CHAPTER 37

# ENDOSCOPIC PLANTAR FASCIOTOMY: Current Controversies

*Michael S. Downey, D.P.M.*

Plantar heel pain remains one of the most frequently encountered complaints in patients seeking treatment for foot and ankle problems. Many of these patients will be ultimately diagnosed as having plantar heel spur syndrome or plantar fasciitis. The majority of these patients will be successfully treated by conservative means. A small percentage will not respond to conservative measures and will elect to undergo surgical intervention. In 1991, Barrett and Day[1,2] described the endoscopic plantar fasciotomy (EPF) procedure as one method to surgically manage a patient with recalcitrant plantar fasciitis or plantar heel spur syndrome. Since its introduction, the EPF procedure has occupied the forefront of the debate as to when and how plantar heel pain should be surgically managed. This paper will review some of the current questions and controversies regarding the EPF procedure.

## QUESTION #1

### How much conservative treatment should be attempted before the EPF procedure is considered?

The question is probably better phrased "How much conservative treatment should be attempted before ANY surgery is considered?" The EPF procedure should be judged like any other surgical approach for recalcitrant plantar fasciitis or plantar heel spur syndrome. The EPF procedure has inherent risks and potential long-term sequelae. Although it is generally associated with a quicker recovery, this should not make one consider the procedure any earlier in the treatment course than one would consider a more traditional approach.

Choices of conservative therapy vary widely and generally include both anti-inflammatory measures and attempts at biomechanical control. Common examples of anti-inflammatory choices are corticosteroid injections, nonsteroidal anti-inflammatory drugs (NSAIDs), and physical therapy modalities such as ice and ultrasound. Examples of biomechanical treatment include rest, activity or shoe changes, padding or strapping, heel cups or pads, orthoses, casting, night splints, weight loss, and physical therapy modalities with goals to improve function (e.g., stretching regimes).

Although many authors advocate a specific time period that conservative treatment should be tried before surgery is considered, it would appear that the nature of the conservative therapy should be more strongly considered. Poor conservative treatment provided indefinitely is likely to fail, whereas sound conservative measures are likely to resolve the patient's symptoms within a reasonable time period. Several recent studies continue to discuss the success of conservative treatment in roughly 90% of patients seeking treatment with diagnoses of plantar fasciitis or plantar heel spur syndrome. From these studies, it would appear that a minimum of 6 months of varied and quality conservative treatment should be tried before surgery is considered as an option.[3,4]

## QUESTION #2

### Is the procedure effective, and if so, is it any more effective than an open plantar fasciotomy?

Numerous surgical approaches for plantar heel spur syndrome or plantar fasciitis have been espoused. Since its introduction in 1991, the EPF procedure has become quite popular as a method to address plantar heel spur syndrome or plantar fasciitis despite a relative lack of studies regarding its efficacy. The endoscopic plantar fasciotomy procedure involves the cutting of the plantar fascia near its origin from the calcaneus through a slotted cannula under endoscopic visualization. Recently, a few reports assessing the efficacy of the EPF procedure have emerged.

Several of the reports discussing the efficacy of the EPF procedure have come from the founding surgeons. In 1991, Barrett and Day[2] evaluated the results of the procedure in 7 patients.

In 1993, they reported their results in 65 EPF procedures in 62 of their own patients.[5] Between 1991 and 1993, the authors altered and improved their surgical technique to include a two portal approach and new instrumentation. Most recently, in 1995, Barrett et al.[6] discussed the results in 652 procedures performed by 25 different surgeons.

The most recent study provides the most intriguing data. In the study, the authors reported that the EPF procedure relieved the patient's heel pain in 633 (97.1%) of the 652 cases. They also identified 62 postoperative complications which occurred in 53 (8.1%) of the 652 cases. The authors divided their complications into lateral column destabilization phenomena, medial column destabilization phenomena, and other complications. Lateral column destabilization problems included calcaneocuboid/midtarsal joint pain, 4th-5th metatarsocuboid pain, peroneal tenosynovitis, and sinus tarsi syndrome. Medial column destabilization pathology included central arch pain and intrinsic myositis. Other complications included continued heel pain, postoperative infection, incisional pain, nerve entrapment, and plantar fibromatosis. The most common complications were calcaneocuboid/midtarsal joint pain which occurred in 25 cases (3.8%), and continued heel pain which occurred in 19 cases (2.9%). Approximately 52% (32 of 62) of the complications were categorized as lateral column destabilization phenomena. Based upon these results, Barrett et al.[6] suggested that the EPF technique should be modified to release only the medial one-third of the plantar fascia.

Other authors have also reported results of the EPF procedure. In 1993, Kinley et al.[7] from St. John Hospital-Macomb Center in Mount Clemens, Michigan reported a comparative study between the EPF procedure and a traditional type of open heel spur surgery. They reviewed 66 EPF procedures and compared them to 26 procedures where the plantar fascia was cut and any plantar heel spur present was removed through a 3 to 6 centimeter plantar-medial incision. These authors reported that in 6 (9.1%) of the 66 EPF cases the patient had a partial or complete return of their pain. This compared to a 19.2% incidence (5 of 26) in the traditional open approach. In total, Kinley et al. reported a total of 27 complications in the 66 EPF procedures (41%) and 15 complications in the 26 traditional procedures (57.7%).[7] The EPF complications included the 6 cases with recurrent pain, 3 cases of neuritis (1 sural nerve, 2 medial plantar nerve), 2 superficial infections, 6 cases of transferred pain, 5 cases of incisional pain, 4 cases of adhesions, and 1 case of pain along the course of the endoscope tract. Of the 6 cases of transfer pain, 3 were described as being in the arch, 2 in the sinus tarsi, and 1 in the forefoot. In comparing the two approaches, these authors concluded that patients undergoing the EPF procedure had a shorter surgical time, earlier recovery, less postoperative pain, and fewer complications.

Tomczak and Haverstock[8] also compared the EPF technique to an open plantar fasciotomy with heel spur resection. These authors compared 34 patients who had an EPF procedure to 34 patients who had the open approach. They concluded that the group undergoing the EPF procedure returned to work much faster (an average of 55 days sooner) than the group undergoing the open fasciotomy with heel spur resection. These authors did not specifically discuss their complications, but did conclude that both of the surgical approaches were equally effective in relieving plantar heel pain.

In 1996, Stone and Davies[9] reported the results of a retrospective survey conducted on 40 patients. These 40 patients responded to a written questionnaire and were not objectively examined or evaluated. Despite this limitation, their study did yield some interesting findings. 70% of the patients responded "Yes" when queried as to whether they would recommend the procedure to others or undergo the procedure again. However, 100% of the patients responding (40 of 75 questionnaires mailed out were returned) reported at least one postoperative complication. The most common complications were arch strain (63%), continued heel pain (45%), fatigue and stiffness (45%), cuboid and lateral pain (33%), and ball and toe pain (28%). The authors suggested releasing only the medial 50% of the plantar fascia, and managing patients postoperatively in a weight-bearing short-leg cast for the first 4 to 6 weeks. They felt that this approach might diminish the incidence of calcaneocuboid joint pain or lateral destabilization problems.

The consensus of current evidence appears to support the EPF as a viable surgical option for the management of plantar fasciitis or plantar heel spur syndrome which is recalcitrant to conservative treatment. Patients appear to recover more quickly with less postoperative pain than patients undergoing more traditional surgical approaches for the same condition.

## Question #3

### Are nerves often subject to damage with the EPF surgical approach?

One of the concerns regarding the EPF procedure is the possible damage a surgeon might inadvertently cause to a local nerve in the heel. Several nerves are potentially subject to nerve injury with any surgical approach to the heel including the medial and lateral plantar nerve, the medial calcaneal nerve, and the first branch of the lateral plantar nerve (i.e., the nerve to the abductor digiti quinti or Baxter's nerve). In early 1995, several clinicians reported anecdotal accounts of nerve injuries in an article on the EPF procedure.[10] More recently, two cadaver studies have directly addressed and evaluated this clinical concern.

Hawkins et al.[11] evaluated the EPF procedure and its reproducibility in 18 fresh-frozen cadaver specimens. They attempted to release 75% of the plantar fascia in each specimen via an endoscopic surgical approach. They then dissected the specimens to expose the plantar heel and evaluated several parameters including the actual amount of the plantar fascia cut, the width of the plantar fascia, and the thickness of the plantar fascia. The authors also evaluated each specimen for any damage to neural structures. When measured, the actual cuts they created in the plantar fascia through the endoscope (the original goal was 75% of the width) varied from 53% to 100%, but averaged 82%. The average medial to lateral width of the plantar fascia was 17.4 mm and the average thickness of the fascia was 3.5 mm. No damage to neural structures was identified in any of the cadaver specimens. The authors found the average distance from the plantar fascia to the nerve to the abductor digiti quinti to be 11.0 mm.

Hofmeister et al.[12] conducted a similar study on 13 fresh-frozen cadaver feet. They attempted to release the plantar fascia completely through the endoscope, but found upon more extensive dissection, that on average only 81% of the fascia had been released. They also assessed the average distance from the plantar fasciotomy to the lateral plantar nerve and nerve to the abductor digiti quinti and found the average distances to be 10.5 mm and 12.3 mm, respectively. None of their specimens demonstrated any injury to neural structures. The authors concluded that with good technique, the "risk to neurovascular structures appeared to be minimal."

The follow-up studies on the EPF procedure appear to support the evidence supplied by these cadaver studies. In their study of 652 cases, Barrett et al.[6] described only one postoperative nerve entrapment. Kinley et al.[7] described 3 cases of postoperative neuritis in their 66 cases. Of these, the sural nerve was involved in 1 case, suggesting the injury occurred with the creation of the lateral portal, and 2 cases involved the medial plantar nerve. No injuries to the lateral plantar nerve or its first branch (i.e., the nerve to the abductor digiti quinti) were reported.

Therefore, the consensus of both cadaver studies and reported clinical studies is that the risk of nerve injury in a properly performed EPF procedure is minimal. In both cadaver studies, the nerve to the abductor digiti quinti was found to be over 1 cm (on average) away from the plantar fascia. This distance would appear to offer a significant "buffer zone" between the fascia and nerve when the proper instrumentation and technique are utilized. Concern of nerve injury would not appear to be a reason for abandoning the EPF technique.

## Question #4

### How much of the plantar fascia should be released with the EPF procedure?

When the EPF technique was initially described, Barrett and Day[1,2] advocated a complete transection of the plantar fascia. Two years later, when they were discussing their results in 65 cases, Barrett and Day[5] recommended that only the medial $^2/_3$ of the plantar fascia be cut. Now, with their most recent report of 652 cases, they recommend performing a release of only the medial $^1/_3$ of the plantar fascia.[6] Ostensibly, the reason for the change in the amount of plantar fascia to be cut is to reduce the common complication of lateral column destabilization. It is hoped that by maintaining intact the lateral fibers of the plantar fascia, the locking mechanism of the calcaneocuboid joint will not be disrupted. A future study evaluating the results with only a $^1/_3$ medial plantar fasciotomy is needed to see if the actual results support this theoretical goal. Until then, a release of the medial $^1/_3$ to $^1/_2$ of the plantar fascia is probably advisable, with the exception being a more lateral release in revisional cases or in cases where the patient's pain is associated with the lateral band of the plantar fascia.

## Question #5

**When calcaneocuboid syndrome does occur, what is the best treatment for it?**

Lateral destabilization problems, including calcaneocuboid syndrome, are perhaps the most common complications associated with the EPF procedure. As mentioned, avoidance or diminishing the risk of these complications by releasing less of the fascia would seem to be advisable. Further, a more restrictive postoperative course including several weeks of limited or partial weight bearing, a short-leg walking cast, and/or night rest splints would also appear to be sensible and might diminish the frequency of these lateral column problems.

When the problem of calcaneocuboid syndrome does occur, it should be managed in an aggressive but conservative fashion. Barrett et al.[6] recommended that initial treatment consist of decreased ambulation and standing, stretching exercises, NSAIDs, orthoses, and physical therapy. If this fails to alleviate the problem, they recommend a removable cast boot or referral to another surgeon experienced in the EPF technique, a pain management specialist, or a neurologist. In certain cases, where nerve entrapment or a potential chronic pain problem are possibilities, referral might be considered. However, in most cases, diligent continuation of conservative measures oriented towards the amelioration of inflammation and control of the calcaneocuboid joint mechanically will lessen or resolve the patient's symptomatology. The author recommends orthotic management with a cuboid pad to help lock the calcaneocuboid joint, or a course of non-weight bearing in a short-leg cast for 4 to 6 weeks. Corticosteroid injections, NSAIDs, and physical therapy are used as adjunctive measures. Manipulation of the joint has been advocated, but the author does not have experience with this approach. Recalcitrant disabling cases could require surgical stabilization of the calcaneocuboid joint alone or in combination with other procedures.

## REFERENCES


1. Barrett SL, Day SV, Brown MG: Endoscopic plantar fasciotomy: preliminary study with cadaveric specimens. *J Foot Surg* 30:170-172, 1991.
2. Barrett SL, Day SV: Endoscopic plantar fasciotomy for chronic plantar fasciitis/heel spur syndrome: surgical technique - early clinical results. *J Foot Surg* 30:568-570, 1991.
3. Davis PF, Severud E, Baxter DE: Painful heel syndrome: results of nonoperative treatment. *Foot Ankle Int* 15:531-535, 1994.
4. Malay DS: Plantar fascitis and heel spur syndrome: a retrospective analysis. In Vickers NS, et al. eds. *Reconstructive Surgery of the Foot and Leg: Update '96* Tucker, GA: Podiatry Institute Publishing;1996: 39-43.
5. Barrett SL, Day SV: Endoscopic plantar fasciotomy: Two portal endoscopic surgical techniques - clinical results of 65 procedures. *J Foot Ankle Surg* 32:248-256, 1993.
6. Barrett SL, Day SV, Pignetti TT, Robinson LB: Endoscopic plantar fasciotomy: A multi-surgeon prospective analysis of 652 cases. *J Foot Ankle Surg* 34:400-406, 1995.
7. Kinley S, Frascone S, Calderone D, Wertheimer SJ, Squire MA, Wiseman FA: Endoscopic plantar fasciotomy versus traditional heel spur surgery: A prospective study. *J Foot Ankle Surg* 32:595-603, 1993.
8. Tomczak RL, Haverstock BD: A retrospective comparison of endoscopic plantar fasciotomy to open plantar fasciotomy with heel spur resection for chronic plantar fasciitis/heel spur syndrome. *J Foot Ankle Surg* 34:305-311, 1995.
9. Stone PA, Davies JL: Retrospective review of endoscopic plantar fasciotomy - 1992 through 1994. *J Am Podiatr Med Assoc* 86: 414-420, 1996.
10. Black E: 10 eminent practitioners respond to the July/August Biomechanics article: rape of the plantar fasciotomy. *Biomechanics* 2:21-29, 1995.
11. Hawkins BJ, Langerman RJ, Gibbons T, Calhoun JH: An anatomical analysis of endoscopic plantar fascia release. *Foot Ankle Int* 16:552-558, 1995.
12. Hofmeister EP, Elliott MJ, Juliano PJ: Endoscopic plantar fascia release: an anatomical study. *Foot Ankle Int* 16:719-723, 1995.