

Scientific Poster Abstracts

Poster 1

Total Knee Arthroplasty Following Shotgun Injury

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Shotgun injuries to articular surfaces that result in posttraumatic arthritis are an uncommon occurrence in the civilian population. These shotgun injuries cause extensive soft tissue damage and complex fractures that often result in post-traumatic deformities that make for a complicated arthroplasty procedure. Ligament balancing and bone cuts are complicated by the severity of the bone deformity and overall joint alignment. Traditional intramedullary alignment jigs may, in this regard, compromise accurate bone cuts. This study provides a review of the literature regarding arthroplasty after war injuries, blast injury, and post-traumatic arthritis. In addition, we present the first known case of a civilian who required a TKA secondary to developing post-traumatic arthritis of the knee following a shotgun injury. Follow-up at one year is presented for this patient successfully treated with primary total knee arthroplasty.

Poster 2

Hydroxyapatite in the Treatment of Skeletal Defects Due to Treatment of Bone Tumors

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Hydroxyapatite cement (HAC) has been used for many years as a substitute for bone in the treatment of skeletal defects resulting from but not limited to infection, trauma or tumors. Despite its current use, few reports exist in the literature regarding this substance for treatment in this area. The records and radiographs of patients treated with HAC for skeletal defects will be reviewed in an attempt to determine the efficacy of its use in the filling of skeletal defects. The treatment of skeletal defects resulting from trauma, nonunions, malunions, infection, and bone tumors may require adjunctive measures such as bone grafting or the use of bone graft substi-

tutes. Conventional bone grafting with autologous cortical and cancellous bone from the iliac crest is the standard by which all other bone graft substitutes are measured. This treatment, however, has its limitations. The supply is limited and the harvesting of the graft is associated with complications both major and minor. One alternative method of treating skeletal defects is the use of calcium phosphate derivatives, also referred to as bone cements. One such ceramic being used is a hydroxyapatite cement which has been shown to be effective in the treatment of defects resulting from trauma, benign tumors, and cysts. Hydroxyapatite has a structure resembling the crystal lattice of bones and provides an osteoconductive matrix in many orthopaedic settings. Tri-calcium phosphate undergoes partial conversion to hydroxyapatite once implanted into the body and provides a matrix that can support the ingrowth of new bone. A very small number of clinical trials have been conducted regarding the use of hydroxyapatite cement for the filling of skeletal defects particularly in bone tumors. No long-term clinical trials have been conducted to determine its effectiveness. This retrospective study is to evaluate the effectiveness of hydroxyapatite cements for filling skeletal defects in the orthopedic setting in particular, treatment of tumors.

Poster 3

Paget's Disease and Early Postoperative Outcomes Following Total Joint Arthroplasty

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Introduction: Paget's disease of bone (osteitis deformans) is a skeletal disorder characterized by excessive focal abnormal bone turnover associated with disordered lamellar bone and increases in local bone blood flow. A significant cohort of patients with Paget's disease will ultimately require total joint arthroplasty. There is anecdotal evidence that patients with Paget's disease have more complications, especially bleeding and need for transfusion, following total hip (THA) and total knee arthroplasty (TKA) but there is little evidence to support this conclusion and quantify the potential risks in this patient group.

Methods: This study analyzed data from the Nationwide inpatient Sample database for over 870,810 patients undergoing elective THA or TKA between the years 1988 and 2004. A cohort of 1,323 patients (0.2%) who had been previously diagnosed with Paget's disease was identified. Multiple linear and logistic regression models were used to ascertain whether these patients with Paget's disease were more likely than their non-diabetic counterparts to die while in the hospital, to have in-hospital postoperative complications, to stay longer in the hospital, to have a higher incidence of non-routine discharge, and to have a higher total cost associated with total joint arthroplasty.

Results: Univariate analysis demonstrated that Paget's disease was significantly associated with postoperative morbidity and mortality following total joint arthroplasty ($p < 0.01$). When THA was examined separately from TKA, however, multivariate regression analysis revealed that a diagnosis of Paget's disease was independently associated with higher rates of postoperative complications (odds ratio 1.24, $p = 0.007$), specifically transfusion (odds ratio 1.36, $p < 0.001$), following THA alone. No association was seen with Paget's disease and postoperative morbidity and mortality following TKA. The length of hospital stay was significantly higher in patients with Paget's disease following both THA and TKA.

Discussion and Conclusions: This large, nationally-representative study of inpatients from across the United States provides evidence that patients with Paget's disease undergoing elective THA are at increased risk for early postoperative complications, specifically need for transfusion. On the contrary, there appears to be no increased risk of morbidity or mortality associated with Paget's disease following TKA. To our knowledge, this is the first large study to report these findings. These results are important in patient selection, informed consent, and perioperative management in this patient cohort. Prospective studies are needed to further explain postoperative outcomes in patients with Paget's disease following total joint arthroplasty.

Introduction: With advances in tools and techniques, percutaneous screw fixation of nondisplaced fractures of the scaphoid has gained increasing popularity in recent years as an alternative to prolonged cast immobilization or open reduction and internal fixation. Many reports cite very low complication rates with this technique, including no complications at all in some series. We present our experience with the dorsal percutaneous technique and the complications we have encountered.

Methods: A retrospective chart review was performed on the 28 patients of the senior hand surgeon at an academic Level I trauma center who underwent surgery between October 2001 and September 2006. All cases involved dorsal percutaneous screw fixation of nondisplaced (< 1 mm fracture gap) fractures of the scaphoid waist or proximal pole. All cases except one involved the Accutrak screw system (Acumed, Inc., Beaverton, OR, USA). An a priori designation of possible complications into major or minor groups was constructed based on established criteria. Postoperative QuickDASH (Disabilities of the Arm, Shoulder, and Hand) and visual analog subjective outcome surveys were administered to all available patients.

Results: Of the 28 patients reviewed, 4 lacked adequate follow-up. Twenty-three of the 24 remaining patients healed (96%), with one patient requiring revision surgery for non-union. Average time until radiographic healing was 17 weeks overall, 14 weeks for nonsmokers, and 23 weeks for smokers. Smoking had a statistically significant effect on healing ($p = 0.03$). The overall complication rate was 29%, with 21% major complications and 8% minor complications. Major complications consisted of the one case of nonunion, three cases of painful hardware requiring removal, and one case of postoperative marginal chip fracture of the scaphoid. Minor complications included intraoperative equipment breakage. One case involving a screw and one case involving a guide wire. Twelve patients completed surveys. The average overall QuickDASH score was 17.6 (range 0-72.7). The average subjective satisfaction rating was 8.8/10 (range 7-10), and all but one patient said that they would have the same surgery again for the same injury.

Discussion and Conclusions: This study emphasizes several important points. First, the percutaneous treatment of scaphoid fractures can provide for fairly reliable, rapid healing. Second, patients are overall fairly satisfied with their subjective outcomes, as evidenced by the results of the postoperative surveys. Third, smoking can almost double the average healing time. Finally, complications can occur easily with inexperience or inattention to technique, but complications may also be due in part to equipment issues or even to the theory of the technique itself. These complications can result in significant morbidity and increased cost, and surgeons should not wan-

Poster 4

Complications in Percutaneous Screw Fixation of Scaphoid Fractures

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tonly assume as much of the current literature may encourage them to do that all patients will have excellent results with low risk for problems. Adoption of the percutaneous technique as the undisputed gold standard for treating nondisplaced scaphoid fractures may ultimately occur, but it depends upon further perfection of approach and equipment, proper patient selection, meticulous attention to detail, and more experience.

Poster 5

Early Clinical Experience with Collagen Nerve Guides in Digital Nerve Repair

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Introduction: Primary tensionless repair constitutes the gold standard for treating a severed digital nerve. In cases where nerve ends cannot be approximated without tension, nerve grafting has historically represented the primary choice for repair. Recently, interest has increased in the use of synthetic nerve guides as an alternative to autogenous nerve grafts. Nerve guides have been constructed from a variety of materials, including polyglycolic acid and collagen – two forms currently available for clinical use. A study in 2000 revealed impressive results with polyglycolic acid tubes to repair human digital nerves. Although studies in rats and primates have shown promise for collagen nerve guides as another effective means of repair, no published clinical study currently documents their success in humans. The purpose of this study was to review our early clinical experience with collagen nerve guides in the repair of digital nerve injuries.

Methods: We analyzed our early clinical experience with collagen nerve guides in digital nerve repair through a study of all cases of the senior hand surgeon at an academic Level I Trauma Center performed in the 18-month period between February 1, 2005 and July 31, 2006. Inclusion criteria were any nerve injury with a gap of less than 2cm in which primary tensionless repair was impossible, where a NeuraGen bovine collagen 20mm nerve guide (integra Lifesciences Corporation, Plainsboro, NJ) was employed in the nerve reconstruction. The primary outcome data points were the return of subjective light-touch sensation (LTS), two-point discrimination (2PD), and Semmes-Weinstein monofilament testing in the distribution of the affected nerve.

Results: Ten patients with collagen nerve guide repair of a digital nerve injury were identified and followed. The average

age at time of surgery was 34 years (range 18-50). One patient underwent delayed amputation secondary to other injuries. Of the remaining 9 patients, the average follow-up time was 7.5 months (range 4-14 months). There were no intraoperative or postoperative complications. At most recent follow-up, 7 patients had normal LTS, 1 patient had LTS that was slightly abnormal, and 1 patient had markedly decreased LTS. Four patients had 5mm 2PD, 2 patients had 8mm 2PD, 2 patients had 11mm 2PD, and 1 patient had 15mm 2PD. Semmes-Weinstein monofilament testing results were variable, with a general trend towards better results with longer periods of follow-up. All patients with follow-up longer than 10 months had full return of sensory function on monofilament testing.

Discussion and Conclusions: While the patients in this study are still within the very early follow-up period, our initial results have been quite encouraging. The return of subjective light-touch sensation and 2-point discrimination compares favorably with results of repair by other methods, and the trend in Semmes-Weinstein results is likewise promising. Although longer follow-up and prospective studies are obviously indicated to further investigate the value of this technique, our preliminary findings suggest that collagen nerve guides may offer a clinically effective alternative to nerve grafts for restoration of sensory function.

Poster 6

Femoral Neck Fracture Risk in Reduction of Pipkin Fracture-Dislocations of the Hip: A Biomechanical Study

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Femoral neck fracture during closed reduction of hip fracture-dislocations is an under appreciated occurrence. The purpose of this study was to evaluate the risk of iatrogenic femoral neck fractures during closed reduction of Pipkin fracture-dislocations of the femoral head in a cadaver model. Twenty fresh-frozen cadaveric proximal femur specimens were obtained. DEXA scan and radiographs were used to evaluate the quality of the cadaver specimens, excluding two due to severe osteoporosis. In total, 18 specimens were included in this study, which were randomly assigned to one of three groups: intact femora (6), simulated Pipkin type I fracture of the femoral head (5), and simulated Pipkin type II fracture of the femoral head (7). Each specimen was tested in a tension model intended to simulate forces experienced by the femoral

neck during closed reduction of a hip dislocation. Peak load at failure (fracture of the femoral neck) was measured, and statistical analysis was employed to evaluate risk of iatrogenic fracture. All but one specimen failed with fracture of the femoral neck, the other with an intertrochanteric fracture. Mean peak load at failure of the femoral neck for intact specimens was 2501 Newtons (N), 2750 N for Pipkin type I fractures, and 2787 for Pipkin type II fractures. Statistical analysis showed no correlation between peak load at failure and bone mineral density (BMD), and also no correlation was found between peak load at failure and the presence of a Pipkin fracture, regardless of type. Femoral neck fracture during reduction of a Pipkin fracture-dislocation is independent of both BMD and the presence of a Pipkin fracture. It can be concluded that femoral neck fracture in this situation is more likely due to an unrecognized fracture of the femoral neck at the time of initial evaluation which displaces with reduction attempt, rather than an inherent geometrical weakness of the femoral neck or excessive reduction force. CT scan of the hip should be completed prior to reduction if time permits, and if an occult femoral neck fracture is suspected, alternate methods of reduction should be employed (i.e., lateral skeletal traction applied in the operating room to aid in an atraumatic reduction).

Poster 7

Novel Fixation Technique for the Prophylactic Treatment of Loosening Lumbar Pedicle Screws

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Introduction: Instrumentation and cementoplasty have been used individually or synergistically to augment screw fixation for better stabilization. This is a report on a pilot study performed that used this relationship in a new way to ensure steadfast placement. Results show there may be indication to use pedicle screw fixation directly augmented by a cement bolus in cancellous bone formed from a bone tamp. The authors seek to show that the cancellous bone cement bolus pedicle screw augmentation presents a more predictable, secure pedicle screw fixation that may decrease the occurrence of screw loosening.

Methods: In 12 cases of patients, pedicle fixation was used for complex decompression. The ages range from 70-85 years and included 8 females and 4 males. All patients underwent a bone tamp bolus formation for each pedicle at the superior level of construct followed by pedicle screw insertion, and

then subsequent levels were fixated by only pedicle screws. For each pedicle screw-cement site there were 3-4 cc. of cement, injected under low pressure for a total of 6 cc.

Results: The preoperative, postoperative, and 3 month follow-up plain x-ray films were evaluated for stable bone tamp implantation, cement leakage, and screw placement. In all 12 cases there was no evidence of screw migration, pull-out, fracture, spinal cord compression, nerve root compression, or complication with cement placement. There was no example of cement extrusion into spinal canal. All patients had uneventful recoveries which included physical therapy, mild analgesics, and bracing.

Discussion and Conclusion: This new technique may solve the obstacle of loosening screws in healthy and osteoporotic bone by providing a more steadfast system not seen in previous studies. These results indicate the technique could be used in other areas of general orthopaedics, particularly for hips. Further study is needed to develop the best technique using the balloon bone tamp system.

Poster 8

Diagnostic Challenges of Periprosthetic Infection: What Role Do Simple Serological Tests Play?

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Introduction: The differential diagnosis of pain after total knee arthroplasty (TKA) should always include periprosthetic infection (PPI). The current diagnostic tools vary in sensitivity, specificity, and predictive value. Currently there is no test with an absolute accuracy to aid the diagnosis of PPI. Furthermore, cost effectiveness of investigations has become an important issue in recent years as increased expenses can place an unnecessary heavy burden on the medical system.

Methods and Materials: We retrospectively evaluated 296 patients who underwent revision TKA at our institution during 2000-2005 and had preoperative erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) performed. The criteria used for diagnosing infection were a positive intraoperative culture on solid media, presence of an abscess or sinus tract that communicates with the joint, positive preoperative aspiration culture, and/or elevated fluid cell count

and neutrophil differential of the aspirated fluid. Noninfected patients with confounding factors that can elevate ESR and CRP including collagen vascular disease, inflammatory arthropathy, malignancy, and urinary tract infection were excluded. The sensitivity, specificity, and predictive values of ESR and CRP were determined. Combinations were performed in parallel that necessitate both tests to be negative to rule out infection. The cost of each serological test was compared to that of other commonly used screening modalities.

Results: A total of 116 patients (39%) were classified as infected and 180 patients (61%) were considered non-infected. The mean ESR and CRP of the infected patients were 85 mm/hr and 110 mg/L respectively. The mean ESR and CRP of the non-infected patients were 22 mm/hr and 7 mg/L, respectively. The sensitivity, specificity, positive predictive value, and negative predictive value for the ESR were: 91%, 72%, 68%, and 93%. The sensitivity, specificity, positive predictive value, and negative predictive value for the CRP were: 94%, 74%, 70%, and 95%. The sensitivity and negative predictive value for the combined studies were 96% and 95% respectively. However, five infected patients (4%) had a normal ESR and CRP. Infection was suspected in all five patients, and an organism was cultured on solid media in 4 of the 5 cases. ESR and CRP were the least costly of all the preoperative tests including radionuclide imaging and joint fluid analysis.

Discussion: ESR and CRP are important preoperative tests in diagnosis of PPI and their ability to elench the diagnosis in majority of cases should not be underestimated. When combined these simple serological tests have improved sensitivity and negative predictive value to rule out infection.

Poster 9

The Changing Organism Profile in Periprosthetic Infection

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Introduction: Periprosthetic infection (PPI) continues to compromise the outcome of otherwise successful joint replacement. Current strategy for treatment of this dreadful

problem is based on antibiotic sensitivity of the infecting organism. The objective of this study was to evaluate the profile of organisms that cause PPI over the last few years.

Methods and Materials: All 351 patients with PPI who received surgical treatment at our institution during 1999 to 2005 were included. The surgical treatment involved irrigation and debridement in 97 cases (28%), one-stage exchange arthroplasty in 31 cases (9%) and two-stage exchange arthroplasty in 217 cases (62%). The remaining 5 cases (1%) included patients who underwent revision arthroplasty for mechanical reasons but had multiple positive intraoperative cultures that necessitated treatment. Patients were included only once in the analysis unless an organism was grown during a second revision procedure that was different from the one cultured during the initial surgery.

Results: The burden of PPI at our institution has increased over the last few years. Gram positive cocci cause 92% of PPI, while the incidence of infection with gram negative organisms (8%) was relatively low. A steady increase in the incidence of infections caused by methicillin resistant staphylococcus was noted with the incidence increasing from 13% in 1999 to over twice that at 30% in 2005.

Discussion: Our data indicates that a change in the profile of infecting organisms resulting in PPI has occurred over the last few years, at least at our institution. The increase in the number of infections caused by methicillin resistant organisms could potentially compromise the success of current treatment for this problem. Although liberal use of antibiotic is likely to be the major reason, future studies are needed to assess the reason behind the worrisome rise in the incidence of methicillin resistant periprosthetic infections.

Poster 10

Tranexamic Acid in Revision Total Hip Arthroplasty

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Introduction: Tranexamic acid and aprotinin are anti-fibrinolytic agents that inhibit fibrinolysis, which leads to a reduction of blood loss without concurrently increasing the risk of thromboembolic complications. Although similar in presumed mechanism of action, tranexamic acid differs greatly in cost

and side effect profile. Aprotinin is made from bovine serum with a reported 10% hypersensitivity reaction while tranexamic acid is synthetic. Aprotinin costs approximately five to eight times as much as tranexamic acid. A recent study has shown that tranexamic acid and aprotinin are not beneficial in primary total hip arthroplasties. However, aprotinin has been shown to reduce blood transfusions in revision total hip arthroplasties. Thus far there have not been any studies that evaluate tranexamic acid's efficacy in revision total hip arthroplasty.

Methods: A double-blinded randomized clinical trial at a single institution was done to investigate the use of tranexamic acid in revision hip arthroplasty. Patients who had a failed total hip prosthesis without infection were enrolled in the study. All of the revision total hip arthroplasty surgeries were performed by a single surgeon. The tranexamic acid or placebo was administered during the surgery only. Data collected included hemoglobin and hematocrit levels for the first three postoperative days, blood loss, allogenic blood transfusions, hospital stay, complications, and cost of using tranexamic acid with regards to blood transfusions.

Results: A total of 10 patients (5 tranexamic acid and 5 placebos) were enrolled in the study. In the tranexamic acid group 3 patients had both the femoral and acetabular components revised with the remaining 2 patients having the acetabular component revised only. In the placebo group 3 patients had both the femoral and acetabular components revised with the remaining 2 patients having either the acetabular or femoral component revised only. No significant difference was found in the hemoglobin/hematocrit levels and total blood loss between the two groups. The placebo group averaged 3.6 ± 2.19 units of allogenic blood transfusions while the tranexamic acid group averaged 0.6 ± 0.89 units ($p < 0.035$). No significant difference was found in length of hospital stay between the placebo and tranexamic acid groups (4.8 days vs. 5.5 days, $p = 0.60$). No complications were reported in either group. The cost of allogenic blood transfusions was reduced by \$1370 per patient ($p < 0.05$) in the tranexamic acid group.

Discussion and Conclusion: Tranexamic acid is effective in reducing allogenic blood transfusions in revision total hip arthroplasty. Moreover, tranexamic is a cost effective method for reducing the use of allogenic blood transfusions without the side effect profile of aprotinin. This drug is a viable option to minimize the use of allogenic blood transfusions in revision total hip arthroplasty surgeries. Blood management and anesthetic protocols should be adapted to reflect the findings of this study as an alternative to minimize the use of blood transfusions.

Poster 11

Custom Compress intercalary Endoprosthetic Reconstruction of the Femur and Tibia: A New Reconstructive Technique

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Intercalary reconstruction for segmental bone defects offers the significant advantage of sparing the proximal and distal joints. While intercalary allografts have been used for this indication, satisfactory fixation may be very challenging when the remaining portion of the native bone is very small. Standard endoprosthetic reconstruction is also severely limited by the need for adequate bone to fix the prosthetic stems, particularly when preservation of the physal plates is desired (in children). A novel prosthesis (Compress, Biomet) utilizing compression of the implant against bone via a spring-loaded plug secured with cross pins was modified to permit massive intercalary reconstruction with extremely short bone segments. Patient 1 (femoral diaphyseal Ewing's sarcoma) was chosen for a physal sparing reconstruction to avoid future limb-length discrepancy. Patient 2 (distal tibial osteosarcoma) was chosen as standard reconstructive techniques for the distal tibia were felt to be inferior to amputation. Patient 3 presented after multiple attempts at intercalary allograft reconstruction left her non-weight bearing for 2 years with a failed infected allograft. Patient 4 (diaphyseal osteosarcoma with pathologic fracture) presented after chemotherapy for definitive resection of his tumor. All patients underwent extensive preoperative treatment (chemotherapy or antibiotic therapy) prior to reconstruction. To minimize bone required for fixation, the dimensions of the anchor plugs were significantly shortened. To augment stability, the anchors were cemented into the bone canal prior to inserting the cross pins and applying pressure to the system. All four patients underwent successful limb salvage using their customized implants. The physal plates in patient 1 were spared and have shown normal growth 2.5 years post implantation. Patient 2 resumed normal walking within 6 weeks of surgery and has resumed sports. Initial fixation in patient 3 failed intraoperatively as a result of attempted aggressive lengthening of her femur. Fixation was successful after reducing the amount of lengthening achieved; she is pain free and fully ambulatory 2 years later. Patient 4 had an immediate body segment disassociation that was easily revised without further sequela. All patients have resumed normal walking without significant functional defects. Modification of the Compress system permitted successful endoprosthetic reconstruction under extremely challenging conditions in 4 patients. Although the need for intercalary reconstruction remains rare, this technique may permit many more

patients to benefit from joint preservation following tumor resection. Further evaluation to determine the longevity of the implant in these patients is planned.

Poster 12

Stem Fit and Thigh Pain in Uncemented Total Hip Replacement

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Introduction: Thigh pain has is a common occurrence after uncemented THR. Stem design is a known factor in causation of thigh pain after THR. The aim of his study was to find any correlation between stem sizes and fit in the diaphysis and thigh pain.

Methods: Radiographs of 400 patients, who had uncemented THR with accolade stem, were reviewed. Radiographic data was divided into those with stem size less than and more than 3. AP radiographs were analyzed for stem fitting in Gruen zones 5 and 6. All patients were specifically asked for symptoms of thigh pain.

Results: Out of 400 patients, only 12 had significant thigh pain. All these patients had stem size 4 and above. All of these patients had osteointegrated stems. There was no thigh pain in patients with stem size 3 and below. Pain resolved in 8 patients and none of the 12 needed a revision. Radiological analysis showed that all the patients with thigh pain had a tighter stem fit in Zone 5 compared to Zone 6, implying a more diaphyseal than metaphyseal fit. Patients with no thigh pain had a proximal metaphyseal fit. Patients with thigh pain had a higher cortical index than the rest of the group.

Conclusion: This study shows that thigh pain is more common in patients who achieve a diaphyseal fit with a tapered stem. It is not seen in patients with more proximal fit. The study calls for a change in design of tapered design so that diaphyseal fit doesn't occur before the metaphyseal fill.

Poster 13

Knee Dislocations: Marginal Tibial Plateau Fractures as a Harbinger of Multi-Ligamentous Knee Injury

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Introduction: There are no known reports in the literature attempting to quantify either the incidence or the strength of the association between various subtle fractures of the tibial plateau recognized on radiographs with multiligamentous injury of the knee.

Methods: All knee radiographs obtained in the emergency department over a 19 month period between April 2004 and October 2005 (n = 2673) at Jacobi Medical Center, a level-I trauma center, were retrospectively reviewed to identify the presence of marginal fractures of the tibial plateau. Exclusion criteria included any Schatzker-classifiable tibial plateau fracture, tibial eminence fracture, Segond fracture, concomitant ipsilateral femur fractures, fibular head fractures, presence of previous hardware or prior surgery. Also, patients with these radiographic findings without a history of trauma were excluded.

Results: Of the 7 patients identified with radiographs demonstrating subtle fractures that met the exclusion criteria, 4 were determined to have had multi-ligamentous injury of the knee. Thus, a 57% association was found between marginal tibial plateau fractures and knee dislocation, with an overall incidence of 0.15% for this type of injury. All these patients subsequently underwent surgical procedures to stabilize the multi-ligamentous injuries that had occurred in association with the knee dislocation.

Conclusions: This study found a very high association between marginal tibial plateau fractures and knee dislocation, a finding heretofore unreported in the literature. This emphasizes the importance of a heightened clinical suspicion necessary in the trauma setting when the mechanism and exam are consistent with knee dislocation, despite the innocuous appearance that may be observed on radiographs.

Poster 14

Treatment of Periprosthetic Infection: Declining Success

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Introduction: Periprosthetic infection (PPI) is one of the most devastating complications after total knee arthroplasty (TKA). It is widely accepted that resection arthroplasty supplemented with 6 weeks of intravenous antibiotics and delayed exchange arthroplasty is the treatment modality of choice for infected TKA. However, the outcome after reimplantation has varied and unpredictable results have been reported. This study evaluates the success of this treatment strategy in a single high volume specialized center. Furthermore, our study aims to identify the factors that lead to failure of this treatment.

Methods and Materials: A thorough review of our joint registry database revealed that 80 patients with an infected TKA underwent resection arthroplasty at our institution during 2000-2005. 65 patients underwent two-stage exchange arthroplasty while the remaining 13 failed to have the second stage reimplantation due to ill health or underwent arthrodesis or amputation. The latter 15 were excluded from the analysis. All patients were followed up prospectively for at least two years. Detailed data including demographics, comorbidities, surgical history, and medication intake was collected. Intra-operative data, organism profile, and complications were also documented. Failure was defined as patient requiring additional surgical procedure for control of infection or loosening.

Results: Two-stage exchange arthroplasty successfully eradicated infection in 45 patients (31%) without need for further treatment. 12 patients (18%) had recurrent infection that necessitated another resection arthroplasty. Eleven (17%) patients required irrigation and debridement for post-operative purulent drainage, which successfully treated infection in five cases (46%). The remaining six patients failed and required resection arthroplasty. Three additional patients had early loosening of components and required revision arthroplasty. The exact cause of loosening in these patients could not be determined and despite lack of isolation of organisms infection was suspected. Our analysis identified that irrigation and debridement prior to resection arthroplasty is major risk factors for failure.

Discussion: Current strategies to treat periprosthetic infection remain imperfect. Two-stage exchange arthroplasty with all its inherent problems and inconveniences imparted a modest success in treatment of PPI at our high volume specialized center. With the increase in the number of infections involving virulent and resistant organisms, patients are undergoing irrigation and debridement more frequently, which may jeopardize the success of two-stage resection arthroplasty. Hence, novel strategies for treatment of PPI are desperately needed.

Poster 15

Color Atlas of Unusual Hand Injuries

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Introduction: During more than 30 years of practice, I collected some unusual traumatic hand cases. These cases are not commonly seen in practice. The purpose of this poster session is to share and discuss with my colleagues my personal experience in taking care of these unique cases.

Methods: I had performed surgery on all of these cases. I wish to exchange the surgical experience with my colleagues.

Results: Some cases were followed over 20 years. The final results are presented here.

Discussion and Conclusion: The cases presented here are rare and not commonly seen in private practice. Indeed, one case with a meat grinder injury is not seen in the textbooks or medical journals. The main reason I have decided to present these cases in a poster session is that I would have ample time to discuss each individual case with my colleagues in detail. My colleagues would have a good look at the cases. Thus, we may learn from each other regarding management of the cases.

Poster 16

Smoking Predisposes Patients to Clostridium Difficile Infection Following Total Joint Arthroplasty

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Background: Clostridium Difficile infection resulting in diarrhea and potentially other serious systemic problems is a recognized complication of total joint arthroplasty (TJA). While some risk factors such as old age, administration of antibiotics, and increased length of hospital stay have been proposed, the exact pathogenesis of this condition following TJA remains unknown. This case-controlled study intended to identify the predisposing factors for this condition.

Methods: There were 18 cases of C. Difficile infections following 10,995 TJA (0.16% incidence) between 2001 to 2006

at our institution. The cases were matched with 36 control patients for month/year of surgery and surgeon. Detailed data was extracted to evaluate potential predisposing factors using univariate and multivariate analysis.

Results: There was no difference between the two groups with regard to gender, age, type of antibiotics, surgical procedure (knee versus hip replacement), and operating time. Multivariate analysis revealed that history of smoking and higher medical comorbidities were significant predisposing factors to *C. Difficile* infection following TJA. Patients with *C. Difficile* infection had a significantly longer hospital stay also. Although most of the patients with *C. Difficile* infection recovered without adverse consequences, two patients developed toxic megacolon that necessitated colectomy.

Conclusions: This study demonstrates that patients with a history of smoking and preexistent medical comorbidities are at a higher risk for developing *C. Difficile* infection after TJA.

Poster 17

Posterior Capsulorrhaphy Through an Infrapinatus Split For Posterior Instability

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Objective: To assess the clinical results of posterior capsulorrhaphy through an infrapinatus split in the treatment of posterior instability.

Methods: Twenty-one consecutive athletic male patients (n = 21 shoulders) with an average age at surgery of 23 years (range 15 - 36 years) were treated for a principal diagnosis of posterior or posterior-inferior instability. Patients with associated anterior instability or history of prior instability repair were excluded. The mechanism responsible for causing acute injury was sports-related in 17/21 (81%) shoulders. Mean follow-up time was 6 months (range 3 - 23 months). All patients underwent EUA and diagnostic arthroscopy prior to open capsulorrhaphy. Operatively, posterior skin incision begins just medial to the posterolateral acromial corner and extends distally about 5-7 centimeters. Roughly four centimeters of deltoid is removed from the posterior acromion and split between middle and posterior thirds to expose the infrapinatus. The superior and inferior portions of the muscle are then split to expose the posterior capsule, which is then incised horizontally. The inferior capsule is advanced and tucked under the superior flap. The capsule is attached to the posterior humeral calcar with suture anchors. The horizontal component of the

capsulorrhaphy is then completed using horizontal mattress sutures in "pants-over-vest" fashion.

Results: On preoperative exam, 12 shoulders (57%) had evidence of instability; 11 shoulders subluxated and 1 frankly dislocated. In contrast on EUA, all 21 shoulders had evidence of instability as 11 shoulders subluxated and the other 10 shoulders (48%) frankly dislocated. Mean preoperative active ROM (FE and ER with arm at side) was 177° (range 120° - 180°) and 88° (range 60° - 90°), respectively. Mean postoperative active ROM (FE and ER) was 175° (range 145° - 180°) and 85° (range 45° - 90°), respectively. Results were excellent or satisfactory in 19/21 (90.5%) of shoulders. At last follow-up, only one patient had a recurrence of posterior instability marked by subluxation or dislocation; this patient had a chronic seizure disorder. Seventeen of twenty-one (81%) patients returned to recreational or competitive athletics.

Conclusions: Posterior capsulorrhaphy through an infrapinatus split for posterior instability is an effective treatment option in an athletic population. This is the largest reported series on the treatment of patients with isolated posterior or posterior-inferior instability using this operative technique and, with only one recurrence in twenty-one patients, represents an attractive alternative to traditional Neer shift for addressing this pathology.

Poster 18

Comparison of Frozen and Freeze-Dried Particulate Bone Allografts

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Introduction: Bone grafting is a commonly accepted clinical procedure. However, orthopaedic surgeons are faced with a choice between frozen and freeze-dried allografts. Although several laboratory studies have showed that freeze-dried bone allografts are less antigenic than their frozen counterparts frozen and freeze-dried allografts are now used interchangeably in clinical practice. To elucidate the differences, if any, between frozen and freeze-dried allografts a study of their incorporation under identical conditions was performed in a non-human primate model. The non-human primate model has an advantage by not forming heterotopic bone in the muscle in response to allograft placement and thus is analogous to humans.

Methods: Experiments were performed on baboons, *Papio hemadryas*. The research protocol was approved by the IACUC. Two animals were used for each group-control,

autografts, frozen particulate bone allograft, and freeze-dried particulate bone allograft. Two 9 mm in diameter and 1.5 mm in depth defects were created in each animal. These were packed with material under study or left open (control). Animals were sacrificed at 6 and 12 weeks. Defects were examined radiologically, grossly and histologically. Morphometric measurement of new bone formation were made with NIH image 1.62 to determine areas of new bone formation. Color conversion studies were done by translating grayscale images to 20-color representations to identify areas of new bone formation.

Results: Defects in control animals did not heal. Defects filled with autografts were completely healed at 6 weeks. Defects filled with frozen bone were incompletely filled with new bone (10-15%). In these specimens allografts remained distinct and clearly visible by all modes of evaluation. By 12 weeks defects were filled with new bone, but scattered allograft particles were recognizable. At six weeks defects filled with freeze-dried particulate allografts were completely replaced with new bone. These particles induced simultaneous activity of osteoblasts and osteoclasts and were rapidly vascularized and replaced by newly formed bone. The same was present in 12 week preparations.

Discussion and Conclusions: The present study clearly shows the difference in the speed of bone replacement between frozen and freeze-dried particulate grafts. Freeze-dried particulate bone incorporates twice as fast as does frozen bone. This is in keeping with results of several immunological studies which report reduced antigenicity of freeze-dried bone. The conclusions reached from this study indicate that in clinical practice filling of osseous defects with freeze-dried particulate allograft is preferable to frozen bone allograft preparations.

Poster 19

Factors Effecting Shoulder Balance After Posterior Spinal Fusion in Adolescent Idiopathic Scoliosis

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Introduction: We set out to determine what factors effect shoulder position before and after spinal arthrodesis for adolescent idiopathic scoliosis.

Methods: Thirty patients with AIS (Lenke 1) treated with posterior spinal fusion were evaluated. Radiographic measure-

ments were recorded pre-and postop, and at 2 years follow-up. The interclavicular Line (ICL) was drawn from the center of the tip of one clavicle to the other. The Thoracic Axis (TA) was drawn from the center of the superior endplate of T1 to the center of the inferior endplate of T12. The Center Sacral Vertical Line (CSVL) was drawn perpendicular to the ground from the center of the sacrum to the level of C7. The interclavicular-Thoracic Axis Angle (ITAA) is the lower right angle made by the intersection of the ICL and the TA, and quantifies shoulder position relative to the thorax. The Clavicle Angle (CA) is the angle formed between the intersection of the ICL and the CSVL, and quantifies the degree of shoulder elevation. The Thoracic Axis-Center Sacral Vertical Line (TACSVL) is the angle formed between the TA and the CSVL, and quantifies the angular deviation of the thoracic axis from the midline. The Lumbosacral Angle (LSA) is drawn from the center of the apex of the lumbar curve to the base of the CSVL, depicting divergence of the lower lumbar spine. All values were converted into Z scores to allow direct comparison of measurements. The Z score bears a one-to-one correspondence to Cohen's d-statistic for measuring effect sizes.

Results: There was no significant effect size change in the ITAA measured on preoperative and postoperative radiographs. There was a medium effect size change in the TACSVL and in the LSA.

Conclusion: The shoulder does not change position relative to the thorax with correction of the primary thoracic curve. Shoulder position was affected by changes in the TA relative to the CSVL, and by changes in the LSA. These findings suggest that shoulder position is dependent upon the behavior of the remaining uninstrumented lumbar motion segments.

Poster 20

Combined Traumatic Occiput-C1 and C1-C2 Dissociations: Two Case Reports

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Background: Occiput-C1 and C1-C2 dissociations and dislocations have been well documented in the literature. However after thorough review of the literature, we found very little in the literature regarding combined occiput-C1 and C1-C2 dissociations in adults who survived.

Purpose: To report the occurrence, diagnosis, associated injuries and management of two cases of traumatic combined occiput-C1 and C1-C2 dissociations. Study Design/Setting: Two case reports and review of the literature.

Methods: We present two case reports describing the clinical presentation, initial management, operative treatment and postoperative course of patients who sustained this uncommon injury. Results: After initial stabilization, both patients underwent open reduction, posterior occipital-cervical fusion with segmental fixation. At recent follow-up, both patients maintain good sagittal alignment without loss of reduction, radiographic progression to fusion, minimal pain and improved neurologic function.

Conclusions: Combined occiput-C1 and C1-C2 dissociations are rare but serious injuries. Incomplete dissociations may not be evident on initial radiographs. CT or MRI is recommended for formal diagnosis. A traumatic dural tear may be present. We recommend open reduction, posterior occipital-cervical fusion with segmental fixation for these patients.

Poster 21

Total Hip Arthroplasty After Failed Intertrochanteric Osteotomy

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 Dr. Sandra Lasurt
 Dr. Jose A. Guillen
 Dr. Jordi Canosa
 Dr. Oscar Salgado

Introduction: Total hip arthroplasty (THA) when it is performed after an intertrochanteric osteotomy, is known to have a high short-term incidence of complications and infection but the long-term results have not been reported. We have reviewed the results of THA after failed femoral intertrochanteric osteotomy in 63 hips.

Methods and Materials: sixty-three intertrochanteric osteotomies in 58 patients (35 women and 23 men) with a mean age of 44,5 years (range, 23 and 66 years) were treated at our institution with hip arthroplasty after the failed an intertrochanteric osteotomy for advanced osteoarthritis. The follow-up was 7.27 years (range 2-22 years). The patients had a varus osteotomies in 31 cases, valgus osteotomies in 17 cases and in 15 cases was a translation osteotomies.

Results: At follow-up, 8 underwent THA revision, 3 for infection, 4 for aseptic loosening of the arthroplasty and 1 case for the periprosthetic fracture with a femoral osteosyn-

thesis. The results at follow up was good result in 42 patients (66,66%) with a 16-18 points of the Merle d'Aubigne score, regular result in 17 cases (26.98%) and bad result in 4 cases (6,34%)

Conclusions: The intertrochanteric osteotomy is a good treatment for a osteoarthritis in young patients.

Poster 22

Biomechanical Comparison of Two Suture Anchor Repair Techniques for Type II Slap Lesions

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Introduction: To evaluate the biomechanical properties of different suture anchor configurations for type II superior labral anterior posterior (SLAP) lesions.

Methods: Standardized type II SLAP lesions were created in eight cadaveric matched paired shoulders using an established protocol. Two different suture anchor configurations were used to repair the type II SLAP lesions. A load to provide a constant force was applied to the biceps tendon and the displacement of the biceps labral insertion was measured at a load of sixty Newton.

Results: The average displacement of the biceps anchor after repair of a type II SLAP lesion with one suture anchor placed anterior and another placed posterior to the biceps labral insertion was 2.93mm. SLAP lesions repaired with two suture anchors placed posterior to the biceps labral insertion had an average displacement of 2.62mm.

Discussion and Conclusion: Study results show no significant difference in repair strength of type II SLAP lesions by different suture anchor configurations in terms of displacement of the biceps anchor with a sixty Newton posterior load. Anatomic studies have shown that the predominant pattern of biceps tendon insertion is posterior into the posterior-superior labrum. Also, the primary mechanism for SLAP lesions in overhead athletes is peel-back of the posterior-superior labrum off the glenoid in the abducted, externally rotated shoulder. Placement of an anterior anchor could, theoretically, tension the anterior capsulolabral structures via the MGHL and SGHL attachments to the superior labrum and thus could result in a loss of external rotation. The results of this study suggest that

there is no biomechanical advantage to placing an anterior anchor and so the use of two posterior anchors may be preferable in the overhead athlete in whom loss of external rotation cannot be tolerated.

Poster 23

Intercalary Endoprosthetic Reconstruction of the Lower Extremity

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Diaphyseal bone lesions of the lower extremity can be difficult to treat. Often these lesions are metastatic lytic tumors that have historically been treated with internal fixation and radiation. However, there are a multitude of modes of failure of this reconstruction. Particularly with the longer longevity of these patients and also our attempt to cure more patients with wide resection of bony lesions, newer methods of reconstruction of diaphyseal lesions are necessary. We present our data for the intercalary endoprosthetic reconstruction of diaphyseal lesions in the lower extremity. This method has applicability in both neoplastic and nonneoplastic conditions. This procedure was performed at our institution in six patients for diaphyseal defects of the femur and tibia. Our followup ranges from 6 months to two years (mean 14 months). No revisions had to be done and no patients were lost to followup. We have had no failures of fixation by this method and suggest that it may have a more widespread use in lower extremity diaphyseal reconstruction.

Poster 24

Ipsilateral Femoral Neck and Shaft Fractures: A Review of the Injury Pattern

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Introduction: Ipsilateral femoral neck and shaft fractures are rare injuries that are often the result of high energy trauma. The diagnosis and treatment of the concomitant femoral neck fracture are important because of the complications of avascular necrosis of the femoral head and nonunion of the fracture. Previous studies found that delayed diagnoses of concomitant femoral neck fractures occurred in 19 to 31% of cases. The rates of the various causes of

delayed diagnoses of femoral neck fractures have not been well established. A review of past literature was performed to evaluate this pattern of injury and to study the causes of delayed diagnoses of femoral neck fractures, which include reasons such as the fracture was: overlooked and not worked up; visible in pre- or intraoperative studies but missed; or clandestine, not visible in either study. Additionally, iatrogenic fractures were evaluated because the fractures are diagnosed postoperatively and may be confused with clandestine fractures.

Methods: A review of past literature of concomitant ipsilateral femoral neck and shaft fractures was performed to evaluate the pattern of injury and the causes of delayed diagnoses of the femoral neck fracture. The review consisted of 14 studies from 1981 to 2007 and comprised a total of 239 cases.

Results: The diagnoses of 54 (22.6%) out of 239 cases of concomitant femoral neck fractures were delayed due to being overlooked, missed, clandestine, or confused with an iatrogenic fracture. Since 2000, delayed diagnoses of femoral neck fractures occurred in 10 of 90 cases (11.1%) compared to 44 of 149 cases (29.5%) in studies prior to 2000. Overall, seven cases (6.1%) were evident on pre- or intra-operative studies but missed; fifteen cases (11.2%) were clandestine; and four cases (2.5%) were iatrogenic. The average time to union of the femoral neck and shaft fractures following treatment ranged respectively from 13.1 to 18 weeks and 14 to 22 weeks. The complications of avascular necrosis of the femoral head and nonunion of the femoral neck fracture occurred respectively in 3 (1.6%) and 4 (2.7%) cases, and only one of three cases of avascular necrosis of the femoral head occurred following a delayed diagnosis.

Discussion and Conclusion: Greater awareness of the pattern of injury and enhancements in the protocol to diagnose the concomitant hip fracture such as relying more on computed tomography and postoperative radiographs likely have contributed to the decrease in the proportion of delayed diagnoses of femoral neck fractures since 2000. A lower, but significant, percentage of diagnoses of femoral neck fractures continues to be delayed, which highlights the necessity of a thorough initial and postoperative evaluation for concomitant ipsilateral femoral neck fractures. The review was unable to significantly correlate delayed diagnoses and treatment of femoral neck fractures with an increased incidence of avascular necrosis of the femoral head and nonunion of the fracture, which supports the results of previous studies and the possibility that repair of the femoral neck fracture may not be as urgent as previously thought.

Poster 25

A Randomized Cadaver Study Comparing Component Positioning and Leg Lengths With and Without an Image-Free Computer Navigation System

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Background: The success of total hip arthroplasty (THA) relies on the accurate placement of the acetabular and femoral components. Implant malposition leads to instability, leg-length discrepancy, polyethylene wear, and ultimately to arthroplasty failure. The use of computer-assisted surgery has been demonstrated to improve component positioning.

Methods: Six frozen, non-preserved, human cadavers were randomly selected for cementless THA, either with or without navigation. Three cadavers (6 hips) were implanted with computer-assisted techniques and three cadavers (6 hips) were implanted using conventional techniques. The components position and the differences in leg-length was evaluated by a blinded observer using postoperative computed tomography measurements.

Results: The average acetabular component inclination of the navigated components was 45.5° compared to 53.2° of the non-navigated hips. The average anteversion of the navigated components was 19° versus 38.5° in the group without navigation. The mean coronal plane alignment for the navigated femoral component was 0.67° degrees, and 3.2° for the group without computer assistance. Femoral stem anteversion mean was 14.3° and 3.2° for the navigated and non navigated procedures, respectively. The average leg length difference using navigation was +8.48 mm, which was very similar to the non-navigation group, 8.45 mm.

Conclusion: Image-free computer-assisted orthopaedic surgery demonstrated increased accuracy for acetabular and femoral component positioning. Leg-lengths were accurately reproduced with both techniques.

Poster 26

Vascular Injuries in Total Joint Arthroplasty

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Background: Vascular injury is a rare and worrisome complication following total joint arthroplasty (TJA). Arterial complications can occur through either direct vessel injury or as result of indirect trauma. The mode of presentation is either acute hemorrhage during surgery or delayed ischemia due to occlusion or embolization. A high index of suspicion, recognition of injury, and prompt treatment with the availability of a vascular surgeon is crucial for a better outcome.

Methods: Prospectively collected data on 13,517 patients undergoing TJA from January 2000 to August 2006. During this period 15,383 TJA were performed. Detailed data was collected regarding the mode of presentation, the intervention delivered, patient's outcome, and the legal aspects of this complication.

Results: The overall incidence of vascular injury after TJA was 0.1% (16 out of 15,383). The incidence of vascular injury following total knee arthroplasty (TKA) was 0.15% (11 out of 7,153), and 0.06% (5 out of 8,230) for total hip arthroplasty (THA). Vascular injury occurred more frequently after revisions arthroplasty at 0.14% than after primary joint replacement (0.1%). Diagnosis was made postoperatively with angiography in 13 patients (81%), the majority of them in the postoperative recovery unit (44%). Intraoperative diagnosis was made in 3 out of 16 patients, all of them during hip surgery. The majority of patients in this cohort (76%) had full restoration of neurovascular function of the affected limb at the time of discharge. Adverse outcomes included wound problems (2), infection (1), peroneal nerve palsy (1), compartment syndrome (8), amputation (1), and death (1). Arterial injury following TJA was associated with a high likelihood of a legal suit. Eight of 16 patients (50%) had launched a legal suit against the operating surgeon, all females following primary TJA. Compartment syndrome and fasciotomy was associated with litigation in 75% of the cases. Further complications such as peroneal nerve palsy, deep periprosthetic infection, and gangrene followed by amputation, were also associated with litigation.

Discussion: Total joint arthroplasty is a successful and safe surgery. However, vascular complications may occur with potential for limb and life threatening consequences. Vascular complications following TKA were related to indirect trauma and thrombosis. The most common mechanism of vascular injury after THA was direct vessel laceration. A high index of

suspicion and close postoperative assessment are essential in a prompt diagnosis and better outcome. Half of the vascular complications experienced at our institution have resulted in a legal suit against the surgeon. Better patient awareness regarding this undesirable complication is needed to defray unnecessary legal suits.

Poster 27

Clinical Use of Ultrasound by the Orthopaedic Foot and Ankle Surgeon: An Outcomes Study

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Introduction: Ultrasound is an emerging technology which has received little attention from the majority of foot and ankle orthopaedic surgeons. Ultrasound offers advantages in allowing portable, real-time, noninvasive, rapid examinations of soft-tissue structures in both the clinic and operating room settings. Objections to ultrasound's use have centered on a perceived high learning curve and operator dependence. It was the goal of this study to prospectively evaluate the impact of surgeon-used ultrasound in an orthopaedic foot and ankle practice.

Methods: Over a one month period new patients presenting to a Foot and Ankle Service were randomized to an ultrasound and a non-ultrasound group. Clinical, diagnostic, temporal, subjective, and economic outcomes were recorded. A hand-held highly portable ultrasound (Sonosite, Seattle WA) was chosen for the study.

Results: 36 patients were evaluated over this time period. Overall 6:32 minutes of extra time were required to evaluate each patient with ultrasound. Overall time to diagnosis was decreased for Achilles tendinopathy, posterior tibial tendinopathy, FHL tendinitis. There was a decrease in the number of additional studies ordered over the course of the study. A number of ultrasound specific procedures were performed. 100% of patients felt that surgeon utilized ultrasound in the clinic benefited their medical care. 100% of patients would recommend ultrasound exam to a friend who suffered a similar problem. In 65% of cases the surgeon and independent observer felt the ultrasound imaging assisted in final diagnosis.

Conclusion: Orthopaedic foot and ankle surgeons are in an ideal position to evaluate and optimize the use of ultrasound. Surgeons are able to verify preoperative images by direct confirmation in the operative theater. Currently there is no accreditation process for ultrasound. Our study highlights the patient-perceived; surgeon-perceived and surgically verified diagnostic benefits of enhancing Orthopaedic physical examination with ultrasonography. Future study is in progress to assess the outcomes of adding ultrasound training to a residency training as well as to continue to define what conditions lend themselves most readily to ultrasound diagnostics. We foresee a time in the near future when ultrasound may be utilized as an Orthopaedic surgeon's "stethoscope": affording real-time noninvasive diagnostics in the clinic and as an extension of physical examination.

Poster 28

Why Did My Hip Fail So Early?

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Introduction: Total hip arthroplasty (THA) is a successful procedure with a low incidence of failure. However, failures after this procedure occur. The rate of THA revision has doubled over the last decade. The purpose of the current study is to determine the contemporary mechanisms of early (<2 years) failure of total hip arthroplasties.

Methods: We prospectively evaluated all patients who underwent revision THA over a one-year period at our institution. The cause of failure was determined using preoperative radiographs, laboratory studies, and the intraoperative findings. In some patients more than one cause of failure was noted. All pertinent details for the patients and the surgical intervention were recorded. The interval from the index THA to revision surgery was recorded.

Results: 159 consecutive patients were included in this cohort (80 females, 79 males). The average age and BMI were 63.7 years (range 26-89) and 28.6 Kg/m² (range 18-48 Kg/m²) respectively. A total of 28% of the patients were revised within 2 years of index surgery. The average time to revision surgery was 8.4 years (range 10 days to 30.8 years). Although osteolysis and aseptic loosening were the main cause of late

failure, infection and instability were the most common reasons for early failure of THA.

Discussion: Despite the immense success, failure after THA can and does occur. Worryingly, some of these failures occur relatively early and may be attributed to technical errors, particularly when performed by low-volume surgeons. Meticulous attention to detail and technically proficient execution of the procedure are critical if early failures after THA are to be avoided.

Poster 29

Corrective Femoral Osteotomy and Modular Femoral Stem for Management Femoral Deformity in THR

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Angular femoral deformity may preclude the insertion of a standard femoral stem in revision total hip reconstruction. Previous studies have documented inconsistent results in achieving corrective osteotomy along with implant longevity. The use of a modular implant to independently fix proximally and distally may allow for a more reproducible result. 26 hips in 24 patients underwent transverse or oblique femoral osteotomy along with insertion of a modular femoral stem for correction of angular or rotational deformity of the femur at 3 centers. There were 6 primary and 20 revision surgeries in the cohort. The surgical technique involved exposure of the osteotomy site at the point of maximal deformity, and minimal soft tissue dissection from the bone. All 3 implants used had distal flutes for rotational control of the distal fragment. 10 hips had an SROM stem with proximal fixation, 15 hips had a Link MP stem and one had a Mallory-Head STS stem with a tapered conical distal fixation. Patients were evaluated at an average 6 years follow-up (range 4-8). 25 of 26 osteotomies developed bridging callus within at an average 3.5 months (range 2-6). There were 2 revisions. One case with an SROM stem developed a fracture of the proximal osteotomy fragment, with fixation failure. The hip was revised to a distally fixed stem. One patient with a healed osteotomy and an SROM developed symptomatic loosening at 5 years follow-up, and was revised to a distally fixed stem. There was one case of perforation of the posterior tip of the distal implant through the femur, treated with strut allografting. One patient has had a stress fracture

around the stem, successfully treated with protected weight bearing. All 4 of these hips utilized SROM stems. Radiographic evaluation of the demonstrated evidence of bony ingrowth in 24 of 26 hips. Previous series of femoral osteotomies have reported nonunion, and loosening as persisting problems. Huo *et al* noted that none of the cases treated with a modular stem in his series had failed. Both types of stems utilized in this study have shown success in osteotomy healing and fixation. Our rate of complications was notably lower in patients with distally fixed conical stems.

Poster 30

Review of MUSC Experience With Distally Fixed Modular Implants for Revision Arthroplasty

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Traditionally the most commonly used femoral implants in revision hip arthroplasty are distally fixed monoblock designs. Revision using this type of stem has been associated with a high incidence of complications including dislocation and failure of ingrowth. Ability to adjust leg length, version, and offset is limited once the stem is inserted. Modular, distally fixed femoral implants have been developed in order to decrease the complication rate by restoring normal hip mechanics. The goal of this study is to evaluate the performance of modular stems as it relates to fixation and instability. One hundred thirty-one (131) revisions were done using three modular stem designs. All stems were common in design featuring a proximal cone shape body attached by a taper to a fluted tapered distal stem. Revisions were performed for loosening, periprosthetic fractures, recurrent dislocations, and infections. Most revisions were in patients with severe bone loss. Follow-up ranged from one half to eighty-nine months with an average of forty-six months. Parameters evaluated included fixation and instability. Preliminary results are as follows: (1) five patients deceased; (2) six dislocations; (3) one stem fracture below the modular junction; (4) two stem fractures above the modular junction; (5) one recurrence of infection requiring removal of hardware and placement of an antibiotic spacer; and (6) no measurable subsidence or aseptic loosening in our series we obtained excellent bony fixation as well as an acceptable dislocation rate in revision of severely compromised femurs. There were no stem fractures at the modular junction at early follow-up. Dislocation was readily managed by revision of

the proximal portion of the stem without compromising distal fixation in two of the patients, a brief period of bracing in one, and revision to a constrained cup in the other. Our study demonstrates that modular approaches can be used successfully.

Poster 31

Biomechanical Comparison of Locking and Non-Locking Screw Constructs: Can You Go Shorter?

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Introduction: The objective of our study is to biomechanically compare various locking and non-locking screw and plate constructs. Locking screws have been shown to have greater pullout strength when compared to conventional cortical screws. We hypothesize that a four hole locked plate construct will provide similar biomechanical strength compared to the traditional six hole non-locked plate.

Methods: We are comparing four different constructs using saw bone humeri models with a mid-shaft transverse fracture. Each construct will have undergone 3-dimensional loading for anterior and posterior bending, cyclic loading, and strength testing. The four constructs being compared are A: six hole large fragment locking plate with six non locking cortical screws; B: six hole large fragment locking plate with six locking screws; C: six hole large fragment locking plate with four locking screws; D: four hole large fragment locking plate with four locking screws. Each construct category has 10 models undergoing testing.

Results: Data is being collected regarding normalized stiffness, average energy absorbed, and Newton cycles to failure. 40 models, 10 in each construct category, will have undergone testing.

Discussion and Conclusion: Because of the recent advancements of plating technology specifically the advent of locking screws and plates, many surgeons are incorporating locking plates in their approach to fixing fractures. We look to determine if a biomechanical advantage exists with locking screw constructs, and if so, do smaller locking constructs offer biomechanical properties equal to or greater than that of a longer non-locking construct.

Poster 32

Percutaneous Anterior Column Stabilization in Conjunction With THA for Acute Acetabular Fractures in The Elderly Patient

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Introduction: There is no debate that achieving an anatomic reduction and stable fixation that will consistently result in positive long term results is the ideal goal when addressing an acetabular fracture. The accuracy of reduction has come into question when dealing with acetabular fractures in the elderly patient partly due to the poor quality and osteoporotic nature of their bone. Acute THA in the elderly patient with an acetabular fracture has been reported on and met with varying degrees of success. Controversy continues to exist in how an acute THA in an elderly patient with a displaced acetabular fracture should be addressed. Previous reports have identified the technical difficulties in achieving effective stability of the acetabular fracture to maximize effective anchorage of the acetabular component and minimize the risk of loosening. Some surgeons resort to two surgical procedures, first to openly reduce and fix the acetabular fracture through one incision, than to perform a THA through a second incision. Others will use a single extensive surgical incision to allow for adequate exposure to attain reduction, fixation, and than THA. The goal of this study was to evaluate the short term outcomes of elderly patients treated with percutaneous anterior column stabilization in conjunction with THA for acute acetabular fractures.

Materials and Methods: Between 2004 and 2006, 11 elderly patients underwent percutaneous anterior column stabilization in conjunction with THA for acute acetabular fractures. Operative time, blood loss, and complications were recorded. Patients were followed both clinically and radiographically. At the time of this abstract, there is a mean follow up time of 10 months.

Results: All patients had resumed full weight bearing with excellent range of motion and pain scores. All fractures had healed; there were no radiographic or clinical signs of THA loosening, infection, or failure. There were also no medical complications to report on.

Conclusion: In conclusion, percutaneous anterior column stabilization in conjunction with THA for acute acetabular fractures may reduce operative time and blood loss, decreasing patient morbidity and potentially improving patient outcomes.

Poster 33

Does Diabetes Predispose Patient to Arthritis

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Introduction: Diabetes mellitus type 2 (DM II) affects 18.2 million Americans and can cause several chronic and morbid complications. Furthermore, 90% of Americans have radiographic evidence of osteoarthritis by age 40. Diabetes may be an important risk factor for symptomatic osteoarthritis later in life. The aim of our study is to determine if diabetic patients are predisposed to osteoarthritis.

Methods: We conducted a review of the all total knee arthroplasty (TKA) cases performed at our institute during the past two years for end stage osteoarthritis. We excluded TKAs performed for post-traumatic arthritis and patients with inflammatory diseases. Comorbidities and demographical information including age, gender, BMI, and family history were collected from our database. A cross sectional study was performed to analyze the prevalence of DM II in our population. This prevalence was compared to that of diabetics in the general population available from various sources including the National Center for Health Statistics.

Results: Our cohort included a total of 3421 patients (1972 females, 1449 males) who had undergone TKA for end stage osteoarthritis. The average age and BMI were 66 years (range 39-92) and 32 (range 21-65) respectively. The prevalence of diabetes mellitus type 2 in our cohort was 12%, while the prevalence of DM II in the general US population currently ranges from 6%-7%.

Discussion: Chronic diabetes causes multiorgan failure via microvascular and macrovascular damage and may possibly lead to degeneration of articular cartilage and eventual arthritis. Based on this study, diabetes appears to be a strong predisposing factor for arthritis. Our laboratory has launched an extensive series of experiments delineating the potential cellular mechanism for such association.

Poster 34

Reamer Irrigator Aspirator (RIA) Bone Graft Harvesting in Non-Union and Segmental Defect Repair

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Introduction: The RIA was designed as a one pass reamer for preparation of fractured long bones in intramedullary nail fixation. Analysis of RIA reaming contents have also demonstrated its use as a tool for harvesting large amounts of quality bone graft with traits similar to iliac crest graft (ICBG). However, complications common in ICBG have not been reported with the RIA procedure. The purpose of the current study was to retrospectively evaluate our experience with the RIA bone grafting procedure.

Methods: We reviewed the medical records of patients who received RIA bone graft for non-unions or segmental defects from 05/04 through 02/06 at our institution. We recorded patient demographics, dates of RIA grafting, dates of union, injury details, complications, graft volume, and use of additional graft material.

Results: The records of 24 patients with 25 fractures were analyzed, 2 were lost to follow-up. 20/23 (87%) fractures achieved union, with a mean time to union of 15 weeks. Nine of the 11 (82%) fractures with segmental defects were treated to union. Complications included 2 non-unions (9%) and 1 graft site infection (4.5%). 5/22 (23%) patients complained of acute donor site pain for an average of only 40 days. Sixteen of 23 received RIA graft alone with an 88% (14/16) union rate, 7/23 received RIA and ICBG and/or bone substitute/augmentation with an 83% (5/6) union rate.

Discussion and Conclusion: The RIA technique is an effective tool for bone graft harvesting. The union and re-operation rates (13.5%) are comparable to ICBG, while complications, including donor site pain, appear to be significantly less morbid. Further prospective study with larger numbers of patients should be done to verify these findings.

Poster 35

The Use of a Tripolar Articulation in Revision Total Hip Arthroplasty: A Minimum of 24 Months Follow-Up

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Introduction: Recurrent instability after revision total hip arthroplasty remains a devastating complication. To deter recurrent dislocations following hip revision, constrained liners have been utilized; however, these components have had disappointing long-term results. The concept of a tripolar articulation was introduced in the mid-1980's and involves the use of a bipolar femoral prosthesis that articulates with a standard THA acetabular component. During this time, case reports have been published documented the success of this technique in treating difficult cases of recurrent instability. The purpose of this study is to report the early results of a tripolar articulation utilized during revision hip arthroplasty.

Methods: A retrospective analysis of 31 hips revised with a tripolar articular construct was performed at two institutions. Two patients were lost to follow-up and one patient died leaving 28 available for review. Patient demographics, preoperative, and postoperative information were recorded in all patients. The average patient age at time of surgery was 65 years and 69% of the patients were women. Our indications for a tripolar construct were recurrent dislocation and the inability to attain intraoperative stability with standard trial components during hip revision. Nine patients (29%) required revision for recurrent dislocation after failure of a constrained liner. Twenty patients (65%) had at least one episode of instability prior to the most recent revision.

Results: At a mean follow-up of 38 months (range 25 to 46 months), modified Postel scores improved from a mean of 5.28 to 9.64 ($p < 0.01$). Heterotopic ossification (Brooker III) was noted in one patient. Radiographic follow-up revealed no evidence of component loosening/migration, osteolysis, or polyethylene wear. Significant improvements for both the walking, 2.6 to 4.6 ($p < 0.001$) and pain, 2.7 to 5.0 ($p < 0.001$) hip scores were noted. Seven patients were ambulating without assistive devices, four required the use of a cane, and three use a walker. Two patients (7%) required revision for recurrent instability and one for femoral component subsidence without episodes of instability.

Discussion: Revision total hip arthroplasty for recurrent instability can be very difficult to treat. In the complex cases treated in this series, a tripolar construct was effective in eliminating or preventing instability in 93% of the cases treated.

These early results support the use of a tripolar construct in treating recurrent instability or instability encountered at the time of revision hip arthroplasty.

Poster 36

Tendon and Ligament Regeneration

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Introduction: Tissue-engineered tendon scaffolds have the potential to significantly improve the treatment of tendon and ligament injuries, especially those associated with tumor, trauma, and congenital deficiencies where autograft or allograft tissue might not be available in sufficient quantity for reconstruction. Ideally, such a scaffold would be: (1) derived from a natural material that mimics the extra-cellular matrix; (2) decellularized to decrease inflammatory potential and host immune response; (3) biocompatible; (4) characterized by sufficient pore size/micro-architecture to allow seeding/infiltration of the patient's own cells prior to/after implantation; and (5) distinguished by sufficient biomechanical integrity to withstand rehabilitation until complete remodeling has occurred. The specific aim of this study was to employ a simple process that combined decellularization and chemical oxidation to remove cellular material and modify the dense architecture of the tendon in order to expose the underlying substructure. It was hypothesized that this treatment would result in a tendon scaffold of increased pore size that retained the majority of its biomechanical properties after modification, was biocompatible in vitro, and possessed negligible inflammatory potential in vivo. It was also expected that cells would readily infiltrate the scaffold in vitro and in vivo.

Methods: Flexor digitorum profundus (FDP) tendons were harvested from the long digit of 56 day old Leghorn chickens. Tendons were trypsinized, then decellularized and oxidized using an aqueous solution containing 2% Triton X-100 and 1.5% peracetic acid for 4 hours. The tissue then was rinsed several times with distilled, deionized water. DNA content was determined pre- and post-decellularization/oxidation. Cellularity and micro-architecture were assessed using light microscopy and scanning electron microscopy, respectively. In vitro biocompatibility was assessed using the MTS™ and Neutral Red assays. Tensile testing of fresh-frozen FDP ten-

dons and decellularized and oxidized FDP tendon scaffolds was also performed. Cell seeding using tenocytes was performed in vitro and assessed microscopically. Cell infiltration in vivo was also qualitatively assessed using histology after subcutaneous implantation in a murine model.

Results and Discussion: A tissue-engineered scaffold was produced that: (1) has absent cellular material histologically, as well as significantly decreased DNA content quantitatively; (2) is biocompatible in vitro; (3) has significant alterations in the micro-architecture, specifically an increase in pore size; (4) retains approximately 75% of the tensile properties of fresh-frozen FDP tendon; (5) is successfully seeded with cells in vitro; and (6) is readily infiltrated by fibroblast-like host cells in vivo as early as 3 days after implantation. The process described here has the potential to produce a material which would be readily-available for use clinically, possess significantly decreased risk of disease transmission and immunogenicity, and promote accelerated incorporation leading to faster patient rehabilitation.