

A review of the minimal incision plantar fasciotomy in the treatment of heel pain

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ABSTRACT

Plantar fascial release is one surgical option available for the treatment of plantar fasciitis when conservative therapies have failed. There are a number of surgical procedures available for the treatment of recalcitrant heel pain with varying results. The purpose of this paper is to describe the anatomy, surgical history and surgical technique involved in minimal incision plantar fascial release, along with complications following surgery. Eleven patients with twelve feet who underwent plantar fasciotomy between 1994 and 1998 were reviewed. The heel pain completely resolved in eight patients, one patient was 70% improved whilst one remained the same and one was worse off. We would advocate the minimal incision plantar fasciotomy as a safe effective treatment for recalcitrant plantar fasciitis.

INTRODUCTION

Plantar fasciitis is a common condition presenting to the podiatrist accounting for 6% of GP referrals to podiatry.¹ The condition is thought to be a consequence of inflammation of the medial portion of the central band of the plantar fascia at the point of attachment to the calcaneus.²

Diagnosis of the condition is made clinically by reproducing the symptoms following direct palpation of the medial tubercle of the os calcis. Patients generally complain of pain following a period of rest, i.e. first thing in the morning or after rising from a chair. This pain is initially intense but then gradually subsides as the patient begins to walk before returning after a period of weightbearing.^{2,3}

Numerous treatments have been described and are generally aimed at reducing inflammation as well as controlling biomechanical foot function. This usually involves a combination of therapies including stretching exercises, ice, orthotics, taping,⁴ steroid injections,⁵ night splints,^{1,6} and immobilisation.⁷ Should conservative methods of treatment fail to resolve the patient's symptoms, surgery may be considered.

ANATOMY

The plantar aponeurosis is an extremely thick layer of deep fascia, which is composed of three distinct bands, a dominant central portion and more finely structured medial and lateral portions.

The central portion is particularly complex and exhibits both deep and superficial components, as well as vertical and transverse fibres. The central portion is triangular in shape measuring 14mm wide at the proximal attachment.⁸ It arises from the medial tubercle of the calcaneum, passes distally and increases in thickness before separating into five distinct

slips. Here the fascia divides into deep and superficial components. The deep component continues as five separate slips, each of which bifurcates investing the deep transverse metatarsal ligament. A series of arches are thus formed through which the tendons of muscle flexor digitorum longus and brevis pass. The superficial component continues distally with the medial slip passing medially towards the hallux and the lateral slip laterally toward the fifth toe. The three central slips tend to be situated interdigitally.

The medial and lateral bands of the plantar fascia arise from the main central portion and provide protection for the abductor hallucis and abductor digiti-minimi muscles respectively. The plantar aponeurosis plays an important role in the stability of the arch of the foot.⁹⁻¹¹

SURGICAL HISTORY

In 1900 Plettner recorded the heel spur as an incidental radiographic finding, and subsequent literature reviews have associated it with sub calcaneal pain.¹² These spurs were initially thought to be related to a venereal cause and many were resected with poor results.¹² It was not until the 1940s that biomechanical factors were associated with the formation of the heel spur.¹²

Many surgical procedures for the treatment of plantar fasciitis have been described, the usual objective being resection of the spur as well as release of the fascia. In 1910,

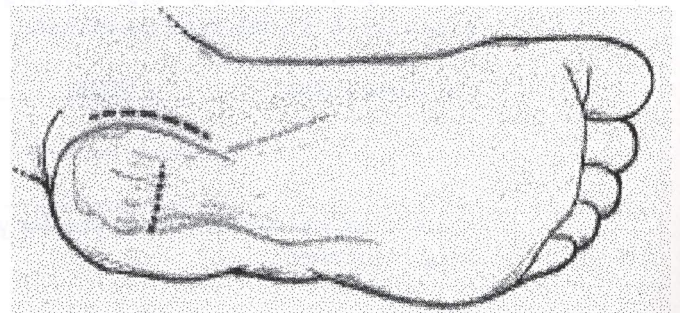


Figure 1. DuVries' medial horizontal approach.

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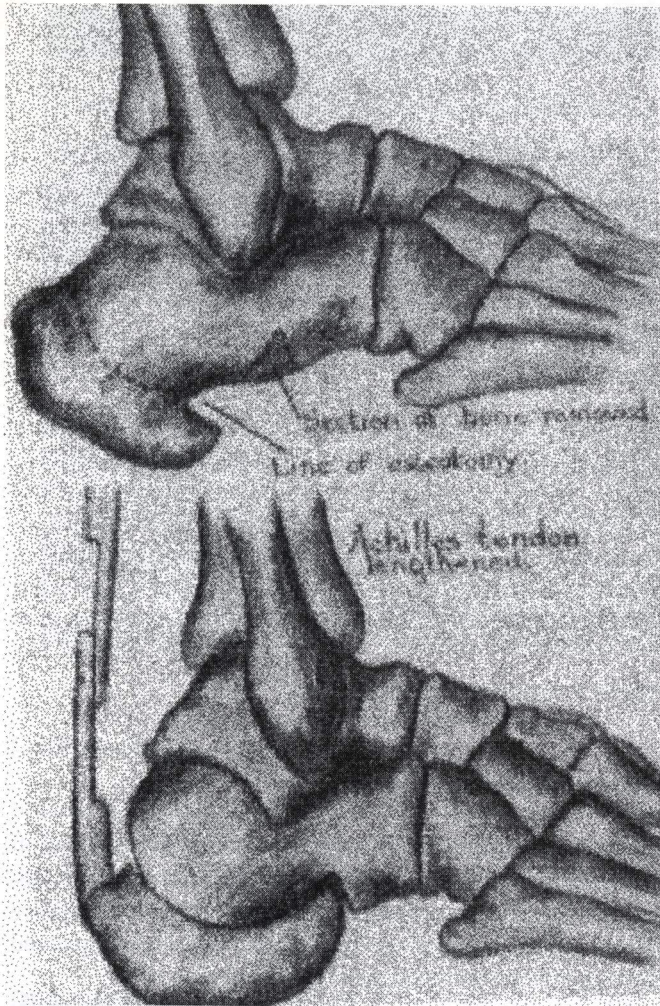


Figure 2. Rotational calcaneal osteotomy.

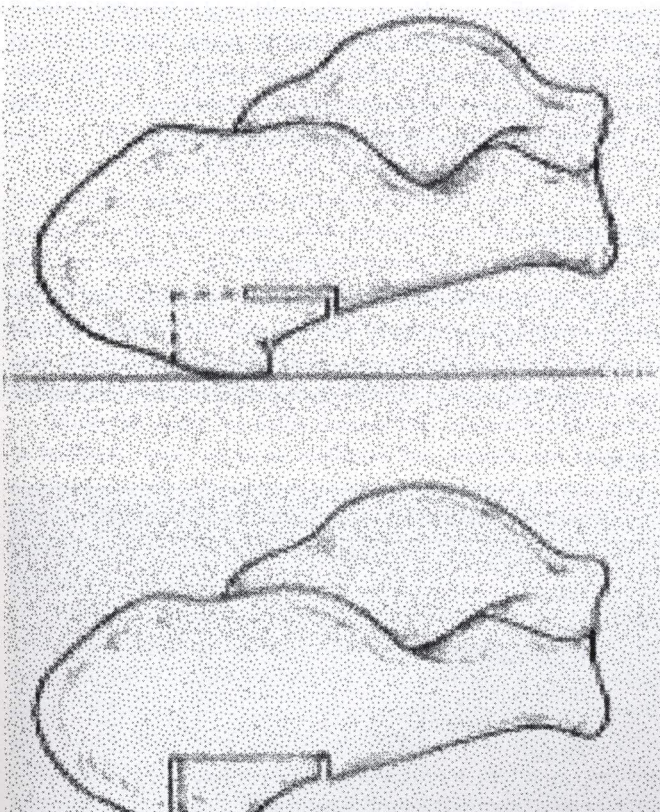


Figure 3. Countersinking osteotomy.

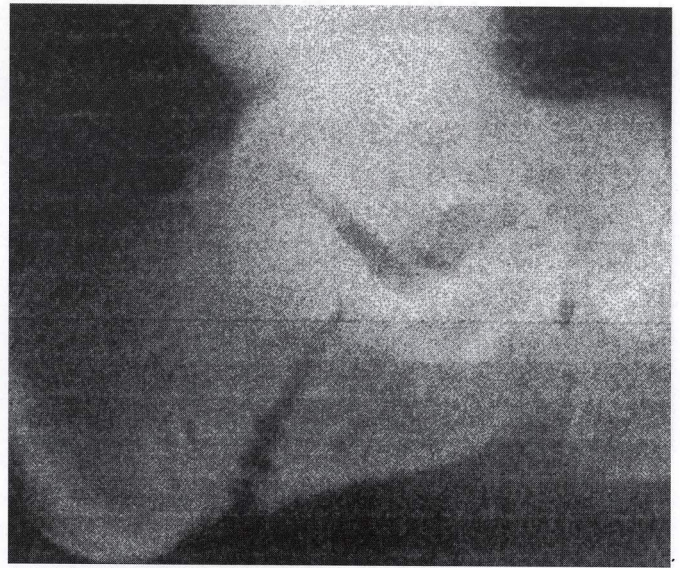


Figure 4. Fracture of calcaneus following decompression drilling.

Griffith used a U-shaped incision around the posterior aspect of the heel reflecting the entire plantar fat pad distally. The osseous spur was then excised. He reported six good outcomes in six heels.¹²

In 1957, DuVries¹² popularised a more conservative approach than Griffith using a 6cm medial horizontal approach. He found this incision adequate as well as much less mutilating. DuVries used a fascial release in conjunction to the spur resection and reported 37 good outcomes in 37 heels (Figure 1).¹²

In 1938, Steindler and Smith¹² devised a rather radical calcaneal osteotomy whereby they rotated the posterior aspect of the os calcis in order to embed the spur within the body of the calcaneus (Figure 2). They reported two good outcomes in eight heels.¹²

Michele and Kruegar described another rather radical approach in 1951. They used a countersinking osteotomy to reduce the high point of the os calcis (Figure 3). They reported two good outcomes in two heels.¹²

Sequential drilling of the body of the calcaneus was a method used by Hassab and El Sherrif to decompress the heel (Figure 4). One complication with this procedure is fracture of the calcaneus due to disruption of the trabeculae, nevertheless they achieved 62 resolutions in 68 cases.¹²

In latter years the heel spur has been seen as less significant in both the cause of heel pain and subsequently the surgical treatment of plantar fasciitis. Most techniques are therefore used to simply release a portion of the fascia. Minimal incision surgery with or without the use of endoscopic visualisation has become more popular, with a number of studies being published.^{2,3,13,14}

SURGICAL TECHNIQUE

Anaesthesia is achieved by selectively blocking the tibial and saphenous nerves using appropriate local anaesthetic. Access to the plantar fascia is achieved via a medial stab incision placed 1–1.5 cm distal to the medial tubercle, the site of which



Figure 5. Pre-operative skin marking to demonstrate medial incision and width of fascia

is determined by palpation. Research has demonstrated that the average width of the central band of the plantar fascia, for both male and female, is 14mm.⁸ A line is drawn on the plantar aspect of the heel equivalent to this and is used as a guide (Figure 5).

After performing a stab incision, a curved mosquito forceps is inserted above the level of the fascia in order to separate the fat pad from the underlying structure. Visualising and feeling the instrument beneath the pre-drawn 14mm skin line can monitor the distance across the sole of the foot. Once the desired distance has been judged, a beaver blade is inserted superficial to the fascia and drawn back whilst actively dorsiflexing the hallux (Figure 6).

The wound can then be closed with one or two non-absorbable sutures and covered with a sterile dressing. Post-operatively the patient immediately returns to a training shoe and is encouraged to ambulate freely in order to reduce the chance of re-attachment of the fascia. Adequate pain control is required to facilitate activities using a combination of non-steroidal anti-inflammatories and compound analgesics, providing the patient's general medical status allows. Sutures can be removed 7–14 days post-op.

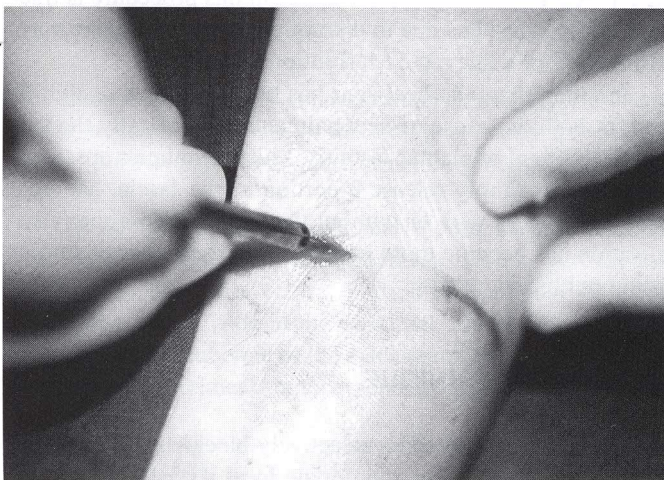


Figure 6. Operative technique utilising beaver blade to release fascia.

Heel pain questionnaire

1. How long did you receive treatment before surgery?
2. Before surgery what conservative therapy did you receive?

oral drugs _____	cortisone injection _____
Physio _____	taping _____
cobra insole _____	coated orthotic _____
Tulle heel cup _____	BK casting _____
night splint _____	
3. How much improvement did you have following surgery? (100% no pain- 0% same as before).
4. How long did it take to get to this level of relief?
5. Were there any complications following the surgery?
6. Would you recommend this treatment?

Figure 7. Standard questionnaire.

PATIENTS AND METHODS

Between 1994 and 1998, 19 patients underwent minimal incision plantar fasciotomy. Patients at that time were not routinely X-rayed to determine if any degenerative changes were present within the midfoot. None of the patients complained however of mid-foot pain prior to surgery.

Eleven patients with 12 feet were included in the study and eight patients were lost to follow-up. All patients had received at least six months of conservative therapy prior to surgery. There were three males and eight females with a mean age of 51.7 years (range 35–78 years). The follow-up time after surgery was 19.9 months (range 5–29 months). Each patient was recalled to clinic for evaluation, which was carried out using a standard questionnaire (Figure 7).

RESULTS

A range of conservative therapies was utilised prior to the patients undergoing surgery (see Figure 7). Patients did not receive all conservative therapies available, as treatment was sometimes initiated by the GP, chiropodist or physiotherapist.

Table 1

Treatment received	Number of patients
Oral-drugs	3
Physio	1
Cobra	9
Tullies heel cup	5
Night splint	5
Steroid injections	10
Taping	6
orthotics	3
BK cast	2

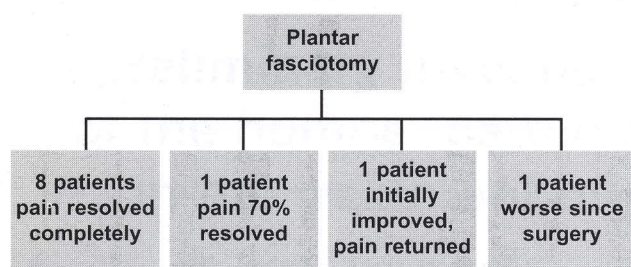


Figure 8. Treatment outcome following fasciotomy.

Table 1 shows the number of patients who actually received each treatment.

Figure 8 demonstrates the outcome of treatment following the fasciotomy. The mean time taken to reach desired outcome was 14.3 weeks (range 4–36 weeks). When asked if they would recommend the procedure, 10 patients said yes, and one no.

Complications

Following surgery one patient developed lateral column pain following a bilateral procedure, one patient had delayed healing, one patient developed symptoms of sub calcaneal bursitis and one patient was worse off.

DISCUSSION

Plantar fasciitis is a common cause of heel pain, which can be both distressing and disabling to the patient. Although surgery is one option in the treatment of this condition, more conservative therapies should be exhausted for at least six months before it is considered, as it suggested that up to 90% of patients receive complete relief with non-surgical methods.^{2,3,13}

The use of endoscopes to visualise the plantar fascia during surgery has become popular in recent years. A study to compare open fasciotomy with endoscopic release suggested that the outcome of treatment was equal in each group with all patients asymptomatic, although the return to work time was much quicker in the endoscope group.³ Endoscopes however are expensive, and there are no reports in the literature comparing their use against minimal incision surgery.

Minimal incision plantar fasciotomy is technically simple to perform under local anaesthetic and creates minimal disruption to the patient's immediate post-op activities. Although the number of patients in our series is small the results demonstrate the usefulness of this technique in the treatment of the condition.

A number of complications have been described in the literature which include infection, dehiscence, flatfoot, arch pain, lateral column instability and damage to vital structures.^{3,10,11,14-16} In our series four patients experienced complications one of whom felt he was worse off. In this case however the patient had a pre-existing spinal problem that was gradually worsening which may have accounted more for his heel pain. He was referred on to another speciality. One

patient developed lateral column pain in the area of the calcaneo-cuboid joint. This is a recognised complication due to release of the lateral band of the plantar fascia leading to instability/hypermobility of the calcaneo-cuboid joint.^{10,14} This is potentially difficult to manage, although the patient gained some relief with orthotics and cortisone injections.

Although the biomechanics of fascial release are not well understood, the development of arch and lateral column pain may be associated with a drop in the arch height of the foot following this type of procedure. In a study using cadaver specimens, the navicular (medial column) dropped by 2.78+/-1.94mm after release of the medial third of the fascia and 4.05+/-1.73mm following total release. The cuboid (lateral column) dropped by 1.19+/-0.56mm following medial third release increasing to 2.57+/-0.58mm following total release.¹⁰

It is essential to evaluate radiographs of the patient's foot pre-operatively to establish if any pre-existing degenerative joint disease may be present within the mid-tarsal area. This, along with overzealous release of the fascia, may increase the risk of arch pain. The patient who developed symptoms of sub calcaneal bursitis improved with the use of a Tullies heel cup. Finally, the patient with delayed healing went on to full recovery.

CONCLUSION

Minimal incision surgery should be considered for the treatment of plantar fasciitis, if more conservative methods fail to alleviate symptoms. It is however important to avoid overzealous release of the fascia which may lead to mechanical complications within the arch of the foot. Further long-term follow-up of these patients is essential in order to understand better the biomechanical consequences of fascial release.

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