Acta Orthop. Belg., 2008, **74**, 483-488

ORIGINAL STUDY

Clinical outcome of surgical intervention for recalcitrant infero-medial heel pain

Friedl SINNAEVE, Geoffroy VANDEPUTTE

From the Heilig Hartziekenhuis Lier, Lier, Belgium

A retrospective review was conducted in 28 patients (31 feet) with recalcitrant infero-medial heel pain, to assess the clinical outcome of a combined release of the first branch of the lateral plantar nerve and the plantar fascia. All patients were questioned by telephone interview on their pre- versus post-operative level of pain and function (based on the Kitaoka mid-foot scale and the visual analog scale), and their satisfaction with the result of the intervention.
Limitations of functional activity decreased, maximum walking distance increased and the level of pain decreased from 8.9 to 1.4 on the visual analog scale. The majority of patients was satisfied with the surgery (90.3%) and would undergo the same procedure again or would recommend it (92.9%).
While conservative management remains the gold standard for treatment of infero-medial heel pain and/or plantar fasciitis, patients with recalcitrant disease usually can be effectively treated surgically with a combined release of the plantar fascia and the first branch of the lateral plantar nerve.

Keywords : infero-medial heel pain ; lateral plantar nerve ; surgery ; outcome.

INTRODUCTION

Infero-medial heel pain is a common problem in daily orthopaedic practice. However, there is often confusion in diagnosis and treatment, mainly due to the complexity of the local anatomy. Inferior heel pain is generally considered to be due to chronic inflammation, degeneration and microtrauma to the plantar fascia and nerve entrapment. There are however other possible causes, such as seronegative arthritis, calcaneal stress fracture, periosteal inflammation, bursitis, increased calcaneal intra-osseous pressure, fat pad degeneration and lumbosacral radiculopathy. Often, several conditions coexist, which may further confuse the clinician (*3*).

Although the aetiology and pathogenesis are not fully understood, heel pain is commonly accepted to be a self-limiting condition, which will resolve spontaneously in approximately 95% of cases. Therefore, it is generally agreed upon that surgical intervention should not be considered until conservative management has been attempted for at least 6 months. Non-operative treatment can include stretching of the Achilles tendon and plantar fascia, application of ice, oral non-steroidal anti-inflammatory drugs, local steroid injections, shock wave therapy, cast immobilisation, insoles and others. Despite all these measures, approximately 5% of

■ Friedl Sinnaeve, MD, Orthopaedic registrar.
■ Geoffroy Vandeputte, MD, Orthopaedic surgeon.
Department of orthopaedic surgery, Heilig Hartziekenhuis Lier, Lier, Belgium.
Correspondence : Friedl Sinnaeve, University Hospitals Pellenberg, Weligerveld 1, B-3212 Pellenberg, Belgium.
E-mail : friedl.sinnaeve@uz.kuleuven.ac.be

No benefits or funds were received in support of this study

patients go on to develop chronic and often disabling symptoms and in this subset of patients surgical intervention may be warranted.

Depending on the local factors which are considered to be contributing most importantly to the symptoms, surgery may address nervous structures, the plantar fascia and/or the bony spur if present. As we believe entrapment of the first branch of the lateral plantar nerve (to the abductor digiti minimi muscle) in combination with some degree of plantar fasciitis to be responsible for the typical infero-medially located heel pain, our surgical procedure of choice was that described by Baxter and Thigpen in 1984 (*2*). This consists of a neurolysis of the mixed nerve supplying the abductor digiti minimi muscle as it passes beneath the abductor hallucis muscle, possibly combined with release of the tight plantar fascia or removal of the calcaneal spur if these pre-operatively seem to be adding to the entrapment of this nerve.

The purpose of this study was to review the results of the patients treated this way in our department from 2001 till 2005 and to compare our results with those in the literature.

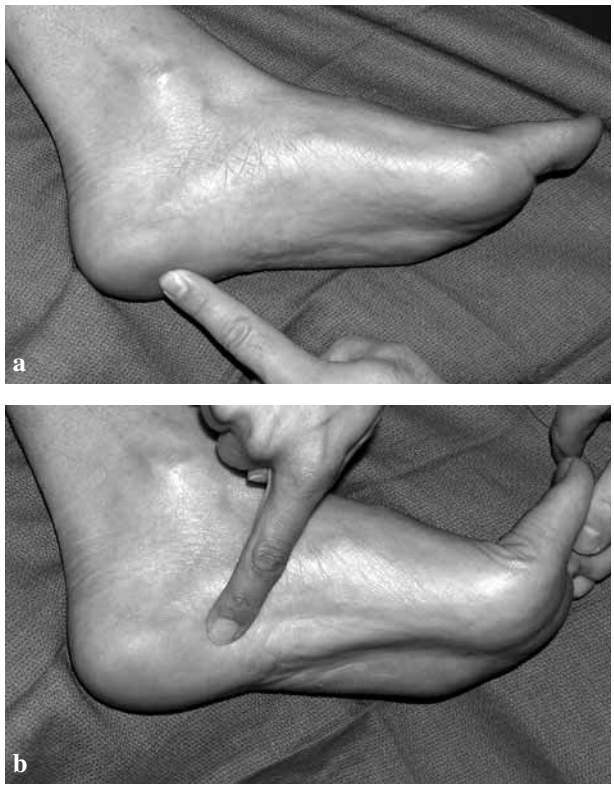

Fig. 1a,b. — On a clinical basis, plantar fasciitis and entrapment neuropathy can be differentiated as causes of infero-medial heel pain by the area of maximal tenderness on palpation, being the inferior (plantar) aspect of the heel in plantar fasciitis and the more medial aspect of the heel in entrapment neuropathy.

PATIENTS AND METHODS

Over a 4.5 years' period of time (April 2001 to October 2005), 33 feet in 30 patients were operated on for recalcitrant infero-medial heel pain. Two of the patients were lost to follow-up. A retrospective review was conducted of the remaining 28 patients (31 feet) to assess the clinical outcome of the procedure, which consisted of a combined release of the plantar fascia and of the first branch of the lateral plantar nerve, with or without resection of a calcaneal spur.

There were 3 male and 25 female patients, of which 3 had bilateral involvement. Fifteen right feet and 16 left feet were treated and none of these feet were operated on before for the same condition. The average age was 47 years (range : 27 to 73). The average duration of follow-up was 38 months (range : 14 to 68). Most patients were overweight, with an average body mass index (BMI) of 30.7 and only 3 patients with a BMI below 25.0. Four of the patients were smokers. Patients rated their professional activities as not (3), mildly (10), moderately (8) or heavily (7) physically demanding.

Physical examination in all patients showed plantar medial heel pain on palpation at the plantar fascia origin as well as point tenderness to palpation in the proximal medial aspect of the heel over the origin of the abductor hallucis muscle (fig 1a and b). However, the contribution of both factors in the total pain syndrome was variable. All patients received non-surgical therapy for at least 6 months (average : 14 months, range : 6 to 36) before an intervention was proposed. This consisted mainly of an average of 1.7 corticosteroid injections (range : 0 to 5) and the use of insoles with soft heel cups in all but one patient. Other frequent treatment modalities were physiotherapy, anti-inflammatory drugs, extracorporeal shock wave treatment and casting.

All patients were questioned by telephone interview on their pre- versus post-operative level of pain and function, and their satisfaction with the result of the intervention. The questionnaire was based on the Kitaoka midfoot scale (*6*). Pre- and post-operative pain was assessed using a visual analog scale (0-10, with 0 as

Fig. 2. — Pre-operatively the location and direction of the planned incision are marked on the patient's skin. However, – when placed properly – only the portion of the incision between the two perpendicular lines should be sufficient to gain adequate view for the procedure.

no pain and 10 as most severe pain possible). Inquiries were made regarding activity limitations, maximum walking distance, and use of external support and footwear requirements. Duration of rehabilitation and patient satisfaction with the surgical intervention were also noted. Finally they were asked whether they would undergo the same procedure again or would recommend it.

Surgical technique

All operative interventions were performed by the same surgeon (GV), with the use of optical magnification and bipolar coagulation. The patient, under general or spinal anaesthesia, was in the supine position and a thigh tourniquet was used.

A short medial curvilinear incision was made, starting from the palpable origin of the abductor hallucis muscle towards a point just dorsal and anterior to the weight-bearing skin of the heel pad (fig 2). The abductor hallucis muscle was identified and its superficial fascia was incised. The muscle fibers were then bluntly elevated off the deep fascia and retracted dorsally. This provided excellent exposure of the superficial aspect of the deep fascia of the abductor hallucis muscle which could then be safely incised under direct vision (fig 3a and b). Underneath, courses the nerve to the abductor digiti minimi muscle (first branch of the lateral plantar nerve), usually accompanied by multiple congested veins. Care should be taken to accurately release the deep fascia of the abductor hallucis and to avoid bleeding.

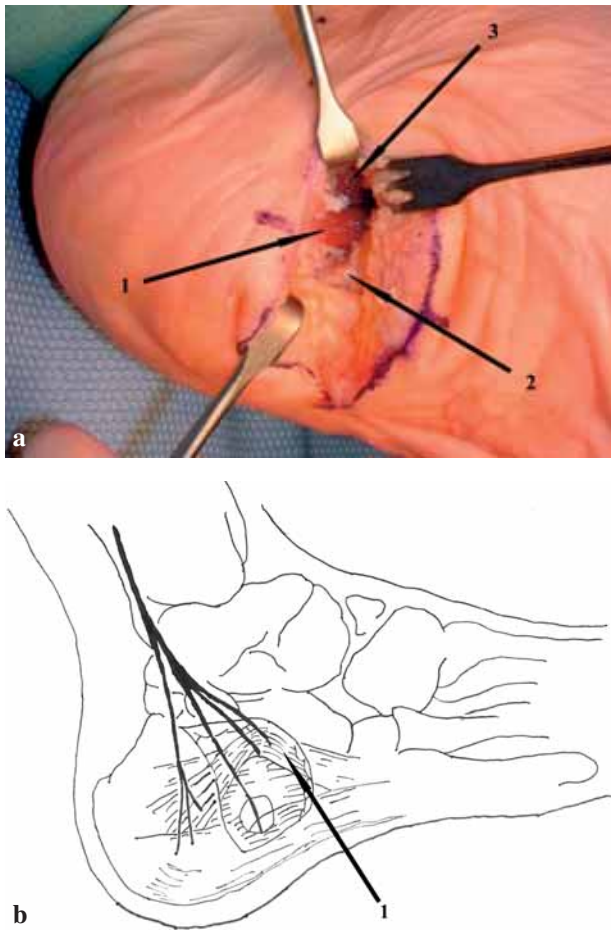

Fig. 3a,b. — Intraoperative view (a) and schematic drawing (b), illustrating the local anatomic features. The abductor hallucis muscle (1), the released plantar fascia (2) and the flexor digitorum muscle (3) are marked with arrows.

In the distal portion of the incision, the plantar fascia was exposed. A medial release and debridement of the region of tendinosis was performed, the extent depending on the intra-operative findings. If there was a bony spur on the plantar side of the calcaneus, it was not routinely resected, but only if the debridement lead to exposure of the spur or if plantar heel pain was the predominant symptom. Otherwise, it was left untouched.

The wound was then irrigated with normal saline, and the skin was closed with interrupted non-absorbable sutures, without the use of deep sutures. A well-padded bandage was applied.

Post-operatively, patients were instructed to avoid weight-bearing and to use crutches for 10 days. At this point, the stitches were removed and weight-bearing on

Fig. 4. — The incisions of the bilateral infero-medial heel release in this patient have healed very nicely.

the lateral side of the foot was allowed, with encouragement to regain full weight-bearing within 3 or 4 weeks. The use of insoles with soft heel cups was recommended for one year.

In our patient population, 19 interventions were performed under spinal anaesthesia and 12 under general anaesthesia. There were 16 admissions in day clinic and 15 admissions for one or more nights (with a maximum of 4). The bony spur was partially resected in 19 heels and was left untouched in 12 heels. All wounds healed without major problems and in most cases the scars were barely visible after a few months (fig 4).

RESULTS

On the visual analog scale, pre-operative pain was rated 8.9 on average (range : 6 to 10) and diminished to an average of 1.4 (range : 0 to 7) post-operatively. A comparison between pre- and post-operative levels of function of the feet is given in table I. Functional activity limitations were rated as none (a), none for daily activities but limitations for recreational activities (b), limitations of both daily and recreational activities (c) and severe limitations of all sorts of activities (d). Maximum walking distance was rated – according to the Kitaoka midfoot scale – in terms of blocks : less than 1 block (a), 1 to 3 blocks (b), 4 to 6 blocks (c) or more than 6 blocks (d). Additional data about the post-operative status are given in table II. Only 2 (7.1%) patients would not undergo the same procedure again for the same symptoms and would not recommend the procedure, but the other 26 (92.9%) patients surely would.

The time needed for full recovery was close to 5 months on average (range : 1 to 12), but most of the working patients returned to their former occupation fairly quickly (after 2 to 3 months). Two patients used crutches pre-operatively as well as post-operatively, a third patient only post-operatively. The standard use of insoles with soft heel cups was recommended for one year. At the time of the telephone interview (at least 14 months post-operatively), patients preferred the further use of insoles for 21 (67.7%) feet and required comfort shoe wear or modified shoes for 9 (29.0%) feet.

DISCUSSION

Although infero-medial heel pain can be managed conservatively in the vast majority of cases,

Table I. — Pre-versus post-operative levels of function

	Pre-operative	Post-operative
Functional activity limitations		
a	6 (19.4%)	26 (83.9%)
b	11 (35.5%)	4 (12.9%)
c	10 (32.2%)	1 (3.2%)
d	4 (12.9%)	0 (0.0%)
Maximum walking distance		
a	14 (45.2%)	0 (0.0%)
b	7 (22.6%)	1 (3.2%)
c	7 (22.6%)	3 (9.7%)
d	3 (9.7%)	27 (87.1%)

Table II. — Post-operative status

Residual heel pain	
None	18 (58.1%)
Mild	9 (29.0%)
Moderate	2 (6.5%)
Severe	2 (6.5%)
Degree of satisfaction	
Completely satisfied	24 (77.4%)
Some reservations	4 (12.9%)
Important reservations	1 (3.2%)
Dissatisfied	2 (6.5%)

some 5% of recalcitrant cases will not improve despite lengthy conservative treatment. These patients may be candidates for a surgical intervention. The type of procedure performed is somewhat dependent on what is believed to be the most important aetiologic factor (entrapment neuropathy, plantar fasciitis, bony spur), and knowledge and understanding in this field has evolved over time.

We now believe that entrapment neuropathy of the first branch of the lateral plantar nerve is an under-recognised and possibly very important cause of infero-medial heel pain. Anatomically, the tibial nerve ramifies into 3 branches : the calcaneal nerves, the lateral and the medial plantar nerve. Just after it branches off from the tibial nerve, the lateral plantar nerve has its first branch. It courses between the deep fascia of the abductor hallucis muscle and the medial fascia of the quadratus plantae muscle. After it passed the quadratus plantae muscle, it changes direction and courses laterally in a horizontal plane, first between the quadratus plantae muscle and the flexor digitorum brevis muscle and then between the flexor digitorum brevis muscle and the os calcis. Entrapment usually occurs between the deep fascia of the abductor hallucis muscle and the medial margin of the quadratus plantae muscle and can be aggravated by inflammatory processes, surrounding varicose veins and local oedema. Hence, neurolysis of this branch seems a rational thing to do *(2)*.

The plantar fascia originates from the medial tubercle on the posterior tuberosity of the os calcis, and it fuses postero-medially to the fascia of the abductor hallucis muscle. It is a stress-relieving structure that spans the bones and joints of the foot. So with each step, forces are transmitted by the plantar fascia, redistributing loads throughout the foot. Concentrated stress transfer occurs at the fascia-bone junction, making this region vulnerable to fatigue failure and micro-tears. So, repetitive microtrauma to the plantar fascia at its origin may lead to plantar fasciitis. Histological examination showed mucoid or fibrous degeneration, similar to what is seen in chronic radial epicondylitis or "tennis elbow" *(7)*. Hence, release and débridement of the affected region of the plantar fascia also seems a reasonable thing to do.

Nowadays, more controversy exists regarding the contribution of a calcaneal spur to chronic heel pain. It cannot be considered as a traction spur of the plantar fascia on the calcaneum, as it was noted to actually lie within the substance of the origin of the flexor digitorum brevis muscle, i.e. deep to the plantar fascia itself. Apparently, there is also a discrepancy between the presence of a spur and of symptoms classically related to it. Tanz *(9)* noted that 15% of normal asymptomatic adult feet have plantar spurs, whereas only about 50% of adult feet with plantar heel pain have spurs. This was also observed by Snook and Chrisman *(8)*.

Historically, the spur was however considered for a long time to be by far the most important aetiological factor for infero-medial heel pain, so several surgical techniques to address this spur were developed. Simple heel spur excision, rotational osteotomy of the calcaneus to imbed the spur into the body and countersinking osteotomy to flatten out the prominence of the exostosis are examples of these. The impact (prolonged revalidation) of these procedures and especially the lack of consistent good results with these techniques in the past have contributed to the still widely spread "bad reputation" of surgical management for infero-medial heel pain in general.

The surgical management we prefer is a combination of the release of the first branch of the lateral plantar nerve, together with some degree of release and debridement of the plantar fascia. A bony spur was only resected if the debridement led to its exposure or if the predominant pain was localised on the plantar aspect of the calcaneus.

In our series, limitations of functional activity decreased, maximum walking distance increased and the level of pain decreased from 8.9 to 1.4 on the visual analog scale. The majority of patients (90.3%) was satisfied completely or with minor reservations with the surgery and 92.9% of patients would undergo the same procedure again or would recommend it .

Similar results with this type of surgical management are reported in the literature. In their original article, Baxter and Thigpen (*2*) reported in 1984 on 34 heels in 26 patients. Thirty two had good results and 2 had poor results. In 2002, Baxter and Pfeffer (*1*) published a larger series of 69 heels in 53 patients. Sixty-one heels (89%) had excellent or good results and 57 heels (83%) had complete resolution of pain. Sammarco and Helfrey (*7*) reported on 35 feet in 26 patients in 1996 : 32 patients (92%) had a satisfactory functional outcome, and three (8%) had an unsatisfactory result (21 excellent, 11 good, 3 fair, 0 poor). Davies *et al* (*5*) conducted a study on 45 heels in 41 patients in 1999, but their results were less satisfying : only 20 of their 41 patients were totally satisfied with the outcome (48.8%) and only 73% were satisfied with or without minor reservations. Conflitti and Tarquinio (*4*) reported good results again in 2004, on 26 feet in 23 patients : 96% of the patients were either completely satisfied or partially satisfied with the surgical intervention.

CONCLUSION

While conservative management remains the gold standard for treatment of infero-medial heel pain and/or plantar fasciitis, patients with recalcitrant disease usually can be effectively treated surgically with a combined release of the first branch of the lateral plantar nerve and the plantar fascia.

REFERENCES

1. **Baxter DE, Pfeffer GB.** Treatment of chronic heel pain by surgical release of the first branch of the lateral plantar nerve. *Clin Orthop* 1992 ; 279 : 229-236.
2. **Baxter DE, Thigpen CM.** Heel pain – operative results. *Foot Ankle* 1984 ; 5 : 16-25.
3. **Bordelon RL.** Subcalcaneal pain. A method of evaluation and plan for treatment. *Clin Orthop* 1983 ; 177 : 49-53.
4. **Conflitti JM, Tarquinio TA.** Operative outcome of partial plantar fasciectomy and neurolysis to the nerve of the abductor digiti minimi muscle for recalcitrant plantar fasciitis. *Foot Ankle Int* 2004 ; 25 : 482-487.
5. **Davies MS, Weiss GA, Saxby TS.** Plantar fasciitis : how successful is surgical intervention ? *Foot Ankle Int* 1999 ; 20 : 803-807.
6. **Kitaoka HB, Alexander IJ, Adelaar RS *et al.*** Clinical rating systems for the ankle-hindfoot, midfoot, hallux, and lesser toes. *Foot Ankle Int* 1994 ; 15 : 349-353.
7. **Sammarco GJ, Helfrey RB.** Surgical treatment of recalcitrant plantar fasciitis. *Foot Ankle Int* 1996 ; 17 : 520-526.
8. **Snook GA, Chrisman OE.** The management of subcalcaneal pain. *Clin Orthop* 1972 ; 82 : 163-168.
9. **Tanz SS.** Heel pain. *Clin Orthop* 1963 ; 28 : 169-177.