

Poster Abstracts

(An asterisk (*) by an author's name indicates the presenter.)

Poster 1

***In Vivo* Graft Deformation in Transtibial and Tibial Tunnel Independent ACL Reconstruction Techniques**

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Introduction: Grafts placed closer to the anatomical ACL center are believed to more closely reproduce native ACL deformation. The purpose of this study was to compare the ability of transtibial and tibial tunnel independent techniques to restore native ACL deformation during weight-bearing flexion in patients.

Methods: 12 patients reconstructed with a transtibial technique and 9 with an independent technique were recruited. All had normal contralateral knees. MRIs were obtained for all subjects and used to create 3D models of both knees. Biplanar fluoroscopic images were obtained of each patient as they performed a single-leg lunge from 0° to 90° flexion. The paired images and 3D models were used to reproduce each subject's *in vivo* knee motion. From these models, the orientation and lengths of native ACL and graft were measured.

Results: In the sagittal plane, the transtibial grafts were statistically more vertical than those placed using an independent technique between 0-75° flexion. At extension, transtibial grafts were $12 \pm 8^\circ$ more vertical than the native ACL, while independent placed grafts were $3 \pm 4^\circ$ more horizontal. In the coronal plane, the transtibial grafts were more vertical than the native ACL from 0 to 90° flexion, and statistically more vertical than those placed using an independent technique between 45 to 60° flexion. Lastly, transtibial grafts were $4 \pm 2\text{mm}$ longer than native at extension, and increased to $6.4 \pm 2\text{mm}$ longer than native at 45° flexion. The lengths of the independently placed grafts were statistically closer to the length of

the native ACL. Independent grafts were within 2mm of the native ACL.

Conclusion: ACL grafts placed with an independent approach more closely reproduce native ACL deformation and elongation during weight-bearing flexion compared to grafts placed using a transtibial technique. Such a graft is more likely to restore normal knee function.

Poster 2

Survival of the Mayo Conservative Femoral Stem Compared to a Conventional System

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Introduction: Short stem hip prostheses have been designed for younger patients in an attempt to preserve bone stock for future revision. One such design, the Mayo Conservative Hip, utilizes a tight proximal interference fit to achieve initial stability. Only two studies have been published regarding mid-term performance of this prosthesis.

Methods: We retrospectively compared outcomes in a single-surgeon series of 125 patients who received Mayo Conservative Stems with a concurrent series of patients who received VerSys cemented ($n = 55$) and uncemented ($n = 55$) stems. Kaplan-Meier survivorship curves were constructed with revision due to aseptic loosening as an endpoint.

Results: Kaplan-Meier analysis for aseptic loosening yielded five-year survivorship of 82.3% for the Mayo Conservative Hip Stem versus 100% for both the VerSys groups.

Discussion and Conclusion: The survivorship of the Mayo Conservative Hip Stem was significantly worse than two more traditional designs in the mid-term, and worse than previously reported series with the same prosthesis.

Poster 3

Alternative Techniques for Repeat Sural Nerve Autograft: A Functional Analysis in Rats

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Introduction: The most common source of nerve for an autograft procedure is the sural nerve. Once a portion of sural nerve has been removed, current thinking dictates that no further segments of the ipsilateral sural nerve may be utilized for future autografts. Additional nerve segments must be excised from the contralateral. The rationale behind the thinking that only one excision can be harvested per sural nerve for use in autograft is not clear. If the graft efficacy of a proximal ipsilateral segment of sural nerve was demonstrated to be the same as the in-tact contralateral nerve, this would provide several important benefits, namely the avoidance of morbidity associated with destruction of both sural nerves in patients requiring repeat autografts.

Methods: Sciatic nerves were transected in S-D rats. In all of these rats, sural nerve lesions were also created in the ipsilateral leg. At 8-weeks post-injury, one group of rats was repaired by cable graft technique using the in-tact contralateral sural nerve. Another group of rats was repaired using the proximal stump of the degenerated ipsilateral sural nerve. Motor function was analyzed using walking track analysis and calculation of SFI for up to 8 weeks post-repair. EMG was performed in order to compare the CMAP amplitude in the fresh contralateral graft versus the previously injured ipsilateral graft.

Results: SFI and EMG analysis showed no statistically significant difference between the two autograft groups (ipsilateral and contralateral).

Discussion and Conclusion: Cable graft repair of a sciatic nerve lesion in a rat using an ipsilateral segment of a sural nerve that is proximal to a prior transection site resulted in recovery comparable to repair using a contralateral segment of sural nerve. Therefore, the proximal segment of a previously transected sural nerve is a suitable donor for autograft repair of peripheral nerve lesions in rats.

Poster 4

Prevalence and Treatment of Methicillin-Resistant Staphylococcus Aureus in Hand Infections Presenting to an Urban Setting

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Introduction: The prevalence of methicillin-resistant Staphylococcus aureus (MRSA) infection is increasing. The purpose of this study was to determine retrospectively the incidence of community-acquired MRSA in hand infections in an urban hospital. Additionally, the susceptibility to 3 antibiotics (Cefazolin, Clindamycin, Vancomycin) commonly used to treat hand infections was evaluated.

Methods: We retrospectively evaluated 72 patients who presented with hand infections to Washington Hospital Center from the years 2003-2008. The specimens obtained during the initial evaluation and treatment were cultured and subjected to antibiotic susceptibility testing. We excluded any nosocomial infections, fight bites, and animal bites.

Results: Forty-one (59%) of 72 patients were MRSA positive. Of the MRSA-positive infections, 100% were susceptible to Vancomycin, 95% were susceptible to Clindamycin, and 0% were susceptible to Cefazolin. Among the 72 patients, the susceptibilities to Vancomycin, Clindamycin, and Cefazolin were 100%, 88%, and 28%, respectively.

Discussion and Conclusion: The rate of community-associated MRSA hand infections in an urban setting is higher than previously suspected. This should be taken into account when managing seemingly routine hand infections given that the treatment options are different for MRSA infections. Specifically, Cefazolin should be avoided as an empiric antibiotic in favor of Vancomycin or Clindamycin.

Poster 5

Does Screw Orientation Play a Role in Fracture Fixation?

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Introduction: The most common and most challenging fracture of the patella for fixation is the transverse fracture. Recently, momentum is shifting from the traditional modified tension band technique using parallel K wires to parallel screw fixation using cannulated cancellous screws with a tension band construct (wire or suture). It is theorized that the orientation of the screws could directly affect the failure rate of the fixation technique. The objective of this study is to compare the traditional 0° parallel screw orientation to a 180° screw orientation.

Methods: The 4.5 mm cannulated cancellous screw was selected for testing from 3 manufacturers demonstrating 3 different designs. The Synthes screw was partially threaded (distally), composed of stainless steel, and designed with a head. The Acutrak screw was headless, fully threaded with a tapered design, and composed of titanium. The Tri-med screw was partially threaded (proximal and distal), composed of titanium, and designed with a countersunk head. Homogenous polyurethane foam with a density compatible with the cancellous bone of the patella was cut into blocks, and a transverse fracture was created. The blocks were tested in tension and 3 point bending.

Results: The Tri-med screw had the highest load to failure with a mean tensile load of 1465 +/- 161 N at 0° and 1435 +/- 155N at 180°. For the Synthes screw, the difference between the 0° and the 180° load at failure in tension was statistically significant (p0.05). Regarding 3 point bending, the Acutrak screw had the highest mean load for crack initiation with a mean compressive load of 670 +/- 139 at 0° and 715 +/- 157 N at 180° (p0.05).

Discussion and Conclusion: The data reflects screw design as screw fixation depends on the purchase of threads in the cancellous bone of the patella.

Poster 6

The Range of Clinical Presentation and Operative Findings at Revision for Failed Metal-On-Metal Hip Arthroplasty

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Introduction: A number of recent reports have described novel failure mechanisms of metal-on-metal bearings in total and resurfacing hip arthroplasty. Hip arthroplasties with metal-on-metal articulations are also subject to the traditional methods of failure seen with different bearing couples. The present study sought to identify the multiple clinical presentations and operative findings of failed metal-on-metal hip arthroplasties that have required revision at our institution.

Methods: Our institutional patient database was reviewed to identify all metal-on-metal total hip or resurfacing arthroplasties revised over the past 3 years. This included all cases sent to our institution for revision from outside institutions as well as revisions for cases performed at the clinic.

Results: Of the 37 revisions identified, ten cases were revised for presumed hypersensitivity specific to the metal-on-metal articulation. This group included eight cases with tissue pathology confirming chronic inflammation with lymphocytic infiltration. Aseptic loosening of a monoblock screwless un cemented acetabular component occurred in nine patients. Two revisions were performed for mechanical problems associated with a large diameter femoral head. Three revisions were for femoral neck fracture after resurfacing arthroplasty. The remainder of the cases were revised other reasons, including infection, instability, component malposition, and periprosthetic fracture.

Discussion and Conclusion: Increased awareness of the modes of failure will bring to light the potential complications particular to metal-on-metal articulations while placing these complications into the context of risks associated with all hip arthroplasties.

Poster 7

The Incidence of Wound Complications Related to Power Outage During Negative Pressure Wound Therapy with Interruption of Treatment in Orthopedic Trauma Patients

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Introduction: Negative pressure wound therapy (NPWT) using the Vacuum Assisted Closure™ system is an invaluable tool for use on patients with complex limb and soft tissue problems. Recently, the manufacturer made significant modifications to the NPWT platform, including computer software, battery, alarming systems, electric cord and plug apparatus, and others. Since these modifications, we have seen several cases in which the NPWT device has powered off resulting in an unrecognized interruption of therapy. We sought to evaluate the conditions and clinical effects, if any, to orthopedic trauma patients who experienced an interruption of NPWT therapy when the device powers off.

Materials and Methods: Retrospective study of consecutive patients treated at two neighboring regional trauma centers. There were 123 consecutive orthopedic trauma patients treated with NPWT by two orthopedic trauma surgeons between May and November 2008. Patient/injury, treatment, and perioperative clinical outcomes data (with emphasis on wound complications such as infection, graft loss, and unscheduled surgery) were collected from medical records and wound care databases.

Results: Twelve patients (10%) had problems with the NPWT device powering off causing an unrecognized interruption of therapy. Eleven patients underwent early (less than 6 hours) wound debridement and re-application of NPWT after detection, of which nine required unplanned surgery. Seven of the twelve patients recognized as having failed NPWT of this type ultimately experienced wound complications, including five deep infections (including one patient who was being treated for necrotizing fasciitis who died) and both patients being treated with an Integra® graft lost their graft.

Conclusions: We have seen substantial problems in orthopedic trauma patients treated with the NPWT, where the device has powered off resulting in an unrecognized interruption of therapy. This has resulted in atypically unhealthy appearing wounds, unplanned surgeries for debridement, and most importantly, an increased incidence of wound complications including infection and graft loss.

Poster 8

Orthopaedic Disability Impact of Combat Injuries Sustained in OEF and OIF

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Introduction: Our current conflicts in Operations Enduring Freedom and Iraqi Freedom have resulted in a significant number of injuries, 54% of which are orthopaedic in nature. To date, there is no published information of what problems these injuries present in the form of long term disability to our Armed Forces. This paper aims to identify what unfitting conditions exist among a cohort of war wounded service members.

Methods: Adopted from a previously published cohort of evacuated combat injured patients, 464 soldiers who had been placed before the Army's Physical Evaluation Board (PEB) where queried in the PEB database to determine board results and the codes indicating unfitting conditions. The soldiers' medical board records were then reviewed to determine what injuries and lasting diagnoses were related to their unfitting conditions. Orthopaedic related conditions were then further classified.

Results: 450 soldiers' board results were included, revealing that 69% of unfitting conditions as a result of combat wounds were orthopaedic in nature. The most common unfitting diagnosis was degenerative arthritis; however amputation had the greatest impact when the soldiers' disability rating (a percentage) was taken into account. Of the soldiers with an injury of the head, thorax, or abdomen that necessitated their evacuation from the combat theater who also had an orthopaedic injury, 84% had an orthopaedic diagnosis as their primary unfitting condition.

Discussion: While 54% of combat wounds in our current conflicts are to the extremities, 69% of the conditions precluding continued service on active duty as a result of combat wounds are orthopaedic in nature. This significant burden of disability due to orthopaedic conditions highlights the importance of further research into the caring for extremity trauma to minimize the long term disability associated with extremity injury.

Poster 9

Revision Arthroplasty with Custom Tri-Flange Acetabular Components for Massive Acetabular Bone Deficiency

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Introduction: This study evaluates the outcome of massive acetabular defects treated by custom tri-flange implants.

Methods: Between 2006-2008, 12 patients with severe acetabular defects were classified according to the AAOS system (Type III or IV) and the Paprosky system (Type 3B). Radiographs were reviewed for classification. Reconstruction was performed with custom tri-flange implants. Six males and six females with a mean age 68.1 years were followed for an average 19 months. Five were revised for infection and seven for mechanical failure. Patients averaged 3.5 prior hip procedures.

Results: Eight Type III/3B and four Type IV/pelvic discontinuities underwent reconstruction. Four patients (33%) sustained a postoperative motor deficit. There were two complete motor deficits (one sciatic – fully resolved by 12 months and one peroneal - persistent). Two partial peroneal palsies showed improvement by 12 months. All patients with a motor deficit had massive acetabular bone loss predominantly of the posterior column. Average increase in leg length for those with a motor deficit was 4.86 cm, those without was 2.05 cm. Patients with a motor deficit rated postoperative pain as 3 (scale 1 -10), those without rated their pain as 2; all were satisfied. Non-revision Harris hip scores improved from preoperative mean of 38 to postoperative mean of 70. One patient underwent early revision of the tri-flange component for aseptic loosening and one is scheduled for revision of the femoral component for aseptic loosening with subsidence. There have been no dislocations and no reoperations for infection.

Conclusion: The use of custom tri-flange acetabular components for reconstruction of massive acetabular bone loss can provide significant improvement in functional restoration of the limb as well as adequate pain relief. However, there may be a higher risk of nerve deficit in patients with severe bone loss predominately of the posterior column or lengthening of the extremity.

Poster 10

Use of Vacuum Assisted Closure in Pediatric Open Fractures with a Focus on the Rate of Infection

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Introduction: The vacuum assisted closure device has given the orthopaedist a new tool for managing severe open fractures and extremity trauma. The VAC's use within the pediatric community is also gaining favor, however, supportive data is still limited to small series and reports. Historical data suggests the rate of infection with pediatric open fractures may be as high as 27%. We suggest the use of the wound VAC within this patient population would decrease the rate of acute and chronic infections.

Methods: A retrospective chart review at a pediatric Level I trauma center was conducted over a 4.5 year span. Twenty-eight patients with 37 open fractures aged 2-17 years who had initial wound VAC therapy to help with soft tissue coverage were identified. Chart review was performed for evidence of acute or chronic infection.

Results: Of 37 pediatric open fractures treated with a wound VAC, there were no cases of superficial infection and two cases of deep infection for an overall infection rate of 5%. Both infections resolved with surgical intervention and antibiotics without development of chronic infection.

Discussion and Conclusion: When compared with historical controls, the use of the VAC for pediatric open fractures appears to be a safe and effective modality for reducing infection in pediatric open fractures and should be considered a valuable tool in treating these injuries.

Poster 11

The Effect of Axial Angle Acuity on Femoral Tunnel Length in ACL Reconstruction Utilizing an Anteromedial Portal

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Introduction: Femoral tunnel placement during anterior cruciate ligament (ACL) reconstruction remains the most technically demanding and critical portion of the procedure. Recently, femoral tunnel drilling via an anteromedial portal has been recommended as a means to place the femoral tunnel in a more anatomically correct position. However, the medial portal approach frequently results in “short femoral tunnels” which may be a concern with certain graft fixation methods, especially those utilizing suspensory fixation over a transverse post or suture loop. The purpose of this study is to correlate femoral tunnel length with axial drilling angle via the anteromedial portal.

Methods: Six anatomically correct saw bones knees were used for this study. With the knee flexed to 120°, tunnels were drilled through a simulated anterior medial portal with a custom outrigger guide. The guide provided consistently reproducible drilling angles of 20°, 40°, and 60° in the axial plane. Femoral tunnel lengths were recorded for each knee at each drilling angle. A one-way ANOVA ($\alpha = .05$) was conducted to compare tunnel length of the three rotational axis groups. Multiple comparisons were conducted using a Tukey post-hoc test.

Results: The average femoral tunnel lengths at 20°, 40° and 60° were 37.0 mm, 36.9 mm and 32.3 mm, respectively. The tunnels drilled at 20° and 40° were significantly longer than the 60° group. There was no difference detected between the 20° and 40° groups.

Discussion and Conclusion: Our study is the first to correlate femoral tunnel length with axial drilling angle. On the basis of this study, we recommend a 40° angle when approaching the lateral wall during femoral tunnel drilling via the anteromedial portal. The 40° angle will provide the surgeon maximum tunnel length, while avoiding the acute angle associated with drilling the tunnel at 20° in the axial plane.

Poster 12

Air Versus Ground Transport in Spine Injured Patients: Does It Matter?

Wayne Kelley Jr., MD

Introduction: Helicopter transport (HEMS) is perceived to be safer than ground transport (GT) for the inter-hospital transfer of patients who have sustained spine injury. However, the use of HEMS is facing public scrutiny due to its significantly greater cost and recent fatal crashes during HEMS. The objective of our study was to determine whether GT for transport of spine injury patients results in less favorable outcomes than HEMS.

Methods: Retrospective review of all patients transferred to a level I trauma center between 1/06 – 12/07 with ICD-9 codes for injury to the spine. Patient records were reviewed for demographics and injury details; all available spine radiographs were reviewed by an orthopedic surgeon blinded to clinical data and transport type. Chi-square, t-tests and multivariate linear and logistic regression models were done using STATA v.10.

Results: A total of 274 spine injury patients were included in our analysis, 84 (31%) of whom were transported by HEMS and 190 (69%) by GT. None of the GT patients had any deterioration in neurologic exam or any detectable alteration in the radiographic appearance of their spine injury attributable to the transportation process. 175 patients (64%) were discharged to home, 15 patients expired (5%), and 84 (31%) were discharged to extended care facilities. After adjusting for patient age and Injury Severity Score, use of GT was not a significant predictor of in-hospital mortality (OR 1.4; 95% CI 0.3 – 5), hospital LOS (11.2 + 1.3 vs. 9.5 + 0.8 days, $p=0.3$), or non-routine discharge (OR 1.1; 95% CI 0.5 – 2.2).

Conclusions: GT for inter-hospital transfer of patients with spinal injury appears to be safe and suitable for patients who lack other compelling reasons (traumatic brain injury, imminent life or limb threatening injury) for HEMS. A prospective analysis of transportation mode in a larger cohort of patients is needed to verify our findings.

Poster 13

***In Vivo* Wear Rate of Ultra-High Molecular Weight Polyethylene (ASTM F 648) Sterilized with Ethylene Oxide Gas**

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Introduction: Ultra-high molecular weight polyethylene (UHMWP) which has not been cross-linked and sterilized with gamma irradiation has been largely abandoned as a weight bearing surface for total hip arthroplasties (THA). Previously, ethylene oxide gas was used for sterilization without prior cross-linking. In this study, we retrospectively review ethylene oxide sterilized UHMWP acetabular cups and measure in vivo polyethylene wear.

Methods: In this retrospective study, 56 patients were identified who underwent primary THA utilizing conventional metal components. Polyethylene acetabular cups were sterilized with ethylene oxide. The polyethylene was made with UHMWP which was not cross-linked. Post-operative and follow-up appointment radiographs were evaluated utilizing the Martell computer-assisted hip analysis software, allowing comparative measurements and calculations using pixilated components. Data collected included vector wear (mm/year), wear displacement (mm/year) and volumetric wear (mm³/year). Measurements were made by two of the authors and averaged for a final reportable value.

Results: Vector wear, wear displacement and volumetric wear were 0.410 mm/year, 0.399 mm/year and 205.5 mm³/year, respectively. These wear rates are higher than historically published results (average vector wear between 0.1-0.2mm/year) using UHMWP sterilized with 2.5 megarads irradiation resulting in some cross-linking of the polyethylene. In this study, we retrospectively review a series of THAs that were done between 1996-2002. The polyethylene acetabular liner being evaluated did not undergo any gamma irradiation thus did not have any cross-linking. While this has been shown to increase fracture resistance, it has not been previously reported to decrease wear

Discussion and Conclusion: The results of our study support the adoption of current techniques of gamma irradiation, annealing and final sterilization. The polyethylene wear rate reported herein is 4-8 times higher than highly cross-linked UHMWPs that are currently available. This study also fills a hole in the literature discussing the development of weight bearing surfaces utilized in THAs.

Poster 14

Mechanical Testing of a Novel ACL Reconstruction Technique with Aperture Fixation and Circumferential Ingrowth

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Introduction: Interference screws are the gold standard for bone-tendon-bone graft (BTB) fixation during ACL reconstruction and are commonly used for soft tissue grafts. This study compares a novel ACL fixation technique and instruments to this standard.

Methods: Common bone tunnels were created in 10 immature porcine femurs and tibias. A novel ACL reconstruction technique was used to secure these grafts using a specialized #5 suture. Novel instrumentation guides the creation of trans-osseous bone tunnels at specific angles and spacing allowing multiple sites of graft fixation. Load to failure testing was conducted using a materials testing system and specially fabricated fixation jigs. The jigs directed the pull force collinear to the bone graft tunnel being tested.

Results: The mean failure for the BTB graphs occurred at 606 ± 141 N and 386 ± 90 N for the femur and tibia respectively. The mean failure for the soft tissue graphs were 482 ± 83 N and 465 ± 108 N for the femur and tibia respectively.

Discussion and Conclusion: Our results indicate that ACL fixation in an immature porcine model using our novel ACL fixation technique equals or surpasses published ACL fixation strengths using interference screws in human and animal cadaveric models. In addition to the fixation strengths demonstrated herein, the implied benefits of our method include aperture fixation and circumferential healing of the graft (soft tissue or BTB) on both the tibial and femoral side of the ACL reconstruction. **Introduction:** Interference screws are the gold standard for bone-tendon-bone graft (BTB) fixation during ACL reconstruction and are commonly used for soft tissue grafts. This study compares a novel ACL fixation technique and instruments to this standard. **Methods:** Common bone tunnels were created in 10 immature porcine femurs and tibias. A novel ACL reconstruction technique was used to secure these grafts using a specialized #5 suture. Novel instrumentation guides the creation of trans-osseous bone tunnels at specific angles and spacing allowing multiple sites of graft fixation. Load to failure testing was conducted using a materials testing

system and specially fabricated fixation jigs. The jigs directed the pull force collinear to the bone graft tunnel being tested. Results: The mean failure for the BTB graphs occurred at 606 ± 141 N and 386 ± 90 N for the femur and tibia respectively. The mean failure for the soft tissue graphs were 482 ± 83 N and 465 ± 108 N for the femur and tibia respectively. Discussion AND CONCLUSION: Our results indicate that ACL fixation in an immature porcine model using our novel ACL fixation technique equals or surpasses published ACL fixation strengths using interference screws in human and animal cadaveric models. In addition to the fixation strengths demonstrated herein, the implied benefits of our method include aperture fixation and circumferential healing of the graft (soft tissue or BTB) on both the tibial and femoral side of the ACL reconstruction.

Poster 15

Patient Perceptions of Certified Athletic Trainers and Orthopaedic Residents as Primary Clinical Support Staff in the Sports Medicine Practice: A Randomized Double Blind Study

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Introduction: Medical assistants, physician assistants, nurses, and orthopaedic residents, are typically utilized as health care extenders in sports medicine practices. However, certified athletic trainers (AT-Cs) are also gaining recognition as skilled and valuable health care professionals in the orthopaedic office setting. The purpose of this study is to determine patient perceptions of certified athletic trainers compared to orthopaedic residents within a university-based sports medicine office practice.

Methods: After informed consent, 108 new sports medicine clinic patients were randomized into two groups: those who would see either an AT-C or an orthopaedic resident as their initial clinician. The primary clinician introduced themselves by name and did not disclose their professional designation at any point during the visit with the patient. Residents and AT-Cs were both required to perform a history and physical exam on each new patient. Upon completion of their visit with the attending physician, patients chosen for the survey were asked to complete a questionnaire. The survey asked each patient to rate their level of satisfaction in eight differ-

ent categories. The data was analyzed with independent samples t-tests.

Results: The AT-Cs scored higher than residents on “knowledge relative to the attending physician.” AT-Cs and residents were perceived on similar levels regarding “knowledge in the field of orthopaedics,” “level of education,” “ability to adequately answer questions,” “efficiently managing patient care,” “professional manner,” “strength of communication skills” and “overall patient satisfaction.”

Conclusions: To our knowledge, this is the first study to evaluate patient perceptions of certified athletic trainers in the sports medicine office setting. When compared to orthopaedic residents, AT-Cs were perceived as similar or better in all eight measured parameters. On the basis of this study, we believe the knowledge and skill of certified athletic trainers make them a good choice when hiring ancillary support staff in the sports medicine office setting.

Poster 16

Is Gender a Predictor of Outcomes After Primary Arthroplasty of the Hip?

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Introduction: Total hip arthroplasty is one of the most successful operative interventions today. Several gender specific THR designs have recently been released. There are significant anatomical differences between the male and female hips. The purpose of this study was to assess if there was a gender difference in primary THR.

Methods: A total of 561 patients (688 hips) undergoing primary total hip replacement were studied. 60.6% were women and 39.4% were men. Each patient was assessed preoperatively and at minimum 2 year’s mark utilizing QWB, SF-36, WOMAC, Hip Harris Score, and HSS. A 2x2 ANOVA was used to assess for differences between groups over time. An independent T-test was used to test for differences between groups. Alpha was set at 0.05.

Results: Before surgery, females scored significantly worse than males for the HSS ($p=0.004$), WOMAC Function ($p \leq 0.0001$), WOMAC Pain ($p=0.006$) and WOMAC total scores ($p \leq 0.0001$). There was a main effect of time; regardless of group, all scores improve at follow-up (range: $p=0.002$ to $p \leq 0.0001$). Regardless of time females had worse scores than males. Delta scores showed that females have significantly

greater improvement over males for WOMAC Function (38.6 vs. 35.2; $p=0.006$); WOMAC Pain (11.3 vs. 10.2; $p=0.005$); and WOMAC Total (53.4 vs. 48.2; $p=0.001$). Males were on average five years (58.35 ± 0.93 SE) younger than females (62.75 ± 0.75 SE).

Discussion: Gender differences exist in terms of level of impairment before treatment. After surgery women score worse than men do. However, women report greater improvement as a result of the intervention when compared to men.

Poster 17

Radiological Severity of Illness in Knee Osteoarthritis: Treat the Patient or Treat the X-Ray?

Carlos J. Lavernia, MD

Introduction: Radiographic findings influence a surgeon's decision as to when a Total Knee Arthroplasty (TKA) is offered to the arthritic patient. Although traditionally not held as the key determinant, radiographic findings will influence the clinician's judgement. Our objective was to evaluate if the severity of knee OA, as assessed on x-rays related to the patient's perception of severity of illness.

Methods: Forty-nine individuals were included in this study; patient perceived outcome measures were obtained before and after TKA (WOMAC, QWB, SF36, KSKS, KSFS). We classified the patients according to two radiographic severity scales. Spearman Rho correlation coefficient and independent t-tests were used to assess for differences between classification grades and within each classification system. A p value less than 0.05 was considered significant.

Results: All dependent measures before and after surgery were poorly related to the radiographic classification systems (range: $\rho=-0.08$ to 0.18). Regardless of classification system, assessments of perceived function, pain, and well being were not different between radiographic severity levels.

Discussion and Conclusion: Metrologically valid measurements of the pre and post operative status has a poor correlation with the radiographic findings. Therefore the surgeon's decision as to when to recommend surgery should not rely on the severity of X-ray findings. The patient's pain, function and motion should continue to be the key factors in deciding whether to do a TKA.

Poster 18

The Metacarpal Length Angle

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Hypothesis: The distal end of finger metacarpals in the normal adult hand subtend a clinically valuable and reproducible angle that is useful to the author in determining the subtle presence of occult wrist and/or metacarpal pathology.

Method: IRB approval for the study was obtained. The PA (Posterior/Anterior) radiographs of 100 adult human hands (some with bilateral Hand X-rays) were randomly selected from the PACS system. Using the PACS "angle" measuring tool, longitudinal lines are drawn to establish the exact center-line of the longitudinal axis of each metacarpal (thumbs excluded). The distal-most point at which this longitudinal line exits each metacarpal distally represents the point at which "metacarpal length" is established. Lines are drawn connecting these points 1. from the distal ends of the index/long metacarpal followed by B. the distal end of the long finger metacarpal to the small finger metacarpal. These 2 lines intersect one another forming the Metacarpal Length Angle. The angles subtended by these lines have been measured and are reported below. The RED lines are the longitudinal axes of the finger metacarpals. The yellow lines are the distal-most end of the metacarpal lengths, and subtend an angle = the METACARPAL LENGTH ANGLE The "normal" metacarpal head length angle on average measures 30° (range $28-33^\circ$). The major cause of the increased range of this angle is related to? "congenitally long index metacarpal length (see Fig. 2) The awareness of the existence and normal appearance of the "Metacarpal Length Angle" serves to provide and/or heighten a level of suspicion of pathology in an otherwise normal appearing PA radiograph of the Hand.

Poster 19

Novel Use of Electromyography (EMG) to Evaluate *In Vivo* Rotator Cuff Muscle Function After Acute and Chronic Detachment of the Supraspinatus Tendon: An Experimental Study in an Animal Model

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Introduction: Rotator cuff tears are a common cause of upper extremity pain and disability. Suprascapular neuropathy may be associated with massive rotator cuff tears. As the supraspinatus muscle atrophies and retracts following tendon injury, traction may be placed on the nerve. This study evaluates the utility of functional EMG testing in evaluating rotator cuff tears.

Methods: A total of 33 uninjured, acutely torn, and chronically torn rat rotator cuffs were examined. The rats were anesthetized, and the suprascapular nerve/supraspinatus muscle exposed. A bipolar electrode stimulated the nerve while compound motor action potentials (CMAP) were recorded. Supramaximal nerve stimulation was applied, and the maximum CMAP was recorded at various locations on the muscle and at various stimulation duration lengths.

Results: The chronically torn experimental group showed a significant reduction in CMAP amplitude and area under the curve (AUC) when compared to the control and acutely injured group. No difference in CMAP amplitude and AUC was detected between the control and acutely injured groups. Further, the chronically injured group had a significant decrease in neuromuscular endurance or functional capacity, as this group did not recover fully from repeated tetanic stimulation. The uninjured and acutely injured groups fully recovered after repeated tetanic stimulation.

Discussion: Neuromuscular activity is significantly impaired in chronically torn rotator cuff muscles. The neuromuscular mechanism underlying reduced functional capacity of a chronically torn rotator cuff may have implications for post-operative rehabilitation. These findings suggest a possible role of supraspinatus neuropathy associated with massive, complete,

chronically torn rotator cuff tears. This neuropathy may contribute to the pathophysiological evolution of the disease process and poor operative outcomes. EMG is an inexpensive, minimally invasive test for rapid functional assessment prior to and following surgery. Future studies are needed to assess the role for EMG in the functional assessment of human rotator cuff evaluation.

Poster 20

Percutaneously Assisted Total Hip Arthroplasty: An Economic Analysis

George Markovich, MD

Introduction: The procedure may represent a new paradigm in minimally-invasive joint surgery. In general, the need for post-op pain management, physical therapy, and nursing services is significantly reduced or eliminated with no compromise to clinical safety and efficacy. We hypothesized that also results in reduced direct hospital costs compared to traditional total hip arthroplasty (THA).

Methods: Hospital charge data were analyzed for each of 13 different PATH THA procedures obtained from three different hospitals. The charge data was categorized by hospital cost center then converted to cost using each individual hospital's 2009 Operating Cost to Charge Ratio (OCCR). The OCCR adjusted costs were then compared to cost data for traditional THA procedures obtained from several different published sources: The Journal of Bone and Joint Surgery (JBJS) and Healthcare Cost and Utilization Project (HCUP) databases.

Results: A traditional THA procedure has a cost of \$24,915 compared to a THA at a cost of \$15,943.06. The variation in cost results from three distinct areas: 1) A reduction in length of stay—2.67 days for the THA compared to 5.6 days for the traditional THA procedures; 2) A reduction in blood products—\$60.49 cost for blood products for the THA compared to \$1,057 for the traditional THA procedures; 3) A reduction in inpatient rehabilitation—\$386.57 for the THA patient compared to \$1,173 for the traditional THA patient.

Discussion and Conclusion: Given the current reimbursement structure related to THA and the ability of the tissue-preserving technique to reduce direct costs and length of stay, there is a definite improved financial outcome. When combined with the improved clinical outcomes of the technique it creates a compelling clinical and resource utilization argument in support of the technique.

Poster 21

Cephalomedullary Fixation of Displaced Femoral Neck Fractures in Elderly Patients – Does it Work?

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Roy Sanders, MD

Introduction: Displaced femoral neck fractures in elderly patients treated with internal fixation have demonstrated failure rates of about 40%. The proximal femoral bone is severely osteopenic, this has led some surgeons to “connect” the head fixation to the femoral shaft, either through a plate device, or some form of nailing.

Materials and Methods: Between 2002 - 2008, Eighteen elderly patients with displaced femoral neck fractures were treated with a cephalomedullary implant. Twelve males and six females, with mean age of 62.7 years. Thirteen fractures were midcervical (one Pauwel Type 1, four Type 2’s, eight Type 3’s), and five were subcapital fractures. Five patients were lost to follow up, thirteen patients followed for an average of 11.9 months.

Results: Five of the thirteen fractures collapsed into varus (38.4%). Average time to failure was 3.8 months. All failures were > 60 (average 71.4 years). Six of the eight healed fractures were < 60 years. Of the failures, three were subcapital (60%). Anatomical reduction was not obtained in three of the five failures. Average tip to apex distance (TAD) for failed treatment was 15.6mm. All of the healed fractures were mid-cervical fractures (one Type 1, two Type 2’s, and five Type 3’s) with an average TAD of 18.4mm. Two patients went on to total hip arthroplasty (varus collapse/cutout). Of the healed fractures, three patients went on to AVN and varus collapse without cutout but have not had any additional surgery.

Discussion: There was a high rate of complications in the series of elderly patients with femoral neck fractures treated with a cephalomedullary device (38.4%). Patients over the age of 60 and those with subcapital fractures seemed to do worse with this form of fixation.

Poster 22

The Dysplastic Acetabulum in Total Hip Arthroplasty: A Successful Technique Using a Small-Diameter, Thin-Walled Acetabular Cup

D. Gordon Newbern, MD

Introduction: Total hip arthroplasty in the dysplastic hip often presents the surgeon with a shallow acetabulum with inadequate bone stock superiorly and anteriorly. This may prevent standard placement of a primary acetabular component due to inadequate capture of the acetabular component by the bone. Strategies to remedy this have included securing bone graft in the deficient area, using revision –type cups with screw fixation and “double bubble” dysplasia components as well.

Method: A series of 25 hips with a minimum of 24 mos and avg 34 mos follow-up were evaluated in a retrospective review, demonstrating good success with this technique evaluated with the Oxford Hip Score.

Results: This paper illustrates a successful solution for the deficient, dysplastic acetabulum with use of thin-walled (6mm) non-modular metal-on-metal cup of small diameter (44 - 48mm). All patients had results in the good to excellent range.

Discussion and Conclusion: The small diameter cup allows the posterior column to be large enough to capture the cup with good initial press-fit fixation. This technique provides a reliable and convenient means of addressing the dysplastic acetabulum. There is also the added benefit of a large femoral head size (38-42mm) for enhanced stability. D. Gordon Newbern, MD and Donna K Barron, PA-C.

Poster 23

Adhesive Capsulitis and Temperature Variations in the Subacromial Space with Use of a Radiofrequency Probe During Arthroscopic Repair

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Introduction: The null hypothesis of this study is there is no relationship between temperature generated by a radiofrequency probe and postop adhesive capsulitis. Adhesive capsulitis is a painful shoulder lacking active and passive mobility. Causes of adhesive capsulitis are not well known. Literature contains little information regarding temperature inside the subacromial space during arthroscopic surgery.

Methods: This prospective, randomized study records temperature variations using a probe inside the subacromial space during rotator cuff repairs, subacromial decompressions, and/or distal clavicle resections. The temperature device was placed inside the subacromial space through the anterolateral portal to ensure proper measurements during acromioplasties and distal clavicle resections.

Results: Four groups were populated with an intention to treat time and an actual time of radiofrequency use to remove tissue or cauterize bleeding. The control group required no radiofrequency probe use. Shoulders treated with the radiofrequency probe were separated into three groups: 0-1 minute (Group 1), 1-2 minute (Group 2), 2-3 minute (Group 3). The time and temperature were measured while using the radiofrequency probe. The control group, using a burr and shaver, had an average surgical temperature of 20.6°C and range of 0.7°C. Group 1 had an average surgical temperature of 21.5°C and range of 4.2°C. Group 2's average surgical temperature was 23.2°C and range of 5.2°C. Group 3 had an average surgical temperature of 27.0°C and range of 10.1°C.

Discussion and Conclusion: This study shows that the radiofrequency probe used in shoulder arthroscopy does increase the temperature in the subacromial space, however, the saline temperature never exceeds body temperature and does not appear to be a causative factor in adhesive capsulitis. Further research is recommended to promote an additional understanding of the mechanism of adhesive capsulitis following arthroscopy.

Poster 24

Comparison of Hemodynamic Changes After Life-Threatening Hemorrhage and Treatment with Hyperviscous Fluids: Keratose Resuscitation Fluid (KRF) vs Hetastarch 6% in Normal Saline

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Introduction: Hemorrhage after trauma continues to be a life-threatening problem. No novel plasma expander has proven to be more beneficial or as effective as whole blood. As a possible plasma expander, KRF may potentiate the release of vasodilators through vascular wall shear stress and increase circulating volume by promoting water transport from the extravascular to intravascular space. The net effects would be better tissue perfusion and increased cardiac contractility without tachycardia (lower cardiac work) due to increased venous return.

Methods: Male Sprague-Dawley rats were anesthetized with 1.5% isoflurane, instrumented with an arterial pressure catheter and a heparinized extracorporeal loop (~1.0ml) between carotid artery and jugular vein. Loop flow probes provided a signal of volumetric flow and blood density. After activation of the extracorporeal pump (6ml/m), venous injection of warm saline triggered automatic determination of cardiac output (CO). Animals were hemorrhaged (37%) and given either 6% Hetastarch or KRF. Blood density measures were obtained and CO measures taken at baseline, immediately after hemorrhage/resuscitation and up to 2 hours later.

Results: Hemorrhage decreased blood density. Resuscitation with Hetastarch or KRF further decreased blood density. While the blood density remained low in the Hextend group, it rapidly increased with KRF to a new level by ~10 minutes (= .04), suggesting an increase in the hematocrit in the arterial blood. Both KRF and Hextend increased CO post-resuscitation period but the increase was higher with Hetastarch.

Discussion: The rapid increase in blood density with KRF suggests that it can mobilize red blood cells from the systemic microcirculation (i.e. spleen). In another work we demonstrated that KRF promotes vasodilation in microvasculature that is not seen with Hextend. The use of KRF in hemorrhage

could reduce cardiac work while also improving perfusion of a higher hematocrit blood to ischemic tissues.

Poster 25

The Biomechanical Consequences of Rod Reduction on Pedicle Screws: Should It Be Avoided?

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Introduction: Rod contouring is required for appropriate alignment of pedicle screw-rod constructs. When residual mismatch is present, a rod-persuasion device is utilized to achieve further rod reduction. Despite its popularity and widespread use, biomechanical consequences of this technique have not been evaluated.

Methods: Fifteen, three-level, human cadaveric thoracic specimens were prepared and DEXA scanned to obtain bone mineral density. Osteoporotic (n=6) and normal (n=9) specimens were instrumented with 5.0-mm diameter pedicle screws with variable lengths (35-45mm). Titanium 5.0-mm rods were contoured and secured to pedicle screws at proximal and distal levels. For middle segments, the rod on the right-side was intentionally contoured to create a 5-mm residual gap between the inner bushing of the screw and rod. A rod-persuasion device was utilized to fully seat the rod within the screw. The left-side served as a control with perfect screw/rod alignment. After 30 minutes, rods were disassembled, and vertebrae were disarticulated and individually potted. Implants were pulled in-line with the screw axis at 0.25mm/sec. Peak pull-out strength (POS) was measured in Newtons (N). For proximal and distal segments, screws on the right were taken out and re-inserted through the same trajectory to simulate screw-depth adjustment as an alternative to rod reduction.

Results: Pedicle screws reduced to the rod generated 48% lower mean POS (495±379N) relative to controls (954±237N). Nearly half (n=7) the screws failed during reduction attempts with visible pull-out of screws. This difference occurred in both normal and osteoporotic bone. Back-out and re-insertion of screws resulted in no difference in POS.

Discussion and Conclusion: In circumstances where a rod is not fully seated within pedicle screws, use of rod-persuasion devices decrease POS of the screw or results in outright failure. Use of a rod-reduction device should be avoided. Further rod contouring or re-direction of screw trajectory is warranted for alignment of pedicle screw-rod constructs.

Poster 26

Balloon Reduction of Calcaneal Fractures

Selene G. Parekh, MD, MBA

Introduction: Minimally invasive surgery for calcaneal fractures has been an area of interest in the orthopaedic community for over a decade. Balloon reductions are commonly used to restore the height of vertebral bodies in compression fractures. A similar method has been used to perform reductions of calcaneal fractures.

Methods: Over a two year period, all calcaneal fractures were evaluated for treatment with a balloon reduction technique. Eleven cases of "calcaneoplasty" surgeries were performed. One balloon reduction case had to be aborted and switched to an open procedure given the failure to reduce the fragments. The average follow-up was 21 months. An incision of 1 centimeter was centered over the posterior calcaneal tuberosity was used to insert the balloon. All reductions were evaluated intra-operatively with fluoroscopy followed by a subtalar arthrogram. The average operative time was 33 minutes.

Results: In the 10 calcaneoplasty cases, adequate reduction of the posterior facet was obtained by subtalar arthrogram evaluation. No wound complications occurred. All patients were allowed to weightbear in a CAM boot by week six. All patients returned to work. All patients would have their surgery again and were satisfied with their results.

Conclusions: Calcaneoplasty of select fractures is a viable option in Sanders 2 and some 3 fractures with minimal varus malalignment. This technique allows patients to have a quicker surgery and recovery with less incisional morbidity.

Poster 27

Arthroscopic Debridement of the Superior Medial Border of the Scapula: Technique and Results

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Introduction: Snapping scapula syndrome or superior medial border syndrome is an uncommon cause of shoulder pain and dysfunction. Patients can be separated into those who have an anatomic lesion, such as an osteochondroma, or those with merely an inflamed scapulothoracic bursa. We report the surgical technique and results of five patients who underwent arthroscopic scapulothoracic bursectomy and superomedial scapular border excision.

Methods: From 2006-2008, five patients (six shoulders) underwent arthroscopic scapulothoracic debridement for refractory snapping scapula syndrome. The mean age of the patients was 41.6 years (range 30-50). All had failed a course of non-operative management, including scapular stabilization exercises and scapulothoracic corticosteroid injections. The operation was performed in the prone position, with standard arthroscopic equipment via a two-portal technique. The involved shoulder was immobilized in a sling for 48 hours post-operatively. Patients were then instructed to discontinue the sling and begin physiotherapy consisting of range of motion and scapular strengthening exercises. Pre and post-operative visual analog pain (VAS) scores and American Shoulder and Elbow Surgeons (ASES) scores were recorded.

Results: There were no post-operative complications. The mean VAS pain scores improved from 7.3 pre-operatively to 1.2 post-operatively. Mean ASES scores improved from 49.2 to 93.8. All patients were discharged to their vocation and sport within three months of surgery. Four of the five patients were satisfied with their procedure and stated that they would have the procedure again.

Discussion and Conclusion: Arthroscopic debridement of the scapulothoracic bursa and excision of the superomedial border of the scapula is a safe and reproducible procedure, requiring no specialized equipment. Patients require minimal immobilization and routinely return to all activities within three months. When compared to our experience with the open approach for this condition, arthroscopy produces equal or better results, with substantially less immobilization, quicker recovery, and improved cosmesis.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation. (Refer to page 42).*

Poster 28

Precision Total Hip Arthroplasty Using Modular Necks and Cost Effective CR Imaging

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W. Seth Bolling, MD

Introduction: Critical features of a successful total hip arthroplasty include component alignment and fit, leg length, and offset. Historically, the surgeon has relied on certain instruments, implants, and the "feel" tempered by experience to achieve the desired result. The success rate, however, can certainly be improved upon. This paper describes the use of modular neck femoral components and computed radiography in THA.

Methods: A consecutive retrospective radiographic review of 467 total hips employing a modular neck femoral component and intra-operative computed radiography was carried out. This femoral component is used to permit incremental adjustments of leg length and offset. The use of affordable, computed intra-operative radiography permits timely (within 45 seconds), precise feedback at a time when further adjustments can be made. Corrections to stem size, cup position, screw length and position, leg length, and offset were made based on an intra-op A-P pelvis x-ray.

Results: Acetabular abduction angle ranged from 35 to 48 degrees (mean 43). Adjustment was performed 25% of the time based on x-ray. Apposition was within 3mm 100% of the time. Re-seating of the cup was carried out in 3 hips. Femoral component was neutral in 87% and 3-5degrees of varus in 13%. Femoral component was upsized 55% of the time. Leg length discrepancy was less than 5mm in 100% of hips. Offset was within 3mm of the normal side in 264 pts in whom this was measurable. There have been no neck fractures or dissociations. Operative time averaged 1hr and 5mins.

Discussion and Conclusion: The use of modular neck femoral components and intra-operative computed radiography permit improved precision of component placement in total hip arthroplasty. The technique should be affordable with regard to actual dollars and time spent.

Poster 29

The Effect of Total Hip Arthroplasty Surgical Approach on Post-Operative Gait Mechanics

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Megan Terry, MS
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Introduction: Improved walking gait has been reported in patients following total hip arthroplasty (THA). Currently, surgical approach is determined by clinician preference from limited prospective data evaluating the return of function and gait mechanics following surgery. The purpose of this study was to examine the effect of surgical approach (Anterolateral (AL) – modified Hardinge, Posterior (P), and Anterior (A) – Rottinger) on post-operative gait mechanics six weeks after the surgical procedure.

Methods: This study examined 38 patients (AL=10, P=13, A=15) who were tested pre-operatively and six weeks following THA. Patients with contralateral hip pain or diagnosis of contralateral joint degeneration were excluded. Patients were evaluated at a self-selected walking pace while bilateral spatial-temporal gait variables, hip flexion, extension, abduction (ABD), and adduction (ADD) kinematics, and ground reactions forces (GRF) were collected in the operative limb. A 2X3 (time X approach) ANOVA was used for analysis ($=0.05$).

Results: No significant pre-op to post-op or procedure differences existed for stance time, step length, step time, swing time, double support time, hip flexion angle at heel strike, peak ABD, or peak vertical GRF. Despite the lack of change in temporal variables, stride length, peak hip extension, and walking speed were all increased following surgery independent of surgical approach. The patients who had a posterior approach demonstrated a significant increase in hip ABD angle when compared with both the anterolateral and anterior approach groups.

Discussion and Conclusion: Surgical approach does not appear to significantly influence early post-operative gait mechanics. The increased hip ABD angle in the posterior approach group is perhaps the result of limited disruption of the hip abductors during this surgical procedure. Surprisingly, the same finding was not present in the other approach (ante-

rior) that spares the abductors. These early results indicate that surgical approach is not a factor in early post-operative gait mechanics.

Poster 30

Relationship Between Near Infrared Spectrometry and Intracompartmental Pressures in the Leg: A Model for Acute Compartment Syndrome Monitoring

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Introduction: Acute compartment syndrome (ACS) can have devastating effects if not treated. Near Infrared Spectroscopy (NIRS) has been suggested as a possible means for detecting perfusion deficits in patients with ACS. The purpose of this study was to longitudinally examine NIRS in an ACS model to determine its responsiveness to decreasing perfusion pressures.

Methods: A NIRS sensor pad was placed under a tourniquet over the anterior compartment in the mid tibia region on twenty volunteers. Initial perfusion pressures (diastolic minus tourniquet pressure) and NIRS values were recorded. The tourniquet pressure was sequentially raised by 10 mmHg in ten minute intervals until systolic pressure was surpassed. NIRS values and perfusion pressure was determined at the end of each ten minute interval.

Results: The average volunteer age was 30 years (25,37). There were fourteen male and six female subjects. The mean BMI was 26 (19-30). There were fourteen Caucasians, three African American, two Asian, and one Hispanic subject. Calf circumference averaged 39 cm (34-47 cm). Mean NIRS values were unchanged from baseline until 30mmHg was reached. A statistically significant drop of mean NIRS value was observed between 10mmHg and 0mmHg perfusion pressure, and again with subsequent decreases of 10mmHg perfusion pressure until systolic pressure was surpassed.

Discussion and Conclusion: These results coincide with previous published studies using alternative methods of measuring blood flow or perfusion. NIRS values were responsive to decreasing perfusion pressures over a longitudinal period of time in an ACS model. These results suggest that NIRS may be useful in a continual, non-invasive manner as a monitoring tool for patients concerning for ACS. Additional studies on traumatized patients are required.

**The FDA has not cleared this drug and/or medical device for the use described in the presentation. (Refer to page 42).*

Poster 31

The Effect of Bearing Type on Postoperative Activity Level After THA

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Introduction: A recent survey of Hip Society members indicated that a number of sports are not recommended because of the potential negative impact on clinical outcome. However, perhaps due to non-scientific dissemination of information via the internet and marketing, many patients have the perception that unrestricted sports activity is allowed following THA with potentially low-wear bearings such as ceramic-on-ceramic, metal-on-highly-crosslinked polyethylene, and metal-on-metal. The purpose of this prospective study was to assess sports activity after THA with these low-wear bearings.

Methods: Pre- and post-operative questionnaires were used to characterize the sports activity of 303 THA patients at a mean of 3 years following surgery. Following initial review, we age-, BMI- and preoperative activity-matched three groups of 30 THAs performed with 1) a ceramic-on-ceramic (COC), 2) a metal-on-metal (MOM), and 3) a metal-on-highly-crosslinked polyethylene bearing (MOP). The variables assessed included age, gender, BMI, bearing surface, preoperative and postoperative sports activity as well as Harris Hip scores (HHS), complications, and time following surgery.

Results: Postoperative participation in sports activity was the only variable that reached a statistically significant difference. Patients who underwent THA with a MOM bearing had a significant higher activity score (10.5) when compared to COC (6.9) and MOP (5.6). There was no difference in HHS. The mean postoperative HHS was 94 points for MOM bearing group, 91 for COC bearing group, and 90 points for MOP bearing group. There was also no difference in complication rate among the three groups.

Discussion: The results of this study suggest that when controlling for factors such as age, BMI and preoperative activity, metal-on-metal patients are more likely to participate in sports activity. We recommend that while all THA patients should be cautioned regarding sports activity and in particular high impact sports, increased precautionary advice may be neces-

sary for metal-on-metal patients who may have been influenced by non-scientific sources. Furthermore, there is a need for long-term studies which evaluate the clinical and radiographic outcomes of THA patients who participate in various sports so that surgeons can caution these patients appropriately.

Poster 32

Acetabular Positioning Frames Variably Underestimate the Abduction Angle of the Cup in Total Hip Replacement

Andrew A. Shinar, MD

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Introduction: Positioning the acetabular component in excessive abduction can be detrimental to the long term survival of a total hip replacement, and can cause cracking of cross-linked polyethylene inserts, squeaking of ceramic on ceramic components, and pseudo-tumors in metal on metal implants. With the intent of reducing the incidence of these outcomes, we sought to determine the accuracy and precision of a commonly used cup positioning frame.

Methods: We prospectively studied 20 consecutive primary total hip arthroplasties performed with a mini-posterior approach, in which we used a cup positioning frame designed to be parallel to the ground to yield 45° of abduction. We measured the position of this device by obtaining intra-operative photographs with a digital camera on implantation of the component with the frame attached. We then compared the abduction the device should have yielded with actual position of the cup on intra-operative and postoperative AP pelvis films.

Results: We (intentionally) placed the cup positioning frame an average of 14.6° less abducted than horizontal, yielding a predicted abduction of 30.4°. The actual abduction of the components averaged 39.6° on intra-operative x-rays, and 38.9° on immediate post-operative x-rays. Thus, the frame underestimated abduction by 9 degrees on average. The frame underestimated abduction on every patient, but did so unpredictably, with a range of 0.6° to 19.3°, and a SD of 6.2°. On five patients, the amount of underestimation was less than 5°, while on 5 others it exceeded 15°.

Discussion and Conclusion: We found that the cup positioning frame always underestimated abduction of the acetabular component, and did do so to an unpredictable degree. We recommend that these frames always be positioned less abducted

than horizontal with a mini-posterior approach, and be used with an understanding that the amount needed to achieve appropriate abduction varies substantially from patient to patient.

Poster 33

Long-term Results of Arthroscopic Ankle Arthrodesis

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Introduction: Arthroscopic tibiotalar arthrodesis has become an accepted treatment for the degenerative ankle in which the tibiotalar joint does not demonstrate any obvious deformity and, as such, can be fused *in situ*.

Methods: We reviewed the records of 34 of 45 patients who underwent arthroscopic tibiotalar arthrodesis. Chart review and patient interviews were used to determine return to activity, pain, postoperative activity level, self-reported results, and patient satisfaction. Double-blinded radiologists evaluated radiographs to determine percent of union, radiolucency about the lateral screws, and pre- and postoperative condition of the subtalar joint.

Results: At an average follow up of 5.3 years, mean preoperative pain scores of 9 had decreased to 3.2 ($p < 0.05$). Postoperative activity improved in 22 patients (65%), worsened in 4 (11.7%) and remained unchanged in 8 (23.5%), with 29 (85%) returning to preoperative work status. Twenty-eight of 34 (83%) patients reported excellent or good results and would have the surgery again. Radiographic interpretation demonstrated less than 10% fusion in 9 patients (26%). Eight patients in this category still rated their satisfaction as excellent or good. Radiographic evaluation of the subtalar joint after fusion demonstrated degenerative progression in 4 (11.7%). Placement of the lateral screw in the fibula rather than the tibia had a statistically significant effect upon hardware loosening ($p = .01$).

Conclusion: Because it offers lower morbidity, this minimally invasive technique may be preferred to open methods of tibiotalar arthrodesis, especially for patients who are candidates for *in situ* fusion and may have compromised skin or vascular conditions. Screws placed in the fibula decreased fusion percentage rates and was associated with radiolucency around screws.

Poster 34

Anatomic Sized Femoral Head Metal-On-Metal Total Hip Arthroplasty May Decrease Dislocation Rates

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Introduction: The role of increased femoral head size and resultant elevated head-to-neck ratio in dislocation prevention has been heavily investigated in the laboratory. Despite this wealth of in vitro information, little clinical data is available on the protective effect of larger diameter femoral heads on postoperative THA stability in vivo. Our purpose is to report our rate of posterior dislocation utilizing anatomically sized femoral heads in THA, and to compare our results to the published results of other authors.

Methods: A retrospective review of consecutive cases performed by two surgeons from August 2003 to December 2005 was performed. A metal-on-metal cementless THR design was utilized. The dislocation rate of this series was compared with dislocation rates in publications from the last 5 years. Those studies were examined for dislocation rates after THA using a posterior approach with formal posterior capsule and short external rotator repair, which produced 11 studies.

Results: During this follow-up period, there have been no dislocations in 127 patients. The average clinical follow-up time was 37.2 months (range 21-51 months). Of the 11 studies produced, a total of 8274 patients were compiled with 146 observed dislocation for a total dislocation rate of 1.8%. The average clinical follow-up time was 49 months (range 4-56 months). Multiple bearing surfaces were used to include ceramic-on-ceramic, metal-on-metal, and metal-on-polyethylene.

Discussion and Conclusion: In the current series, we report no early and medium-term post operative dislocations in a heterogeneous population of patients at varied levels of risk who had primary THAs with anatomic sized femoral head metal-on-metal THA. Based on these encouraging early and mid-term results with modern metal-on-metal designs, the use of anatomic sized metal-on-metal articulation may decrease dislocation rates and is a good option for primary THA.

Poster 35

Arthroscopic Bursectomy for Recalcitrant Trochanteric Bursitis After Total Hip Arthroplasty

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Introduction: We evaluated pain relief after arthroscopic treatment of recalcitrant trochanteric bursitis in patients following ipsilateral total hip arthroplasty.

Methods: Seven patients (eight hips) were enrolled retrospectively in the study to evaluate the use of arthroscopic bursectomy to treat recalcitrant bursitis after a total hip arthroplasty. We used transient response to diagnostic injection of a local anesthetic into the bursa as a relative indication for surgery. We performed an arthroscopic bursectomy on these patients. At follow-up, outcomes were assessed in our study patients with a 10-point numeric pain rating scale via phone interview. Patients were also asked the percentage of time they had painless hip function and whether they would have the surgery again.

Results: At an average 56-month follow-up (range, 34-81 months), seven patients (eight hips) reported an average numeric pain scale improvement from 9.4 to 3.8. An average of 71% of the time, they had painless use of the hip. All patients in the study felt the pain relief gained warranted having procedure again.

Discussion and Conclusion: Arthroscopic bursectomy after total hip arthroplasty for recalcitrant bursitis is a viable option if there is a reliable response to diagnostic injection prior to the surgery. If the injection does not completely relieve the patient's pain, other causes of pain, such as painful prosthesis, should be considered. Arthroscopic bursectomy provided satisfactory and lasting pain relief at an average follow-up of 56 months in our patients. Despite not achieving complete relief of pain, all patients who had the procedure said they would definitely have the surgery again.

Poster 36

Initial Experience with a Monobloc Cobalt-Chromium, Sub-Hemispherical Acetabular Component in Primary Total Hip Arthroplasty

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Introduction: A number of recently introduced large diameter metal-on-metal hip bearings utilize monobloc acetabular components. Some concerns have been raised regarding early failures in some implants.

Methods: The purpose of this retrospective study was to evaluate the performance of 96 initial, consecutive total hip arthroplasties (THA) utilizing the same monobloc, cobalt-chromium, sub-hemispherical device installed between 2006 and 2008 at a single institution. Of these 96 THAs, 83 cases have complete pre and postoperative clinical and radiographic data available at greater than one year after surgery. Clinical outcome measures included Harris hip score, Visual Analog Score (VAS) pain scale, and physical examination. In addition, a subset of patients (31 hips) completed the Short-Form 12 (SF-12®) Health Survey questionnaire. Radiographic analysis was performed to evaluate implants for evidence of lucency and osteolysis around the acetabular components. Further measurements determined cup inclination, change in offset, leg length, and acetabular position relative to the tear-drop.

Results: 83 hips (75 patients) were included with a followup duration of 23.2 months. Two patients required early reoperation for evacuation of infected hematomas at 7 and 14 days postoperatively, respectively. One patient (1.2%) was revised 31 months postoperatively to a ceramic-on-polyethylene bearing surface after developing a pseudotumor consistent with metal hypersensitivity. Harris hip scores improved from 55.3 to 98.4, ROM score improved from 89.3 to 99 and Visual Analog Pain Score (VAS) 5.75 pre-op to 0.5 post-op. SF-12® mental component improved from 53 to 56.9 and physical component improved from 41.8 to 53.3. Radiographic evaluation revealed no evidence of osteolysis in all hips. 16 hips showed evidence of non-continuous radio-lucency on most recent radiograph (10 - Zone I, 4 - Zone II, 5 - Zone III). No cups were radiographically loose or exhibited evidence of migration.

Discussion and Conclusion: Preliminary results show acceptable clinical results and fixation in a THA cohort with monobloc acetabular components. Zone I lucency has not correlated with decreased clinical outcome or cup stability at short-term followup.

tissue macrophage viability and function. Followed by this decreased initial inflammatory response is a subsequent surge in proliferative and remodeling phase factors that are delivered directly and recruited to the local tissue by growth factors in platelet-rich plasma.

Poster 37

Platelet Rich Plasma Modulates Inflammation Via Dense Granule Release Factors

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Introduction: Platelet-rich Plasma is a bioactive component of whole blood. The use of autologous platelet-rich plasma in Orthopaedics is growing based on the potential to enhance muscle and tendon healing. While clinical evidence strongly supports the use of platelet-rich plasma, we continue to define the exact mechanism of action by which tissue healing is enhanced. The positive regenerative effects of various growth factors released from platelet alpha granules are well defined. However, the potential effects of the factors released from the dense granules of platelets are, to this point, poorly defined. Platelet dense granule release factors include adenosine, histamine, and serotonin. These factors are released upon platelet activation. This research focuses on the effects of dense granule release factors on the macrophage cell during inflammation, a critical phase of tissue healing.

Methods: Macrophage cells in culture were challenged with adenosine, histamine, or serotonin in concentrations equal to that released by standard platelet-rich plasma. Macrophage viability and release of Interleukin-1 and Interleukin-6 was measured using ELISA. Groups were compared using ANOVA.

Results: The addition of adenosine alone significantly decreased the cell number across all time points. The Interleukin-1 release from activated macrophages was significantly decreased by the addition of histamine and serotonin at 72 hours. Adenosine resulted in initial increase in Interleukin-1 release that subsided at 72 hours. Interleukin-6 release was not significantly different from baseline in any group.

Discussion and Conclusion: Histamine and serotonin have early suppressive effects on interleukin-1 release from activated macrophage cells. This gives us insight and confirms our previous findings that PRP causes an initial decrease in