



Endoscopic Treatment of Plantar Fasciitis

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Francesco Allegra, Giovanni Corsini,
and Carlo Paglialunga

32.1 Introduction

Plantar fasciitis is a common cause of heel pain in adults. It is a soft-tissue disorder first described by William Wood in 1812 [1] and known by many pseudonyms such as jogger's heel, heel spur syndrome, plantar fascial insertitis, calcaneal enthesopathy, subcalcaneal bursitis, subcalcaneal pain, neuritis, and calcaneodynia. This lifestyle-limiting condition can be defined as a localized inflammation of both perifascial structures and plantar fascia at the proximal attachment on the medial tuberosity of the calcaneus. It is thought to be caused by biomechanical overuse from prolonged standing or running, resulting from chronic repetitive microtears and degeneration secondary to overuse or mechanical and congenital disorders [1]. Plantar fasciitis affects up to 10% of the general population and accounts for 10–15% of all foot pain symptomatology; it is experienced at least once in the lifetime of the afflicted population [2]. Although the etiopathogenesis of plantar fasciitis is poorly understood,

it is actually considered multifactorial: caused by multiple microtears resulting from an increase in stress and repeated fascia stretching, it exceeds the repair capacity of the body. Diagnosis of plantar fasciitis is based on patient history and risk factors. Among them are referenced excessive congenital disorders such as foot pronation (pes planus), high arch (pes cavus), tightness of the Achilles tendon, and intrinsic foot muscle and leg length discrepancy, while being important in daily activities such as working with prolonged standing, walking occupations (e.g., military or police personnel), excessive running, obesity with a body mass index greater than 34.5–35, and poor motor activity. Some studies have shown that plantar fasciitis is better described as plantar fasciosis because its histological changes at the calcaneal enthesis are consistent with a chronic inflammatory condition, myxoid degeneration, noninflammatory degeneration, fibroblastic hypertrophy, and chaotic vascular hyperplasia, indicating a particular histological picture known as fasciosis [3].

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Director of Department: Stefano Gumina

F. Allegra (✉) · G. Corsini · C. Paglialunga
University Department, Polo Pontino c/o ICOT,
University La Sapienza, Latina, Italy

32.2 Anatomic Aspects

Anatomically, the plantar fascia is divided into three bands: medial, central, and lateral. The central band attaches proximally to the medial tuberosity of the calcaneus, separating distally into five individual small bands whose divisions attach to the sesamoids and to the plantar plate of

the second through the fifth toes. First described by Hicks in 1954 as the *windlass mechanism*, the plantar fascia tenses during the terminal stance to toe-off phases of gait. This tension elevates and reinforces the medial longitudinal arch, which in turn allows the foot to work as a rigid lever for forward propulsion [4].

32.3 Findings and Physical Examination

Plantar fasciitis needs primarily a clinical diagnosis, being the onset of inferior heel pain that is insidious and worsens over time with standing and walking. The sharp pain is usually localized to the plantar-medial aspect of the heel or over a small area near the proximal insertion of the plantar fascia at the medial tuberosity of the calcaneus. Most patients suffer heel pain and tightness after standing up from bed in the morning or after a prolonged time seated, the heel pain improving with ambulation. Occasionally pain can intensify day by day, so that the patient may be obliged to continue walking or standing even for a long time. Findings suggestive of plantar fasciitis include reproducible pain with palpation of the plantar medial aspect of the heel and pain with passive dorsiflexion of the ankle and toes (windlass test). The imaging techniques useful in confirmation of plantar disorder are ultrasound (US), plain radiographs, magnetic resonance imaging (MRI), bone scintigraphy (BS), and elastography. Ultrasound (US) is often to be considered in the first step of diagnosis, remaining lower in cost, noninvasive, safe, portable, radiation free, and easy to administer compared to the other modalities. Radiographic images have been used in the process of diagnosing, relative to those cases where the presence of calcaneal bone spurs need to be confirmed. However, subcalcaneal spurs may be present also, and it is generally fundamental to evaluate the presence of a congenital or acquired deformity of the longitudinal plantar arch, which acknowledgment can represent a direct relationship to a diagnosis of plantar

fasciitis. MRI has been confirmed as a reliable and validated tool to effectively diagnose plantar fasciitis, being considered a perfect means to assess and differentiate any abnormalities in its thickness.

32.4 Management and Treatment

Most patients recover without surgery, with only lifestyle modification. Patient education into the expectation and duration of treatment from the outset is fundamental to achieve collaboration at the maximum level. Plantar fasciitis is an overuse phenomenon, and avoiding high-impact activities seems very sensible at its beginning, although patients may consider this change frustrating because this condition has an indolent course. From 85% to 90% of patients affected by plantar fasciitis can be successfully treated with conservative treatment without surgery. Although treatment may be required for 6 months or longer, about 80% of patients treated conservatively have no recurrence of pain for a long time [2]. Initial management should include sufficient foot rest with analgesic and antiinflammatory drug use, as nonsteroidal antiinflammatory drugs (NSAIDs) have been shown to represent an adequate means of pain control, especially when used in combination with other kinds of treatment [5, 6]. The intermittent application of ice seems to provide some benefit to patients in association with or during other treatments. Many physical therapies are available that may mitigate and relieve heel pain associated with fascial disorder: these modalities include manual therapy, such as stretching exercises of the calf muscles. Iontophoresis, ultrasound therapy, extracorporeal radial shock wave therapy (ESWT) [7], and laser therapy [8] could be useful in pain control. Also, monophasic pulsed currents support efficiency in reducing inferior heel pain and tenderness and improving functional activities levels associated with plantar fasciitis [9]. These treatments evaluated in comparison have been demonstrated to be effective for maintaining the improvements

in pain and functional ability among the patients treated with two different therapies until follow-up at 12 months [7–10]. Osteopathic manipulative treatment techniques may occasionally provide immediate improvement of plantar fasciitis symptoms; however, the continued maintenance of these results is still being discussed. In some cases, night splinting, customized inserts, shoe modification, and plantar fascia taping could be beneficial [11]. A wide variety of orthotic device options are available for the management of plantar fasciitis: the use of shoe inserts, such as silicone heel pads, felt pads, and a rubber heel cup, in combination with stretching exercises, has been shown to provide superior short-term improvement in relieving symptoms compared to stretching alone [11].

Local injections should be considered: the use of corticosteroid must be evaluated with caution, because of the potentially unfavorable risk–benefit ratio for patients and the briefness of pain relief. Although the local corticosteroid injection (CSI) technique has significantly better treatment outcomes because it is immediately available and easy to administer, both CSI and extracorporeal radial shock wave therapy (ESWT) could be preferred as the primary treatment of patients with acute plantar fasciitis [12]. Early results of platelet-rich plasma (PRP) local injection have been promising: at 12 months, PRP is significantly more effective than steroids, providing better and more durable results than CSI as a treatment option [13]. Platelet-rich plasma is produced via centrifuged autologous blood. The plasma collected is rich with platelets, which release growth factors to stimulate healing in degenerative tissue; currently, some slight evidence supports the use of platelet-rich plasma for nonhealing tendinopathies [14]. On the other hand, a systematic review and meta-analysis found corticosteroid efficacy as compared to autologous whole blood to be marginally superior in relieving pain intensity in patients at 2 and 6 weeks [15]. When conservative therapies have been ineffective and significant symptoms persist, associated with further complications such

as chronic pain and arch collapse, surgery is often considered as the last resort, and it can be suited to the patient needs.

Fasciotomy results in significant changes in joint position. A decrease in arch height in a quite wide extension is not suggested for patients with preexisting pes planus because possible consequences may lead to further deterioration of foot position [16]. Overall, these biomechanical effects on the foot are still unclear. Plantar fasciotomy may appear to lead to changes in arch stability in cadaveric specimens and models, thus suggesting modifying the procedure from complete to partial release. However, what effect this may have in the longer term on human subjects *in vivo* has not been conclusively demonstrated. Again, surgery for plantar fasciitis is not always clinically successful, with 10–50% of patients left unsatisfied following surgery, and with poorer outcomes being obtained in those with more severe symptoms and with a longer duration of preoperative symptoms [17, 18].

A change in operative technique has been noted in the literature, with endoscopic plantar fascia release (EPFR) becoming a viable alternative to the previously established open procedures. Based on the findings of noninflammatory vascular dysfunction, newer treatments for recalcitrant plantar fasciitis have been aimed at focal stimulation and localized angiogenesis. Because it is considered a fasciosis, radiofrequency coblation has been successfully proposed as a minimally invasive treatment modality for chronic plantar fasciitis. Radiofrequency microtenotomy is demonstrated as effective at relieving pain, improving function, achieving patient satisfaction, and meeting patient expectations as plantar fasciotomy [19]. Plantar fasciotomy is perceived as a risky procedure leading to deterioration in foot stability in time. Surgery for plantar fasciitis remains an appropriate treatment option for a patient who does not respond to conservative therapeutic options, achieving reasonable success in the long term, with stable results that do not seem to deteriorate over time even when surgery

is conducted within 1 or 2 years from symptom onset [20]. The disadvantages of surgery include incision care, immobilization, and potential complications such as arch flattening, nerve injury, calcaneal fracture, length of recovery time, and reflex sympathetic dystrophy.

32.5 Endoscopic Procedure

To assess endoscopic treatment, the patient is in supine position with the foot outside the external border of the surgical bed. Spinal or triple-nerve block anesthesia is performed. A tourniquet is recommended to avoid the risk of lack of visualization because of bleeding, which comes from the deep venous vein net, strongly represented on the plantar side of the foot. The instrumentation is the same for carpal tunnel release: a slotted cannula, a blunt trochar, a retrograde hook scalpel, and a regular 30° scope. Skin demarcation of the posterior aspect of medial malleolus and anterior calcaneus, plantar arch, plantar fascia insertion, and small venous vessels should be outlined before surgery (Fig. 32.1). The first portal is placed medially at the upper insertion of the plantar fascia. Through this portal the blunt trochar is passed (Fig. 32.2) until it emerges under the skin



Fig. 32.1 Skin demarcation is essential to put the portal in the right place, avoiding the risk of a misplacement and of injury to closer structures



Fig. 32.2 The blunt trochar is inserted into the portal and advanced toward the lateral aspect of the heel



Fig. 32.3 The tip of the blunt trochar is seen emerging under the skin on the lateral heel side, taking care to maintain the trochar perpendicular to the longitudinal axis of the foot

projection of the fascia insertion on the lateral side of the heel (Fig. 32.3). The lateral portal is now opened to permit the trochar to advance. The slotted cannula is advanced alongside the trochar, from lateral to medial until emerging medially (Fig. 32.4). When the trochar is removed and the cannula cleaned, the arthroscope is placed to present a visualization of the entire fascia (Fig. 32.5). The central toward the medial portion of the plantar fascia is explored with a hook



Fig. 32.4 After incision, the lateral portal is opened, positioning the trochar in the correct lateral heel side

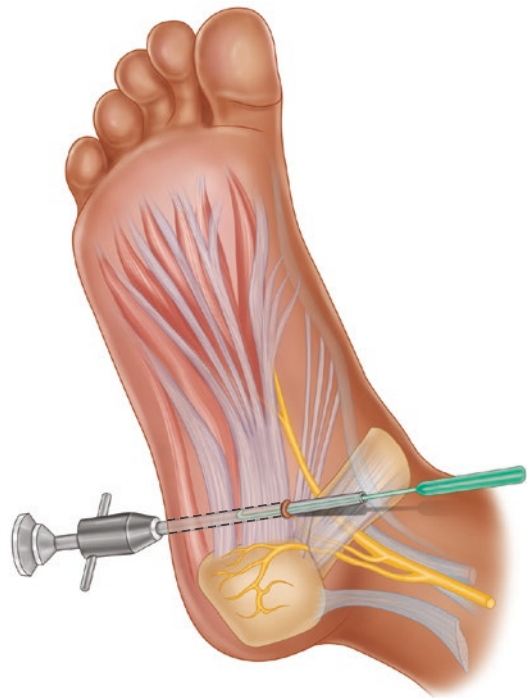


Fig. 32.6 The slotted cannula is placed in its own right position, to permit the instruments to easily proceed transversally on the plantar fascia, which is resected by the hook knife positioned on the medial side of the heel



Fig. 32.5 The slotted cannula is advanced along the trochar from lateral to medial and rotated to provide a complete visualization of the plantar fascia

probe (Fig. 32.6) and then resected from lateral to medial, keeping the scope placed laterally (Fig. 32.7). After a final cleanup of the cannula, resection is evaluated with the hook probe detecting the integrity of the flexor hallucis brevis muscle by moving the toe (see Video 32.1). Skin portals are closed with sutures. An ankle bandage

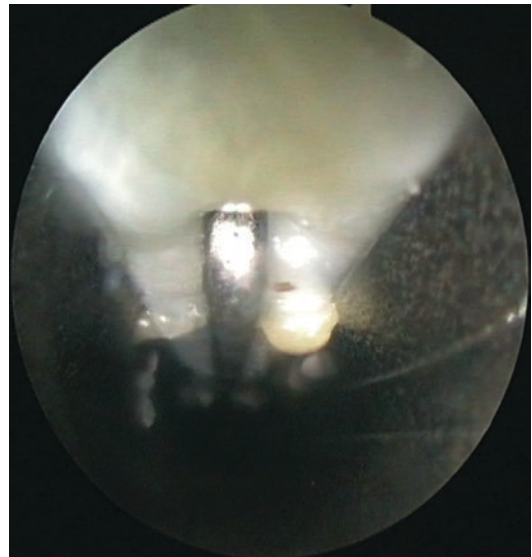


Fig. 32.7 Endoscopic visualization of the hook knife while the section of the plantar fascia is being concluded

is applied for 1 day. Partial weight-bearing is possible with crutches for 2 weeks until complete weight-bearing is permitted.

Traps	Tricks
Do not consider surgery as first therapeutic choice	Primarily make a correct clinical diagnosis
Patient requires therapy with immediate effect on pain	Consider in advance changes in lifestyle and type of shoes
Difficult blind procedure with scope if not performed without blood loss	Use of tourniquet makes a low time-consuming procedure
Frequent postoperative heel discomfort makes patient unsatisfied	Orthotic devices such as silicone heel pads, felt pads, and rubber heel cup should be indicated for a long period after surgery

Key Points

- Plantar fasciitis is primarily a clinical diagnosis and requires a physical examination for differential diagnosis.
- Female patients, middle-aged patients, long-distance runners, military personnel, obese patients, and individuals with a cavus or planus foot deformity are at increased risk for developing plantar fasciitis.
- Lifestyle changes are strongly recommended as first treatment.
- Conservative therapies are recommended for the initial management of plantar fasciitis.
- Among symptomatic patients with low satisfaction and high expectations, 10% can be submitted to plantar surgical release, by fasciotomy or radiofrequency microtenotomy.

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