

Endoscopic Deep-Fascial Approach for the Treatment of Plantar Fasciitis

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Abstract

Study design: Retrospective study.

Objective of the study: The purpose of this study was to determine the clinical results of deep-fascial medial and lateral portals in performing endoscopic surgery for plantar fasciitis.

Background: plantar fasciitis is the most common injury of the plantar fascia, 90% of cases respond to conservative treatment and 10% needs surgical treatment.

Methods: We treated seven patients who complained from plantar fasciitis by endoscopic surgical release of the plantar fascia using the deep-fascial approach after failure of conservative treatment for more than 6 months. They were 4 male and 3 female patients with a mean age at surgery of 36 years (range, 22-55 years). A heel spur was detected in 5 patients and it was resected to establish a clear view of the plantar fascia.

Results: The mean American Orthopedics Foot and Ankle Society Ankle Hindfoot Scale (AOFAS) score was 64 points before surgery and 90 points at 2 years after surgery. In the categories of the AOFAS score, pain was improved significantly: 16.0 points before surgery and 38 points at 2 year after surgery. Six patients returned back to full preoperative activity by a mean of 7 weeks (Range, 6 to 8 weeks).

Conclusions: Endoscopic surgery for the treatment of plantar fasciitis through a deep-fascial approach allows for adequate working space, better visualization of the surgical field, precise cutting of the medial half of the plantar fascia, excision of the calcaneal spur and provide better clinical results than the slotted cannula methods.

Keyword: Plantar fasciitis; Endoscopy; Fasciotomy; Calcaneal spur; Heel pain

Introduction

Plantar fasciitis is the most common injury of the plantar fascia. Up to 40% of the population suffers from painful feet problems at least once during their life time, and more than 10%, at some time during their life, suffer from heel pain that is caused by an inflammation in the proximal insertion of the plantar fascia. The etiology of plantar fasciitis remains unclear [1]. More than 90% of cases respond to conservative treatment including nonsteroidal anti-inflammatory drugs, stretching, night splint use, foot orthosis use, physical therapy, and extracorporeal shock-wave therapy. However, the remaining 10% of patients do not improve with conservative treatment and may be candidates for surgical treatment [2]. If nonsurgical treatment fails, a partial plantar fasciotomy has generally been performed to remove a portion of less than the medial half of the plantar fascia. Treatment may be divided into 3 procedures: percutaneous release, open surgery with plantar medial incision, and endoscopic surgery [3]. Percutaneous release is a less invasive surgery but is not a reliable method to release the plantar fascia. Although open surgery is more common, there have been reported complications including skin problems, infection, nerve disturbance, and persistent pain associated with prolonged recovery time [4]. Recently, endoscopic partial plantar fasciotomy has been developed for treating plantar fasciitis to decrease the occurrence of surgical complications and shorten the duration to return to initial level of activities. Although patients have tended to report subjective satisfaction with these procedures, there remain several issues. The lateral and medial portals have been made at the superficial level of the plantar fascia in all of these procedures. Because that location is between the skin and the plantar fascia and fills with fat tissue, it has been difficult to obtain a sufficient field of vision and working space, so we needed to use a hook probe and slotted cannula system. Furthermore, a calcaneal spur cannot be resected through these portals because it exists deep to the plantar fascia in most cases. To resolve these issues, the deep-fascial medial and lateral portals in performing endoscopic surgery for plantar

fasciitis has been recently introduced. The purpose of this study was to determine the clinical results of this approach [5]. We hypothesized that endoscopic surgery with a deep-fascial approach is effective for the treatment of plantar fasciitis and enables patients to return to full level of activity and the results are superior to the traditional superficial portals and using the slotted cannula system.

Patients and Methods

Between September 2010 and December 2012, seven patients with plantar fasciitis were selected for this study. Plantar fasciitis was diagnosed by history, physical examination, and radiographic investigation. All patients typically had heel pain that was more severe upon the first step in the morning. On physical examination, all patients showed localized tenderness to palpation at the insertion of the plantar fascia and a positive Windlass test. Passive dorsiflexion of the toes (Windlass test) usually does not aggravate the symptoms of the plantar fasciitis, but may do so in severe cases. The windlass mechanism of the plantar fascia as the toes are dorsiflexed was explained as follow, the plantar fascia which originates from the anteromedial plantar aspect of the calcaneal tuberosity and inserts through several slips into the plantar plates of the metatarsophalangeal joints, the flexor tendon sheaths and the bases of the proximal phalanges of the digits, is under constant traction as it is pulled distally around the drum of the windlass

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(metatarsal heads). This tightening elevates the longitudinal arch and in so doing places traction on the origin of the plantar fascia. Patients were subjected to a minimum of 6 months of conservative treatment including nonsteroidal anti-inflammatory drugs, stretching, night splint use, foot orthosis use, physical therapy and at least single steroid local injection. The number of physiotherapy visits ranged from 18-36 visits. Patients failed to respond to conservative treatment and they consented to be subjected to endoscopic plantar fascia release. There were 4 male and 3 female patients, with a mean age at surgery of 36 years (range, 22 to 55 years). The 4 males were heavy manual laborers and the 3 females were house wives. Preoperative standard radiography showed a plantar calcaneal spur in five patients.

Surgical technique

The procedure was performed under spinal anesthesia, supine position and tourniquet control inflated to a pressure of 250 mm Hg. The operative time ranged from an average of 70 minutes in the first three cases to an average of 50 minutes in the rest of the cases. Under fluoroscopy, a deep medial portal is made 5 mm deep to the line that links the medial calcaneal tubercle to the plantar side of metatarsal head and 10 mm anterior to the medial calcaneal tubercle (Figure 1). Because the first branch of the lateral plantar nerve passes directly over the top of the medial process of the calcaneal tuberosity, there is a risk of injuring it when a medial portal is made. The incision is made only in the skin, and blunt dissection is done to only the deep-medial aspect of the plantar fascia.

The deep- lateral portal is established by placing a blunt trocar deep and perpendicular to the plantar fascia, and the skin, tented by the trocar, is incised vertically (Figure 2). A 2.7-mm-diameter (30°) arthroscope is passed through the deep-lateral portal. Through the deep medial portal a motorized shaver is used for making a working space to excise the fat tissue and a plantar portion of the flexor digitorum brevis muscle, as minimally as possible, to obtain good visualization. First, the plantar surface of the calcaneus and the calcaneal attachment of the plantar fascia should be identified for a landmark (Figure 3). If there was a heel spur, it was resected to establish a clear view of the plantar fascia using an arthroscopic burr.

After exposure of the plantar fascia, its width is measured with a probe, and an area of less than the medial half of the plantar fascia is resected with an Arthro-Knife (ConMedLinVatec, Largo, FL) (Figure 4). Care should be taken never to allow the fiber of the plantar fascia to remain. The plantar fascia should be removed until the plantar fat tissue is exposed, which is the sign that the plantar fascia has been resected completely toward its superficial layer (Figure 5). Portals were closed with No. 2-0 silk suture, the pneumatic tourniquet is released and a compressive dressing is applied to the foot and ankle.

After surgery a compressive dressing was applied to the foot and ankle, no weight bearing was allowed for 4 weeks postoperative. Active range-of-motion exercises of the foot and ankle was started one day after surgery. Partial weight bearing was allowed 4 weeks after surgery and gradually increases to full weight bearing in accordance with patient tolerance.

Complications

At 6th week evaluation, one patient showed partial improvement of heel pain but he was still complaining of referred pain to the lateral aspect of his heel that is specific to entrapment of 1st branch of lateral plantar nerve. His pain score was 15 points. He was subjected to extensive physiotherapy for 3 weeks but his symptoms failed to

improve so we performed endoscopic decompression of the 1st branch of the lateral plantar nerve. Patient symptoms improved dramatically three weeks after surgery and his pain score improved to 35 points (Figures 6 and 7).

Results

The clinical results of all patients were assessed with the American Orthopedics Foot and Ankle Society Ankle Hind foot Scale (AOFAS score) [6] before surgery and at 2 years after surgery. The criteria in pain score as follow: no pain (40 points), mild occasional pain (30



Figure 1: Creation of the deep medial portal under fluoroscopic control



Figure 2: Creation of deep lateral portal

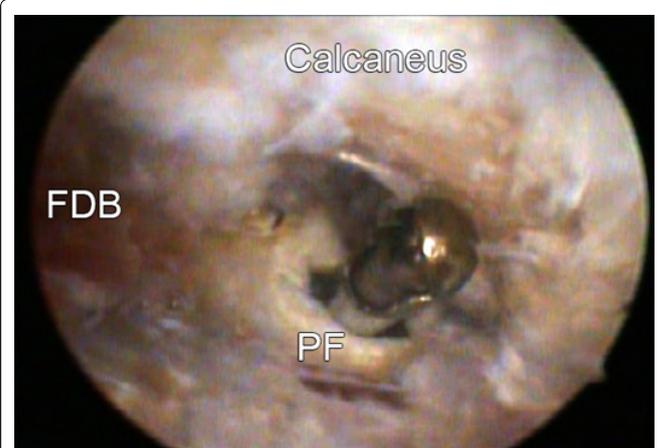


Figure 3: Clear view of undersurface of calcaneus, flexor digitorum brevis (FDB) and plantar Fascia (PF)

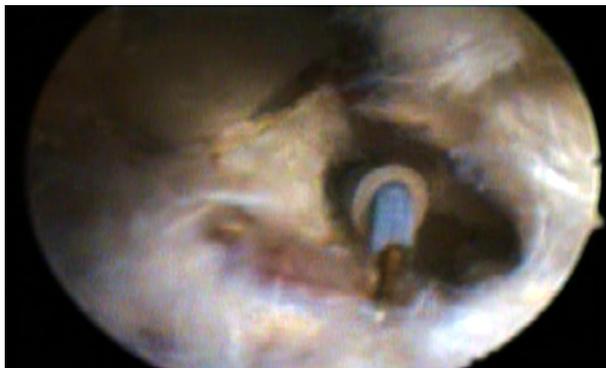


Figure 4: Cutting medial half of plantar fascia with arthro knife



Figure 5: Plantar fat pad exposed after complete cutting of medial half of plantar fascia



Figure 6: Portals for decompression of the first branch of lateral planter nerve



Figure 7: Decompression of first branch of lateral planter nerve

points), moderate daily pain (20 points) and severe almost always present pain (0 points).

The mean AOFAS score was 64 points before surgery and 90 points at 2 years after surgery. In the categories of the AOFAS Score, pain was improved significantly: 16.0 points before surgery and 38 points at 2 years after surgery. Six patients returned back to full preoperative activity by a mean of 7 weeks (Range, 6 to 8 weeks). One patient with coinciding entrapment of the 1st branch of lateral planter nerve returned back to full preoperative activity level at 12 weeks. Three patients had paresthesia on their sole after surgery, but the symptom disappeared within 2 months after surgery. There were no cases of infection, venous thrombosis, residual heel pain, or arch collapse.

Discussion

Barrett and Day [7] reported a single-portal endoscopic technique for treatment of plantar fasciitis in 1991. Thereafter several other authors published studies of endoscopic plantar fasciitis surgery. These reports showed satisfactory clinical and subjective results. O'Malley et al. [8] reported on 20 feet treated with a 2-portal partial endoscopic plantar fascia release, the mean AOFAS score improved from 62 points to 80 points. Bazaz and Ferkel [9] reported that the mean AOFAS score improved from 66 points to 88 points. These reports introduced the portals located immediately anterior and superficial to the medial calcaneal tubercle and superficial to the plantar fascia. In their methods the cutting device was inserted and the plantar fascia released. In performing those procedures, it is difficult to obtain a sufficient field of vision and working space because of the fat tissue filling the space between the skin and the plantar fascia. Therefore there may be a possibility of some plantar fascia fibers remaining that should be resected completely and may cause residual heel pain after surgery.

The deep-fascial medial and lateral portals were introduced by Fumito et al. [10] to make possible a greater working space and better view than those of previously reported procedures, in this study the mean AOFAS score improved from 64.2 points to 92.6 points. Their results were equal to or superior to those of past studies. The better clinical results may have been obtained because of the complete resection of the plantar fascia under good visualization through the deep-fascial portals.

It is now widely accepted that calcaneal spurs can occur with plantar fasciitis but that they are not the cause of heel pain. Previous reports showed that there was no significant pain reduction with calcaneal spur resection in cases of plantar fasciitis. However, a previous article showed that there was connective tissue richly supplied with blood vessels and nerves between the spurs and plantar fascia [11]. Accordingly, they believe that there remains a possibility for the calcaneal spurs to lead to pain and they should be removed. In fact a spur was found in 15-40% of persons with no history of foot pain. About 50% of patients with heel pain do not have a spur. It was proved that the spur can cause entrapment of the branch of the lateral planter nerve to the abductor digitiminimi muscle. It was also proved that there was connective tissue richly supplied with blood vessels and nerves between the spur and plantar fascia. Accordingly, we believe that there remains a possibility for the calcaneal spur to lead to pain and they should be removed [12,13].

Our results are comparable to the study conducted by Fumito et al. [10] regarding the improvement in the overall AOFAS and our results are superior to the studies conducted by O'Malley et al. [8] and Bazaz and Ferkel [9], probably because of the better visualization of the fascia, complete resection of the medial half of the plantar fascia and removal of the calcaneal spur.

Regarding the duration to returning to full activity, Saxena [11] reported the clinical results of uniportal endoscopic plantar fasciotomy performed in 16 patients. The mean period to return-to-activity after surgery was 2.7 months. In Fumito et al. study [10] all cases could walk normally within a mean of 2 weeks after surgery, but the duration to full activity was a mean of 10.9 weeks, similar to past studies. He supposes that the reason for this longer period was the need to resect a portion of the flexor digitorum brevis muscle. We disagree with Fumito et al. [10] in this regard because of the fear of the possibility of the complication of late lateral column and arch pain so we decided to follow a more conservative rehabilitation line, so we allowed patients to do partial weight bearing at 4th week and full weight bearing at 6th weeks.

We totally agree with Fumito et al. [10] as he stated in his study that one of the limitations of this procedure is that it is difficult to observe the first branch of the lateral plantar nerve. However, this nerve is known as one of the causes of heel pain when entrapped around the calcaneal attachment of the plantar fascia [12]. Some reports have shown good clinical results after decompression of the first branch of the lateral plantar nerve [13-15], but it is difficult to perform this through the current technique. In our study we had one patient who failed to improve his symptoms after surgery and we had to address this problem with another procedure. This is probably because of the difficulty to diagnose this issue clinically and to our knowledge by EMG studies, so we have to rely on the subjective improvement of the patient post operatively and put in mind that the patient may need decompression of the 1st branch of lateral planer nerve later on.

Another limitation is the small number of patients and short-term follow-up. A long-term follow-up of more than 5 years is needed for adequate clarification.

Conclusion

Endoscopic surgery for the treatment of plantar fasciitis through a deep-fascial approach allows for adequate working space, better visualization of the surgical field, precise cutting of the medial half of the plantar fascia, excision of the calcaneal spur and provide better clinical results than the slotted cannula methods. The limitation in this study was the few number of patients (seven patients), but these were the resistant cases with no response to other conservative measure for not less than 6 months. However, this will not affect the message given to other surgeons to treat this resistant medical problem by endoscopic deep fascial approach.

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