

8 Rearfoot Surgery

LAWRENCE A. DiDOMENICO, D.P.M., AND RAMY FAHIM, D.P.M.

Persistent Disability Despite Sufficient Calf Muscle Strength after Rupture of Surgically Treated Acute Achilles Tendon Ruptures

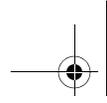
Metz R, van der Heijden GJ, Verleisdonk EJ, Andriik M, van der Werken C (Diakonessenhuis, Utrecht, Netherlands; University Medical Center, Utrecht, Netherlands; Centre for Sports Physiotherapy, Utrecht, Netherlands)
Foot Ankle Spec 2011 Apr;4(2):77-81

Background—Open surgical repair of acute Achilles tendon (AT) ruptures is preferred over conservative treatment because of a lower rerupture risk. Rerupture is a serious adverse event with lasting negative effects on outcome. This study evaluates the long-term impact of rerupture on outcome after primary minimally invasive surgical AT rupture repair.

Methods—The medical records of 340 consecutive patients from a Netherlands hospital were reviewed for the study. Thirteen of these patients confirmed rerupture and were willing to participate in the follow-up measurements. A reference group of 23 patients was created from a randomized trial, including patients with uncomplicated postoperative course after surgical repair of an AT rupture by exactly the same technique as the rerupture group. The primary outcome measure was a score combining questions on recovery with isokinetic calf muscle strength testing. A questionnaire on return to work and sports was also used as an outcome parameter.

Results—Eight of the 13 patients had a fair or poor outcome, whereas 5 of the 23 patients in the reference group showed fair or poor outcome. All patients employed prior to the injury resumed professional life except for 1 patient who suffered persisting pain due to complications from a severe wound infection. None of the 13 patients in the rerupture group returned to their previous level of sports, whereas only 4 of the patients in the reference group resigned from sports. The difference in calf strength between the injured leg and uninjured leg ranges up to 20% in the reference group, while being only 5% to 10% in the rerupture group.

Discussion—The reference group reported better scores and outcome through the questionnaire and questions, but had more muscle loss in the strength test. It is likely that patients with rerupture showed better calf muscle



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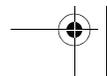
strength because of a difference in follow-up time. Patients in the reference group experienced only 1 year of recovery before follow-up. The rerupture group experienced their first rupture between 1996 and 2003, and the mean time from primary repair to rerupture was 10 weeks. Calf muscle strength after AT rerupture was adequate at long-term follow-up; however, disability persisted. It is expected that calf muscle strength will improve in the uncomplicated cases after a long-term follow-up. The data shows that rerupture has a profound negative impact on long-term outcome.—*M. H. Haldeman*

◆ The authors designed a level II prognostic study comparing the long-term outcomes of reruptured Achilles tendon repairs following percutaneous surgical techniques, to a control uncomplicated group. The data of long-term outcome after rerupture is limited. The results presented provide compelling evidence supporting the argument that reruptures with Achilles tendon repairs have negative and poor long-term outcomes on patients in multifaceted ways, including activities and return to sports activities. Also, there was an overall loss of isokinetic plantarflexion in the rerupture group. The study had a mean follow-up of 8.7 years to the rerupture group and only 11 months to the healthy, uncomplicated one. The prospective design lacked a consistent method to selectively pull the charts from the hospital database since the groups had multiple surgeons involved. The data assessment with the Lippihati score was significant, as it produced accurate confidence intervals with statistically significant figures for poor outcomes with reruptured groups, despite removing the patient groups with severe wound infections. Overall, the design made sense and objectively analyzed the long-term outcomes and complications of Achilles tendon reruptures, thus, supporting the notion to treat Achilles tendon ruptures in order to minimize the daunting statistic of rerupture rates.—*L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.*

Operative versus Non-operative Treatment of Acute Rupture of Tendo Achillis: a Prospective Randomised Evaluation of Functional Outcome

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J Bone Joint Surg Br 2011 Aug;93(8):1071-1078

Background—A rupture of the tendo Achillis is a common occurrence in middle-aged men, usually occurring through sporting activities. A ruptured tendo Achillis is usually treated in either an operative or non-operative manner. It has been generally assumed that surgical repair will heal faster, with improved muscle function and rapid return to activity. The study investigated whether surgical treatment offered any benefits over non-operative management.



Methods—A single-center randomized trial was set up to treat acute tendo Achillis rupture with either an open surgical repair or an immobilization cast. Whether a person was getting an operative or non-operative treatment was decided randomly through selection of a sealed envelope containing a card with the procedure written on it. The surgical procedure was an open technique through a posteromedial longitudinal incision, completed with a core Kessler stitch. The limb was then immobilized for 6 weeks. In the non-operative procedure, the patients were immobilized in a below-knee cast for a total of 10 weeks. Muscle dynamometry was assessed at 3, 4, 6, and 12 months after the presentation, and they also checked for rerupture.

Results—After patients opted out, and some missed follow-up appointments, 37 operative and 39 non-operative patients were fully evaluated. Rerupture occurred in 2 of the operative group, and 4 in the non-operative group, but the difference was not statistically significant. While there were slight differences in the abilities to dorsiflex and plantarflex, there was no statistically significant difference between the two groups' range of motion at any time. No observed differences were significant in the study.

Discussion—The study showed that non-operative procedures have a higher rate of rerupture. While in the study the difference was not significant, it is in accordance with previous studies. Other studies have been conducted testing various aspects of the recovery process, but a strength of the study was in the incorporation of the calf muscle strength and ankle movement through Short Musculoskeletal Function Assessment (SMFA). Based on the findings, the authors do not recommend operative management for acute tendo Achillis rupture.—*N. J. Posge*

◆ The authors designed a prospective randomized study comparing operative versus non-operative outcomes of Achilles tendon ruptures with a one-year follow-up. The study was from the UK and it paradoxically allowed for early mobilization in the surgical group. The results emphasized no statistical significance at the one-year mark, which is impressive; however, the results can be taken with some caution for various reasons. First of all, the extent of the ruptures was unknown in either group since the patients were randomly assigned to treatment. In addition, a one-year follow-up period is not sufficient enough to discuss and expose the true long-term adverse effects of non-operative treatments. Furthermore, albeit statistically nonsignificant, the operative group displayed a lower complication rate with deep vein thrombosis, a quicker return to function and athletic activities, and a lower rerupture rate. Overall, the study raises a viable option to consider in the non-operative treatment with patients who have surgical contraindications. However, the study lacked clear long-term effects of the non-surgical approach and it lacked consistency in the pathology presented, i.e., whether or not the extent of the rupture played a role in the outcomes.—*L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.*

Minimally Invasive Plate Osteosynthesis of the Distal Fibula with the Locking Compression Plate: First Experience of 20 Cases

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Introduction—The purpose of the authors' study was to evaluate the clinical feasibility and possible complications associated with minimally invasive plate osteosynthesis of the distal fibula.

Accurate treatment of complex fractures of the distal fibula is a demanding procedure. There is a high rate of complications, including skin necrosis and nonunion. Indications for fixation of the fibula include unstable displaced ankle fractures and pilon fractures. Fixation of the fibula can improve overall stability of the lower leg fracture. Standard technique for distal fibula is open reduction and internal fixation with a plate. A minimally invasive plate osteosynthesis (MIPO) approach seems to be the most logical when soft-tissue coverage of the distal lower leg is thin and the skin is contused or otherwise injured. This article reviews the experiences and outcomes of MIPO of the distal fibula using a locking plate over a 5-year period.

Methods—Twenty fibular fractures (Orthopedic Trauma Association 42, 43, 44 fractures) were treated with minimally invasive plate osteosynthesis technique using an angular stable screw plate system for the fibula. Fractures of the fibula were included in this cohort study if the fracture occurred in the distal half of the fibula, had a complex fracture pattern, and was associated with moderate-to-severe soft-tissue injury. Patients in this study were selected within a 5-year time frame out of 701 adult patients, but only 20 fulfilled the above inclusion criteria for MIPO technique of the fibula.

Of the 20 fractures in the study, most were due to falls from heights or down stairs, but also from sports injuries and traffic accidents. Most fractures were managed with a two-stage procedure due to critical soft-tissue conditions and/or complex fracture patterns, and many of these patients had additional injuries as well. In all cases, the tibial component of the fracture was addressed first and MIPO of the fibula last. In most cases, the distal fibula was aligned well as a result of the mostly intact talofibular and tibiofibular ligaments. To fix the fibula, a plate of predetermined length was shaped and then inserted epiperiosteally from distal to proximal. The distal part of the plate was centered with good bone contact, and a locking screw was inserted distally. The bridged fracture was reduced under fluoroscopy, and the correct length and rotation in relation to the talus and distal tibia were assessed. After alignment, further locked screws were applied in the distal and proximal fragments of the fibula. Lastly,

stability of the syndesmosis was checked manually and the incisions were closed.

Ambulation was started as soon as soft tissues permitted toe-touch weight-bearing. Full weight-bearing was allowed after 6 weeks in most cases, except for pilon fractures, which began full weight-bearing after 3 months. This study followed the patients postoperatively periodically for 2 years, assessing soft tissues, ankle function, and X-ray evaluation. All patients were observed until full soft-tissue and bone healing occurred. Successful bone healing was diagnosed when the patient was pain-free at the level of the fracture and X-rays showed at least 3 of 4 cortices bridged by visible callus.

Results—Seventeen of 20 fractures healed without complications at an average of 9 weeks, with no soft-tissue complications, skin necrosis, infection, or injury to the peroneal nerve. Three aseptic nonunions were recorded, and all healed without further complications after a single formal open revision using plates and bone graft. None of the patients were lost during follow-up. Mean range of motion of the ankle joint was recorded as 57 degrees (\pm 15.7 degrees standard deviation). Further radiologic analysis was performed as well.

Discussion—The technique is comparable to minimally invasive plate osteosynthesis in the tibia or femur, but is more difficult due to small bone size. Technique is therefore reserved for selected complex fractures of the distal fibula with critical soft-tissue conditions. The MIPO technique was developed to prevent periosteal devascularization and major soft-tissue dissection. The principle of the MIPO is that of making a bridge that provides fracture stability and leads to secondary bone healing with callus formation. MIPO also acts as an internal fixator, which is inserted through small skin incisions, protecting both the skin and fracture.

The goal of this study was to determine the feasibility and results of MIPO for the distal fibula in complex cases. Hess and Sommer found that the MIPO technique can minimize the risk of soft-tissue complications, and highly comminuted fractures can be stabilized well by this approach by MIPO-experienced surgeons.—*A. Jacob*

◆ The authors present a retrospective evaluation of 20 cases for which they utilized minimally invasive plate constructs of distal fibula fractures with/without a coexisting distal tibial fracture (malleolar or pilon). The window of indications included comminuted fibula fractures and areas of suspected soft-tissue compromise secondary to the trauma induced. Seventeen of the 20 patients healed uneventfully, with 3 patients requiring nonunion revisions. The technique involves a small 2- to 3-cm incision in the distal fibula and a supplemented small incision proximally. The incisions are made just posterior and inferior to the superficial peroneal nerve, and as a result, no signs of neuritis were presented. The locking plate construct presented provided enough stability to the construct, spanning the comminuted fragments,

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and successfully reducing the fracture to satisfactory lengths. However, the authors admitted a clear limitation in the study in that the contralateral X-rays were not obtained, thus disabling the authors from objectively comparing their surgical reductions.—*L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.*

Is the Anterior Tibial Artery Safe during Ankle Arthroscopy?: Anatomic Analysis of the Anterior Tibial Artery at the Ankle Joint by Magnetic Resonance Imaging

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Am J Sports Med 2011 Nov;39(11):2452-2456

Introduction—Ankle arthroscopy is a vital tool in diagnosing and treating ankle joint pathology. This method yields smaller wounds and is relatively safer than open surgery. However, it can cause damage to the surrounding neurovascular structures due to the blind insertion of the endoscope. A complication known to ankle arthroscopy is damage to the superficial peroneal nerve. Several studies have shown a pseudoaneurysm of the anterior tibial artery. There is a reported 4.3% anatomic variation rate for the anterior tibial artery in cadaveric studies.

Methods—The study was built to test the relationships between the structures of the anterior ankle, capsule, fat pad, and vessels. Three hundred fifty-three patients were recruited for the study. Average age was 34.8 with 225 men and 128 women participating. The most common pathology diagnosed from the respective MRI study was chronic ankle joint instability and osteochondral lesion of the talus.

Results—MRI analysis revealed that the anterior tibial artery (ATA) was medial to the extensor digitorum longus in 93.8% of cases. This spacing makes the artery safe from the anterolateral portal used in ankle arthroscopy. The ATA is located between the extensor digitorum longus and the extensor hallucis longus (herein referred to as I-A) in 63.1% of type I patients, located under the extensor digitorum longus in 3.3% of cases, and under the extensor hallucis longus in 27.4% of these type I patients. Two percent of cases show the ATA on the lateral side of the extensor digitorum longus and peroneus tertius tendon (herein referred to as type II), and these patients are at an increased risk of complications. It was found that 4.2% of patients were considered a high risk, or type III, where the ATA was located in a safe region, with a similar-sized innominate branch artery in the danger zone. A total of 6.2% of cases had the

ATA in an unsafe zone due to the passage through the anterolateral portal. Fat pad thickness was observed to be a mean distance of 2.3 mm +/- 1.1 mm. Type 1-B ankles seemed to display the shortest distance from the tibial anterior border and the ATA.

Conclusion—A total of 6.2% of cases showed a local variant around the anterolateral portal. In 2% of cases studied, the ATA was found on the lateral side of the extensor digitorum longus and peroneus tertius tendons, therefore putting it in the unsafe zone. The reported cases of vessel injury are rare compared with the arterial location variations described in this study. If a patient is found to have an ATA in the risk category, then this study suggests placing the endoscope in another area to prevent vessel injury and possible pseudoaneurysm. An alternative to MRI study could be a Doppler exam or skin illumination when making the entry with the endoscope to avoid the vessels. Surgeons need to have a complete understanding of ankle anatomy and the relationship of the surrounding structures prior to ankle arthroscopy to decrease the risk of neurovascular complications.—*B. E. Dunning*

◆ This is a level IV review of 358 ankle cases through magnetic resonance imaging to analyze the location of the ATA with respect to the anterolateral arthroscopic ankle portals, thus, adding further considerations to anatomic variations as risks to ankle arthroscopy. This stems from previous cadaveric variations, which showed a 4.3% variation rate in the location of the ATA. Through this MRI analysis, 93.8% of the ATAs were located medial to the extensor digitorum longus (EDL) (thereby making the anterior lateral portal safe). Two percent of the cases showed the ATA to be lateral to the EDL and peroneus tertius muscle, thereby rendering the anterior lateral portal to be of increased risk. Finally, 4.2% of the cases showed the ATA's communicating lateral branch to be located lateral to the extensor digitorum brevis and peroneus tertius muscle. This was considered "high" risk to the anterior lateral portal.—*L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.*

Navicular Excision and Cuboid Closing Wedge for Severe Cavovarus Foot Deformities: a Salvage Procedure

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J Pediatr Orthop 2011 Jul-Aug;31(5):551-556

Background—Plantar flexion of the forefoot is classified as a cavus foot. The cavus foot deformity in most patients is at the apex of the navicular bone. Patients with cavus deformities such as rigid cavovarus, neurological conditions,

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and clubfeet do not always achieve desired results or full correction after corrective surgical procedures. In order to completely correct the cavus deformity, the surgical procedure should occur near the talonavicular and navicular cuneiform joints, to achieve maximum correction. This study looks at how navicular excision and cuboid wedge osteotomy can fully correct rigid cavus foot deformities.

Methods—This study reviewed patients who had a navicular excision and a cuboid dorsal closing wedge to correct their rigid cavus foot deformity. Eleven children (16 feet) were included in the study over the past 8 years at two different surgical centers.

Results—All patients in this study had a rigid cavus foot deformity. The pathologies of the cavus foot included multiply operated congenital clubfoot (5 feet), arthrogryposis (6 feet), and neurological deficits (5 feet). Patients were followed up on average 4.9 years after their procedures. All surgeries in the study resulted in a plantigrade pain-free foot after the procedure.

Discussion—The navicular excision and cuboid closing procedure should be considered when correcting severe rigid cavus feet. Navicular excision has been used for the correction of vertical talus in children, but not studied as a procedure for severely cavus feet. Soft-tissue release and osteotomies should be considered first when correcting cavus feet. However, the excision and closing wedge should be used as a procedure for stiff and/or multiply operated cavus feet.—*B. L. Logan*

◆ This is a level IV retrospective review of 11 patients undergoing a navicular excision and dorsal cuboid closing base wedge osteotomy to correct rigid cavus feet with the apex of the deformity at the site of the navicular. Specific indications include arthrogryposis, multiply operated congenital clubfeet, and other neurological deficits. The follow-up of the procedure was 4.9 years, and to date, this is the first reported series of navicular excision in severe cavus feet deformities. The technique offers an alternative to fusions in severe deformities. Saltzman, et al., previously reported 75% good results in patients with triple arthrodesis at 25 years follow-up and only 28% at 40 years.¹ Thus, there is merit to joint sparing procedures, especially in pediatric populations. However, one should cautiously bear in mind that the study sample was small, with a less predictable follow-up time.—*L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.*

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Talar Neck Fracture after Tibiotalar Arthrodesis: Case Report

Kwon JY, Myerson MS (Massachusetts General Hospital, Boston, MA)
Foot Ankle Int 2011 May;32(5):S560-S563

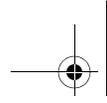
Introduction—Ankle arthrodesis is a common procedure for the treatment of end-stage arthritis of the tibiotalar joint; thus, many techniques have been developed with varied fixation. Fractures of the talar neck are uncommon and are known to result from high-energy trauma. However, this case report highlights a patient who underwent a successful ankle arthrodesis, sustained low-energy trauma, and ended up with a displaced talar neck fracture. This is rare, but the authors feel this situation is under-reported. They use this case report to highlight issues regarding surgical technique and screw placement when performing ankle arthrodesis. They also discuss treatment considerations for talar neck fractures after ankle arthrodesis.

Case Report—The patient highlighted in this case report was a 61-year-old healthy female who initially presented with increasing disability and left ankle and toe pain. She had a significant history of ankle sprains. The patient underwent a left tibiotalar arthrodesis and hemicap removal and interposition arthroplasty of the hallux due to failing conservative treatment and tibiotalar arthrodesis with varus malpositioning. Postoperatively she was non-weight-bearing, but during this time she stumbled, which resulted in an unstable displaced fracture of the talus at the neck/body junction.

Treatment consisted of open reduction internal fixation, which was described as a procedure containing significant difficulties and multiple abandoned attempts at fixation. Eventually, a DePuy small fragment Y-plate was placed along the lateral talar neck with locking and unlocking screws. Postoperatively, the patient was placed in a short leg cast and was non-weight-bearing for 6 weeks, afterwards transitioning into an aircast boot. Radiographs and CT scans showed interval healing and consolidation of the ankle arthrodesis. Currently, the patient is reported as doing well and full weight-bearing with a supportive sneaker.

Discussion—A talar neck fracture after an ankle arthrodesis has never been reported in the literature before this case. Kwon and Myerson feel this association is under-reported and hope to offer insight into treating this difficult problem.—A. Jacob

◆ This was a single case study describing an incidence of a talar neck fracture after an ankle arthrodesis. The patient in this case suffered an axial load injury after the



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fusion, which brings a different perspective to talar neck fracture mechanisms. This phenomenon was previously demonstrated by Peterson, et al., in a cadaver study, where talar neck fractures were reproduced during simulated axial loads with the ankle placed in neutral position.¹ The case brings valid points in screw placement and avoiding pitfalls for failures. The construct demonstrated had a three-screw configuration, for which one was placed from posterior tibia into the anterior medial talar neck, another from the medial malleolus to the lateral body of the talus, and the final one from anterolateral tibia. The problem with the presented case was the placement of the first screw too anterior. The screw did not extend into the distal talar neck, and as a result, it stressed the talar neck, which contributed to the fracture by virtue of a low-energy axial load mechanism.—L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.

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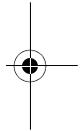
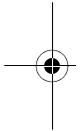
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Radiographic Analysis of an Opening Wedge Osteotomy of the Medial Cuneiform

Lutz M, Myerson M (The Institute for Foot and Ankle Reconstruction at Mercy, Baltimore, MD)
Foot Ankle Int 2011 Mar;32(3):278-287

Introduction—There is a multitude of different etiologies and a broad spectrum of deformities in regard to a symptomatic flatfoot. Recently, the classification of flatfoot deformities has been extended, and attention has been directed to abduction of the midfoot, forefoot varus, and medial column instability. If a forefoot varus deformity persists following a corrective surgery, it may lead to failure with a recurrence of the flatfoot deformity. The medial cuneiform opening wedge osteotomy (MCOWO) has been integrated as part of the surgical treatment for a flatfoot deformity due to the recognition of forefoot supination contributing to the deformity. This study aims to determine the versatility of the MCOWO to manage medial column instability and fixed forefoot varus.

Methods—Between January 2002 and December 2007, patients requiring surgical management of a flatfoot deformity were entered into a clinical database. Of these patients, 86 of them, totaling 101 feet, received MCOWO as part



of their surgical management and were selected for radiographic evaluation. Of these patients, 76 (81 feet) with the mean age being 38 (range 9-80), were available for evaluation. In most patients, concomitant surgery was performed. The decision to perform a MCOWO was determined both preoperatively and intraoperatively, based on an assessment of medial column instability or fixed forefoot supination. Patients were followed for 6 months postoperatively. All radiographs were assessed using digital imaging pre- and postoperatively using selected standardized and validated parameters.

Results—A highly statistical significance ($p < 0.001$) between pre- and post-operative parameters was demonstrated for each radiographic parameter evaluated. When comparing the radiographs taken at 6 months postoperative and 2 years post-operative in these patients, the measured parameters were not significantly different ($p > 0.05$). In 20 patients, 24 adverse events occurred that required management subsequent to previous surgery. There were no non- or mal-unions, but one patient developed osteoarthritis 12 months postoperative and one patient developed a recurrent symptomatic flatfoot at 25 months post-operative.

Conclusion—Our study showed that radiographically, the MCOWO helped correct forefoot varus, medial column instability, and elevation deformities of the first ray. A statistically significant improvement in all radiographic parameters was achieved and persisted over time. MCOWO is a joint and motion sparing alternative to medial column arthrodesis for forefoot varus and medial column instability.—*C. Seat*

◆ This level IV study retrospectively reviewed 101 feet in 86 patients who underwent medial cuneiform opening wedge osteotomy with concomitant procedures. The study presents the largest series of MCOWO cases with radiographic evidence of improvement after 2 years. The procedure was specific to stage II flatfeet with persistent forefoot varus deformities in combination with hindfoot/ankle deformity. The MCOWO serves to realign the forefoot with distribution of weight-bearing forces across a tripod effect. The decision of moving forward with MCOWO versus medial column arthrodesis was made preoperatively and intraoperatively, depending on the medial column instability or fixed forefoot supination after placing the hindfoot in neutral position. Horizontal and sagittal plane instability with hallux valgus are traditional criteria for arthrodesis, but MCOWO was employed in those cases. The MCOWO effectively lengthens the medial column and limits the complication of nonunions as seen with arthrodesis cases, thereby offering a viable alternative to consider.—*L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.*



Achilles Tendon Pain Treated with Gastrocnemius-Soleus Recession

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Introduction—The improvement in Achilles tendon pain and lack of complications found with gastrocnemius-soleus recession compares favorably with other surgical treatments. Achilles tendon pain is thought to be the result of multiple factors due to the large loads applied to it. Gastrocnemius-soleus is common in patients with Achilles tendon pain. Some authors have recommended gastrocnemius recession as treatment. Many fewer wound complications are reported after gastrocnemius-soleus recession. To the author's knowledge, this article is the first that evaluates a series of patients with Achilles tendon pain treated with gastrocnemius-soleus recession alone, as well as potentially preventing foot ulcers and Charcot arthropathy in diabetics and other neuropathic patients.

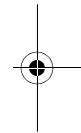
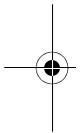
Materials and Methods—Twenty-four patients (8 men and 16 women) with Achilles tendon pain participated. A midline vertical incision was made just distal to the gastrocnemius muscle. The sural nerve and lesser saphenous vein were retracted. The soleus was stretched by dorsiflexing the ankle. The incision was closed with staples. Patients were allowed to bear full weight immediately after cam walking boot. At 1 month, the boot was removed and unlimited walking was allowed. Long-term follow-up was by phone.

Results—All patients (24/24) had initial relief of Achilles pain. Those who participated in the long-term follow-up were 5 men and 13 women. All patients had improvement of pain, and 6 of the 18 had no pain on long-term follow-up. None required additional surgery, nor did the patients with diabetes develop foot ulcers or Charcot arthropathy.

Discussion—Most studies of operative treatment of Achilles tendon pain have reported a high rate of satisfactory results. In the present study of non-athletic patients, none required additional surgery and all had improved pain. There were no wound complications in the present study. If the gastrocnemius-soleus recession fails, other procedures could still be performed.

Conclusion—In this preliminary report, improvement in Achilles tendon pain and lack of wound complications with gastrocnemius-soleus recession compared favorably with other surgical treatments.—*K. Hopkins*

◆ Authors in this paper followed on the previous work of Costa, et al.,¹ Wagner, et al.,² and Maffuli, et al.,³ with addressing Achilles tendon pain (insertional and



non-insertional). The study had an average follow-up of 22 months via telephone interviews. All patients reported significant improvement in pain, and diabetic patients had no reported incidence of Charcot neuroarthropathy. The technique offers advantages of lesser rate of wound complications since the posterior leg proximally is more vascular. The study lacks an objective functional assessment or objective imaging to the quality of the tendons (pre- and post-operatively). However, the results are promising and bring light to consideration on non-athletic, high-risk patients with Achilles tendon pain.—L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.

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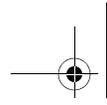
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Ultrasound and Doppler-Guided Mini-Surgery to Treat Midportion Achilles Tendinosis: Results of a Large Material and a Randomised Study Comparing Two Scraping Techniques

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Background—The treatment was based on findings of color Doppler (CD) and ultrasound (US) on midportion Achilles tendinosis and has shown promising results. On a small group of patients a randomized study was performed. Similar short-term clinical results were shown with surgery outside the tendon and sclerosing polidocanol injections, but surgical treatment led to faster return to activity. The objective was to evaluate the clinical results in a randomized study and compare two different techniques for surgical scraping.

Materials and Methods—One hundred three patients (66 men, 37 women) with a mean age of 43 years (range was 24-77), with midpoint tendinosis in 125 Achilles tendons, were included. Patients from a large group (88 tendons) and a randomized study (37 tendons) were given local anesthesia and treated with a US- and CD-guided new surgical approach outside the ventral tendon. All patients in the large group and one arm of the randomized study were treated open with a scalpel. The other arm of the randomized study was treated



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percutaneously. Pain during Achilles loading (Visual Analogue Scale [VAS]) and satisfaction with treatment were evaluated.

Results—Before surgery the mean VAS was 73. After the surgery (range 6-33 months) the mean VAS was 3 in 11 tendons (89%) from satisfied patients back in full Achilles tendon loading activity. In the randomized study, there were no significant differences in the result between open treatment with a scalpel and percutaneous treatment with a needle.

Conclusions—US- and CD-guided scrapings show promising results in mid-portion Achilles tendinosis with few complications in patients on different activity levels. A fast pain relief and return to even high-level sports activity seem possible with this treatment approach.—*K. Hopkins*

◆ The author looked at a prospective randomized design of Achilles tendinosis treatment based on ultrasound and color Doppler to locate the site of “diseased tendon.” One group had a mini-open Achilles tendon treatment, while the other had a percutaneous “scraping” technique using an 18-gauge needle from medial to lateral along the ventral side of the tendinosis. Functional VAS scores had improvement in both groups with categories of walking, recreational sports, high recreational sports, and elite athletes. There was no statistical significance in either treatment group. The ultrasound and color Doppler technology offers a direct and objective way to locate the site of the diseased tendon. The study lacked a long-term functional follow-up. Thus, without recording or addressing the biomechanical issues with the patients, one cannot deduce predictable long-term results.—*L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.*

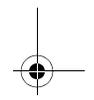
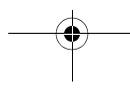
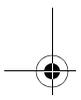
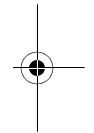
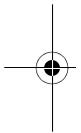
Anterior Distal Tibial Epiphysiodesis for the Treatment of Recurrent Equinus Deformity after Surgical Treatment of Clubfeet

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Introduction—Over time, the treatment of clubfeet has changed constantly and many techniques have been used. Primary surgical treatments such as extensive posteromedial releases of tight structures, supramalleolar osteotomy, triple arthrodesis, talectomy, and the use of a ring fixator were widely practiced. Later, the primary treatment method for congenital clubfoot became the Ponseti serial casting method.

Residual and recurrent deformities of the surgically treated clubfoot are immense pediatric orthopedic challenges. These feet are stiff and deformed,



and scarring tissue makes the foot shortened and rather resistant to treatment. Many techniques are associated with high risk of complications.

Use of anterior distal femoral epiphysiodesis in the treatment of fixed flexion contractures in the knee was first described by Kramer and Stevens.¹ They attempted to avoid extensive procedures such as the supracondylar osteotomy. Anterior distal tibial epiphysiodesis was used in a similar way for the treatment of fixed equinus deformity in clubfeet. The aim of this study was to evaluate the effect of anterior epiphysiodesis of the distal tibia on recurrent equinus deformity in patients with clubfeet previously treated surgically.

Methods—A total of 25 children, 16 boys, 9 girls, and 31 feet were treated in the study. The indication for treatment included children with recurrent progressive equinus previously treated by extensive posteromedial release for congenital clubfeet. Equinus was defined as less than or equal to 10 degrees of dorsiflexion in the ankle. The mean ankle dorsiflexion found before the procedure was 2.5 degrees. Richard staples, 8-plates (87% of patients), and combined procedures (64%) were used in treatment. The mean anterior distal tibial angle (ADTA) measure before treatment was 85 degrees.

Results—All 25 patients were followed clinically and radiographically. The mean increased clinical dorsiflexion was found to be 2 degrees and the mean ADTA changed to 70 degrees. No statistical correlation was found between the radiographic changes and the clinically measured dorsiflexion, and 3 patients had complications.

Discussion—The recurrence rate of the clubfoot deformity treated surgically is documented to be 25% to 47%, and treatment afterwards proves to be difficult. Therefore, many procedures have been developed with disappointing results. A second posteromedial release may be attempted but is very difficult due to scar tissue, altered anatomy, and the high risk of neurovascular injury. Procedures may also cause early osteoarthritis and ankle instability. Supramalleolar tibial osteotomies have been widely recommended throughout prior research and literature, especially in these reluctant and resistant cases.

No clinically significant improvement was seen in this study. The authors believe this was because equinus deformity is progressive, and deterioration in dorsiflexion would have occurred if the hemiepiphysiodesis had not been performed. Posterior ankle soft-tissue contractures were stronger than the anterior ankle joint capsules in these patients, resulting in stretching out the anterior capsule. Therefore, the anterior aspect of the distal tibia moved away from the anterior talus, giving limited clinical dorsiflexion.

These are the first reported results on temporary anterior epiphysiodesis of the distal tibia in the treatment of fixed equinus deformities after primary surgical treatment of clubfeet. The authors of this article state a prospective study should be undertaken before this treatment can be considered, due to disappointing results.—*A. Jacob*



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◆ This is a retrospective study that looked at managing recurrent clubfoot deformities status post previous posterior medial releases. The principle of distal tibial epiphysiodesis is similar to what was first described by Kramer and Stevens in anterior distal femoral epiphysiodesis for treatment of flexed knees.¹ The follow-up was only 22 months, but overall results revealed some improvement in the ankle dorsiflexion and a significant one in the anterior distal tibial angle. However, clinical correlation was minimal. Recurrent clubfeet are challenging deformities and thus, more predictable results with triple arthrodesis are still the treatment of choice. Options such as gradual deformity correction with Ilizarov external fixation and supramalleolar osteotomies are also valuable and are joint sparing, but still lack the predictability of arthrodesis.—L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.

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Taylor Spatial Frame in Severe Foot Deformities Using Double Osteotomy: Technical Approach and Primary Results

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Introduction—Severe foot deformities, including clubfoot deformities seen in children and adolescents, are a complex challenge for the orthopaedic surgeon to treat, especially in adolescents and young patients. Conservative treatments have recently been improving, but they often entail lifelong treatments that have shown decreased compliance in adolescents because they are inconvenient in everyday life activities. The Taylor spatial frame (TSF) is based on the principles of distraction osteogenesis, allowing complicated multiplanar deformities to be corrected with spatial adjusting foundations. In this study the TSF was examined for treating severe pes equinovarus, excavatus et adductus with a double osteotomy.

Method—Seven patients and 8 feet were treated using the TSF operation. The average age at surgery was 15.1, with a range of 9 to 29 years old. Preoperative X-rays were acquired to define the extent of the deformity. Surgery was performed in a supine position. Two semicircular rings, connected by struts, were mounted to the tibia. Perpendicular to the second ring, a U ring was connected to surround the calcaneus, to which a fourth ring was then attached perpendicular to

the forefoot axis. After securing the TSF, a midtalar osteotomy was made, along with an inverted dome-shaped second osteotomy in the calcaneus. In regard to postoperative correction by distraction osteogenesis, web-based planning was done for each patient on the TSF website, in which a limitation to the maximum daily distraction was defined by the surgeon. Criteria for judging the final outcome included lack of pain, ability to walk on a plantigrade foot, absence of recurrence, and individual satisfaction.

Results—The mean duration of the mounted TSF was 59.5 days, whereas the mean interval correction for changing the length of the TSF struts was 28.1 days. The mean follow-up care was 576.5 days. This study revealed good results in 7 feet, fair results in no feet, and poor results in one foot. In 5 feet, pathological preoperative correction was not fully corrected, and no foot was corrected to full physiologic position, although hindfoot correction was good in these patients. Preoperative equinus deformity was corrected in all patients. A limited amount of early complications arose, but no case required surgical intervention. These included pin tract infections, edema, relative shortening of the flexor digitorum with subsequent elevation, and paresthesias of the toes. An ulcer developed in one patient in which wound management and antibiotic therapy were necessary.

Conclusion—Treatment using the TSF showed good results to correct severe foot deformities. Due to an incorporated computer program, the TSF allowed a greater ability to plan the final alignment and adjust the therapy to change the plan as needed. By reason of the severe deformity of the feet, the complication rate was found to be relatively high. The TSF procedure is very time-consuming and costly to both patients and physicians and is recommended only for severe foot deformities. It is a dynamic therapy that allows adjustable correction for individual foot deformities.—*C. Seat*

◆ Authors retrospectively reviewed outcomes of the Taylor spatial frame on complex foot and ankle deformities in a pediatric to adolescent patient population over an average follow-up of 18 months. A total of 8 feet in 7 patients were operated on with the Taylor spatial frame in combination with osteotomies for distraction osteogenesis. The osteotomies were made at the level of the midtarsal area and the calcaneus in a “dome-shaped” orientation. The outcomes were good in 7 feet, but complications of neuritis, pin tract infection were documented. Ferreria, et al., previously had good results with the construct in fixed and rigid foot/ankle deformities.¹ The frame offers gradual distraction with maintenance of joints but requires good patient compliance and patience. The plan with surgical implementation has precise endpoints, and thus the correction is gradual and dynamic. No long-term results are published with this system, but dynamic correction offers an option to avoid fusions.—*L. A. DiDomenico, D.P.M., and R. Fahim, D.P.M.*



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QUESTIONS

- 8-1. Regarding the open wedge osteotomy of the cuneiform reported by Lutz and Myerson, which of the following statements is not true?
 - A. This procedure is performed on patients who have a forefoot varus deformity.
 - B. This procedure is performed on patients who experience medial column instability.
 - C. This procedure is performed on patients who suffer from a stage IV flatfoot deformity.
 - D. This procedure serves to realign the forefoot with distribution of weight-bearing forces across a tripod effect.
- 8-2. Regarding patients who suffer from Achilles pain treated with gastrocnemius recession, which of the following statements is not true, based on the findings of Laborde and Weiler?
 - A. In the diabetic patient, there was no reported development of Charcot arthropathy.
 - B. There is a lesser rate of wound complication with the proximal gastrocnemius recession.
 - C. This study evaluated insertional and non-insertional pain only.
 - D. This study had a 5-year follow-up.

