

Plantar Fasciitis: Evidence-Based Review of Diagnosis and Therapy

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Plantar fasciitis causes heel pain in active as well as sedentary adults of all ages. The condition is more likely to occur in persons who are obese or in those who are on their feet most of the day. A diagnosis of plantar fasciitis is based on the patient's history and physical findings. The accuracy of radiologic studies in diagnosing plantar heel pain is unknown. Most interventions used to manage plantar fasciitis have not been studied adequately; however, shoe inserts, stretching exercises, steroid injection, and custom-made night splints may be beneficial. Extracorporeal shock wave therapy may effectively treat runners with chronic heel pain but is ineffective in other patients. Limited evidence suggests that casting or surgery may be beneficial when conservative measures fail. (*Am Fam Physician* 2005;72:2237-42, 2247-8. Copyright © 2005 American Academy of Family Physicians.)

► **Patient information:**
A handout on plantar fasciitis, written by the authors of this article, is provided on page 2247.



Members of various family medicine departments develop articles for "Evidence-Based Medicine." This is one in a series from the Department of Family Medicine at the University of Virginia, Charlottesville. Coordinator of the series is David Slawson, M.D.

Plantar fasciitis commonly causes inferior heel pain and occurs in up to 10 percent of the U.S. population. Plantar fasciitis accounts for more than 600,000 outpatient visits annually in the United States.¹ The condition affects active and sedentary adults of all ages. Plantar fasciitis is more likely to occur in persons who are obese, who spend most of the day on their feet, or who have limited ankle flexion.² Experts believe that the pain is caused by acute or chronic injury to the origin of the plantar fascia from cumulative overload stress.

Diagnosis

Diagnosis of plantar fasciitis is based on the patient's history and on results of the physical examination. Patients typically present with inferior heel pain on weight bearing, and the pain often persists for months or even years. Pain associated with plantar fasciitis may be throbbing, searing, or piercing, especially with the first few steps in the morning or after periods of inactivity. The discomfort often improves after further ambulation but worsens with continued activity, often limiting daily activities. Walking barefoot, on toes, or up stairs may exacerbate the pain.³ The patient usually has tenderness around the medial calcaneal tuberosity at the plantar aponeurosis. A number of other conditions

cause heel pain; most of these can be distinguished from plantar fasciitis by a history and physical examination (*Table 1*⁴⁻⁸).

Diagnostic imaging is not helpful in diagnosing plantar fasciitis, but it should be considered if another diagnosis is strongly suspected. According to several small case-control studies^{9,10} that compared patients with and without plantar fasciitis, thicker heel aponeurosis, identified by ultrasonography, is associated with plantar fasciitis. Radiography may show calcifications in the soft tissues around the heel or osteophytes on the anterior calcaneus (i.e., heel spurs). Fifty percent of patients with plantar fasciitis and up to 19 percent of persons without plantar fasciitis have heel spurs.¹¹ The presence or absence of heel spurs is not helpful in diagnosing plantar fasciitis. Bone scans can show increased uptake at the calcaneus, and magnetic resonance imaging can show thickening of the plantar fascia.¹¹ However, the accuracy of these tests remains inconclusive.

Prognosis

Case series and the control arms of therapy trials¹²⁻¹⁴ provide the best evidence regarding the prognosis of patients with plantar fasciitis.¹²⁻¹⁴ Most patients with plantar fasciitis eventually improve.⁴ In one long-term follow-up study,¹² investigators found that

SORT: KEY RECOMMENDATIONS FOR PRACTICE

<i>Clinical recommendation</i>	<i>Evidence rating</i>	<i>References</i>
Off-the-shelf insoles, but not magnetic insoles, should be considered to manage plantar fasciitis symptoms.	B	13, 14
Custom-made insoles should be considered to decrease plantar heel pain, but they are not more effective than fabricated insoles.	B	14, 16
Stretching of the plantar fascia is more effective than calf stretching and should be recommended for all patients with pain.	B	17
Corticosteroid iontophoresis should be considered for short-term relief of plantar heel pain if initial therapy fails.	B	16
Custom-made night splints should be considered to relieve plantar heel pain.	B	16
Extracorporeal shock wave therapy is not effective and should only be used to treat runners with chronic heel pain.	B	16, 19-22
A walking cast should be considered for patients with plantar fasciitis who have not responded to conservative measures.	C	23
Open or endoscopic surgery should be considered for patients with plantar fasciitis in whom all conservative measures have failed.	B	24-28

A = consistent, good quality patient-oriented evidence; B = inconsistent or limited quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For more information about the SORT evidence rating system, see page 2160 or <http://www.aafp.org/afpsort.xml>.

80 percent of patients treated conservatively for plantar fasciitis had complete resolution of pain after four years.

Therapy

GENERAL MEASURES

Treatment protocols in most studies include the use of ice and nonsteroidal anti-inflammatory drugs (NSAIDs). However, no studies have specifically examined the effectiveness of these treatments alone.

TAPING

No studies have adequately evaluated the effectiveness of taping or strapping for managing plantar fasciitis.

SHOE INSERTS

Many types of shoe inserts have been used to manage plantar fasciitis. One randomized controlled trial¹³ (RCT) showed that magnet-embedded insoles were no more effective than placebo insoles in alleviating pain. Another study¹⁴ that compared custom orthotics and prefabricated shoe inserts (e.g., silicone heel pad, felt pad, rubber heel cup)

combined with stretching found that the use of prefabricated insoles plus stretching was significantly more effective than custom orthotics plus stretching. Only five patients would need to be treated with prefabricated insoles to benefit one.

NIGHT SPLINTS

Posterior-tension night splints maintain ankle dorsiflexion and toe extension, creating a constant mild stretch of the plantar fascia that allows it to heal at a functional length. Physicians can make custom splints in the office¹⁵ or purchase prefabricated splints. One Cochrane review¹⁶ found limited evidence to support the use of night splints to treat patients with pain lasting more than six months. Patients treated with custom-made night splints improved, but patients treated with prefabricated night splints did not.¹⁶

STRETCHING

Stretching protocols often focus on the calf muscles and Achilles tendon or on the plantar fascia itself (*Figure 1*).¹⁷ In a prospective RCT¹⁷ that compared these two approaches,

researchers found that patients who stretched the plantar fascia showed a greater decrease in “pain at its worst” and a decrease in pain with first steps in the morning. Both groups, however, experienced an overall decrease in pain. The benefits of stretching both the plantar fascia and the Achilles tendon are unknown.

CORTICOSTEROID INJECTIONS

Limited evidence supports the use of corticosteroid injections to manage plantar fasciitis. Results of a Cochrane review¹⁶ showed that corticosteroid injections improved plantar fasciitis symptoms at one month but not at six months when compared with control

TABLE 1
Differential Diagnosis of Heel Pain

Condition	Characteristics
Neurologic	
Abductor digiti quinti nerve entrapment	Burning in heel pad
Lumbar spine disorders	Pain radiating down the leg to the heel, weakness, abnormal reflexes
Problems with the medial calcaneal branch of the posterior tibial nerve	Medial and plantar heel pain
Neuropathies	Common in patients who abuse alcohol and in patients with diabetes Diffuse foot pain, night pain
Tarsal tunnel syndrome	Pain, burning sensation, and tingling on the sole of the foot
Soft tissue	
Achilles tendonitis	Pain is retrocalcaneal
Fat pad atrophy	Pain in area of atrophic heel pad
Heel contusion	History of trauma
Plantar fascia rupture	Intense tearing sensation on bottom of foot
Posterior tibial tendonitis	Pain on the inside of the foot and ankle
Retrocalcaneal bursitis	Pain is retrocalcaneal
Skeletal	
Calcaneal epiphysitis (Sever’s disease)	Heel pain in adolescents
Calcaneal stress fracture	Calcaneal swelling, warmth, and tenderness
Infections	Osteomyelitis Systemic symptoms (e.g., fever, night pain)
Inflammatory arthropathies	More likely with bilateral plantar fasciitis Multiple joints affected
Subtalar arthritis	Heel pain is supracalcaneal
Miscellaneous	
Metabolic disorders	
Osteomalacia	Diffuse skeletal pain, muscle weakness
Paget’s disease	Bowed tibias, kyphosis, headaches
Sickle cell disease	Acute episodes of pain involving long bones, pelvis, sternum, ribs Dactylitis in young children
Tumors (rare)	Deep bone pain, night pain, constitutional symptoms
Vascular insufficiency	Pain in muscle groups that is reproducible with exertion, abnormal vascular examination

Information from references 4 through 8.

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Figure 1. Plantar fascia–specific stretch. Patient crosses affected foot over contralateral leg, grasps the base of toes, and pulls the toes back towards the shin until a stretch in the arch is felt. The stretch is held for 10 seconds and repeated. Three sets of 10 repetitions are performed daily.

Information from reference 17.

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groups. The same review showed that steroid iontophoresis also improved short-term outcomes. However, physicians should be cautious about administering this treatment, because corticosteroid injection is associated with plantar fascia rupture, which may cause long-term discomfort.¹⁸

EXTRACORPOREAL SHOCK WAVE THERAPY

Recent systematic reviews^{16,19} have evaluated RCTs that studied the effectiveness of extracorporeal shock wave therapy (ESWT) in the management of heel pain. In general, the reviewers found that the quality of the studies was poor and that no conclusive evidence supported the effectiveness of ESWT in reducing night pain, resting pain, and pressure pain in the short term (i.e., within six and 12 weeks).

Since the release of these systematic reviews, three groups have published RCTs²⁰⁻²² that studied ESWT. Two well-designed RCTs^{20,22} compared ESWT with a placebo procedure in patients with chronic plantar fasciitis. Neither study found a significant difference between the treatment and control groups three months after treatment. One RCT²¹ included 45 runners who had chronic heel pain for more than 12 months. According to the study, three weekly treatments of ESWT significantly reduced morning pain in the treatment group at six and 12 months when compared with the control group.

CASTING

In one case series,²³ investigators studied 32 patients with chronic heel pain who had not responded to multiple treatments. For six months, the patients wore well-padded fiberglass walking casts with the ankle in neutral to slight dorsiflexion and the toe plate in extension. At long-term follow-up, 25 percent of patients had complete resolution of pain, and an additional 61 percent had some improvement.²³ However, case series and other uncontrolled studies typically overestimate the benefits of treatment.

SURGERY

No RCTs have evaluated the effectiveness of surgery in the management of plantar

fasciitis. Five retrospective case series,²⁴⁻²⁸ which included 278 patients who had experienced pain for an average of 14 months before surgery, showed that 75 to 95 percent of patients had long-term improvement as measured by various criteria. Up to 27 percent of patients still had significant pain, up to 20 percent had some activity restriction, and up to 12 percent had moderate pain that impaired function. The recovery time ranged from four to eight months. No studies have directly compared open procedures with endoscopic procedures.

Recommendations

No evidence strongly supports the effectiveness of any treatment for plantar fasciitis, and most patients improve without specific therapy or by using conservative measures.^{4,12,16} Shoe inserts and stretching exercises, particularly those that focus on the plantar fascia, may be beneficial and should be the first step in treatment. Although no data support the use of NSAIDs or ice, their effectiveness in managing other musculoskeletal conditions makes them reasonable choices for adjunctive therapy.^{14,17}

For patients who do not improve after initial treatment, corticosteroid injection or dexamethasone (Decadron) iontophoresis may provide short-term benefit. However, these therapies do not improve long-term outcomes¹⁶ and may cause plantar fascia rupture.¹⁸ Custom-made tension night splints that place the metatarsophalangeal joints in extension may be beneficial for patients who do not respond to initial therapy, but the benefits of prefabricated night splints have not been proved.¹⁶ ESWT is not beneficial except in runners who have had chronic heel pain for more than one year.^{16,19-22} If conservative measures fail, the physician may choose to refer the patient to a subspecialist for further therapy and possibly surgery. The optimal timing of referral is uncertain, particularly given the self-limited nature of the condition in most patients.²⁴⁻²⁸ Guidelines³ from the American College of Foot and Ankle Surgeons recommend considering surgery if the pain persists after three

months of treatment. The effectiveness of surgery compared with conservative measures remains unproved, but many patients who have not benefited from conservative treatment report long-term improvement following surgery. However, a substantial number of patients will have a prolonged recovery period and will experience continued limiting pain.²⁴⁻²⁸ Limited data suggest that casting may be a beneficial alternative to surgery.²³

Data Sources: For this article, a medical librarian searched PreMEDLINE, the Cochrane Database of Systematic Reviews, the Database of Abstracts of Reviews of Effectiveness, and the American College of Physicians Journal Club using the mapped heading “heel pain” and the text words “plantar fasciitis.” The medical librarian also searched MEDLINE (1996 to 2003) and PreMEDLINE using the mesh heading “plantar, fasciitis” and the text words and mapped heading “plantar heel pain.” She searched MEDLINE using OVID from 1998 on using a search strategy identical to that used by *Clinical Evidence Concise*.²⁹ She reviewed randomized trials, diagnostic studies, and surgical case series published after the initial Cochrane review in 1998. She also hand-searched bibliographies of selected articles.

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