: An isolated fracture of the tibial shaft or so-called “Toddler’s fracture” (as first described by Dunbar in 1964) is a common injury in young children. Believed to be due to a minor twisting mechanism, this fracture has a spiral or oblique pattern of the mid-to-distal tibia with minimal or no displacement and is typically seen in children less than six years of age. The diagnosis is usually readily apparent on plain x-rays, though on occasion the fracture line is not always visible on initial imaging. Clinical findings of inability to bear weight, along with point tenderness or warmth over the tibia and pain with ankle dorsiflexion should lead clinicians to consider a Toddler’s fracture.

Current guidelines recommend the use of a long leg cast for definitive treatment. Fractures in Children 6th Edition recommends a “bent-knee, long leg cast for approximately 3 to 4 weeks” while Skeletal Trauma in Children 4th Edition recommends “a long leg cast for 2-4 weeks depending on the child’s age”. The majority of outcomes studies reported in the literature follow these guidelines.

Compared to a short leg cast, a long leg cast is more difficult to ambulate in, is more difficult to care for and results in both stiffness of the knee joint and atrophy of the thigh musculature. These factors contribute to longer school absences for the patients and to more time lost from work for the patients’ caregivers. We hypothesize that the treatment of Toddler’s fractures with a short leg cast will be as effective as treatment with a long leg cast.

METHODS: A retrospective review of patients’ charts and radiographs obtained from a single surgeon’s practice from 2008-2011 was performed. Inclusion criteria were isolated, spiral fractures of the tibial shaft in patients 13 years of age and younger. Exclusion criteria were multiple fractures (including those of the fibula), displaced fractures requiring reduction, evidence of any underlying metabolic bone disease and lack of adequate radiographic follow-up.

RESULTS: 58 patients were included in this study with an average age of 3 years and 5 months of age. The average initial displacement of the fractures at the time of presentation was 7%. Patients were treated for an average of 37 days in a short leg cast. 9/58 patients required a cast change due to various patient factors. We found that 58/58 (100%) of the patients achieved union at an average of 1.2 months with no loss of alignment occurring during cast treatment. 1 cast related blister occurred. This was the only treatment related complication.

DISCUSSION AND CONCLUSION: Isolated tibial shaft fractures in children have historically been treated by immobilization with a long leg cast. We found that use of a short leg cast safely and effectively decreases post-immobilization knee stiffness and thigh weakness with minimal risk of fracture displacement.

###
Septic Arthritis of the Shoulder in a Pediatric Population

CPT Kelly Fitzpatrick, MD

BACKGROUND: Septic arthritis of the shoulder is a rare infection and little is known about its natural history. A delay in surgical intervention can result in damage to the articular surface of the glenohumeral joint, adjacent osteomyelitis, and possible growth disturbance. Most of our diagnostic assessment is similar to that of septic arthritis of the hip. Our purpose of this study was to assess the patients and their clinical presentation of this disease process.

METHODS: This was a retrospective chart review of patients with the ICD-9 code for septic arthritis of the shoulder was conducted between 2006 and 2011. An analysis of patient demographics, clinical presentation, durations of symptoms, duration of treatment and number of surgeries required to successfully or unsuccessfully treat a patient. Associated sequelae were analyzed such as radiographic progression of shoulder disease. Inclusion criteria for this study were any patient with the ICD-9 code for pyogenic arthritis of the shoulder and patients between the ages of newborn to 18 years of age.

RESULTS: A total of 22 patients met inclusion criteria with an average age of 32 months. Six were female. There was an average of 1.54 surgeries per patient all treated with an open arthrotomy. The average hospital stay was 13.5 days with a total of two readmissions. Fifty percent of patients had preoperative radiographs demonstrating abnormal findings. Preoperative MRI also demonstrated abnormal findings to include presence of effusion, osteomyelitis, subperiosteal abscess or an abscess formation. In the postoperative radiographs, 47% (9/19) demonstrated an abnormal radiographic finding to include progressive cortical destruction, avascular necrosis or cortical irregularities.

CONCLUSION: To our knowledge, this review of septic arthritis of the shoulder in a pediatric population is one of the largest in the literature. These patients appear to require a long duration of treatment after a surgical procedure. This rare disease process appears to have a significant negative affect radiographically, however it is unclear the long-term clinical affect these patients will have.

###
Quickbooks Update

Joseph Varcadipane, MD
HOA Advocacy

Byron Izuka, MD
Why Not Work For a Hospital?

David Skaggs, MD

Abstract available upon request.
Arthroplasty Endgame:
When There Are Very Few Pieces Left on the Board

Kelly Vince, MD

This is not about brilliant surgeries and clever strategies that turn out well. It is about suffering, failure and how information and decisions are more important than products. What is the path to calamity? Often apparently simple procedures that are high risk in some patients with a low probability of success.

How do revisions fail? We may not always recognize precisely when medical comorbidities, depression, trauma, extra-articular deformity, poor bone quality or prior surgeries, push a patient closer to danger, but once a revision TKA fails, calamity may progress to the mercifully infrequent day when, only four options exist:

1. **Arthroplasty salvage.** How we can deal with the obstacles to salvage: soft tissue envelope loss, extensor mechanism loss, ligament compromise, bone deficiency, skeletal disruption form periprosthetic fracture, combined infection and bone loss, ipsilateral THA.

2. **Arthrodesis.** This was once regarded as an alternative to a first revision, but now, by the time the patient agrees to an arthrodesis, it is probably too late, due to bone loss and established infection, so rarely practiced. Very difficult to manage common activities e.g. most women unable to use a public toilet. External fixation may be useful if infection has not been controlled. IM fixation is mechanically more reliable in achieving union but infection must be eradicated first. “Artificial” arthrodesis, using an implant without bone contact has bee practiced.

3. **Resection arthroplasty.** Tantamount to abandonment, when no further surgery can be considered.

4. **Above knee amputation.** Extremely difficult decision to make. Creates a dramatic result and the literature on energy costs preaches that arthrodesis patients can walk and AK patients cannot. These are probably not the same groups of patients. Has the advantage of eradicating infection more reliably, getting patient off expensive, toxic antibiotics and out of hospital. Can more easily be managed on commercial airliners or even cruise ships.

###
Early Aseptic Failure in Total Knee Arthroplasty Using Uncemented Trabecular Metal Tibial Components

Joseph C. Varcadipane, MD; Eddy Zande Van Rilland; Olga Geling, Ph.D; Megan Murai Kuba, MD; Jennifer Wages, Ph.D; Cass Nakasone, MD

Investigation performed at the Straub Hospital & Clinic, Honolulu, HI.

ABSTRACT: Early aseptic loosening of tibial components continues to be of concern in total knee arthroplasty. Previous studies have identified problems with the cement-bone interface in the longevity of these implants, particularly in the young, active patient population.

Trabecular metal (TM) may have potential long-term survivorship advantages compared to traditional cemented tibial components. However, the use of trabecular metal tibial implants is relatively new and experience relatively limited. We report the early aseptic failure rates encountered in a retrospective analysis of 1,024 consecutive primary total knee arthroplasties utilizing either an uncemented trabecular metal (tantalum) tibial component (n=167) or more conventional cemented, non-trabecular metal, tibial implants (n=857) at a minimum of one year follow-up.

There were no significant differences in the rate of early aseptic failures when comparing the use of TM tibial components and cemented tibial components in this series. Longer follow-up is necessary to see whether these results are sustained over time.
Anterior to Posterior Pelvic Radiographs for Measuring Anteversion in Pelvic Acetabular Components

Bryan M. Armitage, MD/MSc; Ashley Aratani; Patrick Murray, MD

PURPOSE: Optimal inclination and anteversion (AV) of hip components are essential for improving long-term outcomes and reducing wear in total hip arthroplasty (THA). There have been many proposed methods for calculating acetabular cup AV based on a variety of imaging techniques, including anterior-to-posterior (AP) radiographs of the pelvis or operative side, lateral radiographs, and 3D CT imaging techniques. McArthur et al showed that CT scans can more reliably provide accurate measurements of lateral imaging in determining cup AV, but that lateral radiographs were also able to give accurate measurements with proper positioning. Kertzner compared three lateral imaging techniques for AV, concluding that “referencing the ischium standardizes pelvic position.” Current methods for calculating AV from AP radiographs require accurate knowledge of the x-ray beam and hip components’ relative positions. It is proposed that using an elliptical method, as published by Visser, to calculate AV combined with a correction for pelvic rotation based on the ischium will provide an accurate and cost-effective way to measure the acetabular component after THA.

HYPOTHESIS: Acetabular AV may be calculated accurately from AP pelvic radiographs when accounting for pelvic rotation relative to the path of radiation.

METHODS: A mathematical model proposed to calculate the AV of the acetabular component in a THA from an AP pelvic film is shown as follows:

\[
\alpha = \sin^{-1} \left( \frac{\text{cup short horizontal axis}}{\text{cup diameter (from ax)}} \right) \pm \sin^{-1} \left( \frac{\text{operative side short ischium}}{\text{long ischial axis (operative side)}} \right) - \sin^{-1} \left( \frac{\text{normal side short ischium}}{\text{long ischial axis (normal side)}} \right)
\]

This equation was validated mathematically with 3D simulations of pelvic imaging using Solidworks™. 10 patients with both CT scans and AP pelvic radiographs after THA will be analysed using this calculation. AV will be measured by CT scans using the methods outlined in Ghelman et al. AV will then be evaluated by AP radiographs using the equation above and compared to the measurements determined by CT scan.

RESULTS: Preliminary results on a mathematically simulated model of a pelvis confirmed the accuracy of the equations. We were able to accurately determine acetabular AV within the limits of the pelvic oblique X-rays. Application of the equations to actual patient imaging has yet to be done at the time of writing this abstract.

CONCLUSION: While this analysis will not differentiate retroversion from anteversion, it does provide a simple and cost-effective method for measuring anteversion of acetabular components from an AP radiograph. Development of a simple program would allow for easy and cost-effective intraoperative measurements of acetabular cup version, thus helping us achieve the goals of improved positioning and reduced need for post-operative revisions.
A Novel Approach to Pre-Total Knee Arthroplasty Alignment and Surgical Decisions

Samantha Andrews

BACKGROUND: Safety concerns, lack of availability, and high cost of hip-to-ankle (HTA) radiographs have made standard films the default for determining alignment prior to total knee arthroplasty. However, standard films have been shown to underappreciate alignment and anatomical deviations.

QUESTIONS/PURPOSE: The purpose of this study was to present a novel alignment approach to making total knee arthroplasty decisions for the treatment of osteoarthritis.

PATIENTS & METHODS: 766 patients received HTA radiographs two weeks prior to surgery and six weeks post surgery. Mechanical axis and tibiofemoral angle were determined from the same radiograph and the differences between the measurements were analyzed.

RESULTS: Based on the mean difference, a tibiofemoral angle of 6.3° would result in a mechanical axis of 0°. Only 31 out of 766 patients had a difference beyond ±3 from 6° which, if a femoral cut was made at 6°, would result in a mechanical axis outside the accepted ±3° from 0°.

CONCLUSION: A six degree femoral cut during total knee arthroplasty resulted in a mechanical axis of ±3 from neutral in 96% of the 766 surgeries analyzed.

CLINICAL RELEVANCE: Establishing a standard cut for total knee arthroplasty would provide lower cost in equipment and would provide better outcomes than using standard films.
Affordable Care Act in 2013 and Beyond

Peter Mandell, MD

What happens when the ACA goes into full effect?

- State Insurance Exchanges
- Independent Payment Advisory Board
- No insurance denials for pre-existing conditions
- Individual Mandate
- No lifetime caps on medical coverage
Metastatic Bone Disease: The Bench and the Bedside

Kristy Weber, MD

OVERVIEW: In patients over 40-45 years of age, the most common diagnosis of a destructive bone lesion is metastatic carcinoma. However, other tumors (including primary malignant bone tumors) do occur in this age group. The treatment of metastatic bone disease and primary malignant bone tumors is very different. A careful, stepwise approach for the evaluation of a patient with a destructive bone lesion will help you do the right thing and avoid compromising the life or limb of the patient.

Clinical Evaluation – work up the patient for likely metastasis but if a primary tumor (ie breast, prostate, lung, etc..) is not found, then do not assume it is a metastasis on history and imaging alone.

History
  o Pain that is progressive - occurs at rest and with weightbearing
  o Constitutional symptoms (weight loss, fatigue, loss of appetite)
  o Check for symptoms related to possible primary sites (hematuria, shortness of breath, hot/cold intolerance)
  o Personal or family history of cancer (ask re/recent mammogram or prostate evaluation) or risk factors (smoking) or prior radiation
  o Primary carcinomas may metastasize quickly or take 10-15 years (breast, renal)

Physical Examination
  o Occasional swelling, limp, decreased joint range of motion, neurologic deficits (10-20%) at metastatic bone sites
  o Check for breast/prostate/thyroid/abdominal mass
  o Stool guiac
  o Regional adenopathy

Laboratory Studies
  o CBC – anemia suggests myeloma
  o SPEP/UPEP – abnormal in myeloma
  o Thyroid function tests – may be abnormal in thyroid cancer
  o Urinalysis (microscopic hematuria in renal cancer)
  o Basic chemistry panel – check calcium, phosphorus, alkaline phosphatase, LDH
  o Specific tumor markers – PSA (prostate), CEA (colon, pancreas), CA125 (ovarian)

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Metastatic Bone Disease: The Bench and the Bedside

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Common scenarios
- Known cancer patient with multiple bone lesions – does not necessarily require confirmatory biopsy
- Known cancer patient with bone pain and normal radiographs – may be symptomatic from chemotherapy/bisphosphonates or may require further imaging (bone scan or MRI) to define an early destructive lesion
- **Patient without history of cancer with a destructive bone lesion – must differentiate between metastatic disease vs. primary malignant bone tumor

Radiographic Appearance/Work-Up

**Appearance**
- Osteolytic (majority) – lung, thyroid, kidney, GI
- Osteoblastic – prostate, bladder
- Mixed osteolytic/osteoblastic – breast
- Most common locations include spine (40%), pelvis, proximal long bones, ribs
- Thoracic spine is the most common vertebral location of metastasis
- Metastatic carcinoma to the spine spares the intervertebral disc
- Lesions distal to the elbow/knee are most commonly from lung primary
- Pathologic fracture is a common presentation (25%)
- An avulsion of the lesser trochanter implies a pathologic process in the femoral neck with impending fracture

**Work-Up**
- Plain radiographs – image in 2 planes and image the entire bone (consider referred pain)
- **Differential diagnosis of lytic bone lesion in patient > 40 includes** metastatic disease, multiple myeloma, lymphoma and, less likely, primary bone tumors (chondrosarcoma, osteosarcoma, MFH), Paget’s sarcoma, hyperparathyroidism, pelvic/sacral stress fractures (examples provided).
- Bone scan –
  -§ Detects osteoblastic activity (may be negative in myeloma, metastatic renal cancer)
  -§ Identifies multiple lesions - common in metastatic disease
- CT scan – chest/abdomen/pelvis – to identify primary lesion
- Staging evaluation of lytic bone lesion will identify primary site in 85% of patients
- Bone marrow biopsy – when considering myeloma as a diagnosis
- MRI scan of the primary lesion – generally not necessary unless defining disease in the spine
- Difficult to differentiate osteoporosis from metastatic disease with a single vertebral compression fracture – tumor is suggested by soft tissue mass and pedicle destruction

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Biopsy/Pathology
  o Must perform a biopsy of a destructive bone lesion unless you are certain of the diagnosis
  o Placing an intramedullary device in 65 year old with lytic lesion in the femur without appropriate work-up is dangerous (could be a primary bone tumor such as a dedifferentiated chondrosarcoma)
  o For diagnosis, can perform open incisional biopsy or closed needle biopsy (FNA/core)
  o Special IHC stains can sometimes determine the primary site of disease
    § TTF1 = lung, thyroid
    § ER/PR = breast
    § PSA = prostate
    § S100, HMB45 = Melanoma

Physiological Disruptions in Patients with Metastatic Disease
  Calcium metabolism – hypercalcemia – present in 10-15% of cases
  o Common with lung, breast cancer metastasis
  o Does not correlate with number of bone metastasis
  o Early symptoms – polyuria/polydipsia, anorexia, weakness, easy fatiguability
  o Late symptoms – irritability, depression, coma, profound weakness, nausea/vomiting, pruritus, vision abnormalities
  o Treatment requires hydration and possibly IV bisphosphonate therapy

Hematopoiesis
  o Normocytic/normochromic anemia – common with breast, prostate, lung, thyroid cancer metastasis

Thromboembolic disease
  o Patients with malignancy have increased thrombotic risk
  o Require prophylaxis especially after lower extremity/pelvic surgery

Pain control/bowel abnormalities
  o Use narcotics for pain control
  o Requires laxatives/stool softener to avoid severe constipation

Biomechanics

Stress Riser in Bone
  Occurs whenever there is cortical destruction
  Open section defect – when the length of a longitudinal defect in a bone exceeds ¾ of diameter, there is a 90% reduction in torsional strength
  50% cortical defect (centered) = 60% bending strength reduction
  50% cortical defect (eccentric) = >90% bending strength reduction

Impending Fractures/Prophylactic Fixation
Indications for fixation
Snell/Beals criteria
- 2.5 cm lytic bone lesion
- 50% cortical involvement
- Pain persisting after radiation
- Peritrochanteric lesion

Mirels scoring system – 4 factors (up to 3 points each)
- Site – peritrochanteric>lower extremity>upper extremity
- Pain – activity-related>moderate>mild
- Radiographic appearance – osteolytic>mixed>osteoblastic
- Size of lesion – greater than 2/3 > 1/3 to 2/3 > less than 1/3

Prophylactic fixation recommended for score of 9 or greater (33% fracture risk)

Spinal lesions – impending fracture/collapse
- Thoracic
  § 50-60% of vertebral body involved alone
  § 20-30% of vertebral body with costovertebral joint involvement
- Lumbar
  § 35-40% of vertebral body involved alone
  § 25% of vertebral body with pedicle/posterior element involvement

Other factors to consider
- Scoring systems are not exact and cannot predict all human factors
- Histology of primary lesion
- Expected lifespan, co-morbid conditions, and activity level
- Base most surgical decisions on plain radiographs
- Prophylactic fixation compared to fixation of actual pathologic fracture
  § Decreased perioperative morbidity/pain
  § Shorter OR time
  § Faster recovery/shorter hospital stay
  § Ability to coordinate care with medical oncology

Treatment
1. Primary malignant bone tumor (ie..chondrosarcoma, osteosarcoma, MFH) – refer to an orthopaedic oncologist for management
2. Multiple myeloma/Lymphoma – refer to a medical oncologist for chemotherapy – often the bone lesion will heal with treatment. Consider surgical treatment initially in myeloma if there is a high risk for a lower extremity fracture
3. Metastatic disease – refer to a medical and radiation oncologist for treatment and manage the bone lesion operatively or nonoperatively depending on factors previously discussed
4. Examples of basic treatment of metastatic disease (UE, LE, spine)
Stepwise Plans to Avoid Mistakes
   1. Patient with a femur fracture
   2. Patient with a history of cancer and a solitary bone lesion/multiple bone lesions
   3. Patient without a history of cancer and a solitary bone lesion

Key Molecular Aspects of Metastatic Bone Disease
   1. Vicious cycle of osteoclastic bone resorption
      a. Breast
      b. Renal
   2. Targets and therapeutic agents for treatment of bone metastasis
      a. Bisphosphonates
      b. RANKL inhibitors
Mobile Computing as a Tool in Orthopaedic Residency Training:  
A Pilot Study

Joseph C. Varcadipane, MD; Stephanie Nishimura, Ph.D; Nicholas Scarcella, MD;  
Maria Chun, Ph.D; Gary Belcher, Med; Jamie Castelo, BA; Robert E. Atkinson, MD

BACKGROUND: As mobile computing technology continues to improve and grow in popularity, portable computers and smartphones are becoming more prevalent in modern medical practice and education. The purpose of this pilot study was to report on the use of an Apple iPad 2 in orthopaedic surgery residency as a means to enhance resident education, clinical practice and patient education. The primary objective was to quantify resident perceptions, usage patterns and the utility of an iPad/mobile computing device over the course of an academic year in orthopaedic surgery residency training.

MATERIALS & METHODS: A total of nine residents were included in the pilot study. A mixed methods approach (i.e., quantitative and qualitative methods) was utilized, given the relatively small sample size. Each resident participated in a baseline survey and post-study survey for the study period of one academic year. The surveys attempted to quantify the usage patterns in three main areas: 1) resident education; 2) clinical practice; and 3) patient education. In addition, a qualitative component (focus group) was conducted to develop themes related to usage patterns.

RESULTS: An overall increase in usage of portable computing (the iPad) as a way for residents to study as well as perform administrative and clinical duties was observed. Sixty seven percent (67%) of participants indicated using iPads for weekly journal club activities. There was a trend towards increased study time “on the go” as 67% of participants ranked “hospital areas” one of their top two areas to study compared to 33% prior to the study period. Overall study time also increased over the study period as a larger percentage (89% versus 67%) spent more than seven hours a week studying. On the contrary, few participants reported using the iPad the majority of the time for accessing radiographic studies or demonstrating conditions to patients. However, there were observed increases in professional activities such as referencing treatment options and ordering lab tests. The focus group discussion emphasized the improved efficiency gained by having quick and easy access to reference and study material. Residents noted more access to journal articles, surgical technique guides and textbooks than typically allowed when conducting clinical duties. However, the lack of informational technology support and infrastructure for integration with the electronic medical records (EMRs) and Picture Archiving and Communication System (PACS) stifled clinical usage. Residents recommended better integration with these systems before such devices can be used to their fullest potential. From the focus group, enhanced patient education was emphasized, but this was not reflected by the survey.
CONCLUSION: Mobile computers such as the iPad can be useful for residents in orthopaedic surgery by improving their access to educational resources and allowing them to study more while “on the go.” This may lead to more time studying in general. Patient education can be enhanced by iPad usage however it is not likely to become the primary means of patient education. Further clinical usage is possible but infrastructure and information technology support is needed for these devices to be used to their fullest potential. More studies with larger sample sizes are needed to further elucidate the utility of such devices in orthopaedic surgery residency training and medical training in general.
Surgical Salvage of Failed Lateral Access Interbody Spinal Fusion (XLIF)

Kim Driftmier, MD; Myles Mitsunaga; Morris Mitsunaga, MD

INTRODUCTION: Recently minimally invasive lateral access spinal fusion has been gaining popularity. Extreme Lateral Interbody Fusion (XLIF) has been shown to successfully treat various pathologies of the lumbar spine. We performed the XLIF on 151 patients from May 2008 to June 2011. We reviewed our series to investigate potential reasons for failure and to assess the results following reoperation.

METHODS: We retrospectively reviewed the charts of 151 patients who underwent the XLIF procedure by the senior author. Lumbar diagnosis included lumbar spinal stenosis, degenerative spondylolisthesis and lumbar degenerative scoliosis. MRI's were reviewed and spinal stenosis was graded according to the MRI classification using qualitative severity grading based on the morphology of the dural sac. Radiographs were followed for progression of subsidence, spondylolisthesis or worsening of scoliotic deformity. The patients were followed clinically and filled out the Oswestry questionnaire before and after initial surgery and subsequent to the salvage procedure.

RESULTS: A total of 241 lumbar levels were operated on in 151 patients. Of these, 21 patients (14%) demonstrated clinical failure necessitating secondary posterior salvage surgery. The most common cause of failure was progressive subsidence with residual spinal stenosis especially in postmenopausal females with spondylolisthesis and osteoporosis. Salvage procedures for these patients included posterior decompression with supplemental posterior instrumentation and fusion, most commonly the Interlaminar Lumbar Instrumented Fusion (ILIF) procedure. Follow up on these patients demonstrated good to excellent clinical results using the Oswestry questionnaire grading score and the Prolo clinical outcome classification.

DISCUSSION AND CONCLUSIONS: We conclude that pre-operative evaluation of bone mineral density and MRI can predict failures of the XLIF procedure. Risk factors for failure include: high grade spinal stenosis, low bone mineral density, and presence of spondylolisthesis with osteoporosis in the postmenopausal female. We found that failed XLIF can be successfully salvaged with a posterior decompressive and stabilizing procedure such as ILIF.
Clinical Outcome Following Single Level Cervical Disc Arthroplasty in a Military Population

CPT J. Matthew Cage, DO; LTC Joseph R. Orchowski, MD; Capt Kim Driftmier, MD

**INTRODUCTION**: In recent clinical studies, cervical disc arthroplasty has demonstrated equivalent, if not superior results compared to anterior cervical discectomy and fusion (ACDF). The purpose of our study is to demonstrate the clinical outcome, as measured by the neck disability index (NDI), in a population of active duty service members undergoing a single level cervical disc arthroplasty compared to a control population undergoing a single level ACDF.

**METHODS**: A retrospective review of all patients undergoing cervical disc arthroplasty at a military medical center between the years 2007 and 2012 was conducted. Patients on active duty status and undergoing a single level cervical disc arthroplasty were included for analysis. A control population of all active duty service members undergoing single level ACDF during the same time period was also identified. The primary outcome measure was the NDI. Patients were evaluated preoperatively, and at 3, 6, 12, and 24 months.

**RESULTS**: Twenty three active duty service members undergoing single level cervical disc arthroplasty provided a pre-operative NDI. Follow up data was collected on 21 arthroplasty patients (91%), with an average final follow up of 12.9 months (range 3-24 months). Eleven active duty service members undergoing single level ACDF with pre-operative NDI scores were identified. Among the patients undergoing ACDF, 5 (45%) were available for follow up. Average final follow up was at 11.4 months for the control group. At six weeks arthroplasty patients demonstrated an average NDI improvement of 11%, however statistical significance was not achieved (p = 0.078). At final follow up, arthroplasty patients maintained a 10% improvement in their NDI score, but again this finding was not statistically significant (p = 0.066). When compared to controls the arthroplasty group had significantly lower NDI scores at final follow up (p < 0.03).

**DISCUSSION**: While multiple industry sponsored randomized controlled trials have demonstrated non-inferiority of cervical disc arthroplasty when compared to ACDF, controversy still exists. Our results demonstrate significant clinical improvement in NDI scores among patients undergoing cervical disc arthroplasty at 3, 6, 12, and 24 months. When compared to similar patients undergoing ACDF, arthroplasty patients appeared to have a more substantial clinical improvement, however NDI scores indicate that the ACDF patients had more pre-operative disability.

**CONCLUSION**: Both arthroplasty and ACDF are acceptable treatments for military patients with cervical radiculopathy.
Update in Distal Radius Fractures

Jorge Orbay, MD

Abstract available upon request.
Arthroscopic Treatment of FAI

J. Lee Pace, MD

Hip problems in the young athlete are unique. Growth centers can represent weak links when powerful muscles contract and lead to unique apophyseal injuries. No firm treatment algorithms and recommendations are scarce.

The ever-evolving world of hip arthroscopy has expanded our knowledge and interest in the young, non-arthritic hip. This has led to the recognition of treatment of several hip conditions, mainly hip impingement. Impingement and associated conditions are being seen with more frequency in the adolescent and young adult population. This is likely twofold due to higher rates of elite competition as well as greater recognition of the condition itself.

Early outcomes for arthroscopic treatment have been favorable with low complication rates making it a valuable tool in the treatment of these conditions in the young athletic population.
Return to Duty After Mini-Open Arthroscopic Assisted Treatment of Femoroacetabular Impingement in an Active Duty Military Population

CPT Justin Ernat; CPT Daniel Song; COL(sel) John Tokish; COL Gregory Lee

INTRODUCTION: Femoroacetabular impingement (FAI) is a common source of hip pain in young, active patients. Early surgical intervention has been advocated to minimize the degenerative process associated with FAI. Surgical options include surgical dislocation, mini-open arthroscopic assisted, and all arthroscopic approaches. To our knowledge, there are no known studies evaluating the surgical outcomes and return to duty of a mini-open arthroscopic assisted approach to FAI in a military population.

METHODS: A retrospective review of the S3 surgical database was performed for all patients at one institution undergoing a mini-open arthroscopic assisted approach for FAI between 2007 and 2011 under the direction of a single surgeon. All Army, Navy, and Marine active duty patients who underwent a primary mini-open arthroscopic assisted approach for FAI were included. Patients who underwent revision surgery for FAI, non-active duty patients, and patients with a history of previous hip surgery were excluded. Operative reports and clinic notes were reviewed for all patients. The US Army e-Profile system and the Physical Evaluation Board Liaison Offices of the Army and Navy/Marines were utilized to obtain return to duty information. Statistical analysis was performed using the Fisher’s exact test, t test, and Chi square analysis.

RESULTS: A total of 179 consecutive surgeries were identified during the study period that met inclusion criteria. Of the 179 surgeries, 23 patients had bilateral procedures resulting in a total of 156 patients. There were 113 males, 43 females, and the average age at time of surgery was 29.5 years old. The study group included 125 patients with Cam FAI and 31 patients with combination Cam & Pincer FAI. With a minimum of 1-year follow-up, only 53% of patients returned to full active duty without any limitations. The remaining 47% of patients had been medically boarded for hip pain (22%), are on permanent profile (21%), or have been on temporary limited-duty profiles for greater than 6 months (4%). There was no statistically significant demographic risk factor identified with regards to branch of service, age, gender, type of lesion, or bilateral lesions.

DISCUSSION: In the general population, good results have been reported for patients without advanced osteoarthritis or significant chondral injuries who have received surgical treatment for FAI. Results of operative intervention for FAI in high level athletes are also good at short to mid-term follow-up with a return to activity rate of 78 – 95%. In our study of one surgeon’s experience of 179 consecutive surgeries on active duty military personnel using a mini-open arthroscopic assisted approach, the return to any form of military duty was 78%.

CONCLUSION: Although a return to full active duty without limitation was achieved in about half of our patient population, nearly four out of five active duty soldiers or sailors can be successful at remaining on some sort of military service after having received surgery for FAI via a mini-open arthroscopic assisted approach.

###
Mental Health Medication Use Correlates with Poor Outcome after Femoroacetabular Impingement Surgery in a Military Population

CPT Daniel J Song; CPT Justin Ernat; CPT Sean Brugman; COL (sel) John Tokish; COL (ret) Gregory Lee

INTRODUCTION: Femoroacetabular Impingement (FAI) is common cause of hip pain in young adults believed to lead to early osteoarthritis. Studies have shown good results with surgical interventions even in high-level athletes. With the high operational tempo in the military with the current conflicts in Afghanistan and Iraq, many patients serve multiple deployments under very stressful conditions. A study by Hoge et al. in 2004 showed that 29% of all military personnel screened positive for PTSD, depression, or anxiety after deployment to Iraq. Multiple studies in the trauma, spine, and arthroplasty literature have shown poor outcomes in patients with mental health diagnoses after surgery. To our knowledge, this is the only study to investigate the correlation of mental health medication use and outcomes in this surgical condition that is common amongst our young active duty population.

METHODS: A retrospective review of the S3 surgical data was performed for all active duty patients at one institution undergoing surgery for FAI between 2007 and 2011. The US Army e-Profile system and the Physical Evaluation Board Liaison Offices of the Army and Navy/Marines were utilized to obtain return to duty information. Electronic medical records were reviewed for history of mental health medication use. A retrospective review of mental health medication use was also performed on all active duty patients who presented for the first time to the Fracture Clinic between April and May of 2010. Patients present to the Fracture Clinic for acute injuries and therefore served as our control group for military mental health medication use.

RESULTS: A total of 156 patients who underwent FAI surgery were identified between 2007 and 2011. The average age at time of surgery was 30 with 113 males and 44 females. For all patients undergoing FAI surgery, 46% were on mental health medications. For patients that were boarded for medical reasons, 60% were on mental health medications. For patients that returned to full active duty after surgery, 41% were on mental health medications. For the 158 patients in our control group, 36 patients or 23% were on mental health medications. There was a statistically significant difference between the rate of mental health medication use for those that returned to duty and those that were boarded (p<0.001). There was also a statistically significant difference the rate of mental health medication use for those who underwent surgery for FAI and those in our control group (p<0.001).

DISCUSSION/CONCLUSION: Similar to the trauma, spine, and arthroplasty literature, patients using mental health medications had poorer outcomes after surgery for FAI. Interestingly, there was also a higher use of mental health medications in patients undergoing FAI surgery compared to our control group with acute injuries. With the increased mental health burden on our active duty patients and the correlation with poorer outcomes after surgery in an elective non-traumatic condition, more research and intervention will be required to better treat mental health conditions and to identify strategies to minimize the effect it has on surgical outcomes.

###
Board of Councilors Update

Linda Rasmussen, MD
Improving Outcomes and Lowering Costs in the Treatment of Scoliosis

David Skaggs, MD

There have been advancements over the last decade that combine to lower costs and improve outcomes in the treatment of scoliosis.

Sending patients to the hospital floor instead of the ICU is associated with less pain medicine, less blood tests, less X-rays, quicker walking, earlier discharge and cost savings.

Preventing complications requiring return to the OR leads to significant cost savings and improved outcomes. Two of the biggest advances have been made in improved infection rates and decreased rates of implant failure and pseudo-arthrosis.
OBJECTIVE: The primary objective of this study is to evaluate the availability of timely orthopaedic care to the pediatric patient with a broken arm who has private insurance versus Hawaii state Medicaid (AlohaCare Quest). The secondary objective is to determine whether practicing orthopaedic surgeons in the state of Hawaii are familiar with other practitioners who accept Medicaid patients. This will be done with two phone calls to the physician offices with a “fake patient”; one with HMSA PPO and the other with AlohaCare Quest to determine if and when the patient would be seen by the physician. This study closely mimics the landmark California Access to Care study performed by Skaggs et al in 2001.

METHODS: This study aims to closely mimic the procedures created by the landmark Skaggs study in 2001. All orthopaedic surgeons, excluding those at Kaiser or Tripler, currently practicing in the state of Hawaii will be selected for participation. The office contact number will be called by a member of the research team, prepared with the following script information: “Hi. I need to make an appointment for my son to see the doctor. He broke his wrist 2 days ago at a park. We took him to a clinic yesterday and they told us the fracture doesn’t involve the growth plate. They put him in a splint and told us to follow up with an orthopaedic surgeon this week. Each office will be called twice, at a minimum of 2 weeks apart. One call will present the scenario with HMSA PPO and the other will present with AlohaCare Quest. We will flip a coin to determine which scenario will be called first for each provider. Offices with multiple orthopaedic surgeons and one main appointment line will be treated as a single practice. Surgeons who have individual office number, but practice in the same location will be called individually. We will record the following data from each call: Date of call, date of given appointment, whether insurance status was requested prior to an appointment being made, whether the appointment was still given after the insurance was known, if the provider will not give an appointment to a child with Medicaid, can they provide a referral to another physician who does see Medicaid patients. If an appointment cannot be made, we will request the reason (ie. Do not take pediatric patients, do not accept insurance, etc) and record this information as well.

DATA ANALYSIS & MONITORING: Descriptive statistics will be calculated for the study variables. Of particular interest is the frequency of Saturday office visits. A x2 test will be used for the comparisons of the percentage of patients in insurance groups offered an appointment in a timely manner. “Timely manner” is defined as within 1 week, since after 2 weeks of healing, it would be very difficult to reduce or manipulate a fracture in unacceptable position. Relative risk of not receiving an appointment due to insurance status will be calculated. ANOVA will be used to evaluate the difference in time to appointment by insurance status.

RESULTS: In progress.

DISCUSSION: In progress.

CONCLUSION: In progress.

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The Effects of Restraint Type on Pattern of Spine Injury in Children

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INTRODUCTION: Despite a dramatic increase in proper seatbelt and restraint use, motor vehicle collisions (MVC) remain a leading cause of morbidity and mortality in children in the United States. While proper use has been shown to protect against a variety of injury types, the association between restraint use and spinal injury is less well defined. Additionally, type of restraint has also been implicated in differing injury patterns (i.e. two-point restraints and flexion-distraction injury), however few comparative studies exist. The purpose of this study is to evaluate the association between restraint type and characteristics of pediatric spine injuries.

METHODS: An IRB-approved retrospective study was performed at a single large Level I pediatric trauma center to identify all patients treated for spinal injury secondary to a MVC between the years of 2003-2011. As spinal injuries in children over the age of ten have been shown to be similar to adult injuries, only children below this age were included. Restraint type was determined from the trauma intake worksheet and pre-hospital documentation. Records/imaging were reviewed to determine the pattern and location of spinal injury. Study groups were created according to restraint type (car seat/booster seat (C/B), 2-point restraint (2P), 3-point restraint (3P), and unrestrained (UR)). Rates of restraint use were calculated according to age divided into two year intervals. Location and type of spinal trauma was then compared within and between groups using Fisher’s exact test and chi-squared analysis.

RESULTS: 113 patients sustained spinal trauma secondary to MVC during the study period, of which restraint data was available for 97. 21/97 (21.6%) were restrained via C/B, 30 (30.9%) with 2P, 21 (21.6%) with 3P, and 25 (25.8%) were UR. C/B patients sustained a high rates of upper cervical (C) spine (62%) and ligamentous (62%) injuries which were significantly higher than the 2P (10%) and 3P (24%) groups (p<0.001). Children using 2P or 3P restraints sustained a significantly higher rate of thoracolumbar injuries (67% and 62%, respectively) than the C/B (14%) and UR (0%) groups (p<0.001). 2P and 3P passengers also had a higher rate of flexion-distraction (F/D) injuries compared to the C/B and UR groups (p<0.001). No significant difference was found in the rate of F/D injuries between the 2P and 3P groups and there were no other significant differences in injury type or location between the 2P and 3P groups. The patients in the UR group sustained a high rate of C-spine (80%) and ligamentous (40%) injuries which were higher than the 2P and 3P groups (p<0.001). Younger children demonstrated higher rates of proper restraint use than older children with 72% of 0-1 year old children travelling properly restrained compared to only 13% in the 4-5 year old group and 42% in the 8-9 year old group (p<0.01).

DISCUSSION: Though a thorough evaluation of the entire spine should be performed in all children following a motor vehicle collision, information regarding restraint type may help focus the clinical and radiographic assessment of such patients. Unrestrained children and those using car seats or booster seats have a significantly higher incidence of cervical spine trauma than children using two- and three-point restraints.
The State of Revision TKA:
The Unwitting Conspiracies That Hold Us Back

Kelly Vince, MD

There are numerous unwitting conspiracies in revision knee arthroplasty; ingrained ways of thinking that pave the way to disaster.

First, conventional wisdom states that the results of revision are poor and so surgeons expect less of their surgery. The current literature reports mediocrity, concludes optimism but rarely explores how results can be improved.

Secondly, revision knee arthroplasty is not one operation, but rather eight different procedures, depending on the mode of failure. The techniques for managing an infected arthroplasty differ tremendously from those for instability or stiffness. There is no uniform diagnostic category for modes of failure.

Third, the first revision is distinctly different to second and third revision procedures, where higher failure rates and inferior function prevail. The best chance for success is a good first revision. And, the most important operation in the life of the young arthroplasty patient will be the first revision, not the cartilage transplant, the ligament reconstruction or the osteotomy.

Fourth, our literature doesn’t agree on the indications for, or definition of, revision knee arthroplasty. Clinical series and registries include disparate procedures as “revisions”, ranging from isolated polyethylene exchanges to secondary resurfacings of the patella.

Fifth, few papers report both the results of surgery and the technique that was used. Indeed, for the longest time, textbooks dealing with revision knee arthroplasty contained reams of information, but never a definite description of how the revision ought to be done.

Sixth, papers often tout the advantages of specific implants in revision surgery, implying that products are the answer, when in fact, clear thinking, solid principles and a sound concept of how to set the knee “right” prevail. The surgeon whose first question is: “Which prosthesis do I use?” is generally asking the wrong question. Despite the appeal of technology for salvage, experienced surgeons remind us to exercise caution.

Seventh, there is unwarranted optimism in the literature; despite the belief that the results of revision arthroplasty are poor, there is a bias against publishing poor results. No surgeon or institution, wants to be identified as less skilled and haunted by failures. Failure attracts neither adoration from colleagues nor future patients. Optimism in publishing takes several forms. Series describing “mid term follow-up” in fact describe cohorts scattered with short-term follow-ups, dressed up by survivorship analyses as longer term studies. Frequent use of heavily constrained implants in these series will make the results seem better than they are likely to be down the track.

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Eight, there is, quite simply, no coherent published series of a minimum ten year follow up of revision knee arthroplasty.

Ninth, few registries track the outcome of revision arthroplasties and in order to qualify as a “failure” a revision procedure must be “re-revised”. This means that many patients with challenging failures may be relegated to wheelchairs and chronic antibiotic therapy but will persist in the registry as successes. Registries do not necessarily collect information on amputations, arthrodesis or resection arthroplasties, so failed revisions may be under-reported. The Australian registry only tracks first revisions performed for aseptic failure.

Finally, there is scant guidance for the “endgame”, the hazardous time after a revision fails when “few pieces are left on the board”, but before “checkmate” when the arthroplasty and the patient are in mortal danger. We know that failed revisions are worse than failed primaries and that infected revisions are the worst of all. We know that revision surgery is expensive. Beyond that, the limits to our understanding of revision knee arthroplasty unintentionally obscure what we should and should not do for arthroplasties in jeopardy.
Raft Constructs and Fracture Stability in Split-Depression Tibial Plateau Fractures

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PURPOSE: The optimal fixation for split depression tibial plateau fractures has been debated in the literature with various implant configurations being recommended. The 'raft-construct,' has been proposed as an effective way to maintain elevation of the articular cartilage after reduction of depressed fragments. Osteoporosis likely increases the likelihood for fixation failure, and demands that the optimal raft construct be understood in order to accomplish the goals of fixation. This method is characterized by multiple screws generally placed from lateral to medial in a single plane along the subchondral bone. The purpose of our study is to evaluate the relative fracture stability yielded by screws placed above a lateral plate, as well as locking and nonlocking screws being used through the plate. Our null hypothesis was that there would be no difference between the raft constructs tested.

METHODS: A reproducible tibia plateau cadaver fracture model was utilized mimicking a splitdepression pattern. We utilized 25 matched pairs of tibias that were randomized across 3 groups so that no one pair was in the same group. The average age was 74.2 years and there were 12 male and 13 female specimens. Groups consisted of I: Raft-construct outside the plate, II: Nonlocking raft-construct through the plate, and III: Locking raft-construct through the plate. We tested cyclic placement (400N, 800N, 1200N, 1600N) and load-to-failure (0.5cm, 1.0cm, 1.5cm 2.0cm) and performed statistical analysis to detect differences between the groups.

RESULTS: Cyclic displacement comparing individual groups against each other showed no statistical significance (p-values 0.68, 0.98, 0.42, 085). However, when combing groups II and III versus I (rafts through-the-plate versus a raft outside-the-plate), a trend was identified (p < 0.23) favoring increased stability in the raft-constructs placed through the plates. Load-to-failure testing also failed to demonstrate statistical significance among the 3 groups individually (p-values 0.15, 0.25, 0.41, 0.41). Utilizing the load-to-failure data and comparing groups II and III against group I, a two-way ANOVA test demonstrated that the groups were significantly different (p < 0.0042) favoring increased fracture stability in the group with the raft-constructs placed through the plate.

CONCLUSIONS: Our study identified statistically significant differences in tibial plateau fracture fixation favoring raft-constructs (both locking and non-locking) placed through laterally-based tibial plateau plates. These findings were demonstrated in a biomechanical model using primarily osteoporotic specimens with split-depression fractures. Our data suggests that when applying a plate to a unicortylar split-depression fracture and the choice to utilize a raft construct is made, consideration should be given to placing the raft-construct through the plate. There were no significant differences favoring locked screws in this model, thus a compelling argument for locked screws in a subchondral raft is lacking.

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Progression of Knee Adduction Moment After Total Knee Arthroplasty

Samantha Andrews

BACKGROUND: Knee adduction moment and lower extremity alignment in osteoarthritic patients have been reported in previous research. However, the changes in knee adduction moment after total knee arthroplasty (TKA) and consequent alignment changes are not fully understood.

QUESTIONS/PURPOSE: The purpose of the study was to examine the affect of TKA and changes in lower extremity alignment on knee adduction moment during walking gait.

PATIENTS & METHODS: Gait analysis was completed for nine osteoarthritic patients pre-TKA and three-weeks, six-weeks, three-moths, six-months, and one year post-TKA. Hip-to-ankle films were also taken two weeks prior and six weeks after TKA.

RESULTS: Peak external knee adduction moment decreased 35% post-TKA without an initial change in ground reaction force and walking velocity. By six weeks post-TKA, knee adduction moment was not significantly different than pre-TKA levels. Static knee alignment was adjusted by TKA from 10.4° varus to 3.7° varus and those patients in a neutral alignment presented with higher knee adduction moment than those with greater than 3° varus alignment.

CONCLUSIONS: Initial decreases in knee adduction moment were found after TKA but these effects were negligible after six months.

CLINICAL RELEVANCE: Neutral alignment, established by TKA, may not provide lower measures of knee adduction moment, therefore stressing the need for strengthening and gait retraining.

CONCLUSION: This study shows many significant differences in the characteristics of spinal injury in children under 4 years of age when compared to older patients. These differences can help guide initial management as well as future prevention efforts.
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Mahalo for attending the
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