

8 Rearfoot Surgery

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A Retrospective Comparison of Cost and Efficiency of the Medial Double and Dual Incision Triple Arthrodesis

Galli MM., Scott RT, Bussewitz BW, Hyer CF
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Background—Medial double arthrodesis (fusion of the subtalar and talonavicular joints) has gained much popularity in recent years due to reproducible results while maintaining mobility of the lateral column and avoiding the common lateral incision complications. The purpose of this retrospective study was to compare the hardware costs and operative time between the medial double- and dual-incision triple arthrodesis. The hypothesis for the study is that the medial double subject would have lower hardware costs and shorter operative time.

Methods—This study is a level III retrospective comparative series that examined a total of 276 patients (277 feet), of which 47 met the inclusion criteria for hindfoot procedures. Among these 47, 21 medial double and 26 triple arthrodeses were performed. All procedures were performed by one of four fellowship-trained foot and ankle surgeons. The primary points of analysis were hardware cost, operative time, and procedure time. Primary data points were analyzed via the nonparametric Wilcoxon test. Given the retrospective nature of the study, the surgeon's fixation choices and costs were not influenced by the study.

Results—Mean medial double arthrodesis operative time was 106 +/- 31 minutes with a mean procedural time of 84 +/- 29 minutes. Mean triple arthrodesis operative time was 127 +/- 23 minutes with a mean procedural time of 104 +/- 23 minutes. The mean fixation cost of the medial double arthrodesis was \$1,197.59 +/- \$635.57 versus the mean fixation cost of the triple arthrodesis, which was \$2,932.75 +/- \$736.60. The statistical significance, *p*, is noted at 0.0028, 0.0033, and less than 0.0001 for OR time, procedural time, and cost, respectively.

Conclusion—The medial double arthrodesis was found to have a 21-minute shorter operative time, 20-minute shorter procedural time, and cost \$1,735 less compared to the triple arthrodesis using the mean values provided. In other words,

the mean medial double OR time was determined to be only 83.4% of the triple arthrodesis.—*C. Mussett*

◆ The triple arthrodesis is a powerful procedure used in advanced foot deformities. Over recent years, the medial double (subtalar joint and talo-navicular joint) arthrodesis has gained popularity. In their work, Astion, et al., found that once the talo-navicular joint was fused, there was only 2 degrees of motion left in the subtalar joint and calcaneal-cuboid joint. In addition, it was found that fusion of the calcaneal-cuboid joint had little effect on both the subtalar and talo-navicular joints. With fusion of both the subtalar joint and talo-navicular joint, very little motion is left in the calcaneal-cuboid joint. The medial double approach was found to be more cost effective and efficient than the double-incision triple arthrodesis. The medial double is a viable choice; however, lateral column pathology must be carefully assessed. If pathology is present, the triple should be utilized.—*L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.*

Patient-specific Instruments for Surgical Resection of Painful Tarsal Coalition in Adolescents

de Wouters S, Tran Duy K, Docquier PL
Orthop Traumatol Surg Res. 2014 Jun;100(4):423-427.

Introduction—A tarsal coalition is said to be a bone, cartilage, or fibrous junction between two bones in the midfoot or hindfoot. Coalitions display a male predilection and occur in about 1% of the population. Tarsal coalitions may be present from birth, but most commonly onsets during the second decade of life. They are a common cause of foot and ankle pain and may cause ankle sprains, tarsal tunnel syndrome, and pes planus. Tarsal coalitions can be diagnosed using plain film X-ray and CT. Radiographic signs include “talar beak” sign, “c-sign,” and the “anteater nose sign.” The purpose of this study was to look at patient-specific instruments for surgical correction of a coalition.

Method—Nine patients with painful tarsal coalitions underwent PSI-assisted surgical resection after conservative therapy had failed. Included were seven talocalcaneal and two calcaneonavicular coalitions. All the patients were assessed using AOFAS scores pre- and post-operatively. Surgical planning was done using CT with 3D reconstruction and the instruments were made from the 3D model. All patients underwent the same surgical technique utilizing a medial incision for talocalcaneal coalitions and an anterolateral incision for calcaneonavicular. Post-operatively, walking was resumed as pain allowed. CT was used to assess post-operative results for talocalcaneal and plain film for calcaneonavicular coalitions.

Results—Mean follow-up time was 17.9 months, and no post-operative complications were reported, including infection of the allograft. There was also no recurrence noted on follow-up. All patients reported pain relief and return to activity. Improved hindfoot mobility was noted on clinical exam.

Discussion—The series shows that a resection of coalitions 3D-guided instruments can produce good results for resistant painful tarsal coalitions. There are other approaches to managing coalition pain that include triple arthrodesis, intraoperative fluoroscopy, and arthroscopic removal of the coalition. All these alternative methods involve greater risk and a higher level of complication. This technique results in shorter surgery time and a smaller surgical incision.—A. Mahmood

◆ Tarsal coalition should be ruled out in a patient presenting with a pes planus deformity. The most common coalition is the talocalcaneal. Fifty percent of cases are reported bilaterally. Depending on the location of the coalition and the amount of presenting arthrosis, a surgeon must decide to resect the coalition or fuse the joint. Resection is done through various methods with or without interposition of graft. The article presents an innovative and precise method of resection. A patient-specific guide, however, adds cost to the procedure. In addition, the patient must undergo a CT scan and wait for the guide to be manufactured. While results with the guide are reported as good, the surgeon must carefully assess which patients require such advanced technology.—L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.

The Effect of Medial and Lateral Calcaneal Osteotomies on the Tarsal Tunnel

Bruce BG, Bariteau JT, Evangelista PE, Arcuri D, Sandusky M,
DiGiovanni CW
Foot Ankle Int. 2014. 35(4):383-338.

Background—Tarsal tunnel syndrome has been well-documented in literature for many years. This study hypothesized the influence of calcaneal osteotomies on tarsal tunnel volume in relationship to a post-operative complication of tarsal tunnel syndrome.

Methods—This study was cadaveric in nature and evaluated eight matched pairs of legs, 16 total legs. Each right foot was studied using a coin flip to determine whether an anterior or posterior calcaneal osteotomy. Following the osteotomy, four types of displacement were performed: far medial, near medial, near lateral, and far lateral. Each osteotomy was evaluated using MRI, and tarsal tunnel was divided into 10, 3-mm sections, and volume determined by radiology residents.

Results—Each osteotomy leg underwent baseline MRIs and four sequential MRIs following osteotomy and displacement. A total of 80 MRIs were taken, only 77 were used. Average displacements for the group's far medial, near medial, near lateral, and far lateral were 11.5 mm, 7.6 mm, 8.0 mm, and 11.7 mm, respectively. No statistical difference of tarsal tunnel volume between anterior and posterior osteotomies was found. However, in both groups, lateral displacement resulted in significant decrease in tarsal tunnel volume. The exit site of the osteotomy posterior and anterior osteotomies in relationship to the tibial nerve location also resulted in significant difference. Anterior osteotomy exit site displayed a 4.0-mm proximity to the tibial nerve, while posterior osteotomy exit site resulted in a 14.2-mm distance from the tibial nerve.

Conclusion/Discussion—The amount and direction of displacement of calcaneal osteotomies were shown to have an impact on tarsal tunnel volume. Lateral displacement of osteotomies provided the biggest volumetric decrease. Placement of osteotomy cuts, specifically anteriorly, may put neurovascular structures of the tarsal tunnel in jeopardy. Further study is needed to evaluate the effect of calcaneal osteotomies on tarsal tunnel volumes in feet that have pathological conditions that require calcaneal osteotomies.—*D. Huntsman*

◆ The tarsal tunnel should be evaluated in all patients presenting with complaint of foot and ankle pain. The tibial nerve is directly affected by foot and ankle position. It is now found that lateral posterior calcaneal osteotomy displacement results in a significant reduction of the tarsal tunnel volume, which could potentially lead to a post-operative tarsal tunnel entrapment neuropathy. As expected, the anterior calcaneal osteotomy proposes a greater risk to the neurovascular bundle than the posterior calcaneal osteotomy, based on anatomical location of the cut. The potential post-operative risk of tarsal tunnel syndrome following a lateral displacement calcaneal osteotomy should be discussed with the patient preoperatively. If a significant change in foot or ankle alignment proposing risk to entrapment neuropathy is planned, the operating surgeon may consider a prophylactic release of the tarsal tunnel.—*L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.*

Percutaneous Versus Open Repair of Acute Achilles Tendon Ruptures

Karabinas PK, Benetos IS, Lampropoulou-Adamidou K, Romoudis P, Mavrogenis AF, Vlamis J

Eur J Orthop Surg Traumatol. 2014 May;24(4):607-613.

Background—Despite being one of the strongest tendons in the body, Achilles tendon ruptures are a very common lower extremity pathology. There is much

debate about which treatment option may be the best. Conservative treatment, although financially beneficial, carries the greatest risk of re-rupture. Percutaneous and surgical repair show mixed results throughout literature for post-operative complications and results. This study compares results of percutaneous versus open surgical Achilles rupture repair.

Methods—Thirty-four patients from the year 2007-2011 were studied and treated; patient age ranged from 25-58. All patients had a Type II Achilles tendon rupture, with a tendon gap greater than 3 cm, 2-6 cm proximal to calcaneal insertion of tendon. Of the 34 patients, 19 had open surgical Achilles tendon repair and 15 had percutaneous repair. Mean follow-up of 22 months' open repair, 20 months for percutaneous operation. All injuries were treated within 48 hours of occurrence. Both groups were treated the same post-operatively. At each follow-up, wound complications, ankle range of motion, activity level, patient's return to work, and subjective assessment of treatment were recorded. Functional evaluation was done using the ankle-hindfoot scale developed by AOFAS.

Results—Tendon healing for both groups of patients occurred by 7-9 weeks, and the average time of patient's return to work for percutaneous was 9 weeks versus 7 weeks for those patients who underwent open surgical repair. Both groups of patients were full-weightbearing by 7 weeks and returned to non-contact sports by 5 months. The mean AOFAS score for the open repair group was 98, while the percutaneous group scored a 95. All patients displayed a negative Thompson test, capability of single heel rise test, and less than 5 degrees loss of dorsiflexion and plantarflexion of the ankle joint. No complications of re-rupture, infection, sural neuroma, or Achilles tendonitis were noted. All patients except one who received incision pain rated treatment as good. Percutaneous repair showed significantly better cosmesis.

Conclusion/Discussion—In conclusion, when evaluating treatment outcomes of open surgical Achilles tendon repair compared to percutaneous repair, both groups displayed successful clinical and functional outcomes. Despite what the literature states about surgical complications, only one patient had any complication, and was associated with pain. Percutaneous repair provides a much better cosmetic appearance and the cost is half of open surgical repair.—*D. Huntsman*

◆ Surgeons have three choices when managing Achilles tendon ruptures: conservative casting, percutaneous open repair, or open repair. When the gap between tendon ends is < 3 cm, percutaneous repair may be a viable, successful option. The presented percutaneous method resulted in no significant difference in wound healing, complications, ankle range of motion, and patients' return to work over the open repair. The risk of sural nerve injury is greater in the percutaneous group, since the nerve may not be completely visualized.—*L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.*

Mini-Open Tenorrhaphy of Acute Achilles Tendon Ruptures

Keller A, Ortiz C, Wagner E, Wagner P, Mococain P

Am J Sports Med. 2014 Mar;42(3):731-736.

Background—Achilles tendon rupture rates are increasing yearly, especially among aging adults as they participate in more high-demand activities. The purpose of Achilles tendon rupture treatment is to recover a normally functioning gastrosoleus complex. There is a variety of treatment options for ruptures including non-operative management (braces, casts) and open or minimally invasive surgical repair. Surgery is the preferred option, especially in younger active patients. Surgery also tends to have lower re-rupture rates than non-operative management alone. Unfortunately, there is a high incidence of soft tissue complications related to surgical repair of the Achilles tendon. These issues have paved the way for the development of a minimally invasive surgical procedure such as the Dresden procedure. The Dresden procedure reduces wound-healing issues and avoids sural nerve damage, as well as providing good functional results.

Method—A retrospective analysis on 100 consecutive patients was performed with mean follow-up of 42 months. Diagnosis of an Achilles tendon rupture was made via clinical evaluation with criteria including the presence of a palpable defect, loss of a physiological equinus, and absence of plantarflexion via the Thompson squeeze test. The Dresden technique was performed on all 100 patients. A small, longitudinal paramedial incision was made 2-cm proximal to the rupture site of the Achilles tendon, using a specific surgical interval between the superficial fascia and the paratenon, preserving this last layer and the local hematoma. At latest follow-up, a thorough clinical evaluation was performed, an AOFAS score was registered, a time to return to work/sports, subjective satisfaction, and any complications were recorded. Twenty-one patients were evaluated with an isokinetic test using a Gymnex dynamometer, where peak torque and total work-in plantarflexion and dorsiflexion were recorded.

Results—Ninety-eight of the 100 patients were satisfied with the procedure according to the Johnson satisfaction scale. The mean AOFAS score was 97.7, with the most frequent complaint being isolated local pain. The mean time return to work was roughly 56 days. The mean time to return to sports was roughly 19 weeks. A total of 80 patients were able to return to their previous sports activity at the same or higher level. Five patients returned to the same sport, but at a lower level. Seven patients did not return to sports at final evaluation. There were no soft tissue infections, wound dehiscence, or scar adherence. No sural damage was reported following surgery. Two cases of re-ruptures and five cases of DVT were observed in seven individuals. The isokinetic evaluation showed good recovery of the involved muscles.

Conclusion—The Dresden technique is a reliable, safe technique for tenorrhaphy of Achilles tendon ruptures. The relative ease of the procedure, reproducibility, low cost, excellent functional results, and avoidance of sural nerve damage make it an ideal alternative for repairing acute Achilles tendon ruptures.—*K. Alexander*

◆ The posterior incision made with open Achilles tendon repairs is a concern to the operating physician. The incision is prone to wound complications. If dehiscence does occur, the Achilles is left exposed. Complications are reported in a range from 11%-34.1%. The mini-open tenorrhaphy procedure provides the surgeon with an option to repair the tendon with a lower risk to the soft tissues. In the proposed method, the sural nerve can be visualized, which minimizes the risk to the nerve presented in other percutaneous techniques. Further studies should be employed to assess the re-rupture rate with percutaneous versus open repair. The method was found to have excellent functional and satisfaction results.—*L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.*

Calcaneoplasty and Reattachment of the Achilles Tendon for Insertional Tendinopathy

Lin HA, Chong HA, Yeo W

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Introduction—The Achilles tendon is located in the posterior calf halfway down and inserts into the middle posterior aspect of the calcaneus. There are conservative and surgical treatment options for Achilles tendinopathy. Some conservative treatments include orthotics, shoe modifications, extracorporeal shockwave therapy, and non-steroidal anti-inflammatory drugs. More persistent Achilles tendinopathy cases are treated with surgical intervention. This article is focused on using a new surgical technique that includes a calcaneoplasty and Achilles tendon reattachment.

Methods—Twenty-nine women and 15 men with a mean age of 53 years of age were a part of this study. After conservative treatment was attempted and failed, one surgeon performed all 44 surgeries from August 2007 to September 2010. Clinical evaluation of the patients before and after surgery was analyzed by a physiotherapist via the visual analogue score (VSA) for pain, the SF-36 health survey, and the American Orthopaedic Foot & Ankle Society (AOFAS) ankle-hindfoot score. The patients' satisfaction and expectations of the surgery were also scored and analyzed.

Results—Of all the 44 patients in this study, 37 were followed up to 3 months, 43 were followed up to 6 months, and 27 followed up to 12 months. The mean VAS score showed a significant decrease from 7.2 prior to surgery to 3.3 at the 3 months' time frame. At 6 and 12 months, the score decreased to 2.6 and 1.7, respectively. The mean AOFAS increased from 43.5 prior to surgery to 66.2 at 3 months, 78.5 at 6 months, and 86.5 at 12 months. The mean score of SF-36 drastically improved over the initial 6-month span that includes bodily pain and physical functioning and role functioning. The mean patient expectation score and satisfaction score both increased from 2.1 at 6 months to 1.5 at 1 year and 2.4 at 3 months to 1.7 at 1 year. None of the patients in this study had an infection or rupture post-operatively.

Discussion—Twenty-two patients in the series had calcified Achilles tendinopathy at the insertion, had tendon detachment, debridement of the calcaneus, and then reattachment surgery done. After 34 months, AOFAS mean score was significantly increased from 53 to 89. The 21 patients who underwent a lateral approach endoscopic calcaneoplasty due to retrocalcaneal bursitis returned to normal function faster than usual. Patients who underwent removal of the posterior calcaneal tuberosity and bursectomy without releasing the Achilles tendon in another series showed 10% had persistent pain and 83% had residual pain for 0.5 to 2 years in a 6-year follow-up study. After 20 months, the residual pain decreased to persistent residual pain. The persistent pain could stem from not looking at all the pathologies that could cause the pain. This study covered all the pathologies showing a majority result of satisfied patients. Some of the factors that can attribute to a reduction in pain are early weightbearing and early rehabilitation to improve the functional outcome. To prevent ankle equinus, the Achilles tendon was reinserted with the ankle in a plantigrade position. Due to the short duration of the follow-up period, this study was limited on its results.—*S. Lampl*

◆ Insertional Achilles tendinopathy is a common complaint seen by foot and ankle surgeons. Once conservative treatment measures are exhausted, surgical intervention is warranted. The technique presented includes a lateral incision rather than the common posterior midline incision. The lateral incision avoids direct exposure of the Achilles should a post-operative wound dehiscence occur. In addition, the method allows resection of the posterior calcaneal spur without full detachment of the Achilles tendon. Without detachment, patients are able to weight bear and attend physical rehabilitation sooner. The surgeon should assess for underlying equinus deformity. If such deformity exists, a lengthening method should be combined with the proposed calcaneoplasty and reattachment of the Achilles.—*L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.*

Endoscopic-Assisted Achilles Tendon Reconstruct with Free Hamstring Tendon Autograft for Chronic Rupture of Achilles Tendon: Clinical and Isokinetic Evaluation

El Shazly O, Abou El Soud MM, El Mikkawy DM, El Ganzoury I, Ibrahim AM

Arthroscopy. 2014 May;30(5):622-644.

Introduction—Delayed treatment, misdiagnosis, or conservative treatment failure of Achilles tendon rupture can develop into chronic rupture after 4 weeks of initial injury. The Achilles tendon will retract and degenerate, and fibrotic scar tissue will fill in the rupture space. These changes, along with wound complications, make surgical treatment for chronic Achilles tendon ruptures difficult. The purpose of this study was to determine if endoscopic-assisted reconstruction of chronic Achilles tendon ruptures would be equal to the results of similar open Achilles tendon reconstruction.

Methods—Fifteen patients with chronic Achilles tendon ruptures underwent endoscopic-assisted reconstruction of the Achilles tendon. Before the procedure, patients underwent functional evaluation and were assigned an American Orthopaedic Foot & Ankle Society (AOFAS) score. The hamstring tendon graft was obtained from the semitendinosus muscle. The graft was passed through the superior part of the Achilles tendon and brought inferiorly. The graft was then inserted into the calcaneus, anterior to the Achilles tendon insertion. The graft was fixated with biodegradable interference screw while applying tension to the graft and keeping the ankle in a neutral position. Patients were immobilized initially and gradually began weightbearing around 6 weeks. Initial MRIs were taken post-operatively and then another MRI taken at follow-up 12 months post-op. At 24-month post-up follow-up, patients were once again functionally evaluated using the AOFAS score as well as with an isokinetic strength test.

Results—The mean return time to full daily activities was 12.6 weeks (SD 1.39 weeks). On post-operative MRIs, the gap in the Achilles was absent and there was homogenous signal intensity of the tendon. The mean preoperative AOFAS score was 32.6 (SD 7.5). The mean post-operative AOFAS score was 90.8 (SD 3.54). The mean plantar flexion power deficit at 60° was 2.3%. The mean dorsiflexion power deficit at 60° was 2.1%. The mean plantar flexion power deficit at 120° was 2.3%. The mean dorsiflexion power deficit at 120° was 1.3%. None of the cases resulted in infection or DVT.

Conclusion—The patients' AOFAS 2-years scores improved when comparing the preoperative scores to 2-year post-op follow-up scores. There was minimal calf muscle power deficit when comparing to the uninvolved side. There were no cases that resulted in infection or wound complications. Therefore, endoscopic-assisted

Achilles tendon reconstruction appears to be a viable option for repairing chronic Achilles tendon ruptures.—*S. Lesnick*

◆ Chronic Achilles tendon injuries can pose a challenge to the operating surgeon due to retraction of tendon ends and degeneration of the tendon. The mainstay treatment is surgical. End-to-end repair can be attempted if the gap is < 3 cm and tendon ends are sufficient. Oftentimes, after tendon debridement, a V-Y advancement, graft, or tendon transfer is required. The proposed technique requires harvest of semi-tendinosus, which requires a second surgical site and likely surgeon. In addition, it employs hindfoot arthroscopy, which has a learning curve for surgeons who do not regularly employ arthroscopic methods. The graft is passed through an anterior calcaneal tunnel, which can potentially impact power and range of plantar flexion. Wound complications are always a concern with an open procedure, and this procedure does provide a minimally invasive technique. In addition, it utilizes autogenous graft, which is superior to using allograft.—*L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.*

Z-lengthening of the Achilles Tendon with Transverse Skin Incision

Kim HT, Oh JS, Lee JS, Lee TH

Clin Orthop Surg. 2014 Jun;6(2):208-215.

Background—Selecting an appropriate procedure for Achilles tendon lengthening can be challenging. Achilles tendon lengthening procedures come with inherent risks—the length of surgical exposure and the method for lengthening. Risks can often lead to post-operative complications. This study proposes a novel comprehensive technique to minimize complications.

Materials and Methods—This study introduces a novel Z-lengthening modification technique and uses the American Orthopaedic Foot & Ankle Society (AOFAS) Ankle Hindfoot Scale to evaluate and compare this novel technique to pre-existing techniques.

Results—This study evaluated the tightness of 57 patients' Achilles tendons (95 ankles) by utilizing a short transverse incision on a skin crease of the heel and by Z-lengthening of the tendon. The results of these 95 ankles were compared to those of 18 ankles (which underwent percutaneous sliding lengthening) and 19 ankles (which received Z-lengthening with a medial longitudinal incision). The novel technique improved the mean AOFAS score from 56.1 to 81.8.

Discussion—Functional and cosmetic satisfaction was successfully achieved among those who underwent this novel technique. Operation time of the new technique is shorter and it reduces the rate of complications such as scarring, adhesion, total transection, excessive lengthening, and recurrence of shortening.—*S. Bastian*

◆ The equinus deformity has a significant impact on foot and ankle pathology and is often overlooked. Lengthening of the gastroc-soleal complex can be performed through endoscopic, percutaneous, and open procedures. In neuromuscular disorders, the endoscopic and percutaneous methods are often insufficient. The Z-lengthening performed through transverse skin incisions was found to provide adequate lengthening. The incisions are made along resting skin tension lines, which provides an advantage for wound healing. In addition, the incisions are smaller than the open midline incision, which has improved cosmesis. The method combines percutaneous and open techniques. An additional advantage is the preservation of the paratenon and deep fascia. There was recurrence of equinus in neuromuscular patients, which is a risk with all lengthening procedures in this patient subset.—L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.

Comparison between Tenocutaneous Suture and Kessler Suture Techniques in Treated Acute Closed Achilles Tendon Rupture

Ding WG, Li H, Zhu YP, Liu ZW

Foot Ankle Surg. 2014 Jun;20(2):105-108.

Introduction—Acute Achilles tendon rupture is a very common sports injury for which there is much debate on what available treatment method is most effective for the patient. Existing treatments can be classified as: conservative treatment, open surgery, and minimally invasive repair. Conservative treatment involves cast immobilization, which lengthens the tendon, reducing its strength, and increasing the chance of rupturing again. Open surgery is commonly used, but comes with possible complications, including possibly compromising the functionality of the lower limb and the quality of life of the patient. The percutaneous technique is a minimally invasive option offering similar outcomes as the open surgery technique, with greatly reduced surgical complications. The tenocutaneous technique combined with a small incision is used to resolve the rupture and closure of the tendon sheath to protect the tendon's blood supply.

Methods—To compare the minimally invasive tendon skin suture with the traditional Kessler suture technique, the outcomes of 34 acute closed Achilles tendon ruptures in 33 patients from February 1998 to December 2008 were compared. The patients, including 22 males and 11 females, ranged in age from 22-60 with an average of 38 years. Patients were divided into groups A and B, with group A receiving traditional Kessler technique (before 2003) and group B receiving the tenocutaneous technique (after 2003).

Results—In group A, 76.9% of patients could raise their heels easily with a mean AOFAS ankle-hindfoot score of 92, with an average scar length of 6 cm. In group B, 90% of patients could raise their heels easily with a mean AOFAS ankle-hindfoot score of 95, with an average scar length of 3 cm. The excellence

rate, according to the American Orthopaedic Foot & Ankle Society ankle-hindfoot scale, was 91% and 98%, respectively, with a significant difference between groups ($p < 0.05$).

Discussion—In this comparative study, tenocutaneous suture demonstrated considerable benefits compared with conventional Kessler technique. Surrounding structures remain intact with the use of the tenocutaneous technique, which promotes healing and avoids most surgical complications. Tenocutaneous technique minimally affects the blood supply, the torn ends are effectively reconnected with simple absorbable sutures, the ruptured ends are retained and cleaned with a specific length of tendon overlap occurring, maintaining good range of motion.— *M. Liette*

◆ The Achilles tendon is a common tendon rupture in sports injuries. Treatment options include conservative casting, minimally invasive surgery, and open repair. Each treatment option provides its own pros and cons. Minimally invasive repair has gained popularity recently. The tenocutaneous suture method combines open repair with minimally invasive properties. The open repair is performed through a smaller incision and allows debridement of tendon ends without full disruption of the Achilles paratenon. The remaining repair is done percutaneously. The method provides another viable technique for repair of the Achilles tendon.—*L. A. DiDomenico, D.P.M., and D. Butto, D.P.M.*

QUESTIONS

- 8-1. The medial double arthrodesis is _____ than the triple arthrodesis according to Galli, et al.
- A more efficient but less cost effective
 - B less efficient but more cost effective
 - C less efficient and less cost effective
 - D more efficient and more cost effective
- 8-2. Equinus deformity recurs more often with _____ in the article by Kim, et al.
- A open z-lengthening
 - B tenotomy
 - C percutaneous lengthening
 - D Sagittal Z