

ABSTRACTS PRESENTED AT THE

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IS RETURN TO COMPETITIVE ATHLETICS POSSIBLE AFTER SELECTIVE PARS REPAIR IN ADOLESCENT PATIENTS WITH SPONDYLOLYSIS ?, Abbott Byrd, M.D., Eastern Virginia Medical School, Virginia Beach, Virginia

BACKGROUND CONTEXT: One cause of LBP in the adolescent athlete is acute spondylolysis. Though most patients respond to non-operative treatment some do not and have continued severe pain.

PURPOSE: The purpose of this paper is to examine a group of adolescent athletes with pain due to acute spondylolysis unresponsive to non-operative treatment and preventing athletic competition to determine if it is possible to return them to athletic competition with selective surgical repair of the spondylolysis.

STUDY DESIGN/SETTING: This is a prospective study of adolescent athletes with LBP due to acute spondylolysis who failed non-operative treatment, were unable to continue with their athletic sport and elected surgery in an attempt to continue their athletic career.

PATIENT SAMPLE: Four adolescent athletes make up the study group. None were lost to follow-up.

OUTCOME MEASURES: The primary outcome measure was the ability to return to competitive sports. The secondary outcome measure was pain relief measured on a visual analog scale. The tertiary outcome measure was an assessment of pars healing on plain radiographs.

METHODS: Four adolescent athletes with LBP secondary to acute spondylolysis unresponsive to non-operative treatment underwent selective pars repair with iliac crest bone graft and internal fixation using a pedicle screw-rod-hook construct. Patients were followed for an average of 48 months with a range of 25-72 months. Patients were assessed at each visit with an analog pain scale, physical exam, radiographs and a determination of their athletic ability.

RESULTS: All four patients returned to competitive athletic competition. The average pain relief was 90%. All pars repairs appeared to heal on plain radiographs.

CONCLUSIONS: Selective pars repair is effective in returning the adolescent athlete debilitated by LBP from acute spondylolysis to competitive athletic competition.

DISCLOSURES: NA: This abstract does not discuss or include any applicable devices or drugs.; NA: This abstract does not discuss or include any applicable devices or drugs.; NA: This abstract does not discuss or include any applicable devices or drugs.

CONFLICT OF INTEREST: Author (AB) Royalties - Royalty income secondary to numerous patents on the Polaris Pedicle Screw System and Solitaire Anterior Lumbar Fusion Cage - Major; Stock ownership (options, warrants) - Stock options in Applied Spine Technology which is a motion preservation company - Minor; Speaking arrangements - Biomet Spine - Minor; Scientific Advisory Board - Applied Spine Technology - Minor.

TOTAL ANKLE REPLACEMENT IN EXTREME DEFORMITY, James K. DeOrio, M.D., Duke Medical Center, Durham, North Carolina

The INBONE TAA is a fixed-bearing two-component design with a modular stem system for both tibia and talar components. The tibia is inset into the tibial metaphysis, but does not resurface the malleoli. The talar component entirely replaces the superior aspect of the natural talus, after a flat dome resection. Multiple modular segments may be added to the tibial stem, depending on the surgeon's determination of how much stability is needed or how much the stem should pass beyond a simultaneous supramalleolar osteotomy performed for tibial malunion. The talar component's stem may be limited to the body of the talus or can be extended across the subtalar joint into the calcaneus if greater support for the talar component is required or when a simultaneous subtalar arthrodesis is warranted. However, the longer talar component calcaneal stem is not currently FDA approved.

Unique to the INBONE total ankle system is the alignment guide placed after the ankle is exposed via an anterior approach. The device demands simultaneous alignment of the talus with the tibia. Once that is achieved, a drill is passed from the plantar foot through the calcaneus, just anterior to the posterior facet, through the center of the talar body into the center of the tibial metaphysis; much like the guide pin for a retrograde ankle arthrodesis nail. While many argue that it is undesirable to violate the subtalar joint when performing TAA, the designers of the alignment guide maintain that if the device is applied appropriately, the drill safely negotiates the subtalar joint between the arterial anastomosis on the inferior talar neck and the posterior facet's articulation with the inferior talus. Because of the alignment system with the leg pinned to a metal stand and with the aid of lamina spreaders

tensioning the concave side of the ankle, significant varus and valgus deformities can be corrected with orthogonal bone cuts. Afterwards the ankle is supported by the broad polyethylene insert on a saddle shaped talar component articulation. With over 200 INBONE ankle replacements personally performed, the author's expanded indications and techniques for extreme deformity will continue to grow.

DDH TREATMENT WITH OPEN REDUCTION: MEDIUM TERM OUTCOME, Robert D Fitch, M.D., Nikolaos Rigopoulos M.D., Duke Medical Center, Durham, North Carolina

Purpose. To evaluate clinical and radiographic outcomes of patients treated by anterior open reduction performed by a single surgeon.

Materials and Methods. A retrospective chart review was done for years 1983-2006 of those patients identified to have DDH who required treatment by open reduction with or without pelvic and femoral osteotomy. Data collected included procedure, transfusion requirements, complications, and subsequent procedures. Radiographs were reviewed and the presence of AVN was recorded and the Severin grade was determined from the last recorded radiograph. A subset of bilateral cases treated in a contemporaneous fashion was analyzed separately.

Surgery. Modified Smith-Peterson approach; open reduction; Salter capsulorrhaphy; pelvic osteotomy if older than 18 months; Pre reduction traction if less than 2 years; Femoral shortening if greater than 2 years of age.

Results. 80 patients were identified. 41 patients (53 hips) had greater than 2 years of follow up with appropriate radiographs. 11 of the 12 bilateral cases were treated at the index procedure. Mean age at the time of surgery was 24 months (3-133). Mean follow up was 8.1 years (2.5 to 24). EBL for unilateral cases was 50 cc. One required transfusion. EBL for bilateral cases was 85 cc. None required transfusion. There were 4 redislocations. 3 underwent repeat open reduction; one had open reduction with femoral and pelvic osteotomy. 6 hips had subsequent pelvic osteotomy for residual acetabular dysplasia. 4 patients developed radiographic evidence of AVN: 3 type I, 1 type II, 1 type IV. Severin Classification: 41 hips class I; 11 hips class IIA; 1 hip class III.

Conclusion: Medium term outcomes are promising with 98% of hips classified as Severin I or II at last follow up. Patients with bilateral dislocations can be treated in a contemporaneous fashion with no deterioration in outcome.

RANDOMIZED PROSPECTIVE CLINICAL TRIAL COMPARING REAMER IRRIGATOR ASPIRATOR (RIA) TO STANDARD REAMING (SR) IN BOTH MINIMALLY

**INJURED AND MULTIPLY INJURED PATIENTS WITH CLOSED FEMORAL SHAFT FRACTURES TREATED WITH REAMED INTRAMEDULLARY NAILING (IMN),
Langdon A. Hartsock, M.D Laura Liles, M.D., Kyle Kokko, M.D.,
Ph.D., William R. Barfield, Ph.D., Medical University of South
Carolina, Charleston, South Carolina**

Introduction:

Femur fractures, are common in blunt trauma. Intramedullary nailing (IMN) has become the treatment of choice for long bone skeletal injuries in the multiple injured patient.

Reaming causes embolization of marrow elements, fat and bone spicules. An alternative method of reaming that uses aspiration during the reaming removes marrow and fat and reduces embolization of this material.

Clinical and biochemical data may be helpful in stratifying the risk associated with reamed IMN. This includes cytokine measures and measures that assess the systemic inflammatory process.

Methods:

A prospective, randomized, single-blind trial was conducted on 19 patients who had a closed femoral shaft fracture amenable to reamed IMN. Patients were randomized to undergo IMN with standard reaming or IMN with the RIA in a 1:1 ratio.

A thorough history and physical was obtained upon arrival to the emergency room.

Plasma samples were obtained at admission, after induction of anesthesia for Intramedullary nail placement, 6 hours following repair and 24 hours following repair. These measurement intervals were chosen based on previous studies that demonstrate peak cytokine levels within 6 hours of a major stimulus. Broncho-alveolar lavage (BAL) for determination of lung IL-6 and IL-10 levels and neutrophil myeloperoxidase priming was obtained immediately following induction and again at the completion of surgery.

Results:

Nineteen patients were randomized to the SR or RIA groups. Independent t test analysis found no significance between reamer type compared to age (p=0.22) or estimated blood loss (EBL) (p=0.26). Chi square tests for reamer versus race and reamer versus gender showed nonsignificant finding for race (p=0.25) and significant findings (p=0.047) for gender. Nonsignificant findings were also found comparing reamer versus fracture type, injury severity score (ISS), infection rate, and nonunion rate. Serum levels of IL-10 showed significant increases in the postop/24 hour group (p=0.05). The RIA method of reaming is a safe and effective alternative to the SR. The clinical significance of the increase in postop IL-10 in the RIA group has yet to be determined. Bronchial lavage specimen analysis is pending.

IL-6 is a pro-inflammatory cytokine produced by macrophages. We selected IL-6 as a candidate variable because it has been characterized, is correlated with poor outcomes such as MODS, and can be reliably measured. IL-10 was selected as a candidate variable because IL-10 has been previously characterized. Increased IL-10 levels are associated with increased morbidity and mortality and the ratio of IL-10 to IL-6 correlates with SIRS severity and outcome.

TECHNOLOGY ASSESSMENT IN ORTHOPAEDICS, John S. Kirkpatrick, M.D., Gunnar B. J. Andersson, M.D., Ph.D., University of Florida School of Medicine, Jacksonville, Florida

The development of new technology, or the novel application of technology from other fields, is an integral part of improving patient care. The evaluation of technology through scientific studies and clinical trials generally allows surgeons to decide whether to apply such technology to their practices. With rising healthcare costs it becomes critically important to avoid unnecessary and perhaps ineffective new technology. This is particularly true when the technology also increases the cost or adds risks of complications.

Technology assessment ultimately depends on the extent of information available at any point in time, and is a moving target depending on availability of new information. We propose for consideration a process of technology assessment intended for application by surgeons and third party payors to a product or technology after FDA approval has been obtained. This process involves answering a series of questions in a stepwise process ultimately providing a rationale for the adoption or rejection of technology. These questions include: What is it supposed to do? Does it actually do that? If so, is that clinically beneficial? Are there other alternatives? Is the new alternative as good as the existing alternatives? Is it cost-effective? Examples of recent clinical developments in technology will be discussed illustrating how these concepts are applied. Our hope is to stimulate a discussion of a very important topic which can stifle or foster progress toward better patient care.

RELATIONSHIP OF SURGICALLY REPAIRED ULNAR COLLATERAL LIGAMENT INJURY OF THE THUMB TO THE MORPHOLOGY OF THE METACARPOPHALANGEAL JOINT OF THE THUMB, Gary M. Lourie, M.D., Byung Koo, M.D., Glenn Gaston, M.D., Emory School of Medicine, Hand and Upper Extremity Center of Georgia, Atlanta, Georgia

Introduction

Many authors have examined the range of motion at the metacarpophalangeal (MCP) joint of the thumb and found that there is considerable variation in flexion and extension between individuals (1-10). Harris and Joseph (1) concluded that this was owing to difference in the shape of the metacarpal head, differences in capsular laxity, or both. Yoshida et al. (2) studied the relationship between the morphology of the thumb MCP joint and the range of motion, and found that the flat metacarpal head had significantly decreased motion compared to the round metacarpal head. Shaw and Morris (3) found that the patients with a soft-tissue injury around the MCP joint had significantly less range of motion at the joint. They thought these patients were less able to disseminate forces acting upon the joint because of decreased motion. However, they did not study the relationship between soft tissue injury and the morphology of the metacarpal head.

The purpose of this study is to retrospectively review the patients who had undergone surgical treatment for the ulnar collateral ligament injury of the thumb MCP joint and compare the morphology of the metacarpal heads. Our hypothesis is that the patients who underwent surgical treatment for the ulnar collateral ligament injury of the thumb MCP joint will have higher incidence of the flat metacarpal head.

Material and Methods

Between 1997 and 2008, Thirty one patients underwent operative repair for rupture of the ulnar collateral ligament of the thumb at our senior authors' (GL and GG) practices. We reviewed their charts and radiographs. One patient was excluded from the study due to advanced degenerative changes found on the radiographs. Thus, thirty patients (22 male, 8 female) were included in our study. The mean age of our patients was 34.6 years, ranging from 13 to 71 years.

We assigned each patient either a round or a flat metacarpal head morphology based on a value method used by Yoshida et al in an earlier study (Figure 1). The distance from the volar to the dorsal edge of the articular surface (A) and the radius of curvature of the articular surface (r) of the metacarpal head were measured on the lateral view. The shape of the head was given a value using the A/r ratio. If the A/r ratio was equal or greater than 1.7, it was categorized into a round group. An A/r ratio of less than 1.7 was categorized into a flat group.

Results

The A/r ratio of the 30 thumb metacarpal heads, which were analyzed radiographically, ranged from 1.26 to 2.1 with a mean of 1.64. There were 20 flat (14 male, 6 female) and 10 round (8 male, 2 female) metacarpal heads in our study (Figure 2). 17 of the injured thumbs were in dominant hand.

Of the 64 cadaveric thumb metacarpal heads in Yoshida's study, 37 were round and 27 were flat. Thus, the odds ratio for the operative cases was 2.6 (Table 1).

Discussion

The MCP joint of the thumb is almost a hinge-joint, capable of flexion and extension, and a small amount of radial and ulnar movement. Previous studies have confirmed that there is a considerable variation in the range of motion in this joint. One factor which may cause this is the shape of the MCP joint: subjects possessing a relatively flat metacarpal head have a smaller range of motion (1-3). Yoshida et al. found that the flat metacarpal head had significantly decreased motion compared to the round metacarpal head. Shaw and Morris showed that the patients with less range of motion had a higher incidence of soft tissue injury at the MCP joint.

Our study shows that the individuals who underwent surgical treatment for ulnar collateral ligament injury of the MCP joint of the thumb had higher incidence of having the flat metacarpal head. As far as we know, ours is the first study of its kind evaluating the relationship between the morphology of metacarpal head and surgically repaired ulnar collateral ligament injury.

There are several limitations to our study. First, it is a retrospective study and has a relatively small number of subjects. Second, we did not directly measure the range of motion at the thumb MCP joint in our patients. However, previous studies have shown that the patients with flat metacarpal heads had stiffer MCP joints. Third, we only examined surgically repaired ulnar collateral ligament injuries. It would be interesting to examine the incidence of flat metacarpal heads in non-operative ulnar collateral ligament injuries.

We are currently working on a cadaveric study in which we hope to show that the ulnar collateral ligaments with flat metacarpal heads have smaller load to failure compared to round metacarpal heads.

X-ray Lateral View

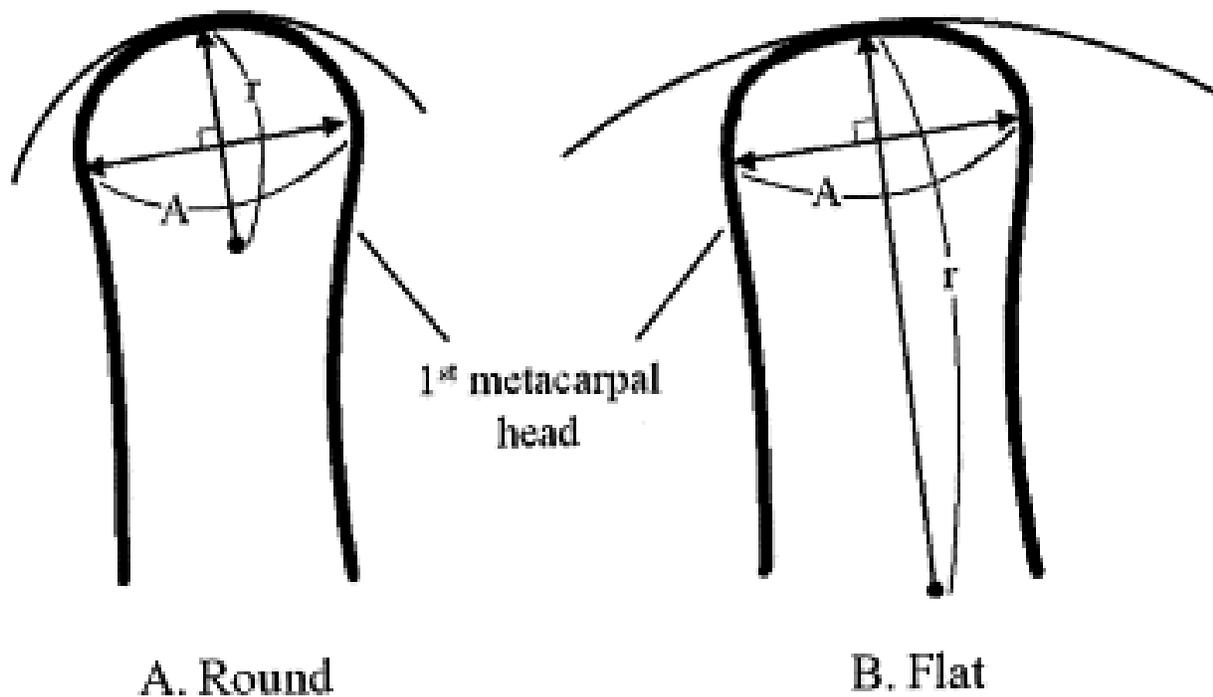


Figure 1. (A) Round and (B) flat thumb metacarpal head showing the distance (a) from the volar to the dorsal edge of the articular surface of the thumb metacarpal head as would be seen on a lateral radiograph and (r) the radius of curvature of the articular surface. (Reprinted with permission from Ryo Yoshida et al. Motion and morphology of the thumb metacarpophalangeal joint. *J Hand Surg.* 2003;28A:753-757.)

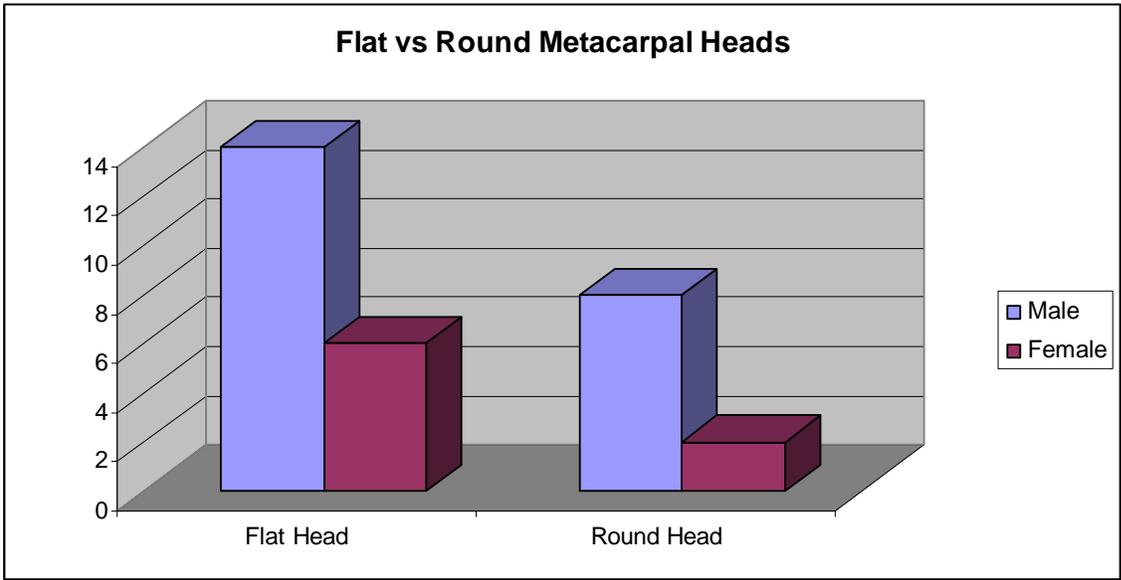


Figure 2. Flat metacarpal heads vs Round metacarpal heads



Figure 3. Lateral radiograph of a flat thumb metacarpal head.
The A/r ratio was 1.4.

	Flat heads	Round heads
Operative Cases (GML/GG)	20	10
Cadaveric Sample (Yoshida)	27	35

Table 1. Odds ratio of the study = 2.6

GML remember flatter heads display a smaller load to failure and less ability to disseminate force acting on the joint secondary to decreased range of motion.

Loading data: In talking with Sam and Glen. We used 2_ thumbs xrayed (r/o oa or prior trauma) them and using Yoshida data divided into R or F.

Then loaded them Instron or Instrom STS or MTS using Harley technique JHS vol 29A, 2004 with one diff instead of using 1.6mm diameter spheric metallic markers placed in the origin and insertion , we placed strain gauge in the lig otherwise same.

There was no stastically significant difference between the R and F heads in load to failure.

But there was a very strong trend I think in the R head in strain to failure higher strain I think there were errors in reporting the R head due to difficulty controlling sup pro or spinning of the MP head in the RH and gave some false data actually shortening of lig which is impossible, so we need to control this with more fixation in the thumb when loading but this is important and our obs of this actually means that the in vivo situation may actually help "self protect" also G says we should do BLB loading to see if there is a diff in the R F.

References:

1. Harris H, Joseph J. Variation in extension of the metacarpophalangeal and interphalangeal joints of the thumb. *J Bone Joint Surg.* 1949;31B:547-549.
2. Yoshida R, House H, Patterson R, Shah M, Viegas S. Motion and morphology of the thumb metacarpophalangeal joint. *J Hand Surg.* 2003;28A:753-757.
3. Joseph J. Further studies of the metacarpophalangeal and interphalangeal joints of the thumb. *J Anatomy.* 1951;85:221-229.
4. Shaw SJ, Morris MA. The range of motion of the metacarpophalangeal joint of the thumb and its relationship to injury. *J Hand Surg.* 1992;17B:164-166.

5. Palmer AK, Louis DS. Assessing ulnar instability of the metacarpophalangeal joint of the thumb. *J Hand Surg.* 1978;3:542-546.
6. Jenkins M, Bamberger HB, Black L, Nowinski R. Thumb joint flexion. *J Hand Surg.* 1998;23B:796-797.
7. Hume MC, Gellman H, McKellop H, Brumfield RH. Functional range of motion of the joints of the hand. *J Hand Surg.* 1990;15A:240-243.
8. Bostock S, Morris MA. The range of motion of the MP joint of the thumb following operative repair of the ulnar collateral ligament. *J Hand Surg.* 1993;18B:710-711.
9. Barmakian JT. Anatomy of the joints of the thumb. *Hand Clin.* 1992;8:683-691.
10. Coonrad RW, Goldner JL. A study of the pathological findings and treatment in soft-tissue injury of the thumb metacarpophalangeal joint. *J Bone Joint Surg.* 1968;50A:439-451.

THE ROLE OF MINIMALLY MANIPULATED TISSUE GRAFTS IN CLINICAL ORTHOPAEDICS, R. Rocco Monto, M.D., Monto Orthopaedics, West Tisbury, Massachusetts
Introduction

Chronic Achilles tendonosis is a common but difficult condition to successfully treat. Platelet rich plasma (PRP), a concentrated bioactive component of autologous blood that is rich in cytokines and other growth factors, was examined in this study to assess its ability to promote healing in severe cases of Achilles tendonosis resistant to traditional non-operative treatment paradigms.

Methods

Thirty patients (17 males 13 females) with an average age of 47 (36-66) and who had failed an average of 8 months (6-10) of standard non-operative management for Achilles tendonosis (rest, heel lifts, PT, NSAIDS, cam walker / cast immobilization, night splinting, local modalities) were prospectively included in the study. All patients had pre-treatment MRI (18) and/or ultrasound (12) studies and clinical scoring was completed using the AOFAS hindfoot scoring system. Patients were treated by injecting a single dose of 4 cc of unbuffered PRP under local anesthesia directly into the injured zone of the Achilles tendon using ultrasound probe guidance. All patients were then immobilized fully weight bearing in a cam walker for 48 hours and then allowed to return to normal activities as tolerated and without support.

Results

Pre-treatment AOFAS scores averaged 34 (26-60), all patients had MRI and ultrasound evidence of chronic tendonosis and 9/30 had partial tears of the Achilles. All patients were considering operative intervention due to clinical dissatisfaction. All patients had evidence of chronic Achilles tendonosis on pre-treatment MRI or ultrasound with 9/30 demonstrating partial tears or calcifications. Post-treatment AOFAS scores improved to 84 (80-87) at 1 month, 87 (84-90), at 2 months 88 (87-100) at 3 months, and 92 (90-100) at 6 months with resolution of abnormalities seen in 27/30 post treatment MRI or ultrasound studies. Twenty-eight of 30 patients were clinically satisfied with their clinical results and no complications were reported.

Conclusion

This study suggests that platelet rich plasma can be effective in the treatment of severe Achilles tendonosis refractory to traditional non-operative management.

UPDATE ON LUMBOSACRAL FUSIONS USING TRANS-AXIAL FIXATION, Richard J. Nasca, M.D., Wilmington, North Carolina

The purpose of the study was to evaluate the clinical results, rate of fusion and complications in patients who had undergone an anterior interbody fusion using a trans-axial paracoccygeal approach through the pre-sacral retroperitoneal space. Clinical data was available on 236 patients from 5 centers and included patient diagnosis, pre-op and post -op Visual Analogue Scale (VAS) and Oswestry Disability Index(ODI). Flexion and extension radiographs and thin cut CT scans were done to evaluate the fusion. The fusion was considered to be present if there was 50% or more bridging bone from vertebral endplate to endplate. Mean age was 39.6 years with a range of 18-80years. Conservative care was given 6 months or more prior to surgery. The diagnoses were degenerative disc disease, degenerative scoliosis, internal disc disruption, previous discectomy, spondylolysis, spondylolisthesis up to grade 2 and previous non union. Contraindications were infection, Crohn's disease, ulcerative colitis, pervious anterior pelvic surgery, tumor and deformities of the coccyx limiting exposure. The procedure involved doing a discectomy of L5-S1 and preparing the end plates for fusion using Nitonal cutters, placing autogenous bone and bone graft extenders in the interspace , inserting a threaded rod(AxiaLIF rod, TranS1 Wilmington ,NC) and placing pedicle or facet screws as posterior fixation at L5 -S1.

Results: The pre-op VAS was 77 and the post- op was 28. The pre-op ODI was 54 and the post- op 28. At one year there was an

88% fusion rate and a 91% at 2 years. The rate and quantity of the fusion mass was noted to become more robust during the follow-up period. Overall complication rate was 1% in contrast to 4% or more with traditional open anterior interbody procedures. Blood loss was rarely greater than 50 to 100cc. Hospital stay was 1-2 days. Some patients were discharged the day of surgery.

Conclusion: The trans-axial fusion procedure results in improved functional outcome, reduction in pain and an acceptable quality of fusion.

WRIST ARTHRODESIS AS A SALVAGE OPERATION FOR FAILED WRIST IMPLANT ARTHROPLASTY, Marco Rizzo, M.D., Duncan B. Ackerman, M.D., Robert D. Beckenbaugh, M.D., Robert Rodrigues, M.D., Mayo Clinic, Rochester, Minnesota

HYPOTHESIS:

The purpose of this study was to evaluate the clinical utility of wrist arthrodesis as a salvage procedure for failed wrist arthroplasty. Wrist arthrodesis can be a successful salvage procedure for failed wrist implant arthroplasty.

METHODS:

An IRB approved, retrospective review of our institution's computer database was performed between 1980 and 2006. Nineteen wrists in 15 patients were identified as having undergone wrist arthrodesis for salvage of a failed wrist arthroplasty. Charts were reviewed to identify implant type, mode of implant failure, revisions prior to arthrodesis, method of fusion, the use of allograft or autograft bone at the time of fusion, rate of union, and clinical outcome.

RESULTS:

Eleven females (73%) and 4 males (27%) underwent wrist implant arthroplasty at an average age of 55 years (range, 27-78). The type of arthroplasty utilized was a Biaxial prosthesis in 12 (63%) wrists, a Meulli prosthesis in 4 (21%) wrists, a silicone arthroplasty in 2 (11%) wrists, a KMI prosthesis in 1 (5%) wrist. The mode of failure in the majority of wrists was loosening, migration, or instability of the components (n=14, 74%). Three wrists (16%) were removed due to infection and were subsequently fused. The average time from the index arthroplasty to wrist arthrodesis was 7.6 years (range, 7 months-20 years). Three patients had undergone 4 revisions prior to the index salvage operation. Structural autogenous iliac crest bone graft was utilized in 6 (32%) wrists, a structural femoral head allograft was utilized in 8 (42%) wrists, local host bone was used in 2 (11%) wrists, allograft bone in 2 (11%) wrists, and was unavailable in 1 (5%) wrist. The method of fixation utilized to obtain arthrodesis was Steinmann pins in 9 (47%) patients, plates and screws in 6 (32%)

patients, staples in 2 (11%) patients, an external fixator in 1 (5%) patient, Steinmann pins and staples in 1 (5%) patient. Six (32%) wrists underwent 8 revisions due to initial nonunion, with 2 of these wrists achieving radiographic union. Overall 10 (53%) wrists achieved radiographic union, 9 (47%) wrists had a pseduarthrosis/nonunion with the majority of patients complaining of minimal to no pain. The average followup was 5.3 years (range, 1.5-21 years).

SUMMARY:

- 1) Bony union was achieved in only 53% of wrists in whom arthrodesis was attempted as a salvage procedure for a failed wrist arthroplasty.
- 2) Although the radiographic union rate was relatively low, the majority of patients had clinical improvement with no or minimal pain at last followup.

UPPER EXTREMITY INJURIES IN CHILDREN, Sigurd Sandzen, M.D., Vero Beach, Florida

Factors which influence wound healing and ultimate function in the child include:

1. Rapid healing
2. Increased growth potential
3. Presence of physes
4. Positive mental acceptance of and adaptation to tissue loss or physical impairment
5. Uninhibited use after subsidence of pain
6. Increased scar potential
7. Minimal, if any, rehabilitation required

Basic principles of initial wound care include:

1. Accurate wound evaluation, particularly nerve function (sensory and motor) distally e.g. prior to fracture or joint reduction
2. Adequate anesthesia
3. Meticulous wound toilet
4. Preservation of all viable tissue, most important in the severe open complex wound
5. Early diagnosis and radical lysis of a closed compartment syndrome
6. Appropriate functional immobilization

Injuries discussed include: open wounds, finger tip injuries, amputations, nail bed injuries, compartment syndrome, fractures, burns, skin coverage, tendon and nerve repair, immobilization, rehabilitation, and secondary reconstruction.

EFFICACY OF TANTALUM TRABECULAR METAL IMPLANT FOR EARLY HIP OSTEONECROSIS, John W. Shaffer, M.D., Case Western Reserve University, Cleveland, Ohio

Twenty-four patients (28 hips) have been treated by core drilling and trabecular metal implant for osteonecrosis of the hip (AVN). There were 17 male and 7 female patients. The average age was 39. Most patients' hips were staged to be Enneking-Marcus Stage 1 or 2, and one patient was Enneking-Marcus Stage 3. The average follow up was 19.6 months.

Most patients have done well after the procedures. They have used crutches for protected ambulation for six weeks postoperative after which they ambulated without external support. Complications were noteworthy with 4 subtrochanteric hip fractures which occurred early after the procedures. Each of these 4 patients was treated by hip open reduction, internal fixation. One of these fracture patients was acutely intoxicated and fell while the other 3 patients were noncompliant walking without external support, fell, and sustained the hip fractures. In addition, over time 3 patients had increasing pain and arthritis which required total hip replacement.

2009 PIEDMONT SOCIETY SURVEY: CURRENT TRENDS AND PRACTICES FOR ORTHOPAEDIC ER COVERAGE. David C. Urquia, M.D., VCU Medical College of Virginia, West End Orthopaedics, Richmond, Virginia

The final results of an on-line, interactive survey of the national Piedmont Orthopedic Society membership were presented, 30 questions, 100 respondents, 61.8 % still taking unassigned ER call.

Selective results were as follows :

- 34.5 % of hospitals had full-time orthopedic traumatologists on staff, mainly at academic centers.
- 75.6% had access to medical hospitalists to assist in the ER admission process.
- 37.7% of surgeons at non-academic centers used physician-extenders (PA/NP) to see ER orthopedic patients directly without surgeon present.
- 43.7% of hospitals provided OR block time for orthopedic add-on trauma cases.
- 39.7% of respondents receiving some form of hospital-provided compensation for ER coverage.
- 5% of hospitals covered by private-practice surgeons had hired their own orthopedic MD's specifically to cover ER patients.

The full results of this survey available on the Piedmont Orthopedic Society website :
www.piedmontorthopedicsociety.org

The most important aspect in the treatment of the open wound is meticulous wound toilet (e.g. debridement of foreign bodies and nonviable tissue followed by copious irrigation). Primary closure, or if necessary, primary resurfacing usually by a thick split thickness skin graft (e.g. 16 - 18/1000ths of an inch) follows. If there is any question of wound cleanliness or additional tissue necrosis is anticipated, delay primary closure or resurfacing or secondary closure becomes necessary. Donor site of the split thickness skin graft is either the anterior thigh, abdomen, or upper arm just distal to the axilla. The split graft becomes durable, has a more predictable "take" and provides better sensibility. A full thickness graft is derived from the groin. Flaps are rarely necessary and multiple tissue transfers are extremely rare.

Finger tip injuries can usually be closed primarily after wound toilet. Extreme contamination requires a differing initial treatment as noted above. Nail bed and germinal epithelial wounds should be anatomically repaired. To retain functional and cosmetically acceptable digital length a palmar or dorsal cross finger graft offers excellent coverage.

Compartment syndrome must be recognized immediately and decompressed adequately. Commonly, they occur with fractures about the elbow (e.g. supracondylar fracture), high voltage burns, circumferential full thickness burns, and crush injuries.

All amputated digits in the child are reattached with a ratio of 1 ½ -2 veins per artery. Reattachment of significant digital length without vessel repair is contraindicated.

It is vitally important to access nerve and tendon functions distal to a fracture site prior to reduction. Some angulation in the flexion - extension plane may be accepted, depending on Wolff's Law for growth and correction. Lateral angulation is corrected and displacement of an articular fracture (particularly Salter III and IV) must be anatomically reduced. Gamekeepers fracture and reverse Gamekeepers fracture should be reduced and stabilized usually surgically.

Nerve and tendon repairs should be effected at primary or delayed primary wound treatment and not put off to a later date (when the child is older and more cooperative). Tendon transfers are usually later.

Burns should be judged as to depth (partial or full thickness) and treated accordingly. As noted above, closed compartment syndrome must be recognized and treated immediately.

Prior to foreign body removal nerve and tendon function should be accurately determined.

Immobilization must be adequate and in the functional position often incorporating a long arm cast particularly in the young child combined with constant vertical elevation.

Therapy is generally unnecessary except after tendon or nerve repair or joint reconstruction.

Reconstruction includes:

1. Scar contracture release or excision
2. Wound closure, if possible
3. Z plasty or multiple Z plasties, if necessary augmented by skin graft
4. Large skin graft
5. Pedicle graft, either adjacent or distal
6. Deeper reconstruction, as indicated (e.g. tendon or nerve graft or tendon transfer)
7. Functional immobilization