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Abstracts 2007

2007 MINIMALLY INVASIVE UNICOMPARTMENTAL KNEE ARTHROPLASTY: A COMPARISON OF ALL-POLYETHYLENE AND METAL-BACKED TIBIAL COMPONENTS, Jeff D. Almand, M.D., Mississippi Orthopaedics and Sports Medicine, Jackson, MS

Purpose: This study compares the clinical and radiographic results of unicompartmental knee arthroplasty with all polyethylene and metal backed tibial implants.
Methods: This is a comparative prospective analysis of consecutive cohorts of 142 all-polyethylene and 88 metal backed unicompartmental (UKA) tibial components implanted with a minimally invasive technique. These groups were then compared with a cohort of 75 metal backed UKA performed through a traditional arthrotomy. The three groups were similar in demographics and knee pathology. Outcome assessment included knee scores, range of motion, radiographic analysis, and complications. Knee Society scores were assessed preoperatively and again at 6 weeks, 1, and 3 years post-op. Statistical analysis included ANOVA, chi squared, and Wilcoxon rank sum.
Results: While all 3 groups showed significant improvement in knee scores, the metal backed implants had better knee scores (p=.037) and pain scores (p=.024) at 1 year but were equal at 3 years. The minimally invasive knees had better range of motion at 3 years than the traditional UKA group (p=.026). Postoperative limb alignment and implant position were similar for the 3 groups. At 1 and 3 years, the incidence of radiolucent zones beneath the tibial implant was higher with all polyethylene implants (p=.0042), but did not correlate with pain or function (p=.919). Complications and re-operations were more frequent in knees with all polyethylene tibial components.
Conclusion: While satisfactory results can be obtained with all three techniques, better clinical and radiographic results may be obtained in UKA with metal backed tibial components.

2007 OPERATIVE REPAIR OF BILATERAL SPONTANEOUS GLUTEUS MEDIUS AND MINIMUS TENDON RUPTURES: A CASE REPORT, David A. Fisher, M.D.[1], Jeff D. Almand, M.D.[2], Melanie Watts, ATC/L, CSCS[1] , Mississippi Orthopaedics and Sports Medicine, Jackson, MS

Investigation performed at the Indiana Orthopaedic Hospital, Indianapolis, Indiana. Spontaneous avulsion or rupture of the gluteus medius and minimus tendons is a debilitating source of lateral hip pain and is thought to be an uncommon yet often under recognized or misdiagnosed condition.[1-3] Patients presenting with ruptures of the gluteus medius or minimus tendons are often diagnosed as having “greater trochanteric pain syndrome”(GTPS) which is a term often used to denote a common clinical syndrome that is usually classified as trochanteric bursitis.[1, 4] Patients with lateral hip pain or GTPS

and gluteal ruptures are often treated for bursitis and therefore go undiagnosed. This is thought to be due to the difficulty in diagnosing this condition by routine history and physical examination and magnetic resonance imaging (MRI) may be necessary for an accurate diagnosis.[2, 5-7]

Common conditions associated with GTPS include degenerative diseases of the lumbar spine, hip arthritis, pelvic obliquity, iliotibial band and abductor tendonitis, and difference in leg lengths of the lower limbs.[4, 8, 9] The cause of tendinosis and ruptures of the gluteus medius and minimus tendons is uncertain. The causes may be related to local mechanical trauma or predisposing systemic conditions related to tendon ruptures.[10, 11] The gluteus medius and minimus have been regarded as part of the abductor apparatus or the "rotator cuff of the hip", analogous to the rotator cuff of the shoulder which may predispose to rupture in the same manner.[12-14]

We report the clinical presentation, radiographic findings and surgical management of a patient diagnosed with bilateral spontaneous ruptures of the gluteus medius and minimus tendons. Our patient is unique in that the patient was young, had bilateral ruptures and no predisposing condition for tendon rupture. In addition, the ruptures occurred 5 years apart. The patient granted permission for submission of data concerning her case for publication.

Case Report - A forty-two-year-old woman was referred for evaluation of a seven month history of moderate to severe debilitating right lateral hip pain. She initially presented to her local physician with a one month history of spontaneous lateral hip pain and was treated for trochanteric bursitis for the following six months. Her treatment consisted of NSAID's and multiple cortisone injections and physical therapy. She later took narcotics for pain control.

After failed conservative treatment for trochanteric bursitis, the patient was evaluated and found to have no history of any medical problems or any history of predisposing conditions for tendon rupture. She also had no history of related trauma, lumbar spine disease, or contralateral hip pain. The patients lifestyle was moderately active.

On examination, the patient weighed 150 lbs. and was 5 ft. 8 in. tall. She had symmetric spine movement, an even pelvis and no leg length discrepancy. She had an antalgic gait, a noticeable limp and a positive Trendelenburg sign. There was mild tenderness over the trochanteric bursa and severe tenderness over the insertion of the gluteus medius and minimus tendons. No palpable lesions were noted. There was full symmetric range of motion of both hips and no groin pain with provocative maneuvers. There was weakness and trochanteric pain with resisted hip abduction and flexion as well as mild tightness but no snapping of the iliotibial band. Straight leg raise was unrestricted and pain free and deep tendon reflexes were symmetrical, 2+ at the knees and ankles. Patrick's sign to assess intraarticular hip disease was negative.

Plain radiographs were negative for boney avulsion and for calcification adjacent to the greater trochanter or within the substance of the gluteal tendons. There was no sclerosis of the greater trochanter or degenerative disease of the hip. An MRI was obtained to rule out any pathology related to the greater trochanter and consisted of coronal T1, coronal STIR, axial T1, sagittal T2 fast spin-echo with fat saturation imaging sequences of the pelvis and small field-of-view coronal proton density fat-saturated images. The images revealed focal edema surrounding the insertion of the gluteus medius and minimus tendons with rupture of the gluteus minimus and at least partial tear

of the gluteus medius. The musculature and tendinous insertions of the left hip were within normal limits.[Figure 1]

Surgical reattachment was offered to the patient because of her severe debilitating symptoms and failed conservative treatment. The patient agreed and was taken to the operating room definitive treatment.

A longitudinal incision was made over the right hip and the tensor fascia lata incised in line with its fibers. The trochanteric bursa was noted to be normal. The anterior gluteus medius tendon was partially avulsed from the greater trochanter. The gluteus medius tendon was released anteriorly to expose the gluteus minimus tendon. The majority of the gluteus minimus was found to be avulsed [Fig. 2A]. Several sutures were placed in the free end of the tendon and repaired back to the greater trochanter through interosseous drill holes. The repair was augmented using the Restore TM orthobiologic patch (DePuy Orthopedics, Warsaw, IN, USA). The patch was unwrapped, reconstituted, cut to fit the repaired area, and then sutured under slight tension to the gluteus minimus and the trochanteric remnant with 2-0 vicryl suture[Figs. 2B, 2C]. The anterior portion of the gluteus tendon was then advanced and repaired back to the cuff of tendon attached to the greater trochanter. Interosseous sutures were also used to secure the repair of the medius. The wound was closed in routine fashion.

She was discharged home on the next day and had no postoperative complications. After two weeks she was begun on abduction exercises and graduated to one crutch. At 5 weeks her pain and limp were gone and she had full return of abduction and flexion strength. By four months she was symptom free and able to walk two miles without difficulty.

Five years later she presented with a four month history of spontaneous progressive lateral pain and weakness of the opposite hip and no history of trauma. Her exam was the same except that the patients limp and Trendelenburg sign were not as pronounced. As before, her MRI findings revealed a rupture of the gluteus minimus tendon and possible tear of the gluteus medius tendon.[Figure 3] The right hip was found to be normal.

Because of her previous history, conservative as well as surgical treatment was offered to the patient. The patient opted for surgical treatment. Surgical repair was performed using the same technique. The patient is currently 8 weeks from surgery and ambulating without pain, crutches or a limp.

Discussion

Although rupture of the gluteus medius and minimus tendons is thought to be an uncommon injury, unilateral ruptures have been recently reported in both the orthopedic and radiographic literature. However, in our literature review, we found no mention of spontaneous bilateral ruptures or description of surgical repair. There are several findings characteristic of gluteus medius and minimus ruptures. These findings, however, often lead the orthopedist, rheumatologist, as well as the primary care physician to the wrong diagnosis. Patients are often diagnosed with trochanteric bursitis and treated for months with NSAID's, cortisone injections, and physical therapy. Some patients get better but most often have lingering symptoms with intractable pain and hip weakness.[12, 14-16]

Patients usually present with chronic lateral hip pain often associated with a disabling limp without antecedent history of trauma. They may complain of a "grinding" sensation and difficulty climbing stairs. On exam, there often will be exquisite tenderness over the

insertion of the gluteus medius and occasionally over the trochanteric bursa.[8, 9, 17] The two most reliable clinical signs are the Trendelenburg sign and pain on resisted hip abduction, both of which are reported to have greater than 70% specificity and sensitivity. Pain on resisted hip internal rotation is a helpful sign but not as reliable.[1]

Conditions such as fibromyalgia, mechanical low back pain, buttock and leg pain, lumbar spinal stenosis, lumbar radiculopathy and femoral nerve irritation, stress fracture and avascular necrosis may mimic this condition and should be considered in the differential diagnosis.[1, 9] A variety of systemic conditions (Table 1) may predispose to degenerative changes in the tendon and these changes may lead to eventual rupture of the tendons.[6, 18] The gradual attritional changes caused by these conditions may lead to eventual rupture in the same way as the rotator cuff in the shoulder.[6, 14] This, however, doesn't account for patients without these conditions. It has been postulated that pelvic morphology, high valgus angle and leg length discrepancy biomechanically predispose patients to injury as the greater trochanter impinges on a tight iliotibial band. Tension within the iliotibial band may result in frictional trauma to the gluteus medius and minimus tendons, just as the acromial process causes trauma to the rotator cuff in the shoulder girdle.[2, 8, 9, 12, 14] An alteration in gait due to altered biomechanics is likely a predisposing factor and may play a role in causation as well.[2]

Clinical diagnosis of the gluteus medius or minimus tendon ruptures alone is often difficult. Plain radiographs are usually not helpful but may show calcification within the gluteal tendons or boney avulsion. Tendinous calcification has been reported in up to 40% of patients diagnosed with greater trochanteric bursitis, however, other studies found radiographic signs to be less common. Shapira et.al found positive signs in only 9 of 72 patients.[19] Scintigraphic findings are largely nonspecific to the lateral aspect of the greater trochanter. However, some researchers have suggested that scan findings may indicate gluteal tendonitis and not bursitis because of the characteristic appearance of a short linear band of increased uptake confined to the superior and lateral aspects of the greater trochanter on early blood pool or delayed images.[20] Tendonitis, tears and ruptures of the gluteal tendons are most accurately diagnosed by MR imaging. Coronal T1 with fat saturation images and axial fast spin-echo T2 with fat saturation images were found to be the best imaging modality for identifying tears of the gluteus medius and minimus. These techniques may reveal calcification within the tendons and edema within the muscle and adjacent compartments.[2]

Ultrasound can also be a useful aid in detecting gluteal injuries. Connell et.al. evaluated 75 consecutive patients with pain and point tenderness over the greater trochanter with ultrasonography in order to discriminate tendinosis from partial or complete tear. 53 of 75 patients showed sonographic evidence of gluteus medius tendonapathy, 16 partial tears, and 9 full-thickness tears along with 10 patients with gluteus minimus tears. Twenty-two patients required surgery.[21]

GTPS is most commonly seen in middle-aged and elderly women. For this reason it is thought that gluteal tears would follow the same pattern. The overall incidence of injury to the gluteus medius and minimus tendons is unknown.[4, 7] Howell et. al.[22] found degenerative tears of the gluteus medius or minimus in 20% of 176 patients undergoing total hip arthroplasty and Bunker et.al.[13] reported a 22% incidence of tears in a prospective study of 50 consecutive patients with femoral neck fractures. The percentage of symptomatic patients in these two studies was not known.

Gluteus tendon ruptures, if diagnosed early, can be treated conservatively by unloading the involved hip with crutches or a cane, NSAID's, and physical therapy once acute symptoms have subsided. Surgical management may by necessary if the patient fails conservative treatment or the patient's pain and weakness warrant it. Surgery should include conjoined tendon debridement, transosseous fixation and possibly augmentation with soft tissue graft material. The latter could include autograft, allograft, or xenograft in the case of the Restore TM orthobiologic patch.

In conclusion, gluteus medius and minimus tears are often misdiagnosed, under recognized, and may be more common than previously appreciated. This diagnostic dilemma is particularly true for spontaneous ruptures in patients with no predisposing condition. A thorough history and physical exam followed MR imaging is most important in making the correct diagnosis. Ultrasound may represent an alternate diagnostic procedure to consider. Injury to the gluteus medius and minimus should be included in the differential diagnosis of patients presenting with acute or chronic hip pain.

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2007 MEDICAL MALPRACTICE CRISIS- FACT OR MYTH?, David E. Attarian, M.D., F.A.C.S., Duke Medical Center, Durham, NC The medical malpractice crisis inevitably produces a contentious discussion among the various stakeholders, i.e. physicians, attorneys, patients, consumer groups, insurance companies, and government officials. The crisis has been defined as a medicolegal environment of increasing claims and lawsuits, increasing settlements and awards, increasing insurance premiums, physicians and hospitals limiting access to high risk services to reduce liability, unnecessary higher healthcare costs (defensive medicine), adversarial relationships between physicians and patients, and a dysfunctional legal system that consumes healthcare dollars that should ultimately be directed to injured patients or improving the overall quality of care. Many argue that the crisis is a myth. On average, medical malpractice premiums only represent 4% of physician revenues; and the vast majority of cases that go to court are found in favor of the defendant doctor. Others add that the real crisis is the prevalence of negligent care, the failure of the medical profession to police its own, and poor economic decisions by the insurance companies that lead to higher malpractice premiums. Attorneys believe that every patient has the right to a jury trial; and that the threat of such legal action functions as an incentive for physicians and hospitals to improve the quality of service. Key points that favor the reality of the crisis include: physicians have a 1:6 chance of being sued in any given year (higher for some specialties), more than 80% of claims are without merit or frivolous, defensive medicine costs the U.S. more than $120 billion per year and adds more than 3 million people to the

list of “uninsured”, and more than 50% of the dollars spent on medical malpractice actions are consumed by the legal system. Given the ongoing escalating costs of the healthcare economy (> 15% GDP), the current situation will be unsustainable. Some short term solutions are: tort reform to limit non-economic damages, clear definition of medical experts combined with a “certificate of merit” when a lawsuit is filed, and more rapid acknowledgement and treatment of injuries from medical errors. Long term strategies may include: specialized healthcare courts for timely, unbiased, evidence based resolution of disputes and provision of fair compensation to the injured patient, transparent quality assurance programs and sharing of information within the healthcare system to reduce mistakes, and more stringent oversight by the medical profession of its members. All physicians should be politically active by articulating the problems and potential solutions cited to their patients and government representatives. By advocating for cost effective and fair medical malpractice dispute resolution, the described crisis can be reduced or eliminated.

2007 MOBILE BEARING UNICOMPARTMENTAL KNEE ARTHROPLASTY: INDICATIONS AND OUTCOMES, Keith R. Berend, MD, Adloph V. Lombardi, Jr., MD, FACS, New Albany, OH Unicompartmental knee arthroplasty (UKA) has seen an increasing level of interest in recent years built upon better implant design, minimally invasive techniques, and improved outcomes. Into the second decade, the reports of the Oxford UKA appear to rival that of traditional total knee arthroplasty, despite somewhat more liberal indications commonly referred to as the Oxford Indications. These indications for UKA continue to be debated. The purpose of this study is to report the early outcomes and revisions in a consecutive series of UKA implanted for anteromedial osteoarthritis. Between July 2004 and December 2005 316 medial, Oxford Mobile Bearing UKA (Biomet, Inc., Warsaw, IN) were implanted by 2 surgeons utilizing an exacting surgical technique. The indications in each knee were: complete bone-on-bone disease medially on a weight bearing radiograph, functionally intact ACL and MCL, and correctible varus deformity. Correctability of the deformity is examined using a valgus-stress radiograph in each UKA candidate. Using these criteria, the indications for UKA can be as high as 30-35% of osteoarthritic knees. The demographics and patient characteristics were reviewed to examine the indications and their potential influences on outcomes. 40% of patients had a BMI greater than 32 and 25% had a BMI greater than 35. Despite this increased BMI, no increase in failure was noted. 54% of patients were younger than 60 at index surgery, and 15% younger than 50. Again no increase in failure was noted in these younger, active patients. Only 68% of patients reported isolated medial sided pain pre-operatively, with 21% reporting global knee pain, and 6.1% reporting anterior knee pain. No difference in knee scores or post-operative pain was noted between patients with and without pre-operative anterior knee pain or isolated medial sided pain. 43% of knees had pre-operative radiographic evidence of patellofemoral DJD. Despite this, no difference in pain or outcomes was noted between those with and those without radiographic evidence of patellofemoral DJD. In this initial series there were 5 failures (1.6%). No relationship could be established between any outcome measure, including failure, and any of the patient demographics examined. We

would therefore conclude that the so-called Oxford indications for UKA appear to be a safe and accurate measure of candidacy for UKA. Excellent early results are seen with liberal indications using this mobile bearing partial knee replacement.

2007 PERI-ARTICULAR INJECTIONS CONTAINING A CORTICOSTEROID DURING TKA: PRELIMINARY RESULTS, Christian P. Christensen, MD, Cale A. Jacobs, PhD, Lexington Clinic Sports Medicine Clinic, Lexington, KY Multimodal pain control protocols that include intra-operative, peri-articular injections have been reported to decrease pain and improve early outcomes following TKA. While injections containing a corticosteroid have been demonstrated to be safe and effective, to our knowledge no randomized trials have been performed to evaluate the specific role of the corticosteroid in early postoperative outcomes. The purpose of this study was to compare pain, range of motion, narcotic consumption, length of hospital stay, as well as Knee Society Scores between 40 patients randomly assigned to receive peri-articular injections consisting of bupivacaine HCl (80 mg), morphine (4 mg), epinephrine (300 mcg), clonidine (100 mcg), cefuroxime (750 mg), and normal saline either with or without the inclusion of methylprednisolone acetate (40 mg). During the hospital stay, there were no differences in pain, narcotic consumption, or range of motion; however, the length of hospital stay was significantly reduced for patients that received the corticosteroid (2.6 days) compared to the group of patients that did not received the corticosteroid (3.2 days, p=.04). There were no differences in Knee Society Score or range of motion between the two groups preoperatively, or at the 6- and 12-week follow-ups. Furthermore, 82% of the patients that received the corticosteroid were discharged home compared to 72% of the group of patients that did not receive the corticosteroid. There were also no differences in complication rates between groups, with one patient that did not receive the corticosteroid being readmitted to rule out infection, and one patient that did receive the corticosteroid undergoing manipulation under anesthesia. Our preliminary results indicate that the inclusion of corticosteroid resulted in a slight decrease in length of hospital stay; no improvements in pain, range of motion, or early clinical outcomes; and no increased risk of infection or other complication. We conclude that peri-articular injections containing a corticosteroid appear to be safe; however, our preliminary results question the use of this medication as part of a multimodal pain control protocol as it does not appear to provide a measurable benefit.

2007 THE EFFECT OF EVOLVING TECHNIQUE ON OUTCOME AND LIMB ALIGNMENT IN TOTAL KNEE ARTHOPLASTY, Robert Friedman, M.D., Orthopaedic Associates of the Greater Lehigh Valley, Easton, PA

Purpose: Within the last five years several variations in technique to perform a total knee replacement have been introduced. While the procedure is touted as being highly successful in improving the quality of life for many patients, it also can be significantly painful, expensive, labor intensive, and resource consuming. The purpose of this study is

to determine what effect specific changes in technique would have on patient's early mobility, pain control, and component alignment and sizing.
Methods: A consecutive series of three groups of patients was studied. These groups consisted of 25 patients before changes were implemented (A), 25 patients when the mid-vastus approach was added (B), and 25 patients after computer assisted navigation was added (C). Patients were assessed on functionality, pain control, and blood loss during their hospital stay, as well as the limb alignment achieved.
Results: Early function was substantially improved. 80% of patients in group C achieved greater than 90 degrees of flexion by discharge versus only 18% in group A. 92% of patients in group C went home while only 8% in group C went home. There was trend toward less need for pain pills and a reduction in need for intravenous rescue from 64% in group A to 28% in group C. Blood loss was not substantially different. Limb alignment improved with less deviation from target parameters. 92% of tibias in group C were within one degree of the 0^0 target while only 36% in group A achieved that target.
Conclusion: The sum total of specific changes in this study measurably improved the functionality, pain control, and limb alignment of patients undergoing total knee arthroplasty.

2007 LONG-TERM OUTCOMES OF HIGH-GRADE SPONDYLOLISTHESIS MANAGED WITH POSTERIOR DECOMPRESSION, POSTEROLATERAL FUSION AND FIBULAR DOWEL STRUT GRAFT, Christopher G. Furey, M.D., George H. Thompson, M.D., Henry H. Bohlman, M.D., Department of Orthopedic Surgery, Case Western Reserve University, Cleveland, Ohio

Purpose: To evaluate the long-term results of pediatric patients with high grade spondylolisthesis treated with posterior decompression, posterolateral fusion and fibular dowel strut graft.
Study Design: Retrospective clinical and radiographic study.
Materials: Twenty-two patients underwent surgery and were followed an average of 8.7 years (range 3-17 years). Average age at the time of surgery was 13.5 years (range 11-17 years). 5 patients had Meyerding grade III spondylolisthesis, 12 had grade IV, and 5 had spondyloptosis. Each patient underwent a wide decompression with an L5 laminectomy and bilateral foraminotomies. A fibular dowel was placed in a posterior to anterior fashion across the disc space from the sacrum into the L5 body. A posterolateral fusion with autogenous iliac crest bone graft was performed in each case. Pedicle screw instrumentation was employed in 12 cases. No forceful reduction of the deformity was attempted. Clinical assessment was with the SRS-24 instrument as well as specific queries regarding relief of pre-operative back and leg pain, improvement in quality of life, satisfaction with surgery, and willingness to retrospectively repeat surgery. Radiographic parameters evaluated were: slip grade, slip angle, sacral inclination, and lumbar lordosis.
Results: Relief of back pain was excellent in 18 patients (82%), good in 2 patients (9%), and fair in 2 patients (9%). Relief of leg pain was excellent in 20 patients (91%) and good in 2 patients (9%). 21 patients (95%) reported improvement in their quality of life

post-operatively, at the most recent follow-up. 21 patients (95%) felt their pre-operative expectations had been met. There was no statistical difference in SRS-24 scores between patients who had instrumented and uninstrumented fusions. The SRS-24 was slightly lower in patients who required revision surgery though it was not significant. 20 patients (91%) had a solid fusion at 6 months postoperatively. The 2 patients (9%) with a pseudarthrosis had uninstrumented fusions. 4 patients (18%), all of whom had uninstrumented fusions, had deformity progression of one slip grade. Slip angle improved an average of 16 degrees in patients in with instrumented fusions compared with 2 degrees in uninstrumented cases. Transient L5 neuropraxia occurred in 4 patients (18%), all of which resolved within 3 months post-operatively. No focal motor deficits occurred. 3 patients (14%) required additional surgery, 2 for revision fusion and 1 for removal of prominent pedicle screw instrumentation.
Conclusion: Posterior decompression with posterolateral fusion and fibular dowel strut placement is an effective technique to address high grade spondylolisthesis, with predictable relief of back and leg pain and improvement in quality of life.

2007 ANKLE ARTHRODEDSIS WITH AN ANATOMICALLY CONTOURED ANTERIOR PLATE, Changan Guo, William R Barfield, Langdon A. Hartsock, Medical University of South Carolina, Charleston, SC

Background*:* More than 40 fusion techniques for the ankle joint have been reported. The purpose of this retrospective study was to review our preliminary clinical and radiographic results by using an anatomically contoured anterior plate for ankle arthrodesis.
Methods: From Sept 2004 to Oct 2006, 10 arthrodeses were performed by the senior author (LAH) using an anatomically contoured anterior plate (Synthes, Paoli, PA) through anterior approach. The patients include 6 men and 4 women with an average age of 43.6 (range from 23 to 79). All the patients were followed up from 5 months to 28 months with an average of 13 months.

All patients had disabling ankle arthritis of variable etiology. Preoperative diagnosis consisted of three patients with primary degenerative osteoarthritis, one with avascular necrosis of talus, six with posttraumatic osteoarthritis. Among the six patients with posttraumatic osteoarthritis, five of them were complicated with infection after open ankle fracture, in which two have undergone skin graft or flap. Five of ten patients were combined with bone defects which were located at the distal end of the tibia and the fibula, talus and medial malleolus. The indications for surgery were severe pain and/or deformity which had no responded to conservative treatment. Three patients had not undergone any previous surgeries on the involved ankle, two had one operation, three had two operations, one had three operations, and one had four previous operations. Eight patients underwent primary arthrodesis by using anatomically contoured anterior plate, one patient underwent secondary arthrodesis by reapplying the same plate for distal screw loosening after primary fusion, one patient underwent the third arthrodesis for nonunion of fusion with cortical and cancellous or cannulated screws twice.

All patients were evaluated by a reviewer who was not involved with the initial

surgery. Plain radiographs of ankle 3 views were taken usually after operation immediately, 6 weeks, 12 weeks, 24 weeks postoperatively to aid in determining the stability of fixation and time of fusion. AOFAS clinical rating system for ankle-hindfoot, [10] which includes scores for both ankle and hindfoot, was utilized selectively (Table 2). Because two cases in our series were combined with subtalar fusion simultaneously, which made it impossible to evaluate the hindfoot motion by using AOFAS system. We also were unable to use AOFAS system to measure the maximum walking distance because it was dependant on estimation.

Results: Nine of ten patients achieved solid fusion radiographically and clinically at an average of 15 weeks (range 12 to 22 weeks). Bony healing was achieved after an additional 12 weeks for the patient who underwent re-fusion. There were no postoperative wound problems or recurrent infection. All patients reported an improvement in their pain level following successful fusion.

Conclusion: The application of anatomically contoured plate through anterior approach provides many advantages, including minimal soft tissue disruption, ease of deformity correction, early rehabilitation, and high rate of union. It is easily reproducible and can be recommended for patients with failed fusion and posttraumatic arthritis with infection and poor bone quality.

2007 ANOMALOUS THENAR MUSCULATURE ASSOCIATED WITH ABERRANT MEDIAN NERVE MOTOR BRANCH TAKE-OFF, AN ANATOMIC AND CLINICAL STUDY, Gary M. Lourie M.D., Atlanta, GA

Anatomic variation involving the median nerve and intrinsic muscles exist in the hand. Knowledge of this is important to avoid iatrogenic injury during carpal tunnel release. The purpose of this study is to describe a previous underreported relationship between an aberrant course of the median nerve motor branch and anomalous thenar musculature.

Materials/Methods - This study is two part, in the clinical part 20 cases were encountered (of total 530 CTR between 1/2000-1/2007) that demonstrated an anatomic variation between the motor branch and the thenar musculature. A cadaveric study (42 upper extremities) was performed to describe its frequency.

Results - In the clinical study 20/530 cases (4%)of cases demonstrated an anomalous head of the flexor pollicis brevis (FPB) associated with a more ulnar take-off of the recurrent branch. In the cadaveric study this was documented 5% of the time. Unpaired T-Tests results confirm a p-value of .0001. ANOVA with post-hoc analysis confirmed to a p-value of .0001 the relationship of the aberrant course with its relation to the anomalous muscle.

Conclusion - This muscle has a 1) triangular shape, 2) minimal fascial covering, and 3) ranges from an extension of the FPB to an additional head. Its presence has been associated 100% of the time with an ulnar take-off of the motor branch and should alert the surgeon operating in this area.

2007 CMC ARTHROPLASTY UTILIZING A ARTELON BIOABSORBABLE SPACER EARLY CLINICAL EXPERIENCE, Richard S. Moore, Jr., M.D., Wilmington Orthopaedic Group, Wilmington, NC

Abstract: Arthritis of the thumb carpometacarpal (CMC) joint in young active patients is an increasingly common problem faced by the hand surgeon. Multiple reconstructive procedures ranging from simple trapeziectomy to trapeziectomy and tendon transfer for ligament reconstruction and interposition have been reported with universally good results but primarily in a more aged population. This report reviews the early clinical results of a single surgeon's experience with a limited trapeziectomy and bioabsorbable interpositional implant for treatment of thumb CMC arthritis.

Methods: Twenty-three patients with symptomatic thumb CMC arthritis underwent arthroplasty with a limited trapeziectomy and implantation of an Artelon spacer. All patients had failed maximal conservative measures and had clinical and radiographic evidence of CMC arthritis with no STT involvement. The patient population (n=23) consisted of 17 females and 5 males (1 female bilateral) with an average age of 51 years (range 42-65). The procedure was performed on 9 right hands and 14 left hands – 7 dominant and 16 nondominant. Six patients underwent simultaneous carpal tunnel release and 2 underwent trigger thumb release. Patients were immobilized in a thumb spica splint for 10-14 days followed by a thumb spica cast for 4 weeks. A neoprene splint was utilized until 12 weeks post-op at which time full unrestricted activity was allowed.

Results: A minimum 6 month follow-up was available on 16 patients. Average follow-up was 12 months with a range of 6 – 15 months. There were no complications and all patients were satisfied with the results reporting good pain relief and return to function. There was 1 revision for instability following a severe motor vehicle accident.

Early results of CMC arthroplasty utilizing an Artelon spacer are promising with good pain relief and return to activity. Longer term follow-up with more objective evaluations are warranted and ongoing.

2007 LUMBOSACRAL FUSIONS USING TRANS-AXIAL FIXATION, Richard J. Nasca M.D., Wilmington, NC

Clinical and radiographic data from a consecutive series of 26 patients treated with one and two level lumbosacral interbody fusions using trans-axial fixation inserted thru a presacral approach were reviewed.

The average age was 42 years with an age range of 20-68 years. Twenty –four of the patients had back and radicular pain. No patient had a neurologic deficit. A trans-sacral approach was used. An axial tract was reamed in the S1 body using C arm control in the A.P. and Lat. planes. Through this portal the L5-S1 intradiscal contents were removed and the end plates were prepared with special cutters. Autogenous bone, BMP and bone filler was placed in the prepared interspace and a trans-axial screw was inserted into the sacral body and into L5 after reaming an axial channel in the L5 vertebra. Pedicle fixation was used in all cases.

The mean Oswestry went from 50% pre-op to 33% post- op and the mean VAS from 67 mm pre –op to 41 mm post –op. Average blood loss was 150cc. There were 3 superficial infections that resolved. There were no fixation failures. There was some lysis noted around the trans-axial screw in 3 patients not achieving an interbody fusion. Two spine surgeons and a neuroradiologist reviewed the post operative reformatted CT scans. Each reviewer worked independently and submitted their data for tabulation. Fusion rate was 88 %. There was only one discrepancy regarding fusion among the 3 reviewers.

In conclusion, the trans-sacral approach using the trans-axial screw provides interbody fusion rates consistent with more invasive anterior techniques. Complications and morbidity were rare and the clinical results showed improvement in the Oswestry and VAS scores.

2007 STREAMLINING OUTCOMES RESEARCH IN ORTHOPEDIC SURGERY, Pietrobon R, Olson S, Richardson WJ, Moorman CT, Nunley J, Vail TP, Duke Medical Center, Durham, NC

Analysis of clinical outcomes is of paramount importance for the establishment of evidence-based practice guidelines in Orthopedic Surgery. Despite its significance, collecting and analyzing clinical data with subsequent publication of scientific results is time and resource demanding. Barriers are increased when multiple sites are required to achieve a representative patient population. This presentation will demonstrate a series of Web applications developed by the Division of Orthopaedic Surgery at Duke University to streamline clinical research processes. The Web applications include activities of prospective data collection, project management, online writing of scientific articles, and overall project management. Each Web application will be demonstrated using examples of ongoing clinical projects involving Duke University and participating sites in academic and non-academic institutions.

2007 SKIN COVERAGE/RESURFACING OF THE HAND, Sigurd Sandzen, M.D., Vero Beach, FL

The primary object of open wound care is to provide closure or coverage as soon as possible.

Two basic procedures should be in the armamentarium of the physician who deals with upper extremity injuries and reconstruction: the split thickness skin graft and the random flap either groin or abdominal pedicle.

A split thickness skin graft .016-.018 inches thick offers qualities of a reliable “take” and good durability and sensibility. The healed graft occupies about 60 percent of the area of the original wound and during healing acts in a purse-string fashion to draw centrally normal skin and subcutaneous tissue.

The split graft is as durable as the full thickness skin graft and has similar sensibility with a better chance for survival. It will have the pigmentation of the donor site so

occasionally it may be taken from the hypothenar area of the hand to resurface digital defects in patients with darker skin.

The Davol battery powered dermatome may be used to obtain smaller grafts from the upper inner arm just distal to the axilla. Otherwise for larger grafts a standard dermatome harvests skin from the thigh or abdomen.

A meshed split thickness graft provides very effective resurfacing of dirty granulation tissue and burns particularly when donor's skin is scarce. The transudate exudates or blood escapes from the interstices of the graft and healing progresses to fill the defects from the normal skin latticework.

Distant random pedicles either abdominal or groin provide excellent secondary and occasionally primary resurfacing from the elbow distally. Deeper reconstruction of skeleton nerve or tendon or a combination can be carried out simultaneously with flap application or release or at a later procedure.

The flap must be thin with appropriate fat removal since the skin of the flap is nourished by the subdermal vascular plexus. The donor area of the flap is closed primarily if possible or covered by a split thickness skin graft. The pedicle may be severed at three weeks after application with donor site revision.

A random flap can be used to fabricate a thumb-index web after release of a severe contracture by the method of Littler.

Two or more random flaps can be applied simultaneously.

Seldom is it necessary to utilize a composite free graft which necessitates microvascular anastomosis of artery and veins

2007 RADIOGRAPHIC AND ANATOMIC PREDICTORS OF SCAPULAR NOTCHING IN THE DELTA III REVERSE TOTAL SHOULDER REPLACEMENT, Ryan W. Simovitch, M.D., Palm Beach Orthopaedic Institute, Palm Beach Gardens, FL

Background: The reverse DELTA III shoulder prosthesis can successfully relieve pain and restore function in cuff tear arthropathy. The most frequently reported radiographic complication is inferior scapular notching. The purpose of this study was to evaluate the clinical relevance of notching and to determine the anatomic and radiographic parameters that predispose to its occurrence.

Methods: Seventy-seven consecutive shoulders of 76 patients of an average age of 71 years with an irreparable rotator cuff deficiency were treated with a reverse DELTA III shoulder arthroplasty and followed clinically and radiographically under fluoroscopic control for a minimum of 24 months (mean: 44, range: 24 to 96). The effect of glenoid cranial caudal component positioning and of the prosthesis ? scapular neck angle on the development of inferior scapular notching and clinical outcome was assessed.

Results: All shoulders which developed notching did so in the first fourteen months. Of the seventy-seven shoulders studied, thirty-four (44%) had inferior scapular notching, twenty-three (30%) had posterior notching and six (8%) had anterior notching. Osteophytes along the inferior scapula occurred in twenty-one (27%) of the seventy-seven shoulders. The angle between the glénosphère and the scapular neck (r=+0.677)) as

well as the cranio-caudal position of the glénosphère (r=+0.654) were highly correlated with inferior notching (p<0.001). A notching index (notching index = height of prosthesis + (prosthesis scapular neck angle x 0.13) was calculated using the height of implantation of the glénosphère and the postoperative prosthesis scapular neck angle: This allowed a prediction of the occurrence of notching with a sensitivity of 91% and specificity of 88%. The height of implantation of the glenosphere had approximately an 8 times greater influence on inferior notching than the prosthesis scapular neck angle. Inferior scapular notching was associated with a significantly poorer clinical outcome than absence of inferior notching: At final follow-up, the respective average subjective shoulder values were 62% and 71% (p=0.032), relative Constant scores were 72% and 83% (p=0.028), abduction strength was 4.3 versus 8.7 kilograms (p<0.001), active abduction was 102° versus 118° (p=0.033) and flexion averaged 110°versus 127° (p=0.004).

Conclusion: Inferior scapular notching after reverse total shoulder arthroplasty adversely affects midterm clinical outcome. It can be prevented by optimal positioning of the glenoid component.

2007 FAILED DARRACH PROCEDURE: ALLOGRAFT RECONSTRUCTION,

Sotereanos D.G.[1], Giannoulis F.S.[1], Payatakes A.H.[1], Greenberg J.A.[2], Weiser R.W.[1]
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Background data: The Darrach procedure (excision of the distal ulna) has been the gold standard for surgical treatment of DRUJ arthritis (DJD, RA, post-traumatic). Despite modifications (Bower hemiresection, matched resection, wafer procedure) failure rates remain high (7-48%). The typical cause of failure is painful radioulnar impingement and instability leading to pain and loss of grip strength. Failed distal ulna resection comprises a difficult reconstructive dilemma. Several salvage techniques have been described (tenodesis, revision resection, silicone capping, implant arthroplasty) with variable results.

Purpose of study: To evaluate a new salvage procedure for management of failed distal ulna resection.

Material and methods: Seventeen patients with incapacitating pain and weakness following distal ulna resection were treated using a new surgical technique with allograft reconstruction of the DRUJ. The distal ulnar stump and the medial aspect of the distal ulna were initially exposed through the previous incision. An Achilles tendon allograft was fashioned into a bulky spacer and interposed between the distal radius and the distal ulnar stump. The graft was stabilized with placement of bone anchors into the medial cortex of the radius and drill holes through the distal ulna. Adequate graft size was verified by rotating the forearm and applying pressure to the medial aspect of the ulna while assessing for crepitus. Postoperatively a long arm splint and cast were placed for 6 weeks, followed by physical therapy. Patients were evaluated for demographic parameters, pre- and post-operative pain (recorded on a visual analog scale), range of motion, grip strength, presence of crepitus, and radiographic parameters. Patient satisfaction with the procedure was also assessed.

Results: Mean patient age was 47 years (range 39-68). The mean elapsed time since the index procedure was 15 months (range 9-26). Mean follow-up was 46 months with a minimum of 12 months. Pain improved significantly by an mean of 6 points. Forearm rotation improved by a mean of +72° (pronation +30°, supination +42°). Grip strength improved by mean of 74%. Persistent crepitus was noted in the first patient of the series. This failure was attributed to inadequate graft size. The remaining patients graded their results as excellent (6 cases) or good (10 cases). Post-operative X-rays showed maintenance of the radioulnar space with no impingement with loading of the forearm in neutral rotation. Mild forearm swelling resolved within 2 weeks in all cases. No evidence of infection or clinically significant graft-related complications was noted.
Conclusion: Allograft reconstruction of the DRUJ effectively prevented radioulnar impingement and stabilized the distal ulna. This novel technique provides an attractive alternative to implant arthroplasty for salvage of failed distal ulna resections. Long-term follow-up is necessary to validate these promising early results.

2007 THE DYNAMIC PHASES OF PERONEAL AND TIBIAL INTRANEURAL GANGLION FORMATION: A NEW DIMENSION ADDED TO THE UNIFYING ARTICULAR THEORy, Robert J. SPINNER, Kimberly K. AMRAMI, Huan WANG, Bernd W. SCHEITHAUER, and Stephen W. CARMICHAEL, Mayo Clinic School of Medicine, Departments of Neurologic Surgery, Orthopedics, Anatomy, Radiology and Laboratory Medicine, Rochester, MN.

Object: The pathogenesis of intraneural ganglia has been controversial for more than a century. Recently we have identified a stereotypic pattern of occurrence of peroneal and tibial intraneural ganglia and based on an understanding of their pathogenesis, provided a unifying explanation. Atypical features occasionally observed have offered an opportunity to further verify and expand upon our proposed theory.
Methods*:* Ten unusual cases are reviewed to introduce the dynamic features of peroneal and tibial intraneural ganglia. In part I, we analyzed 2 of our own patients who shared the essential principles common to peroneal intraneural ganglia: namely a) connections to the anterior portion of the superior tibiofibular joint, and b) intraepineurial dissection of the cyst along the articular branch of the peroneal nerve and proximally. These patients also demonstrated unusual MRI findings: a) the presence of a cyst within the tibial and sural nerves in the popliteal fossa region, and b) spontaneous regression of the cysts on serial examinations performed weeks apart. We then identified a clinical outlier that could not be understood in terms of our previously reported unified theory. Reported 32 years ago, this patient had a tibial neuropathy and was found to have tibial, peroneal and sciatic intraneural cysts without a joint connection at operation. Our hypothesis, based on our initial experience was that this reported patient had a primary tibial intraneural ganglion with proximal extension, sciatic cross-over and then distal descent, and that a joint connection to the posterior aspect of the superior tibiofibular joint with remnant cyst within the articular branch would be present, a finding that would help us explain the formation of the different cysts by a single mechanism. We proved this by careful inspection of a recently obtained postoperative MRI. In part II, we retrospectively

reviewed 20 additional cases of our own and identified 7 examples with subtle unrecognized MRI features of sciatic cross-over (as well as several examples in the literature).
Conclusions: These cases provide firm evidence for mechanisms underlying intraneural ganglia formation and allow us to expand our unified articular theory to elucidate unusual presentations of intraneural cysts. Whereas an articular connection and fluid following the path of least resistance was pivotal, we now incorporate dynamic aspects of cyst formation due to pressure fluxes. These principles explain new patterns of primary ascent, sciatic cross-over and terminal branch descent when cyst fills the sciatic nerve's common epineurial sheath.

2007 CARPAL TUNNEL RELEASE: AN EVIDENCE BASED REVIEW OF A SINGLE SURGEON'S EXPERIENCE WITH ENDOSCOPIC CARPAL TUNNEL RELEASE, James R. Urbaniak, M.D., Vani Sebesan, M.D., J. Mack Aldridge, M.D., Duke Medical Center, Durham, NC

Background: Although its introduction was over twenty years ago, there remains continual debate and controversy regarding endoscopic approach to carpal tunnel release. A number of meta-analyses have attempted to review the large body of literature on open versus endoscopic techniques, including both retrospective and prospective studies with varying levels of evidence. Unfortunately no definitive conclusions can be drawn from these studies and controversy still remains in regards to the increased technical difficulty, cost, and complication rates for the endoscopic technique. This retrospective review attempted to examine the outcomes of a single surgeon's experience with the endoscopic technique over the last 15 years to better understand effects of a surgeon's experience on outcomes and complication rates.
Methods: A retrospective review was performed on a case series of 155 hands in 130 patients ages 25-89 years old. An endoscopic carpal tunnel release was performed on all patients by a single surgeon at a Duke University over the course of 15 years. All patients had clinical signs or symptoms and electrodiagnostic findings consistent with carpal tunnel disease and almost all had failed non operative treatment.
Results: The average age of these patients was 55 years old with two times as many females compared to males. The Tinel's sign and two point discrimination test appeared to have the weakest correlation to a diagnosis of carpal tunnel syndrome. Twenty three patients had other contributing problems in either the upper extremity or cervical spine which were evaluated prior to surgery. There was an average of three month follow up for all patients and one postoperative complication that required return to the operating room. Ninety six percent of patients had significant improvement in severity of nerve symptoms and pain at follow up. The billed cost of endoscopic carpal tunnel release at our university was 9% more than standard open release and the average return to work was 3weeks. There is a positive trend demonstrating improved outcomes for patients treated in the last 7½ years of experience compared to this single surgeons first 7½ years utilizing this technique.
Discussion: Previous recommendations against the endoscopic carpal tunnel release

have focused on increased complication rates and cost, with no reported significant differences in long term clinical outcomes or patient satisfaction. Our results demonstrate increased success and lower complication rates for this series of patients treated by a single surgeon over 15 years. This may indicate a significant correlation between a surgeon's expertise and outcomes for the endoscopic carpal tunnel release.

2007 SURGICAL ELECTROPHYSIOLOGICAL MONITORING. A SURVEY AND SUMMARY OF THE PIEDMONT ORTHOPEDIC SOCIETY MEMBERSHIP, David C. Urquia, M.D., West End Orthopaedic Clinic, Richmond, VA

A presentation of the current EP techniques available (EMG,SSEP,MEP) and common applications in Orthopedic surgery. A review of recent literature and case reports presented. Data presented from surveys of the national Piedmont Society membership.

Recommendation made that EP be employed in combination (EMG/SSEP/MEP) to minimize the false-negative rate for clinical neurological injury detection.

Majority consensus exists that surgical EP monitoring should be employed for selective high risk cases, mainly spinal deformity, spinal instrumentation, and myelopathy cases. However, controversy does exist on the clinical usefulness and cost effectiveness for EP monitoring in the operating room setting.