



Plantar Fasciitis

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Plantar Fasciitis

Current Concepts to Expedite Healing

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IN BRIEF: Plantar fasciitis is a degenerative condition affecting many active people. Anatomic and biomechanical factors can contribute to its genesis, as can overuse. Clinicians can recommend correcting gait disorders, modifying footwear, using tension night splints, and stretching tight calf and plantar tissues to bring about lasting relief. Anti-inflammatory modalities, such as medications, iontophoresis, and corticosteroid injection generally provide temporary improvement. Recent studies on the efficacy of extracorporeal shock wave therapy are conflicting. A small percentage of patients who have refractory symptoms may benefit from surgical division of the plantar fascia.

Plantar fasciitis is a localized degenerative condition of the plantar aponeurosis. It affects approximately 2 million Americans each year¹ and as much as 10% of the population over the course of a lifetime.² Plantar fasciitis is seen primarily in athletes and military personnel as a complication of overuse, though it has been reported in sedentary patients as well.³

The foot consists of 26 bones that form two arches, one longitudinal and one lateral. The arches function as shock absorbers, supporting the body and enabling stable ambulation. Clinicians typically divide the foot into three zones: the forefoot, midfoot, and hindfoot. The plantar fascia is a dense, fibrous membrane that spans the entire length of the foot, originating at the tubercle of the calcaneus and attaching at the proximal phalanges. The fascia protects the underside of the foot and helps support the arches. It consists of a thick central portion and thinner lateral and medial bands that provide

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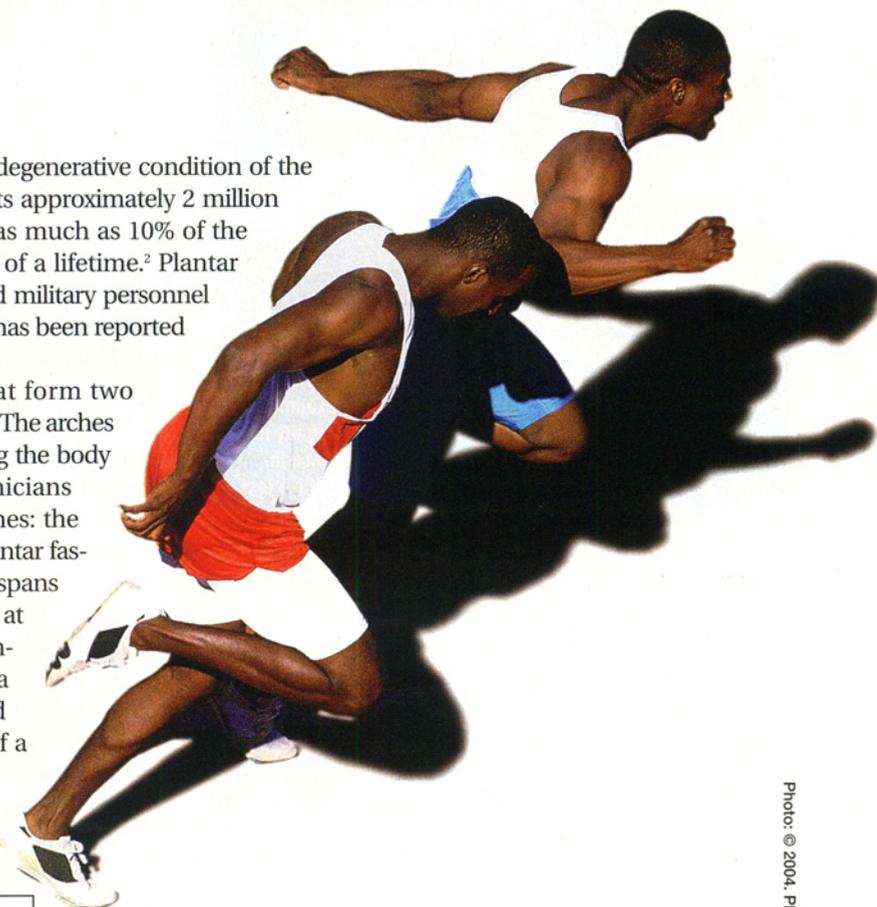


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TABLE 1. Predisposing Factors for Plantar Fasciitis

Anatomic

Excessive femoral anteversion
Lateral tibial torsion
Leg length discrepancy
Overpronating gait
Planus or cavus foot

Biomechanical

Inappropriate footwear
Muscle tightness
Nerve entrapment
Obesity (body mass index > 30 kg/m²)
Overtraining or overuse

flexibility and help maintain the longitudinal arch.

Anatomic, biomechanical, and genetic factors contribute to the development of plantar fasciitis (table 1).^{4,5} However, because the condition is caused by repetitive microtrauma, most athletes experience plantar fasciitis as part of an overuse syndrome following changes in their training regimen.

The source of plantar fasciitis is poorly understood. Reduced dorsiflexion of the ankle may be an important risk factor.⁶ Plantar fasciitis is associated with several arthritides, diabetes, and Paget's disease, but in 85% of cases the cause is unknown.⁶ Current thinking is that cumulative stress overload causes microtears and chronic collagen degeneration in the plantar fascia.¹

Making the Diagnosis

Patients often report severe heel pain upon weight bearing. Pain is typically worse in the morning with the first steps, possibly because the foot assumes a talipes equinus position and the plantar fascia contracts during sleep. Patients may note that their pain gradually improves with activity. Stretching with weight bearing causes increased pain.

On examination, the patient typically has a point of

maximal plantar tenderness on the medial calcaneal tuberosity (figure 1). Pain may be exacerbated by passive dorsiflexion or active plantar flexion. Brown⁷ described the windlass test as an objective means of diagnosing plantar fasciitis. A positive finding consists of pain at the insertion of the plantar fascia with forced dorsiflexion of the great toe. However, a recent study⁸ of the windlass test found a sensitivity of only 13.6% among patients in the non-weight-bearing position who had a clinical diagnosis of plantar fasciitis.

The differential diagnosis of plantar fasciitis is broad. It may include calcaneal stress fracture, bursitis of the plantar heel, and tarsal tunnel syndrome. Entrapment of the posterior tibial, medial plantar, or lateral plantar nerve can cause symptoms mimicking plantar fasciitis. In a reported case of fibrosarcoma of the foot,⁹ the patient had symptoms similar to those of plantar fasciitis. And finally, the astute clinician must consider lumbar radiculopathy in any patient who has chronic foot pain.

Figures: Courtesy of James L. Glazer, MD

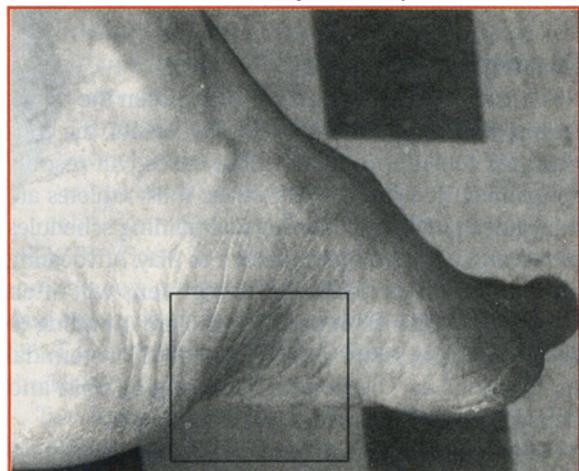


FIGURE 1. An area of maximal tenderness can typically be palpated in the anteromedial region of the calcaneus (box) in patients who have plantar fasciitis.

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Diagnostic testing is rarely indicated in the initial evaluation of plantar fasciitis. Although plain radiographs occasionally show osteophytes on the anterior medial portion of the calcaneal tuberosity, 15% to 25% of asymptomatic individuals also have heel spurs and many symptomatic individuals do not.¹⁰ The heel spur may be caused by plantar fasciitis, but it is generally not responsible for the pain unless the spur is particularly large and downward-pointing in patients who have seronegative spondylarthropathy.

Ultrasonography of the heel can confirm the diagnosis and can help exclude other entities, especially fascia rupture.¹¹ Ultrasonographic diagnostic criteria include thickening, hypoechogenicity, and alterations in the normal fibrillary pattern of the plantar fascia.¹² Ultrasound may be used both as a guide for placement of corticosteroid injections¹³ and as an objective measure of response to treatment.¹⁴ Other radiographic modalities may also be employed in the case of atypical plantar pain, including computed tomography for the exclusion of occult foot fractures or magnetic resonance imaging if the clinician suspects other soft-tissue pathology.

Nonsurgical Treatments

Conservative treatments have long been the mainstay in managing plantar fasciitis. In general, the condition is self-limiting, and most cases will resolve spontaneously with rest.¹⁵ However, most athletes are reluctant to interrupt their normal training schedules to rest and demand speedy return to play. Advocating alternative and varied exercise regimens will often increase compliance in patients who are unwilling to accept absolute restrictions on activity. Nonsteroidal medications can be helpful in managing pain and debility, especially in mild-to-moderate cases.

Footwear. Many athletes train in inadequate footwear that may be old or ill-fitting. Shoes should be changed after 3 months or 500 miles of wear. One study¹⁵ found that in 14% of patients with chronic heel pain, a change in shoes was the most effective treatment. Improving shock absorption and midfoot support can also ease symptoms. A recent prospective randomized study¹⁶ found that prefabricated orthoses were more effective than either stretching or custom orthoses in improving symptoms. In the prefabricated orthoses group, 95% of patients who had plantar fasciitis reported improvement of symptoms at 8 weeks.

Night splints. Because contraction of the plantar fascia during sleep exacerbates pain associated with

plantar fasciitis, physicians have developed dorsiflexion splints. Nighttime splinting effectively relieves symptoms of plantar fasciitis. Several studies¹⁷⁻¹⁹ have reported improvement in approximately 80% of patients. Some of these studies were not prospective or randomized, so it is difficult to predict how splinting compares with other modalities. Splinting seems to be most effective in patients whose symptoms have persisted for more than 12 months. One other strength of splinting is its tolerability: One very small study¹⁷ reported compliance rates of 95%.

Stretching. Treatment programs for plantar fasciitis should include stretching. Increasing flexibility can correct functional risk factors such as gastrocnemius and soleus muscle tightness and can help overcome weakness in the intrinsic muscles of the foot. Patients are instructed in wall, curb, or stair stretches. Newer slant or rocker boards can aid patients in controlled dynamic stretching (figure 2). DiGiovanni et al²⁰ investigated plantar-specific stretching, in which the patient manually hyperextends the toes while seated. This program was more effective than traditional wall stretches in treating symptoms over an 8-week period.

Corticosteroid injections. First described as a treatment for plantar fasciitis in 1975,²¹ corticosteroid injections can be effective in rapidly relieving pain and debility if given early in the course of the disease. It is best to warn patients that these injections can be very painful. Most clinicians favor a medial approach, and ultrasound has been used to help place the injection.^{13,22} Response rates are consistently greater than 70%.^{13,21} Patients frequently experience relief after only a few days, making corticosteroid injection a good choice for an athlete who desires immediate return to play. Evidence shows that the underlying pathologic process is degeneration (fasciosis) and not inflammation (fasciitis), as with tendinopathies.²³ Even though corticosteroid injections can provide clinical benefit, they are not curative.

Corticosteroid injection carries significant risks, including fat pad atrophy and plantar fascia rupture. One series found the rate of rupture to be almost 10%.²⁴ Although longitudinal arch strain has been reported as a frequent complication of plantar fascia rupture,²⁴ some clinicians consider rupture to be a definitive treatment for plantar fasciitis. Patients undergoing release of the fascia, either through surgery or rupture, often experience complete and permanent relief of their pain.^{24,25}

Iontophoresis. The use of electrical impulses to

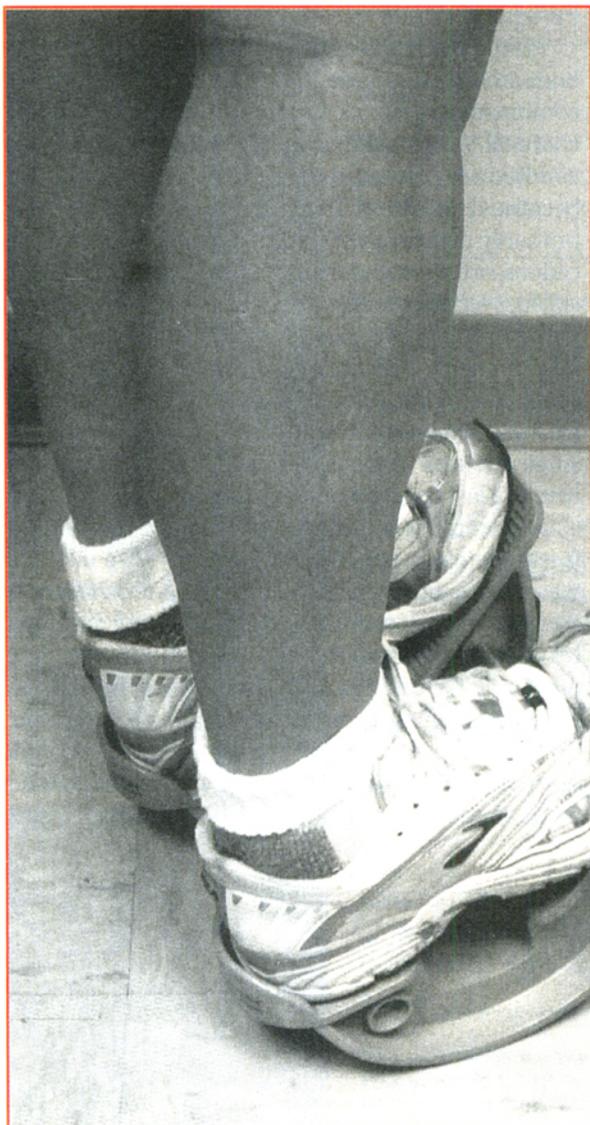


FIGURE 2. Several devices are available to help patients stretch the Achilles tendon and plantar fascia, including a rocker-bottom foot stretcher. Stretching with this or other devices may relieve some pain and help correct the biomechanical imbalances that may lead to plantar fasciitis.

drive topical corticosteroid into deep soft-tissue structures is effective in the initial treatment of plantar fasciitis. One randomized, blinded, and controlled study²⁶ found significant reduction in symptoms at 2 weeks. No differences were observed in the iontophoresis group after 6 weeks, suggesting that the effects of this treatment may be short-lived. No major

complications of iontophoresis have been reported. One drawback stems from the fact that the technique is time- and labor-intensive. A typical course of treatment involves visits to a physical therapist two or three times weekly. Because of this limitation, it is probably best reserved as an initial treatment for elite athletes who seek speedy return to competition.

A New Modality

Recently, extracorporeal shock-wave therapy (ESWT) with ultrasound has been proposed for the treatment of plantar fasciitis. ESWT is used extensively in the treatment of urolithiasis.²⁷ In the 1990s, it was introduced as a treatment for tendinopathies.²⁸ ESWT may provide analgesia and stimulate a healing response in the plantar fascia when traditional therapies fail. The US Food and Drug Administration has approved two devices capable of delivering ESWT.^{29,30}

The efficacy of ESWT for the treatment of plantar fasciitis remains controversial. Initial studies showed promising results, and a recent meta-analysis supported its use.³¹ However, most of these studies are flawed, and some were funded by ESWT manufacturers, making their conclusions difficult to generalize. Currently, no standardized treatment protocol is used, and devices and patient populations vary widely among the studies. In addition, the literature contains few prospective, randomized, placebo-controlled studies supporting the use of ESWT.^{29,32} Some involve no comparison group,^{33,34} or compare two groups receiving ESWT without a standard treatment arm.²⁹ Two studies that did compare ESWT to alternative treatments found outcomes to be similar in both groups.^{35,36}

Two recent important studies have cast doubt on the efficacy of ESWT.^{12,37} However, subtle differences exist between the ESWT studies, making them difficult to compare. Variations in the energy type and dose imparted, the site where it is concentrated, and the selection of the patient population exist in all the studies, whether they support or oppose ESWT. It is likely that an optimal dose for ESWT exists and that a protocol for directing the ultrasound waves could improve outcome. The therapy may be more effective for patients with symptoms of longer or shorter duration. Clinicians may find that ESWT is more suitable for use in athletes than in a sedentary population. More research is needed to delve into these questions and to further explore the potential of this therapy.

continued

Surgical Treatments

For years, the definitive treatment for recalcitrant plantar fasciitis has been surgery. While nearly 90% of affected patients will respond to conservative measures, a significant minority have ongoing debility.³ Early surgical approaches to this group focused on heel spur resection or neurolysis.^{38,39} However, unacceptable complication rates without improved outcomes have led surgeons to adopt isolated plantar fasciotomy as their treatment of choice. In this procedure, the medial one third of the plantar fascia is divided. Although variations have been proposed to minimize the impact of the procedure,⁴⁰ in most series, athletes undergoing surgical release of the plantar fascia have prolonged recovery times, with return to running in approximately 9 weeks⁴¹ and to full pre-morbid activity levels after 18 weeks.⁴²

Endoscopic plantar fascia release has been proposed as a better alternative to the traditional open approach.⁴³ It avoids much pain, return to activity is speedier, and outcomes are more predictable.^{44,45} O'Malley et al⁴⁶ described a technique in which two portals are used, and the medial one third of the fascia is divided endoscopically. Even with this newer approach, 2% to 35% of patients undergoing surgery will have continued symptoms.⁴⁷

Persistent Points

Plantar fasciitis is a common condition that affects both athletes and sedentary people. It arises from a combination of factors, including the effects of biomechanical abnormalities and overtraining. Once the condition is present, the pain associated with it can become debilitating. Treatment of plantar fasciitis is primarily conservative (with stretching, shoe modifications, orthoses, and night splints), and most patients will recover completely within 6 to 9 months. Corticosteroid injection and iontophoresis provide short-term relief for some patients. ESWT may be efficacious for some cases of recalcitrant plantar fasciitis, though the available data are controversial. Open or endoscopic surgical release of the plantar fascia should be considered as a last resort for only the most intractable cases.

In general, many of the interventions for plantar fasciitis provide only temporary relief. One possible reason for short-term success and long-term failure is that the treatments are successful in settling down the condition, but unless the underlying factors (eg, tight plantar fascia, calf muscle tightness, excessive pronation) are addressed, recurrence is almost inevitable. This pitfall, common to the treatment of almost all overuse injuries, can be avoided by the clinician who employs patience and a holistic approach. **PSM**

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**A complete reference list will be available at www.physsportsmed.com beginning in December 2004.*