43rd Annual
Mallory-Coleman
Resident Research Day

Friday, June 5, 2015
Fawcett Center
OSU Campus
Javad Parvizi, MD, a native of Azerbaijan, completed his medical training in the United Kingdom graduating from University of Sheffield in 1991. He then completed his surgical training at the Mayo Clinic in Rochester, MN, where he also attained a master’s degree from the Mayo Foundation in Molecular Biology. His research in bone healing and cartilage repair sparked his interest in both basic science and clinical research. His fellowship training was completed under the direction of Professor Reinhold Ganz in Inselspital, Switzerland.

Dr. Parvizi is currently the James Edwards professor of orthopaedics and the director and vice chairman of research at the Rothman Institute in Philadelphia. His clinical practice involves reconstruction of complex pelvis, hip, and knee conditions with special emphasis on joint preservation and periprosthetic joint infection. As the Vice Chair for Research, he oversees the operations of clinical and basic science research. He has extensive experience on conducting clinical trials and outcome studies on joint replacement patients. His research on developing self-protective smart orthopedic implants and molecular diagnosis of periprosthetic joint infections has been funded by National Institute of Health, the Department of Defense, the Orthopaedic Research and Education Foundation, and the Musculoskeletal Transplant Foundation. He was given the best researcher of the year award by the Arthritis Foundation in 2011. He has authored over 400 peer-reviewed manuscripts, 120 book chapters, and is the editor of 16 text books in orthopaedics.

He is a member of numerous national and international Societies and has served in leadership roles in a large number of national committees. He chaired the workgroup that proposed the Musculoskeletal Infection Society (MSIS) definition of PeriProsthetic Joint Infection (PJI) in 2010 that has been adapted by the Center for Disease Control. While serving as president of the MSIS, the society held the International Consensus Group (ICG) on PeriProsthetic Joint Infection that brought together over 300 world experts on PJI from 52 countries and 130 different societies. The document generated as part of that meeting has been widely disseminated across the globe and translated to numerous languages. He also served as a member of the CDC committee that produced the updated SSI prevention guidelines in 2014.

Dr. Parvizi is an NIH study section member and reviews grant applications for various other funding organizations. He is the associate editor for the Journal of Arthroplasty, and a member of various editorial boards for orthopedic journals. He has received wide recognition for his clinical and basic science research including numerous awards from the Hip Society, the Knee Society, the American Association of Hip and Knee Surgeons, and the MSIS. His international reputation has led to membership in the Brazilian Hip Society, the British Hip Society, the Peruvian Orthopaedic Society, the Venezuelan Orthopaedic and Traumatology Society, and numerous others.

Past Visiting Professors:

2014  Leesa Galatz, MD
2013  Howard An, MD
2012  Regis O’Keefe, MD
2011  Henrik Malchau, MD
2010  Freddie Fu, MD
2009  James Heckman, MD
2008  Cato Laurencin, MD
2007  William Garrett, MD
2006  Peter Stern, MD
2005  James Goulet, MD
2004  Steven Arnoczky, DVM
2003  Joseph Buckwalter, MD
2002  Victor Goldberg, MD
2001  James Urnaniak, MD
2000  Douglas Jackson, MD
1999  Douglas Dennis, MD
1998  Thomas Einhorn, MD
1997  Larry S. Matthews, MD
1996  Gary Friedlander, MD
1995  James Herndon, MD
1994  Clement B. Sledge, MD
1993  Eric L. Radin, MD
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<td>7:00 am</td>
<td>Welcome and Introduction</td>
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<td>7:15 am</td>
<td>Sean Sutphen, DO</td>
<td>“Prevalence of Pseudotumor in Patients after Metal-on-Metal Hip Arthroplasty: A Single Surgeon’s Large Case-Series”</td>
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<td>7:30 am</td>
<td>Zubair Sarmast, MD</td>
<td>“Novel Technique Utilizing &quot;Lift-Off Screw&quot; Results in Accurate Sagittal Tilt Correction in a Distal Radius Fracture Model”</td>
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<td>7:45 am</td>
<td>Erica Fisk, MD</td>
<td>“Analysis of Functional Outcome Following Primary Achilles Tendon Repairs Using Modified Gift-box with Suture Loop Technique vs Locking Krackow Technique”</td>
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<td>8:00 am</td>
<td>Craig McMains, MD</td>
<td>“The Impact of Payer Characteristics Upon Quality of Care for Patients Undergoing Lumbar Spinal Fusion”</td>
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<td>8:15 am</td>
<td>Aaron Boyles, DO</td>
<td>“Traumatic, Posterior Pediatric Hip Dislocations with Associated Posterior Labrum Osteochondral Avulsion: Recognizing the Acetabular &quot;Fleck&quot; Sign”</td>
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<td>Matthew Swearingen, PhD</td>
<td>“Microbiological Analysis of a Periprosthetic Knee Joint Infection Case”</td>
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<td>Carmen Quatman, MD</td>
<td>“Clinical Assessment Tools Identify Functional Deficits in Fragility Fracture Patients”</td>
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<td>9:00 am</td>
<td>Roger Wiltfong, MD</td>
<td>“Polymethyl Methacrylate Utilization in Primary Total Knee Arthroplasty: A Potential for Cost Savings”</td>
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<td>9:30 am</td>
<td>Jared Bentley, M.D.</td>
<td>“The Prevalence and Combined Prevalences of Anatomic Factors Associated With Recurrent Patellar Dislocation”</td>
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<td>9:45 am</td>
<td>Bridget Corey, D.P.M.</td>
<td>“Osteomyelitis and Diabetic Foot Infections: A Retrospective Review of the Effectiveness of Oral vs intravenous Antibiotic Treatment of Isolated Osteomyelitis of the Diabetic Foot After a Primarily Closed Amputation”</td>
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<td>10:00 am</td>
<td>Adam Madsen, D.O.</td>
<td>“Difficulty of Total Hip Arthroplasty Following Open Reduction and Internal Fixation of Acetabular Fractures”</td>
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<td>10:15 am</td>
<td>Indranil Kushare, MD</td>
<td>“Incidence of Hip Dysplasia Associated With Bladder Exstrophy”</td>
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10:30 am  Jonathan Hancock, DO  
“Induced Membrane Technique: An Effective Method to Obtain Bony Union”

10:45 am  Marissa Jamieson, MD  
“The Effect of Tibial Stem Length on the Maintenance of Position of the Tibial Component in Total Ankle Arthroplasty: An Analysis of Coronal Plane Deformity”

11:00 am  Jeffrey Otte, MD  
“Intrawound Vancomycin Powder Reduces Surgical Site Infections in Total Hip and Knee Arthroplasty”

11:15 am  Nathan Rimmke, MD  
“Intra-operative Nerve Monitoring with a Hand-Held Intraoperative Biphasic Nerve Stimulator, Evaluation of Efficacy in Preventing Acute Neurologic Injuries During the Latarjet Procedure”

11:30 am  Richard Davis, MD  
“Treatment of Acute, Unstable versus Chronic, Stable Slipped Capital Femoral Epiphysis using the Modified Dunn Procedure”

11:45 am  Lunch

12:30 pm  Javad Parvizi, MD, Professor and Moderator  
“Periprosthetic Joint Infection: Challenges and Opportunities”

1:30 pm  Aimee Riley, DO  
“Peroneal Tendon Repair: A Retrospective Review of Patient Reported Outcomes”

1:45 pm  Amy Ravindra, MD  
“Age-Based Patellofemoral Morphology in the Immature Knee Obtaining”

2:00 pm  Mark Sommerfeldt, MD  
“Incidence and Risk Factors of DVT/PE after ACLR- A Systematic Review”

2:15 pm  Sean Sutphen, MD  
“Pediatric Diaphyseal Femur Fractures: A Comparison of Outcomes after Submuscular Plating, Flexible Intramedullary Nailing, and Rigid Intramedullary Nailing”

2:30pm  Sean Reyes, DPM  
“Analysis of Plantar Fasciitis Websites using the DISCERN Instrument”

2:45 pm  Devendra Dusane, PhD  

3:00 pm  End of Day
INTRODUCTION:
Metal-on-metal (MOM) total hip arthroplasty (THA) was felt to be the resolution for failures related to wear in total hip replacement while offering a large head size and enhanced stability [1]. However, there has been much concern that surrounds the issues of implant design-related failures, failure of ingrowth, and pseudotumor formation after metal-on-metal THA [2]. Pseudotumors causing severe symptoms have been found to be locally destructive, requiring revision surgery in a high number of patients [3]. In a recent meta-analysis of the prevalence of asymptomatic pseudotumors in metal-on-metal arthroplasty and resurfacing, the prevalence of pseudotumors ranged from 0% to 6.5% [4]. The purpose of this study is to quantify the prevalence of pseudotumors in patients with well-functioning and painful metal-on-metal total hip arthroplasty, to characterize the pseudotumors with the use of MARS-MRI, and to assess the relationship between pseudotumors and metal ions.

METHODS:
We retrospectively reviewed 102 single surgeon patients that underwent metal-on-metal total hip arthroplasty with a mean follow-up of 60 months using MARS-MRI with serum cobalt and chromium measurements.

DATA AND RESULTS:
The results showed 68.6% developed pseudotumors with 60.9% of the asymptomatic group developing pseudotumors. The symptomatic group had a higher proportion of patients with elevated serum cobalt levels ($P=0.035$). There was no difference found with elevated metal ions and prevalence of pseudotumors, but elevated cobalt levels were associated with larger pseudotumor size ($P=0.001$).

| Table 1: Patient demographics, lab results, and MARS-MRI results after MOM THA |
|-------------------------------------|-----------------|-----------------|-----------------|
| **Demographics**                   | Overall (N=102) | Symptomatic (N=58) | Asymptomatic (N=44) |
| Age, mean (SD)                     | 65.7 (9.8)      | 65.1 (10.6)      | 66.0 (8.5)       |
| Male, N (%)                        | 52 (51.6%)      | 37 (63.8%)       | 15 (34.1%)       |
| **Lab Results**                    |                 |                  |                  |
| Elevated cobalt (CO) levels, N (%) | 38 (37.3%)      | 18 (55.3%)       | 20 (36.4%)       |
| Elevated chromium (Cr) levels, N (%) | 7 (7.9%)       | 2 (3.4%)         | 5 (11.4%)        |
| **MRI Results**                    |                 |                  |                  |
| Number of days from primary THA surgery to post-op MRI, mean (SD) | 1004 (279.1) | 1791 (321.0) | 1813 (236.1) |
| Pseudotumor formation              | 76 (66.6%)      | 31 (81.6%)       | 39 (60.0%)       |

DISCUSSION:
The available evidence indicated that most patients that develop pseudotumors are asymptomatic, and that elevated serum cobalt levels may be associated with symptoms and pseudotumor size. Our findings demonstrate that clinical symptoms do not necessarily correlate with the size and presence of a pseudotumor found on MARS-MRI. Based on our results from the present study, we feel that regularly used follow-up exams (x-rays and clinical exam) will undervalue the prevalence of asymptomatic pseudotumors in MOM THA.
PREVALENCE OF PSEUDOTUMOR IN PATIENTS AFTER METAL-ON-METAL HIP ARTHROSCOPY: A SINGLE SURGEON’S LARGE CASE-SERIES, CONTD.

Presenter: Sean Sutphen, DO

REFERENCES:

DISCLOSURES:
None
NOVEL TECHNIQUE UTILIZING “LIFT-OFF SCREW” RESULTS IN ACCURATE SAGITTAL TILT CORRECTION IN A DISTAL RADIUS FRACTURE MODEL

Authors: Zubair Sarmast MD, Adam Martin MD, Erica Fisk MD, Kanu Goyal MD
Presenter: Zubair Sarmast, MD

INTRODUCTION:
Several methods exist to achieve anatomic reduction and secure plate fixation in dorsally angulated distal radius fractures. Commonly these techniques are categorized as proximal-first plate fixation or distal-first plate fixation. Achieving proper sagittal tilt can be a difficult during surgery. We have developed a technique that helps the surgeon “dial in” the amount of desired volar tilt using a variation of the distal-first fixation method for volar plating of distal radius fractures. The amount of sagittal tilt correction can be estimated based on the length of screw placed in a proximal locking screw hole. We predict that actual sagittal tilt correction will closely follow theoretical correction using a sawbones-based model with osteoporotic specimens showing less correction than normal specimens.

METHODS:
Twenty foam radius models (Sawbone) were divided evenly into two groups, “A” and “B”. Dorsally angulated extra-articular distal radius fractures were simulated by removing a dorsal wedge of variable size. Group B specimens underwent further modification to simulate an osteoporotic model. After static pinning in various degrees of angulation, opaque fiducial markers were placed, and fluoroscopy was used to measure pre-reduction sagittal tilt. An appropriate “lift-off screw” was chosen based on the length of the plate and the angular correction needed to restore normal sagittal tilt. Prior to plate fixation, the “lift-off screw” was placed into a designated proximal locking hole. The distal radius plate was then positioned on the sawbones in standard fashion distally; however, proximally it was separated from the radial shaft by the “lift-off screw”. After distal locking screws were inserted, the “lift-off screw” and k wires were removed, and the plate with the distal fracture fragment was reduced with subsequent proximal fixation into the radial shaft. The post-reduction sagittal tilt was then measured. We then compared the actual versus predicted sagittal tilt correction.

DATA AND RESULTS:
The length of the plate from the hinge point to the proximal locking hole was 30 mm. Pre-reduction sagittal tilt ranged from 3 to 52 degrees dorsal tilt from normal (10 degrees volar tilt). Corresponding “lift-off screws” were calculated (tangent of tilt correction needed multiplied by plate length) and ranged from 5 to 42 mm in length. Actual tilt correction highly correlated with screw length in a linear fashion. The mean difference between actual and predicted tilt correction for a given screw length was 3.9 ± 2.8 degrees for all specimens. There was no difference between normal and osteoporotic specimens.
DISCUSSION:

- In our sawbones model we were able to simulate distal radius fractures with varying degrees of dorsally angulated sagittal tilt.
- With the use of a simple mathematical formula, we were able to calculate a “lift-off” screw of a specified length positioned in the proximal part of the plate in order to restore normal sagittal tilt.
- The actual sagittal tilt correction with the “lift-off” screw was accurate within a few degrees of the predicted correction.
- The “lift-off screw” length can be simply calculated, and this technique can be used with any distal radius peri-articular locking plate with locking options in the shaft.

REFERENCES:


ACKNOWLEDGEMENTS:

No external funding used. Volar plates donated by Biomet.

DISCLOSURES:

None.
INTRODUCTION:
The Achilles tendon is the strongest and thickest tendon in the body, but also one of the most commonly injured. Various methods of repair are described for surgical repair of the Achilles tendon. A newly developed technique for Achilles repair using a continuous nonabsorbable suture loop with modified gift-box suture configuration was recently proposed in the literature1. We hypothesize that patient reported functional outcomes using the Achilles Tendon Rupture Score (ATRS) will not differ significantly between the Modified Gift-Box with Suture Loop technique and a traditional Krackow surgical repair, with shorter operative times using the suture loop.

METHODS:
A prospective case series of 25 patients who sustained complete Achilles tendon rupture between February of 2012 and August of 2014 were treated operatively with the Suture Loop technique for Achilles tendon repair. The patients were followed prospectively by the primary surgeon for a minimum of 9 months; each patient underwent a phone survey postoperatively. Demographic data, interval between injury and surgery, operative time, complication rate, and functional outcome via the ATRS (an internationally validated scoring survey) were collected. This data was compared with patients who underwent repair using the locking Krackow suture technique. Statistical Analysis was performed using standard software package (STATA 13.0, college Station, TX), a value of p <0.05 was considered significant.

DATA & RESULTS:
Twenty five patients underwent primary surgical repair with the suture loop technique, and five patients were treated with the locking Krackow fixation during the study period. Of these patients, 24 out of 25 (96%), and 5 out of 5 (100%) completed the postoperative ATRS survey respectively. There was no significant difference on average ATRS between surgical groups. (p=0.32). Operative time was approximately twenty minutes longer on average for the Krackow group (mean 89 minutes) vs the suture loop group (mean 69 minutes) (p=0.0009). There was no difference in overall complication rates between groups, but older patients had a trend toward better postop results regardless of surgical technique. Finally, outcome measures tended to improve with time as there was an association between improved ATRC with longer length of follow up.

DISCUSSION:
The modified gift-box technique using a nonabsorbable suture loop for end to end repair is a novel method for treatment of Achilles tendon ruptures. Early patient reported functional outcomes have shown equivocal results between traditional repair with the locking Krackow technique and continuous suture loop technique. The suture loop method has also shown to be more time efficient in the surgical theatre without resulting in increased complication rates. Longer follow up and greater numbers may delineate other differences between the two techniques.

REFERENCES:
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INTRODUCTION:
Spinal fusions are becoming one of the most commonly performed operative procedures in the field of orthopaedic surgery. They are frequently employed to treat a multitude of problems in effort to relieve pain and improve overall quality of life. In the arthroplasty literature, several studies have assessed the influence of payor characteristics on quality of care for patients undergoing total hip and knee arthroplasty. Thus far, the research revealed that payor characteristics such as clinical, demographic, and economic factors influence treatment and outcomes. There is an absence of research examining the specific effects of payor characteristics on treatment and outcomes for patients undergoing spinal fusions.

The purpose of this study was to determine how payor characteristics affect pre- and post-operative clinical outcomes among patients undergoing spinal fusion. Our hypothesis is that patients utilizing government programs such as Medicare will exhibit worse clinical presentation and outcomes than those with private insurance. This information will allow healthcare professionals to identify patients at risk of poorer outcomes and to take steps necessary to improve their care.

METHODS:
After obtaining institutional review board approval, we retrospectively reviewed the records of adult (18 years or older) patients that underwent primary or revision lumbar or thoracolumbar fusions by either of two fellowship trained orthopaedic spine surgeons between August 2011 and January 2014. We included both primary and revision fusions performed from either an anterior, posterior, or combined approach.

Age, sex, body mass index (BMI), American Society of Anesthesiologists (ASA) status, type of surgery, length of stay (LOS), discharge disposition, patient reported outcomes, and insurance type were recorded for each patient. Patients were then grouped into one of two insurance type groups: government payor or private/self-pay. Using unpaired t-tests and frequency distribution tables we investigated the relationship between insurance type and the demographic and clinical variables.

The average distance traveled by each patient was calculated using the patient’s listed mailing address on file and measuring from this to the Wexner Medical Center.

DATA AND RESULTS:
There were 79 subjects in the government payor group (F=47; M=32) and 57 in the private/self-pay group (F=31; M=26). We found that the government payor group presented significantly older (59.78±13.09) than the private/self-pay group (49.02±12.86) (p<0.0001). The average ASA score of the government payor group (2.73±0.61) was significantly worse than the private/self-pay group (2.28±0.49) (p<0.0001). Also of significance were the number of operative levels (p=0.0161) with the government payor group requiring fusion of a greater number of levels on average compared to the private/self-pay group; 4.63±4.79 and 2.88±3.62, respectively. Post-operative LOS was significantly longer in the government payor group (p=0.0016). Both BMI and discharge disposition were not found to be significantly different.

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The average distance traveled by Medicaid patients was noted to be higher than either Medicare or Private insurance patients. Self-pay patients were found to have traveled the farthest for their care.

DISCUSSION:
Our analysis shows that patients utilizing government sponsored insurance programs such as Medicare and Medicaid have several significant differences from other patients. These differences suggest a population which is more unhealthy and requiring a larger procedure on average. The only outcome measure of significance was the post-operative length of stay, suggesting that the patients with government sponsored insurance utilize a higher amount of healthcare funds per procedure. The discrepancy in the distances traveled by the different patient groups highlights how patients with fewer resources have decreased access to care. Our data evaluating the pre- and post-operative ODI scores was not sufficient to perform a comparison between the two groups. We suspect that the ODI scores would correlate with our other outcome measures if properly documented. This should be the focus of future endeavors to document the impact of payer status in lumbar fusions.

REFERENCES:

ACKNOWLEDGEMENTS:
A special thanks to Sue A. Ferguson, Ph.D. CPE for assisting with the statistical analysis of our data.

DISCLOSURES:
The listed authors have no financial disclosures to announce.
TRAUMATIC, POSTERIOR PEDIATRIC HIP DISLOCATIONS WITH ASSOCIATED POSTERIOR LABRUM OSTEOCHONDRAL AVULSION: RECOGNIZING THE ACETABULAR “FLECK” SIGN

Authors: Chris Blanchard, DO, Indranil Kushare, MD, Aaron Boyles, DO, Kevin Klingele, MD
Presenter: Aaron Boyles, DO

**INTRODUCTION:** Traumatic dislocation of the hip is uncommon in the pediatric population. Concentric reduction is usually achieved by closed means. Open reduction may be needed if there is femoral head fracture, incarcerated fragment or incomplete reduction due to soft tissue entrapment. We present a series of ten patients who sustained a posterior hip dislocation or subluxation with associated osteochondral avulsion of the posterior labrum. During surgery they were noted to have a labral injury pattern not previously recognized. Such treatment was dictated by post-reduction advanced imaging which revealed a consistent acetabular “fleck” sign indicative of this labral injury which has not been previously described in literature.

**METHODS:** This was a retrospective case review of patients with traumatic posterior hip dislocation and/or subluxation that was treated operatively for a suspected associated labral tear and fractures.

**DATA AND RESULTS:** Eight patients had post reduction CT scans which revealed a posterior acetabular wall “fleck” sign, suggestive of osteochondral injury. The small bony fragment was consistently displaced at least 2-3 mm in all patients with majority of the posterior wall remaining intact. Closed reduction was felt to be congruent in seven out of the ten patients. All patients were treated operatively for exploration and stabilization of the suspected posterior labrum pathology and associated injuries using a surgical hip dislocation. A consistent pattern of labral pathology was seen in all patients, with disruption of the posterior labrum from the superior 12 o’clock attachment to detachment at the inferior 6 o’clock location. Reattachment of the osteochondral labral avulsion was performed with suture anchors along the posterior rim and the associated femoral head fractures were also addressed with internal fixation. Two patients had inadequate follow-up and were excluded, the average follow-up for remaining 8 patients was 9.8 months (6-26 months). There were no findings of avascular necrosis in any of the 8 patients.

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TRAUMATIC, POSTERIOR PEDIATRIC HIP DISLOCATIONS WITH ASSOCIATED POSTERIOR LABRUM OSTEOCHONDRAL AVULSION: RECOGNIZING THE ACETABULAR “FLECK” SIGN, CONT'D.

Presenter: Aaron Boyles, DO

Figure 2. Postoperative radiographs status post open suture anchor repair of posterior labrum osteochondral avulsion via a surgical dislocation approach.

DISCUSSION:
Posterior hip dislocation in children may produce an acetabular “fleck” sign on advanced imaging which in a stable, concentrically reduced hip has been treated without surgery in the past. Acetabular fleck sign may represent a near complete avulsion of posterior labrum as seen in our series. We recommend a high suspicion for this type of labral pathology and surgical repair when acetabular “fleck” sign is identified with hip subluxation or dislocation. Traumatic, posterior hip dislocations in young patients may be associated with significant labral pathology. Acetabular “fleck” sign on advanced imaging may predict such pathology.

REFERENCES:

INTRODUCTION
The incidence of periprosthetic joint infection (PJI) for total knee arthroplasty is relatively low at 1 - 2%\(^1\). However, PJI is a devastating complication often requiring multiple clinic visits and surgeries. A growing body of evidence suggests that bacterial biofilms are a main etiological agent of PJIs\(^2\). However, it is unclear if biofilms colonize one or multiple components of artificial joints. Here, we mapped biofilm colonization on a total knee PJI case. Because biofilms can colonize a wealth of surface types, including metals and plastics, we hypothesized that biofilms would attach to all foreign bodies associated with the PJI.

METHODS
Freshly explanted orthopaedic hardware including a cobalt-chromium (Co-Cr) femoral component, titanium tibial tray, plastic glider and patella, and permanent sutures were encased in rich agar medium and incubated to promote biofilm outgrowth from the surface of components. Confocal laser scanning microscopy (CLSM) was used to confirm the presence of biofilm on suture specimens. Finally, a 16S rRNA gene phylogenetic analysis of total DNA extracts from each individual artificial knee component was conducted, and the rank abundances and similarity between individual components were statistically analyzed via Bray-Curtis similarity.

DATA AND RESULTS
The agar encasement culturing method (AECM) allowed visualization of biofilm outgrowth, in the form of colonies, from the surfaces of the femoral component and suture material, and colonies were enumerated in the bulk agar of the femoral and tibial component (figure 1 below).

CLSM confirmed the presence of a staphylococcal biofilm and putative rods in a biofilm on the sutures. A 16S rRNA gene phylogenetic analysis of the individual components suggested a polymicrobial infection including *Bacteroides fragilis*, *Pseudomonas aeruginosa*, *Stenotrophomonas maltophilia*, *Staphylococcus aureus*, *Acinetobacter schindleri* and *Propionibacterium acnes*. Finally, analysis of the relative abundances of bacteria identified via 16S rRNA sequencing did not indicate significant difference in the similarity of the metal, plastic and suture components with respect to the colonizing organisms, but it is worth noting that the plastic components were more similar to each other than the metal and suture components (figure 2 below).
DISCUSSION
The implications and findings of this case report are that biofilm bacteria may colonize all infected prosthetic components in PJI cases, including permanent braided suture material. These findings also provide further evidence that culture can fail to detect all of the infecting pathogens, and thus, the polymicrobial nature of an infection. In the future, we will employ the phylogenetic analysis approach to probe for bacterial colonization patterns in a larger sample size of PJI cases.

REFERENCES

ACKNOWLEDGEMENTS
We thank Maurice Manring, Ph.D. for his guidance in this work. This work was supported by The OSUCOM and funds provided from the OSU PHPID program.

NO DISCLOSURES
INTRODUCTION:
Over 1.5 million fragility fractures occur in the United States annually and due to the substantial financial costs of surgical treatment, hospitalization and rehabilitation, the socioeconomic impact of caring for these orthopaedic trauma patients is profound. Estimated annual costs in the United States for fragility fractures are over 17 billion dollars. Despite improvements in surgical techniques and medical management of comorbidities, up to 50% of fragility fracture patients show substantial decline when compared to prior daily function and have a 15-30% risk for mortality within 1 year of fracture. In addition, prior fragility fracture is one of the strongest predictors for future fracture risk. Prevention of even a small percentage of fragility fractures could have substantial medical and economic benefits for society.

The purpose of this study was to identify inexpensive, non-invasive, portable, clinical assessment tools that can be used to assess functional performance measures that may put older patients at risk for falls such as balance, handgrip strength, hip abduction strength and lumbo-pelvic control.

Hypothesis: Inexpensive, portable clinical assessment tools can detect differences in balance, grip strength, and lumbo-pelvic tilt between fragility fracture patients and healthy controls.

METHODS:
Twenty fragility fracture patients and twenty-one age-matched healthy control subjects were evaluated using clinical assessment tools that measure functional performance during activity of daily living tasks. These tools included the Nintendo Wii Balance Board (WBB), a handheld dynamometer, and an application for the Apple iPod, the Level Belt. Balance (Wii balance board), handgrip and hip abduction strength (handheld dynamometer), and lumbo-pelvic control (iPod Level Belt) were compared in fragility fracture patients versus healthy controls. Stability was evaluated using the Nintendo Wii video game platform and the WBB. In conjunction with the WBB, two “mini-games” from the Wii Fitness program were used to assess postural sway and stability in participants. All hardware and software is commercially available and was not altered from its purchased state. In addition, all subjects completed a fear of falling survey.

DATA AND RESULTS:
Fragility fracture patients had lower scores on the vertical component of the Wii Balance Board torso twist task (P=0.042) and greater medial-lateral lumbo-pelvic sway during a 40m walk (P=0.026) when compared to healthy controls. Unexpectedly, the fracture patients had significantly better balance scores on the left leg and total components of the Wii Balance Board single leg stand task as well as less faults during the left single leg stand task than the controls (P=0.020, 0.010, 0.003). Fragility fracture patients also had significantly lower hip abduction strength compared to controls (P=0.046 left hip and P=0.023 right hip). In addition, fragility fracture patients with lower hip strength reported higher fear of falling scores (r=-.331 left hip, P=0.26; and right r=.426, P=0.005).

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DISCUSSION:
The clinical assessment tools utilized in this study are relatively inexpensive and portable tools of performance measures that were able to detect differences in postural sway and hip abductor strength between fragility fracture patients and controls. Interestingly, when looking at a more functional dynamic task of gait compared to single leg balance, these same postural sway deficits actually reversed and fragility fracture patients had decreased postural sway control (increased ML sway). Gait requires a different level of concentration with a controlled perturbation in ground contact with each step.

Patients with a history of fragility fracture had significantly lower hip abduction strength compared to control patients. More importantly, the findings in this study suggest that hip abductor strength, as measured by commercially available belt-fastened hand-held dynamometers, negatively correlates with fear of falling in patients with a history of fragility fracture. This may indicate that these patients, who have lower hip abduction strength, have limited activity, reduced quality of life, and potentially be at greater risk for fall.

The results of this study demonstrate compelling evidence that variability of movement and strength during functional tasks captured by inexpensive, portable clinical tools reveal functional deficits in fragility fracture patients that may put them at risk for future fracture and falls.

REFERENCES:

ACKNOWLEDGEMENTS:
Rossler and Bennet OSU Medical Research Scholarships. Jeff Pan, PhD for statistical consultation.
INTRODUCTION:
With rising healthcare costs, efforts should be made to maximize the cost effectiveness of disease treatment. One area of orthopedic surgery where this is relevant is knee replacement surgery. During implantation of the prosthetic knee components, excess cement is extruded from the bone-implant interfaces before the cement has hardened and is subsequently discarded. To our knowledge, there has been no study that has examined the amount of discarded cement and compared this quantity to the original total quantity of cement prepared for the case. We feel that quantification of this amount may reveal an opportunity for cost savings. We therefore designed a prospective study to quantify the amount of bone cement utilized during primary total knee arthroplasties at our institute by various surgeons. The goal was to establish a reasonable minimum amount of bone cement that would be adequate for all primary total knee arthroplasties at our institute. Our hypothesis was that 1 unit of bone cement would be adequate.

METHODS:
This prospective study was performed at a single institution with six participating orthopedic surgeons. The study was approved by the Institutional Review Board. Patients undergoing primary total knee arthroplasty were eligible to be enrolled. A total of 71 patients were included in the final analysis.

SmartSet Bone cement (DePuy, Warsaw, IN) was used in all cases. Either 1 unit (40 grams), 1.5 units (60 grams), or 2 units (80 grams) of cement were prepared at the time of implantation for each case depending on the surgeon’s preference. Four of the surgeons preferred to use medium viscosity cement, while two preferred high viscosity cement. After preparation, cement was applied to the bone surfaces and components. The residual bone cement that was extruded from the bone-implant interfaces after impaction was collected by the operative team before the cement cured. Once cured, it was placed in a sterile container and handed off the field for analysis. For each sample, the mass and volume were measured. Two units of medium viscosity and 2 units of high viscosity cement were mixed independently as standards to determine the total mass and volume in a single unit of the bone cement. The mass and volume of the samples were averaged together. This allowed for calculation of the total unimplanted portion of cement per case, and by subtraction from the standards, the amount of implanted cement used to fix the prosthetic components. Because the individual surgeons prepared various amounts of bone cement for the cases, the final values were calculated as a percent of 1 unit to facilitate data analysis.

DATA AND RESULTS:
Overall, the average amount of cement actually implanted during the procedure as a percentage of 1 unit was 52% when specifically looking at mass and 52% when specifically looking at volume. The table below shows these values when broken down by surgeon. No cases required more than 1 unit.
Polymethyl Methacrylate Utilization in Primary Total Knee Arthroplasty: A Potential for Cost Savings, Contd.

Presenter: Roger Wiltfong, MD

Average Masses and Volumes of Cement Implanted per Case as a Percent of One Unit.

<table>
<thead>
<tr>
<th>Surgeon</th>
<th>Number of Cases</th>
<th>Average Mass of Cement Implanted per Case</th>
<th>Average Volume of Cement Implanted per Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>36</td>
<td>53.08%</td>
<td>53.68%</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>52.04%</td>
<td>52.22%</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>42.66%</td>
<td>42.92%</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>60.24%</td>
<td>61.90%</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>50.35%</td>
<td>51.52%</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>44.05%</td>
<td>43.43%</td>
</tr>
<tr>
<td>Weighted Average</td>
<td></td>
<td>52%</td>
<td>52%</td>
</tr>
</tbody>
</table>

DISCUSSION:
Efficient use of bone cement may be one way to diminish costs during primary total knee arthroplasty. The list price of 1 unit of SmartSet medium viscosity cement is $164. A total of 615,050 total knee arthroplasties were performed in the US in 2008. If half of these cases utilized 2 units of cement, a potential cost savings of $50 million could be realized.

The goal of our study was to establish a reasonable minimum amount of bone cement that should be prepared and would be considered adequate for all primary total knee arthroplasties at our institute. Regardless of surgeon, implant brand, or implant size, we found that preparing 1 unit of bone cement was adequate for a primary total knee arthroplasty at our institution and preparing more would be an excessive cost to the healthcare system.

REFERENCES:
1. Losina E, et al; The Dramatic Increase in Total Knee Replacement Utilization Rates in the United States cannot be fully explained by growth in population size and obesity epidemic; JBJS 2012 February 1;94(3):201 7

ACKNOWLEDGEMENTS:
We would like to thank all of the ancillary staff at Mount Carmel West for assisting in sample collection.

DISCLOSURES:
The authors have no disclosures.
**THE PREVALENCE AND COMBINED PREVALENCES OF ANATOMIC FACTORS ASSOCIATED WITH RECURRENT PATELLAR DISLOCATION**

Authors: Robert N. Steensen, MD, Jared C. Bentley, MD, Thai Q. Trinh, MD, Jeffrey R. Backes, MD and Roger E. Wiltfong, MD.

Presenter: Jared Bentley, MD

**INTRODUCTION:**
Anatomic factors, including patella alta, increased tibial tubercle–trochlear groove (TT-TG) distance, rotational deformities, and trochlear dysplasia, are associated with dislocation of the patella. Identifying the presence of these anatomic factors both in isolation and in combination may influence treatment in patients with patellar dislocation. The aim of this study was to compare the prevalence and combined prevalences of these anatomic factors using magnetic resonance imaging in a group of patients with and without histories of recurrent dislocation of the patella.

**METHODS:**
The prevalence and combined prevalences of patella alta, increased TT-TG distance, rotational deformity, and trochlear dysplasia on magnetic resonance imaging were reported and compared in 60 patients with and 120 patients without histories of recurrent patellar dislocation. Patellar height was measured as the Insall-Slavati ration. Knees with ratios >1.2 were considered to have patella alta. TT-TG distance >20mm were considered abnormal. Rotational alignment was evaluated by measuring the tibial tubercle rotation angle (TTRA) as described by Muneta et al. where < 65° was reported as abnormal. Trochlear shape was assessed by a simple modification of the Dejour Classification. A flat or convex trochlea was considered dysplastic.

For reporting purposes, the following abbreviations were used: P for patella alta, Q for increased TT-TG distance (Q-angle surrogate), R for abnormal rotation, and S (for “sulcus”) for trochlear dysplasia. Chi-square or Fisher exact tests were used to compare the study and control groups according to sex, side affected, and the proportion abnormal for each of the anatomic factors (P, Q, R, and S). The Student t test was used to compare mean ages between the study and control groups. The Mann-Whitney test was used to compare the median number of abnormal factors between the study and control group. P values < .05 were considered statistically significant.

**DATA AND RESULTS:**
The study group consisted of 60 patients (60 knees) with recurrent dislocation of the patella, and the control group consisted of 120 patients (120 knees) with no histories of patellar dislocation or chronic anterior knee pain. The prevalence of patella alta in the study group was 60% and in the control group was 20.8% (P<.005). An increased TT-TG distance was present in 41.7% of the knees in the study group, compared with 3.3% in the control group (P<.005). The prevalence of rotational deformity as measured by the TTRA in the study group was 26.7%, while the prevalence in the control group was 2.5% (P<.005). Trochlear dysplasia was present in 68.3% of the study group and in 5.8% of the control group (P<.005).

Significant differences were identified in the Insall-Salvati ratio, TT-TG distance, and TTRA between study and control groups. No abnormal anatomic factors were noted in 8.3% of the study group and 70% of the control group. One-third (33.3%) of study group knees had 1 abnormal factor, and 28.3% of the control group knees had 1 abnormal factor. When identifying combined prevalences of factors in the study group, 26.7% had 2 abnormal factors, 16.7% had 3 abnormal factors, and 16.7% had 4 abnormal factors.

Continued on Next Page
THE PREVALENCE AND COMBINED PREVALENCES OF ANATOMIC FACTORS ASSOCIATED WITH RECURRENT PATELLAR DISLOCATION, CONT'D.

Presenter: Jared Bentley, MD

had 3 abnormal factors, and 15.0% had all 4 factors with abnormal values. In the control group, 1 patient (0.8%) had 2 abnormal factors, 1 patient (0.8%) had 3 abnormal factors, and no patient had 4 abnormal factors. The most common prevalence and combined prevalences in the control group were no abnormal factors (70%), type P (20.8%), and type S (4.2%). Only 2 patients (1.7%) in the control group demonstrated more than 1 abnormal factor.

DISCUSSION:
Recurrent patellar dislocation is associated with an increased prevalence of patella alta, increased TT-TG distance, rotational deformity, and trochlear dysplasia compared with patients with no histories of patellar dislocation. Multiple anatomic factors were identified in the majority of patients with recurrent dislocation. Further research may identify which factors play a greater role in patellar stability and may allow physicians to predict which first-time dislocation patients are more likely to sustain recurrence.

REFERENCES:
INTRODUCTION:
Diabetic foot infections and osteomyelitis (OM) continue to be a costly and complicated medical problem for medical professionals. The optimal route and duration of therapy for osteomyelitis remains controversial. Most of today’s recommendations are based off a 1970 study by Blockey and Watson which saw better outcomes in the treatment of OM with a 4 week course of IV antibiotics. Amputation and wide surgical margins augments treatment allowing for better outcomes. Even though much has changed in the world of antibiotic therapy and surgical treatment, a 4-6 week course of IV antibiotic therapy remains the current recommendation by the IDSA for positive surgical margins. Negative margins require 2-5 days of antibiotics. Prospective studies comparing oral versus IV antibiotics and duration in the setting of isolated diabetic OM are limited and there is no clear protocol for treatment. We hypothesize that the majority of the patients antibiotic therapy for OM treated by surgical resection reviewed does not follow the IDSA protocol and are treated for longer than the recommended time intervals. We will review how patients with clean surgical margins and those with residual OM relate to post-operative antibiotic regimens as well as measure outcomes.

METHODS:
This is a retrospective study evaluating diabetic patients with a primarily closed amputation. A total of 87 patients charts were reviewed from January 1st, 2012 to December 31st, 2013 using CPT for foot/ankle amputations and ICD 9 codes for diabetes mellitus. Open amputations, emergent cases, and foot infections complicated by PVD were not included. A total of 62 patients were included, 57 with type 2 diabetes and 5 with type 1. Charts were reviewed for sex, type of diabetes (1 or 2), advanced imaging, type of amputation, pathology and microbiology results, were clean margins obtained, antibiotic dosage and duration, follow up, outcomes, and complications. This data was analyzed to help identify average antibiotic route and length based off of intraoperative cultures in the presence of OM in a diabetic patient with a primarily closed amputation. We will identify outcomes as healing without complication, wound dehiscence, reulceration rate, or more proximal amputation. We will then compare the results to the IDSA guidelines.

DATA AND RESULTS:
Of the patients with diabetes and primary closed amputation, 33 of the 62 patients healed with no complications for a percentage of 53%. Of that population 69% of the patients had negative micro results and were on antibiotics for an average of 16 days. This same group had 27% patients with positive micro results and their antibiotic duration was 33 days. Antibiotic regimens were reviewed for all patients and were broken down into average duration of PO, IV and combined therapies. Overall, patients taking PO antibiotics average duration was 18 days, while IV antibiotic regimens were 33 days and combined PO/IV regimen was an average of 39 days. It was also determined that 68% of patients treated with PO antibiotics healed with no complications compared to those with IV antibiotics healed with no complications healed 61% of the time. The average follow up time for patients in this study was 12 months.

Continued On Next Page
DISCUSSION:
The diabetic foot and its sequelae is a complex medical condition that debilitates many. Studies show 1 out of every 15 diabetics will have complications secondary to OM and require a subsequent amputations. Antibiotic therapy and its duration after confirmed OM and amputation has remained unclear. There has yet to be a study that encompasses a unified, standard clinical, surgical, and antibiotic protocol to address isolated OM in the foot. In 2012 the IDSA guidelines state that in the setting of diabetic OM of the foot after resection of bone with negative surgical margins merits a course of antibiotics for 2-5 days and positive surgical margins need 4-6 weeks of antibiotics. Our review found that patients with negative surgical margins antibiotic course was 10 days longer then the IDSA recommends. Those with positive surgical margins did fall within the IDSA recommendations. Interestingly, patients on PO and those solely on IV healed with no complications at the same rate. Moving forward, comparing the complications patients with PO vs IV antibiotics would provide further information about treatment. A prospective, randomized trial would be helpful in determining the most efficacious treatment with the least amount of complications.

REFERENCES:

ACKNOWLEDGEMENTS:
None

DISCLOSURES:
None
INTRODUCTION:
The incidence of post traumatic arthrosis after acetabular fractures ranges from 12-67%\(^1\), and leads to the need for secondary total hip arthroplasty (THA). These cases of conversion arthroplasty are technically much more challenging that routine primary THA. There is a paucity of literature in the past decade on techniques or results of modern treatment methods of THA after acetabular open reduction and internal fixation (ORIF). The goal of our study was to evaluate the difficulty of secondary THA as compared to primary THA performed by the same surgeon.

We hypothesized that patients who undergo THA for posttraumatic arthritis following ORIF of an acetabulum fracture will have increased operative times, intraoperative blood loss, hospital length of stay, and discharge to rehabilitation facilities; however, we do not anticipate an increased incidence of perioperative or early postoperative complications when compared to patients undergoing THA for primary osteoarthrosis.

METHODS:
After IRB approval, we retrospectively identified 30 patients who underwent secondary THA after ORIF of an acetabulum fracture and a comparison group of 20 patients who had undergone primary THA for degenerative joint disease. All THA was performed by primary surgeon with fellowships in trauma and adult reconstruction. We excluded patients <18 yrs old and those who underwent acute THA. Hospital and office charts were reviewed to obtain perioperative complications, demographic variables, and follow-up data.

Kocker-langenbeck approach had been used in 60% acetabular fractures. Harware removal (HWR) was performed if it interfered with cup placement. Standardized postoperative clinical pathways were utilized in both groups.

Descriptive statistics, including mean, median, standard deviation, frequency, and percentage were used to describe numerical data. Fisher Exact Test and Chi-Square Analysis was used to compare categorical variables, while continuous variables were analyzed using Student’s t-test.

Figure 1.
AP pelvis of Left acetabular fracture; ORIF; and THA conversion

\(^1\)Chäusern S, et al. 2002
DIFFICULTY OF TOTAL HIP ARTHROPLASTY FOLLOWING OPEN REDUCTION AND INTERNAL FIXATION OF ACETABULAR FRACTURES, CONT'D.

Presenter: Adam Madsen, DO

<table>
<thead>
<tr>
<th></th>
<th>Post-ORIF THA (n=30)</th>
<th>Primary THA (n=20)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>51.7 ± 11.4 (23-69)</td>
<td>55.3 ± 12.7 (37-80)</td>
<td>0.31</td>
</tr>
<tr>
<td>Sex (Male)</td>
<td>15 (50%)</td>
<td>10 (50%)</td>
<td>1</td>
</tr>
<tr>
<td>Surgical Approach (Anterolateral)</td>
<td>15 (50%)</td>
<td>20 (100%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Operative Time (minutes)</td>
<td>217.4 ± 91.4 (151-365)</td>
<td>113.7 ± 20.9 (74-156)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Estimated Blood Loss (mL)</td>
<td>875.8 ± 616.0 (150-2000)</td>
<td>365.0 ± 218.3 (100-800)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Hospital Length of Stay (days)</td>
<td>3.7 ± 1.7 (1-8)</td>
<td>3.6 ± 1.5 (2-7)</td>
<td>0.88</td>
</tr>
<tr>
<td>Discharge to Home</td>
<td>15 (50%)</td>
<td>11 (55%)</td>
<td>0.73</td>
</tr>
</tbody>
</table>

DATA AND RESULTS:
All secondary THA were performed for post-traumatic arthritis, except one case performed for avascular necrosis. Demographic data was similar between groups. HWR was deemed necessary in 21 patients (70%). Allograft was needed for bone defects in 33% of secondary, but none of the primary THA’s. Operative time (217.4 min vs. 113.7 min, p < .01) and estimated blood loss (875.8 ml vs. 365 ml, p < .01) were significantly greater in the secondary THA group. Discharge to home and length of stay was similar between groups.

Early post-operative complications were higher in the secondary THA group, including: four intraoperative fractures, two with positive intraoperative cultures, seven that needed a return to the operating room, two readmissions for medical reasons, and one with symptomatic heterotopic ossification. Of those with return to the OR, 2 had revisions (aseptic acetabular loosening; metallosis), 2 superficial infections, 1 seroma, 1 non-union repair, 1 periprosthetic femur fracture.

DISCUSSION:
Our study confirms that THA after acetabular ORIF is more technically challenging based on longer operative times and higher EBL. Some technical challenges include scar tissue from prior surgery, 50% required a non-preferred approach dictated by prior approach, necessary HWR, management of bone deficiency requiring graft and cages, and use of revision components.

Our study shows that secondary THA has a higher rate of complications than primary THA. An algorithm for ruling out infection must be followed in patients with prior surgery including inflammatory markers, aspiration, and intraoperative frozen section.

Patients need to be well informed as to their increased risk of major and minor complications when compared to primary total hip arthroplasty, although their immediate postoperative condition and disposition was not shown to differ.

REFERENCES:
INTRODUCTION:
Exstrophy of the bladder is a rare congenital defect seen in 2.15 children out of every 100,000 live births, with the most severe variant, cloacal exstrophy, only occurring in 1 in 200,000. Developmental dysplasia of the hip (DDH) describes a spectrum of disease ranging from mild hip instability to frank dislocation. Underlying malformations, such as, myelomeningocele and arthrogryposis are often associated with the most severe variant of hip dysplasia, teratologic hip dislocation. The varying degrees of severity in DDH have been encountered in bladder exstrophy patients, but the exact incidence is unknown. We sought to determine the incidence of DDH in bladder and cloacal exstrophy (CE) patients.

METHODS:
We performed a retrospective review of all children with bladder or cloacal exstrophy presenting to a single pediatric center between 1994 and 2014. Each chart was reviewed for correct diagnosis of bladder or cloacal exstrophy, patient age and demographics, associated medical conditions, pertinent surgeries performed, and the age at operation. Patient imaging was reviewed to determine if bilateral hip imaging was available.

DATA AND RESULTS:
In a 20-year retrospective review, we identified 66 patients that were diagnosed with either bladder or cloacal exstrophy and had available hip imaging (38 males and 28 females). Of these, 11 patients were found to have radiographic evidence of DDH, for an incidence of 16.7% (11/66). Five of these patients had cloacal exstrophy, whereas six presented with classic bladder exstrophy. The first radiographic evidence of DDH was noted at a mean age of 5.75 years (Range: birth-22 years). Figure 1 shows a child with increased acetabular angles after spica casting. Figure 2 is the same child at 5-years-old after bilateral iliac osteotomy.

DISCUSSION:
Pelvic abnormalities have commonly been described in bladder exstrophy patients. In addition to these abnormalities, there is compelling evidence that a relationship between exstrophy and hip dysplasia exists. Thomas and Wilkinson, and Meglin et al. observed that skeletal anomalies are exceedingly common in CE patients. More recent studies emphasize the importance of close monitoring of bladder exstrophy patients for hip dysplasia.
Considering that osseous abnormalities are present, a multidisciplinary approach between the urologist and orthopedist should be sought early in the evaluation process. Surgical intervention is often necessary to decrease morbidity. With early diagnosis of hip dysplasia, surgical planning may be individualized to account for the extrophied bladder, as well as, the dysplastic hip. However, DDH treatment may need to be delayed to achieve optimal patient outcomes.

Our 16.7% incidence of DDH in bladder exstrophy acknowledges that a significant relationship between bladder exstrophy and DDH exists, but additional studies will be needed to further characterize this link and to determine optimal patient outcomes.

Based on our results and the current hip screening guidelines, we advocate the use of routine hip screening ultrasound in all infants born with either bladder or cloacal exstrophy. Early identification of DDH in these patients may allow additional treatment options to coincide with frequently used osteotomy and orthopaedic interventions.

REFERENCES:
INTRODUCTION:
Critical bone defects remain a significant problem for orthopaedic surgeons, and although several methods have been described for this issue, many questions remain. Our investigation was designed to critically review the outcomes and issues associated with the induced membrane technique in a trauma population.

METHODS:
The study design is a retrospective case series, Level IV therapeutic study in an urban Level I trauma center setting. Sixty-nine patients aged 18 or older who underwent treatment of bone loss with the induced membrane technique. All patients underwent open treatment of their traumatic bone loss with a two-stage induced membrane technique. Bony union rate, as evaluated with radiographic and clinical signs of healing was our main outcome indicator.

DATA AND RESULTS:
Patients in this series averaged 4.4 surgeries, which included initial debridement to definitive fixation. The tibia was the most common site of bone loss, encompassing 50.7% of the series, while femoral bone loss was next at 24.6%. Polymethylmethacrylate spacers were in place for a mean of 11.2 weeks (mode of 8 weeks) prior to bone grafting for an average bony defect volume of 76.6 cm³. Union was obtained in 82.6% of patients at a mean of 26.6 weeks after grafting. Mean follow-up for these patients was 23.8 months.

Table 1. Patient Demographic Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (Male)</td>
<td>51 (73.9%)</td>
</tr>
<tr>
<td>Age (Years)</td>
<td>42.3 ± 16.9 (18-79)</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.7 ± 0.2 (1.5-2.0)</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>27.8 ± 6.3 (16-46)</td>
</tr>
<tr>
<td>Tobacco Use</td>
<td>30 (43.5%)</td>
</tr>
<tr>
<td>Daily Alcohol Use</td>
<td>5 (7.2%)</td>
</tr>
<tr>
<td>Illicit Drug Use</td>
<td>11 (15.5%)</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>10 (14.5%)</td>
</tr>
<tr>
<td>Peripheral Vascular Disease</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td>Pre-Injury Employment</td>
<td>28 (40.5%)</td>
</tr>
</tbody>
</table>

* Absolute numbers are given as means and standard deviations, with ranges in parentheses. Categorical numbers are given as absolute numbers with percentages in parentheses.

Table 2. Clinical Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Bony Defect (cm)</td>
<td>5.0 ± 2.9 (1.3-14.0)</td>
</tr>
<tr>
<td>Volume of Bony Defect (cm³)</td>
<td>76.6 ± 103.6 (3.1-492.6)</td>
</tr>
<tr>
<td>Overlap of Spacer on Bone Ends</td>
<td>58 (84.1%)</td>
</tr>
<tr>
<td>Time from Spacer to Bone Grafting (weeks)</td>
<td>11.2 ± 13.0 (1-98)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Union Rate</td>
<td>82.6%</td>
</tr>
<tr>
<td>Time to Union (weeks)</td>
<td>26.6 ± 29.3 (6.208)</td>
</tr>
</tbody>
</table>
INDUCED MEMBRANE TECHNIQUE: AN EFFECTIVE METHOD TO OBTAIN BONY UNION, CONT'D.

Presenter: Jonathan Hancock, DO

Table 2 Clinical Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Result</th>
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<tr>
<td>Length of Bony Defect (cm)</td>
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</tr>
</tbody>
</table>

| Union Rate | 82.6% |
| Time to Union (weeks) | 26.6 ± 29.3 (0-208) |

<table>
<thead>
<tr>
<th>Complications</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Superficial Infection After Spacer</td>
<td>9 (13.0%)</td>
</tr>
<tr>
<td>Deep Infection After Spacer</td>
<td>7 (10.1%)</td>
</tr>
<tr>
<td>Superficial Infection After Grafting</td>
<td>0</td>
</tr>
<tr>
<td>Deep Infection After Grafting</td>
<td>10 (14.9%)</td>
</tr>
<tr>
<td>Wound Dehiscence</td>
<td>7 (10.1%)</td>
</tr>
<tr>
<td>Skin Graft or Flap Failure</td>
<td>0</td>
</tr>
<tr>
<td>Implant Removal</td>
<td>10 (14.5%)</td>
</tr>
<tr>
<td>Repeat Bone Grafting</td>
<td>5 (7.2%)</td>
</tr>
<tr>
<td>Amputation</td>
<td>2 (2.9%)</td>
</tr>
</tbody>
</table>

* Absolute numbers are given as means and standard deviations, with ranges in parentheses. Categorical numbers are given as absolute numbers with percentages in parentheses.

Figures B-E: Figure B represents the cement spacer placed into the defect after the final debridement. C. shows the membrane being held by Adson forceps. D. is an AP radiograph that illustrates the bony callus formation of a healed segmental defect injury by the induced membrane technique. E. represents a patient who retained his limb and has full function due to the procedure.

DISCUSSION:
The induced membrane technique is an effective method to obtain bony union when utilized in the trauma population. However, it is not without fail, and attention must be paid to the critical subtleties of the procedure. Further investigation is necessary to help determine the optimal spacer composition and other technical aspects of the procedure, such as timing of exchange.

REFERENCES:

DISCLOSURES:
There is no financial interest that any of the authors have in the work.
INTRODUCTION:
Coronal plane deformity is common in patients eligible for total ankle arthroplasty. The correction of this deformity is paramount to the long term survival of the implant as residual or recurrent deformity can result in ankle instability and increased implant wear rates. Coronal plane correction can be achieved with soft tissue balancing, ligament reconstruction, osseous procedures, and in some part maintained through articular geometry of the implant. The purpose of this study was to assess the influence of the INBONE™ II modular tibial component stem length on the coronal plane stability, with special emphasis on the effect off stem lengths of two and of those greater than two. We hypothesized that increased tibial stem length would not significantly improve the ability to obtain or maintain coronal plane correction of the ankle and of the tibial component.

METHODS:
A retrospective case series of 43 consecutive patients who underwent a primary total ankle replacement using the INBONE™ II modular multi piece tibial stemmed implant over a one year period at a single institution was performed. Patients were excluded from the study if they lacked at least 6 months of follow up. Utilizing previously described techniques, coronal and sagittal plane deformity was measured in each patient in 3 sets of AP and lateral weight bearing radiographs, immediate pre-operative, first post-operative, and most recent post-operative films. All AP films were reviewed for tibiotalar joint or implant congruency and coronal deformity (neutral or degrees varus/valgus). Pre-operative lateral films were reviewed for subluxation of the tibiotalar joint and post-operative lateral films were reviewed for tibial implant slope (neutral or degrees plantar/ dorsiflexion) and coverage of the anterior and posterior cortexes.

Patients who received two tibial stem components were compared to patients who received more than two tibial stem components. Pre-operative deformity between these two groups was compared using the Wilcoxon rank sum test due to non-normal distribution. Paired t-tests were used to compare change in ankle deformity and implant slope and two sample t-tests were used to compare the change in mean ankle reduction between the two groups.

DATA AND RESULTS:
In this series, 20 patients received the INBONE™ II tibial component with 2 stems and 23 patients received greater than 2 stems. The preoperative mean coronal deformity of the ankle was 5.7 degrees with valgus being more common than varus. There was no significant difference between the two cohorts with respect to pre-operative deformity, demographics, or length of time between radiographs.

Pre-operatively to the first post-operative measurement, both groups had significant correction of ankle alignment (mean of 3.8 degrees) and there was no difference in mean change between the groups. At a mean final radiographic follow up of 266.3 days following the first post-operative weight bearing x-ray, coronal deformity significantly increased by a mean of 0.4 degrees overall (p=0.031). Among patients with two tibial stem components, mean ankle deformity increased by 0.2 degrees which was not significant (p=0.507), and patients with more than two tibial stem...
components had a mean increase of 0.7 degrees which was significant (p=0.022). However the difference in mean change in coronal plane ankle deformity between the two cohorts was not significant (p=0.259). There was no significant change in mean tibial implant slope from the first to last post-operative measurement (p=0.860), and the percentage of patients with anterior (67.4%) and posterior cortex (81.4%) coverage remained exactly the same from first post-operative films to final x-rays.

**DISCUSSION:**
Several different total ankle systems have been developed that address the issue of tibial base plate fixation in an attempt to improve maintenance of ankle alignment and longevity of the implant. The INBONE™ II system uses vertical fixation with a modular stem length to achieve immediate implant stability. In this study, coronal plane deformity had a tendency to recur albeit at a much smaller angle than pre-operatively with the INBONE™ II system. Tibial stem lengths of greater than two segments did not influence the ability to obtain or maintain correction of ankle coronal plane deformity, suggesting that recurrence is due to a soft tissue issue rather than an tibial implant shift. It is clear from this study that the purpose of extended length tibial stems would be for tibial bone support and not any perceived benefit to coronal plane stability. Further studies are needed to elucidate the mechanism behind recurrent deformity and preventative techniques.

**REFERENCES:**

**ACKNOWLEDGEMENTS and DISCLOSURES:**
None
INTRODUCTION:
Surgical site infections (SSIs) are a devastating complication with significant patient morbidity in total joint arthroplasty. Intrawound vancomycin powder has shown efficacy and safety in decreasing postoperative spine infections. Its use in arthroplasty has not been well established. The purpose of this study was to compare the rate of SSIs with and without the use of local vancomycin powder during total hip and knee arthroplasty. We hypothesize that the use of intrawound vancomycin powder in total hip and knee arthroplasty will be associated with a significant reduction in the incidence of SSIs.

METHODS:
A retrospective chart review of all patients who underwent primary or revision hip or knee arthroplasty by two fellowship trained orthopaedic surgeons over a 2-year time period at a single hospital system was performed. Group 1 (control group) consisted of 824 patients treated prior to the introduction of intrawound vancomycin powder. Group 2 (treatment group) consisted of 816 patients treated after the introduction of intrawound vancomycin powder. Standard perioperative and intraoperative arthroplasty protocols were utilized in all patients in both groups with the only difference being the addition of 1 gram intrawound vancomycin powder in the treatment group. Patient baseline characteristics and follow-up within 90 days of surgery were analyzed. The incidence of SSIs, recognized as positive deep cultures within 90 days of the procedure, was the primary outcome evaluated.

Differences between baseline characteristics were evaluated using a two-tailed Fisher’s exact test for categorical variables and two-tailed Student’s t-test for numerical variables. Two-tailed Fisher exact tests were performed to evaluate differences in deep SSI incidence between groups.

DATA AND RESULTS:
A total of 1640 patients underwent knee or hip arthroplasty between May 2012 and April 2014. The control group (n=824) had similar baseline characteristics compared to the vancomycin group (n=816), except for the incidence of diabetes. There were a statistically greater percentage of diabetics in the vancomycin group (p=0.0004). There were no significant differences in patient demographics (age and gender), BMI, or the rate of tobacco use (p>0.05). The rate of follow-up within 90 days after surgery was similar between the control and treatment group (99.9% vs. 99.7%, respectively). There was no significant difference in the number and types of procedures performed between the control and treatment groups.

There was a significant decrease in SSI rate after intrawound vancomycin powder was introduced. SSIs occurred in 13/824 (1.57%) patients in the untreated group compared to 4/816 (0.49%) patients in the vancomycin group (p=0.0479). No systemic complications attributable to vancomycin powder were identified.

Subgroup analysis comparing the incidence of SSIs in primary, revision, hip, and knee procedures between groups revealed that all subgroups except revision surgery lacked a significance difference in the rate of SSIs. Revision surgeries showed a significant decrease in the incidence of SSIs after the addition of intrawound vancomycin powder (3.89% to 0%; p=0.0217).
DISCUSSION:
While there is extensive evidence in spine literature demonstrating the efficacy and safety of local vancomycin powder for infection prophylaxis, its use in joint arthroplasty has not been established. The only study to our knowledge evaluating its use in joint arthroplasty was a biomechanical wear simulation study performed by Qadir et al.¹ This study addressed the concern for third-body wear with the addition of vancomycin crystalline substrate and it clearly demonstrated that local vancomycin powder does not alter wear rates.

Our study was able to demonstrate that the application of intrawound vancomycin powder in the surgical wounds of knee and hip arthroplasty procedures decreases the incidence of SSI within 90 days after surgery (1.57% to 0.49%; p=0.0479). Subgroup analysis demonstrated a significant decrease in SSI rate in revision procedures after initiation of local vancomycin powder (3.89% to 0%; p=0.0217).

The use of intrawound vancomycin powder was associated with a significant reduction in the incidence of SSIs following total hip and knee arthroplasty. It may have an even greater impact on reducing SSI rate in high-risk revision knee and hip arthroplasty procedures. There were no adverse clinical outcomes related to the local application of vancomycin. The use of intrawound vancomycin powder in total joint arthroplasty is a safe and cost-effective means to help reduce the risk of SSI and is routinely incorporated into our joint arthroplasty protocols. This study is the first to address this specific population and supports the current evidence that local vancomycin powder reduces the rate of SSIs.

REFERENCES:

DISCLOSURES:
Two of the co-authors have financial relations with Smith & Nephew and/or DePuy, A Johnson & Johnson Company.
INTRODUCTION:
The Latarjet procedure has proven to be successful for the treatment of primary and recurrent shoulder instability. However, this surgery is technically challenging with neurologic complication rates from 1.8 - 20.6%. Recently, intra-operative neuromonitoring has been used to define the stages of the latarjet when the nerves are at the highest risk. However, for the majority of sports surgeons, this type of monitoring is not practical. In addition, it is unclear if all reported intraoperative alerts are clinically relevant. Our goal was to find an alternative way to monitor the neurologic structures intra-operatively in an effort to avoid clinically detectable nerve injuries. We began using a biphasic handheld nerve stimulator throughout the Latarjet procedure in 2012. We felt that this was a simple and safe tool to protect nerves from injury. Our objective is to present our patient population, demographics that could influence nerve injuries, short term neurologic outcomes, and technique of using this device.

METHODS:
We retrospectively evaluated the charts of all patients who had undergone a latarjet procedure by the senior author once we began using the handheld nerve stimulator. We collected data on factors that could influence the incidence of nerve injuries: age, gender, number of prior surgeries, BMI, length of surgery, and anesthetic. The biphasic handheld nerve stimulator was used throughout the case to detect injury to the axillary and musculocutaneous nerves. Patients were sent home with an interscalene nerve block and catheter. Detailed neurologic exams were documented at the first post-operative visit.

DATA AND RESULTS:
Thirty-seven patients underwent a latarjet procedure between May, 2012 and September of 2014. The average (avg) age was 23. 35 were male; 2 were female. 17 were revisions with an avg of 1.3 prior surgeries and 20 were first surgeries. Avg BMI was 26; avg length of surgery was 132 minutes. No deficits were clinically detectable in sensory or motor exams at the first postoperative visit.

DISCUSSION:
The use of the nerve stimulator allowed us to leave the operating room confident we had protected the nerves. No patient had any detectable nerve deficits at the first postoperative visit. Therefore, the use of this technology provides a practical way for surgeons to avoid clinically relevant nerve injury during the Latarjet procedure.

REFERENCES:

ACKNOWLEDGEMENTS: None
DISCLOSURES: None
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TREATMENT OF ACUTE, UNSTABLE VERSUS CHRONIC, STABLE SLIPPED CAPITAL FEMORAL EPiphySIS USING THE MODIFIED DUNN PROCEDURE

Authors: Richard I. Davis II, MD; Freddie Persinger, DO; Kevin E. Klingele, MD
Presenter: Richard I. Davis, MD

INTRODUCTION: The modified Dunn procedure (open subcapital realignment via a surgical dislocation approach) has been shown to be a safe and effective way of treating acute, unstable slipped capital femoral epiphysis (SCFE). Multiple studies have shown restoration of anatomy and function with low rates of complications, including avascular necrosis. On the contrary, there is a paucity of literature comparing the same procedure in stable SCFE. The purpose of this study was to compare a single surgeon's experience of treating acute, unstable versus chronic, stable SCFE managed with the modified Dunn procedure.

METHODS: From November 2006 to April 2014, 31 consecutive hips (29 patients) with acute, unstable SCFEs, and 17 consecutive hips (15 patients) with chronic, stable SCFE were treated with the modified Dunn procedure. Patients with underlying endocrinopathy or syndromes were excluded. A retrospective review was performed using operative reports, inpatient and outpatient charts, and pre and postoperative radiographs. Demographics, multiple radiographic measurements, and complications were recorded and compared. Chi-squared and T-tests were used to compare variables.

DATA AND RESULTS: 31 consecutive hips (29 patients) with acute, unstable slips, and 17 consecutive hips (15 patients) with chronic, stable slips were reviewed. Average age was 12.5 and 13.8 years for acute and chronic respectively (p=0.05). Mean follow-up was 23.5 months (acute) and 35.5 months (chronic). No statistical significance was seen between the groups in regards to follow-up time, heterotopic ossification, or removal of symptomatic hardware.

Average post operative Southwick angle was 15.5 (acute) and 23.1 (chronic) (p=0.027). Greater trochanteric height averaged 6.2 mm below the center of femoral head in the acute group and 5.8 mm above the center of the femoral head in the chronic group (p<0.001). Average femoral neck length measured 34.1 mm (acute) and 27.1 mm (chronic) (p<0.001). Two patients (6%) developed avascular necrosis (AVN) in the acute group and 5 patients (29.4%) in the chronic group which was statistically significant (p=0.027). Three patients in the chronic group developed post-operative hip subluxation or dislocation requiring additional treatment compared with none in the acute group. All patients with hip instability developed AVN.

DISCUSSION: While both acute and chronic SCFE can be successfully treated with the modified Dunn procedure, the complication rate is statistically higher in patients with chronic SCFE, specifically both AVN rate and post-operative instability. We also showed that normal anatomy is more difficult to establish in regards to greater trochanteric height and femoral neck length. The modified Dunn procedure has great utility in the correction of the anatomic deformity associated with SCFE, but should be used cautiously in patients with chronic, stable SCFE.

REFERENCES:

ACKNOWLEDGEMENTS: None
DISCLOSURES: None
INTRODUCTION:
There is limited data on outcomes after primary repair of peroneal tendons. The current literature is limited to small cohorts and are mostly retrospective. The purpose of this study is to identify a more extensive number of patients who underwent primary repair of the peroneus brevis tendon, and evaluate clinical outcomes.

We hypothesized that patients undergoing primary repair would see improvements on the Foot and Ankle Ability Measure (FAAM) and the Foot Function Index (FFI) postoperatively as well as return to previous activity level.

METHODS:
A retrospective chart review of a single foot and ankle specialty practice was performed to identify all patients who had undergone primary repair of the peroneus brevis from January, 2008 to January, 2012. A total of 201 patients over the age of 18 with acute or chronic tears that were repaired primarily with or without biologic augmentation were included. Patients were asked to complete a follow-up questionnaire, the FAAM questionnaire, as well as the FFI to compare pre-op and post-op scores. A 2-sided paired t-test was used to compare FFI scores between the pre-op and post-op periods. Statistical difference was set at p<0.05. A power analysis showed that 16 patients would be needed to detect a difference of 24 points on the FFI.

DATA AND RESULTS:
Of the 201 patients who underwent primary peroneus brevis repair, 71 (35.3%) returned the patient follow-up and FAAM questionnaire, and 52 completed the Foot Function Index questionnaire prior to surgery as well as post-op. Of the patients who returned the follow-up questionnaire, all patients had at least 2.9 to 7 years of follow-up, with a mean follow-up of 4.6 years. The average age at time of surgery was 44.3 years, and 107 (53.2%) were female. The mean post-op Visual Analog Score was 1.3.

The majority of patients reported the return to pre-injury athletic activities at a rate of 76.5%, with 62.3% returning to the same level of activity one year post-op. 56.3% of patients were very satisfied, 29.6% somewhat satisfied, 7% somewhat dissatisfied, and 1.4% very dissatisfied with their outcome. 91.4% of patients reported they would choose to undergo the same procedure again.

The mean FAAM score was 85.2 out of 100 points at follow-up. The mean preoperative FFI score was 41.1, and the postoperative mean improved to 12.2. This was a significant decrease in the FFI score of 28.9 points after primary repair. Additional procedures performed at the time of repair most commonly included peroneal tendon synovectomy (41.8%), Brostrum lateral ligament reconstruction (31.3%), and superior peroneal retinaculum (SPR) repair (29.4%).
DISCUSSION:
Peroneus brevis tears are a source of chronic pain and disability. With <50% cross sectional diameter involvement, peroneal brevis tears are amenable to repair with good clinical outcomes. Most previous studies have included smaller patient numbers, and some include both tenodesis and repair in analysis. However most patients return to work or athletic activity after repair. This is the largest retrospective peroneal repair study to date. Our outcomes show that primary repair of peroneal brevis tendons provide consistent statistical improvement in clinical outcomes in the majority of patients, as measured by validated scoring system, the FFI. FAAM scores demonstrate good function compared to historical controls. The majority of patients are able to return to pre-injury athletic activities at a similar level of intensity. Weaknesses of the study include retrospective design as well as recall bias with completion of questionnaires.

REFERENCES:

ACKNOWLEDGEMENTS:
Emily Stansbury and Carrie Kall, OFAC Research Coordinators.

DISCLOSURES:
This study was not funded, and there are no disclosures.
INTRODUCTION:
Patellar instability (PI) is a common cause of anterior knee pain and disability in the pediatric population. The use of patellofemoral measurements on MRI provides a quantitative means for PI assessment and has now become an important diagnostic tool, but these techniques largely rely upon adult standards. Our goal is to describe morphologic trends in the skeletally immature knee and to predict the age at which adult norms can reliably be used in the evaluation of the pediatric knee.

METHODS:
We retrospectively reviewed 144 normal knee MRIs in 133 skeletally immature patients that presented between 2002-2014. Patients were equally distributed by age and gender with ages ranging from 1-16. MRI exclusion criteria included: moderate to severe effusions, cartilaginous defects, patellofemoral abnormalities, ligamentous injury, neoplasms, infection, congenital disease, or arthritic changes. All 1 and 2 year olds were included due to lack of MRIs and only females younger than 15 were used to account for anticipated physeal closure. On axial MRI sequences containing the largest femoral condyle width, we measured: lateral trochlear inclination (LTI), trochlear facet asymmetry (TFA), trochlear depth (TD), tibial tuberosity-trochlear groove distance (TTTG), and sulcus angle (SA). Patellar height ratio (PHR) was recorded on midline sagittal MRI. All measurements used cartilaginous landmarks and results were stratified based on age and gender. Each measurement was charted in a linear regression model with 95% Confidence Limits and compared to adult normative data to provide a “cutoff” age between children and adults. T-test analysis was then used to further compare younger children to the children at or above our regression cutoff. (p < 0.05).

DATA AND RESULTS:
Each measurement can reliably be performed at all ages with good inter- and intraobserver reliability. All MR measurements were graphically represented in a linear regression model and are shown to approach adult norms with increasing age. The age at which there is no statistical difference between our pediatric patients and the adult norms is shown as the “regression cutoff” (Table 1). Further t-test analysis suggests a 2nd cutoff that serves as the age at which younger should not be compared to adult norms (Table 1).

<table>
<thead>
<tr>
<th>Prediction Model</th>
<th>Regression Analysis</th>
<th>Predicted Mean at Regression Cutoff Age</th>
<th>Adult Mean Values</th>
<th>T-test Cutoff Age</th>
<th>Observed Mean</th>
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1. Based on linear regression model with 95% Confidence Limits
2. Age at which younger children are statistically significant when compared to children ≥ regression cutoff age, p value < 0.05
3. Data shown as an inverse ratio for comparison to the external trochlear to internal trochlear (ETIT) ratio as described by Charles et al
4. Mean values as described by Charles et al.
DISCUSSION:
The measurements commonly used to evaluate for patellar instability in the adult population are subject to considerable variation throughout skeletal maturation. Based on our analysis, children < 10 years of age should not be compared to adult standards. Conversely, children ≥ 10 appear to have reached near patellofemoral maturation and are consistently shown to be within adult norms.

Recognition of age-based morphologic trends allows for early and accurate identification of patellar instability in the pediatric population, and as a result, may lend to improved treatment modalities and patient outcomes.

REFERENCES:
2. Charles et al. AJSM. 41(2):374-84. 2013

ACKNOWLEDGEMENTS:
Yurong Lu: Biostatistician, NCH
INTRODUCTION:
The risk of deep venous thrombosis (DVT) and pulmonary embolism (PE) after knee arthroscopy has been investigated in recent systematic reviews. To date, no systematic review has investigated the risk of DVT and PE strictly after anterior cruciate ligament reconstruction (ACLR). The objectives of this study were to 1) Quantify the incidence of DVT or PE after ACLR and 2) identify risk factors associated with the development of DVT and PE after ACLR.

METHODS:
We performed a systematic review of the English language literature to assess the incidence of venous thromboembolic complications after ACLR. A thorough search of databases including PubMed, EMBASE, CINAHL, Cochrane Library, and Web of Science was completed. Studies in which all patients were screened for DVT with imaging, studies involving large databases, and randomized controlled trials (RCTs) were reviewed. Non-English, non-human subjects, and unpublished studies were excluded. Data regarding DVT prophylaxis, patient number, mean age, gender, risk factors, surgical details, time of DVT examination, symptomatic vs. asymptomatic DVT, diagnostic method of detecting DVT, total DVT number (proximal or distal), and the total PE number were extracted from the included studies. The data were collated to estimate the total incidence of DVT/PE after ACLR.

DATA AND RESULTS:
Eleven studies fit the inclusion criteria: 7 studies in which all patients underwent screening imaging for DVT, 3 studies involving large databases, and 1 RCT. In the 7 screening studies, the incidence of DVT was 9.70% (83/856), with one PE (0.12%, 1/856). Exclusion criteria set forth in these screening studies included known risk factors of DVT, such as older age, elevated BMI, history of DVT, patients on antithrombotic or antiplatelet medications, and patients requiring additional procedures on the same knee. Additionally identified risk factors included age greater than 35, female gender, and tourniquet use greater than 2 hours. In the 3 database studies, the available data indicated that the incidence of symptomatic DVT was 0.23% (70/30,133), with a 0.13% incidence of PE (40/30,133). Age > 40 was identified as a risk factor in one of these database studies. The 1 RCT reported a DVT incidence of 17.1% (30/175) and no PEs. Patients were divided into a control group receiving short duration prophylaxis and an experimental group receiving extended duration Enoxaparin. The control group had a DVT incidence of 41.2% (28/68) and the experimental group had an incidence of 2.8% (72). Identified risk factors included age > 30 and preoperative immobilization. Both groups reported zero PE’s.

DISCUSSION:
The primary finding of this systematic review is that the incidence of DVT and PE after ACLR in screening studies is 9.70% and 0.12% and in database studies is 0.23% and 0.13%, respectively. The discrepancy in DVT incidence is due to the fact that screening studies detect asymptomatic DVT, whereas database studies detect only symptomatic DVT. Whether asymptomatic DVT should be prophylaxed against or sought out is controversial. RCT data suggests that the use of prophylaxis after ACLR may significantly decrease the incidence of asymptomatic DVT. Known risk factors for
INCIDENCE AND RISK FACTORS OF DVT/PE AFTER ACLR—A SYSTEMATIC REVIEW, CONT'D.

Presenter: Mark Sommefeldt, MD

DVT include previous DVT/PE, female gender, age>45-50, history of malignancy, oral contraceptives or hormone therapy, and varicose veins. In this review, age>30-40, female gender, preoperative immobilization and prolonged tourniquet use were identified as factors associated with increased risk of DVT after ACLR.

REFERENCES:

DISCLOSURES:
None.
PEDIATRIC DIAPHSEAL FEMUR FRACTURES: A COMPARISON OF OUTCOMES AFTER SUBMUSCULAR PLATING, FLEXIBLE INTRAMEDULLARY NAILING, AND RIGID INTRAMEDULLARY NAILING

Authors: Sean Sutphen DO, Juan Mendoza BS, Andrew Mundy MD, Jingzhen Yang PhD MPH, Allan Beebe MD, Kevin Klingele MD

Presenter: Sean Sutphen, DO

INTRODUCTION:
Pediatric diaphyseal femur fractures account for 1.7%\(^1\) of all pediatric fractures with the annual incidence estimated at 19 per 100,000.\(^2,3\) Fracture management is influenced by associated injuries, patient age, fracture characteristics, body weight, and cost. Over the past decade, surgical stabilization has gained favor in the management of femoral shaft fractures in skeletally immature children. Options for surgical stabilization include plate fixation, flexible intramedullary nailing, and rigid intramedullary nailing. Each method has unique advantages and disadvantages, with the ideal technique largely debated. The purpose of this study is to compare the radiographic and clinical outcomes of pediatric diaphyseal femur fractures treated by submuscular plating, flexible intramedullary nailing, or rigid antegrade intramedullary nailing using a trochanteric entry point in skeletally immature patients aged eight years and older.

METHODS:
We conducted a retrospective review of skeletally immature patients aged eight and older who were treated with submuscular plating, flexible intramedullary nailing, or rigid intramedullary nail from 2001-2014 with a minimum 12-week follow-up. Treatment outcomes were compared for statistical significance, including time to union, malunion, nonunion, heterotopic ossification, avascular necrosis, time to full weight bearing, limb-length discrepancy, residual limp, painful hardware, infection, and hardware removal.

DATA AND RESULTS:
We identified 198 femur fractures in 196 patients (mean age, 11.9 years). Each femur fracture was treated with submuscular plating (35), flexible intramedullary nailing (61), or rigid intramedullary nailing (102). Mean follow-up across the cohort was 48 weeks, ranging from 12 to 225 weeks. Flexible nailing was found to have an increased incidence of malunion ($p<.0001$), hardware irritation ($p=.0204$), and time to full weight bearing ($p=.0018$). Rigid nailing had an increased incidence of limp at the 12-week follow-up ($p=.0412$). Additionally, 23.5% of the rigid nail patients developed heterotopic ossification. Submuscular plating allowed for quickest time to FWB (7 weeks) and the fastest healing rates (6 weeks) amongst all surgical methods. Incidence of limb-length discrepancy was not statistically significant between the three groups, and in all patients, there was no evidence of avascular necrosis.

<table>
<thead>
<tr>
<th>Results</th>
<th>Rigid Nail</th>
<th>Flexible Nail</th>
<th>Submuscular Plate</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total N=198</td>
<td>102</td>
<td>61</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Time to union in weeks*</td>
<td>11.1</td>
<td>8.1</td>
<td>6.2</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Time to full weight bearing in weeks*</td>
<td>9.5</td>
<td>12.1</td>
<td>7</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Fluoroscopy time in seconds*</td>
<td>218</td>
<td>108</td>
<td>85</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Limb at 12 weeks</td>
<td>24 (12.8%)</td>
<td>10 (16.7%)</td>
<td>5 (5.9%)</td>
<td>0.0514</td>
</tr>
<tr>
<td>Hardware irritation</td>
<td>13 (6.8%)</td>
<td>14 (23.3%)</td>
<td>1 (2.9%)</td>
<td>0.0204</td>
</tr>
<tr>
<td>Hardware removal</td>
<td>20 (10.6%)</td>
<td>30 (49.2%)</td>
<td>20 (37.1%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Limb-length discrepancy</td>
<td>5 (4.9%)</td>
<td>3 (4.9%)</td>
<td>1 (2.9%)</td>
<td>0.6827</td>
</tr>
<tr>
<td>Malunion</td>
<td>2 (2.6%)</td>
<td>3 (4.9%)</td>
<td>2 (2.9%)</td>
<td>0.6827</td>
</tr>
<tr>
<td>Heterotopic ossification</td>
<td>24 (12.8%)</td>
<td>0 (0.0%)</td>
<td>2 (5.9%)</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

*Values are given as the mean
PEDIATRIC DIAPHSEAL FEMUR FRACTURES: A COMPARISON OF OUTCOMES AFTER SUBMUSCULAR PLATING, FLEXIBLE INTRAMEDULLARY NAILING, AND RIGID INTRAMEDULLARY NAILING

Presenter: Sean Sutphen, DO

DISCUSSION:
Our results indicate a 100% union rate in femoral shaft fractures treated in skeletally immature patients older than eight years of age utilizing one of the three described techniques. Submuscular plating resulted in faster times to union and full weight bearing with minimal complication rates. Rigid, trochanteric-entry, intramedullary nailing resulted in a lower incidence of malunion and hardware-related complications, however, there was an increased incidence of heterotopic ossification and residual limp postoperatively. Flexible, retrograde intramedullary nailing resulted in the highest rates of malunion and hardware irritation, along with longest delay to full weight bearing.

REFERENCES:

DISCLOSURES:
None
ANALYSIS OF PLANTAR FASCIITIS WEBSITES USING THE DISCERN INSTRUMENT

Authors: Sean Reyes, DPM, Christy Ortigas
Presenter: Sean Reyes, DPM

INTRODUCTION:
Patients and healthcare providers have become increasingly dependent on using the internet as the primary source of information. Eighty percent of internet users look up medical information online, making it the third most searched topic on the internet. The information on the internet, however, varies in quality, accuracy, readability, and remains uncontrolled. There are numerous websites on nearly every health topic and many have no rules overseeing the quality of information that is provided. One of the most common foot complaints is plantar fasciitis. The objective of this study is to determine the quality of plantar fasciitis websites using the DISCERN instrument. Furthermore, it seeks to assess readability of these websites through the Flesch-Kincaid Algorithm, the factors that affect variability in DISCERN Scores and grade levels, and the relationship between quality and readability.

METHODS:
Two key terms (“plantar fasciitis” and “heel pain”) were used in Google and Yahoo search engines. The DISCERN instrument was utilized to evaluate these websites. DISCERN is an instrument or tool used to measure the quality of health information based on its content, and helps consumers decide what treatment choices are good for them. Readability ratings were assessed using the Flesch-Kincaid Readability Algorithm. The two-sample t-test (using alpha = 0.05) assuming equal variances (if $f > f_{critical}$) and unequal variances (if $f < f_{critical}$) were used to explain the variability in DISCERN scores and grade level readability. The independent variables for testing these variability were potential for commercial gain, health related seals of approval, language(s) and multimedia features. Lastly, Pearson r was used to test the correlation between the DISCERN Scores and grades.

DATA AND RESULTS:
A total of 100 websites were assessed. 10 were eliminated in accordance with the exclusion criteria and 55 duplicate websites were excluded, leaving 35 unique websites (see Fig. 1). In assessing the quality of the unique websites, of a maximum score of 80, the overall average DISCERN Score was 51.0 (SD=15.5) and readability (grade level) of 58.1 (9.4) (SD=2.0). The t-tests demonstrated that websites seal of approval ($p =0.002$) and potential for commercial gain ($p = 0.017$) were contributing factors to higher and lower DISCERN scores, respectively, while none of the independent variables made a significant difference on grade level readability, as indicated by their $p$ values ($p > 0.05$). Pearson r showed no correlation between DISCERN Scores and grades ($r = 0.264$).
ANALYSIS OF PLANTAR FASCIITIS WEBSITES USING THE DISCERN INSTRUMENT, CONT'D.

Authors: Sean Reyes, DPM, Christy Ortigas
Presenter: Sean Reyes, DPM

DISCUSSION:
The mean DISCERN Score for the 35 unique websites was 51.0, which suggests information of moderate quality with potentially important but not serious shortcomings. The mean grade level readability was 9.4, indicating a fairly difficult reading level which would require some high school degree. The potential implications of this study for clinical practice are limited to treatment because DISCERN was designed for that purpose. Websites with a seal of approval contributed to higher DISCERN scores. This suggests that websites should strive to get a health-related seal of approval. However, websites that aim to sell commercial products contributed to lower DISCERN scores. Since these websites are more focused on commercial gain, this means that patients should be educated to avoid them because of the poorer quality of health information.

REFERENCES:
INTRODUCTION
Antibiotic-loaded bone cement is a primary option for the treatment of prosthetic infections. Poly(methyl) methacrylate (PMMA) and calcium sulfate (CaSO₄, Stimulan) based cements loaded with antibiotics are generally used. However, the antibiotic release dynamics and efficacy in different cement materials is unclear. We hypothesized that the antibiotics loaded bone cement, PMMA and Stimulan would have (i) different elution characteristics and (ii) different efficacy against planktonic and lawn biofilms.

METHODS
Fluorescein was used as a standard to study elution kinetics in agar medium. Fluorescein beads prepared in PMMA and Stimulan were placed on 1% agar surfaces and fluorescein release was measured using BioRad GelDoc. To test the efficacy of antibiotics in PMMA and Stimulan, beads with and without vancomycin and tobramycin antibiotics were prepared. Antibacterial activity was determined against bioluminescent methicillin resistant Staphylococcus aureus and Pseudomonas aeruginosa on Brain Heart Infusion (BHI) and Luria Bertani (LB) agar, respectively. Antibiotic beads were placed on (i) planktonic cells spread on agar surface and (ii) biofilm lawns formed for 24h at 37°C. Zone of inhibition (ZOI) was measured at different time intervals.

DATA AND RESULTS
Stimulan loaded with fluorescein showed better release than with PMMA (Figure 1).

Figure 1: Short term release of fluorescein from Stimulan and PMMA
Antibiotic efficacy was higher in Stimulan with faster rate of killing than in PMMA against planktonic and lawn biofilm bacteria (Figure 2).

Figure 2: Efficacy of tobramycin loaded PMMA and Stimulan beads against lawn biofilm of *P. aeruginosa* Xen41.

**DISCUSSION**

Antibiotic loaded CaSO₄ (Stimulan) had greater short term rate of elution than PMMA. The higher rate of elution could be due to absorbable feature of CaSO₄ as compared to the dense PMMA. This was also evident from the increased rate of killing of lawn biofilm bacteria with antibiotic loaded Stimulan than with PMMA. These findings provide further evidence that antibiotic loaded bone cements are effective in the treatment of biofilm related prosthetic infections.

**REFERENCES**


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**DISCLOSURES**

PS has consulted for Biocomposites Ltd.
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For coordinating the scientific presentations

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