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Thomas J. Melvin PharmD

Marshall University, melvin17@marshall.edu

Zach J. Tankersly DPM

Marshall University, tankersleyz@marshall.edu

Zain N. Quazi

John J. Jasko

Marshall University, jasko@marshall.edu

Russell Odonno MD

See next page for additional authors

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Authors

Thomas J. Melvin PharmD; Zach J. Tankersly DPM; Zain N. Quazi; John J. Jasko; Russell Odonno MD; and Franklin D. Shuler MD, PhD

Primary Care Management of Plantar Fasciitis

Thomas J. Melvin, Pharm D, MSII

Medical Student, Joan C. Edwards School of Medicine, Marshall University

Zach J. Tankersley, DPM, FACFAS

Associate Professor, Chief, Foot and Ankle Surgical Service, Marshall University, Department of Orthopaedic Surgery

Zain N. Qazi, MD

Orthopaedic Research Fellow, Marshall University

John J. Jasko, MD

Assistant Professor, Marshall University, Department of Orthopaedic Surgery

Russell Odon, MD

Resident PGY V, Marshall University, Department of Orthopaedic Surgery

Franklin D. Shuler, MD, PhD

Professor, Orthopaedic Trauma
Vice Chairman, Orthopaedic Research
Medical Director, Senior Fracture Program
Marshall University, Department of Orthopaedic Surgery

Corresponding Author: Zach J. Tankersley, DPM, FACFAS, Marshall University, Department of Orthopaedic Surgery, 1600 Medical Center Drive, Suite G-500, Huntington, WV 25701. E-mail: tankersleyz@marshall.edu.

Abstract

Plantar fasciitis (PF) is present in 10% of the population and is the most common cause of plantar heel pain. PF is painful, can alter daily activities and presents as a sharp pain localized to the plantar foot and medial heel. The underlying etiology involves microtrauma to the plantar fascia, specifically at its insertion point on the calcaneus. Successful management of plantar fasciitis is typically achieved with the conservative therapy approaches discussed.

Introduction

Plantar fasciitis is a common overuse injury that can be associated with substantial heel pain. It typically arises from repetitive microtrauma to the plantar fascia; a thick aponeurotic tissue that extends from the medial tubercle of the calcaneus to the proximal phalanges of the toes. (Figure 1) Its function is to support the arch, wherein it acts like a suspension

system when the foot bears weight, providing static support and dynamic shock absorption.^{1,2} Microtears in the plantar fascia most commonly occur at the calcaneal-fascial interface. This microtrauma can cause a combination of degeneration and inflammation of surrounding tissue, which may lead to significant heel pain.^{3,4}

Plantar fasciitis is commonly seen in primary care as it accounts for 80% of all heel pain and 10% of all running related injuries.⁵ Additionally, it is estimated that one million people in the United States receive treatment for plantar fasciitis each year.^{5,6} This condition is seen more commonly in females, athletes, obese individuals (BMI > 30 kg/m²), and has a peak incidence of 40-60 years.⁶ Other risk factors include individuals with pes planus (flat foot), pes cavus (high arch), reduced ankle dorsiflexion, and excessive pronation (body weight staying on the inner edge of the sole) during walking or running.⁶⁻⁸

Clinical Manifestations and Diagnosis

The hallmark sign of plantar fasciitis is a history of post-static dyskinesia: heel pain with the first few steps in the morning and/or after periods of inactivity.^{8,9} Pain is typically elicited when palpating the fascial attachment site on the medial distal edge of the heel pad. (Red star in Figure 1) This disorder is commonly associated with plantar heel spurs, but there is debate about the presence of heel spurs as a cause of pain; studies have discovered 50%-75% of heel pain patients have heel spurs. However, these same studies have also found the heel spurs in up to 63% of asymptomatic individuals.^{10,11} Cadaveric studies show spurs often lie dorsal to the plantar fascia

within the flexor digitorum brevis and abductor hallucis muscles.¹² Others have demonstrated that these bone spurs can grow off the calcaneus to alleviate the stretch of the plantar fascia. In this case, they are thought to be part of the solution and not the problem.¹³

Diagnosis of plantar fasciitis can be established with a thorough history and physical exam. A history of post-static dyskinesia is pathognomonic for plantar fasciitis, especially in the acute setting (<3 months). Additionally, the history will typically reveal an exacerbation of pain when walking barefoot, on toes, or up stairs.¹⁴ Pain may persist or worsen throughout the day when inflammation has occurred over a subacute to chronic period (>6 months). If such pain persists without amelioration through conservative management, then an alternative diagnosis should be considered. Pain that tends to increase with walking is a feature of calcaneal stress fractures and nerve entrapment, whereas pain that is habitually worse at night can be a sign of tarsal tunnel syndrome or infection.¹⁴⁻¹⁶

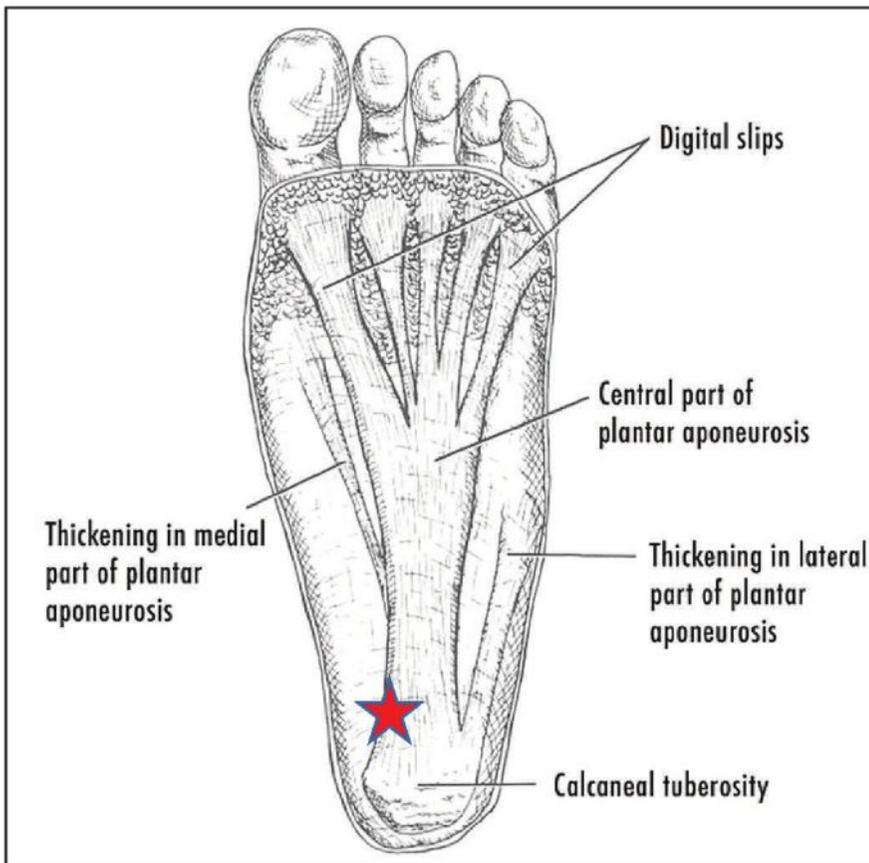
The physical exam will usually show substantial pain on palpation about the medial plantar region of the heel (calcaneal-fascial interface, see Figure 1), tightness of the Achilles tendon, and reduced ankle dorsiflexion. The use of diagnostic imaging for PF is typically not warranted unless another diagnosis is strongly suspected.¹⁴

Treatment

Conservative Therapy

Plantar fasciitis is typically self-limiting; however, resolution normally takes around 6-12 months.¹⁷ Of the many treatment options available for plantar fasciitis, rest can be the most fundamental and effective.

Figure 1: Plantar fascia diagram. The plantar fascia runs from the calcaneal tuberosity to the metatarsal heads. The red star highlights the point of maximal tenderness to palpation in plantar fasciitis.



In a follow up survey comparing conservative treatments, rest was cited as the most effective treatment for 25% of patients.¹⁸ Advising patients to avoid walking barefoot on hard surfaces, avoid running, and avoid excessive standing/walking may provide adequate rest to the plantar fascia. Another fundamental aspect in the management of plantar fasciitis is replacing worn shoes with ones having adequate arch support. Changing footwear can have a significant impact on treatment and was cited by 14% of patients as a treatment that worked best.¹⁸ Suggestions for incremental treatment options are demonstrated in the plantar fasciitis treatment ladder (Figure 2).

There are a plethora of other treatments for plantar fasciitis documented in the literature (Table 1). It is generally recommended to start treatment conservatively with stretching, ice massages, NSAIDs, and orthotics. Stretching exercises (Table 2) are aimed to help correct functional risk factors (weakness of intrinsic foot muscles) and decrease tension in the calf muscles. Stretching can be targeted to the calf muscles/Achilles tendon or be specific to the plantar fascia itself. In a randomized controlled trial comparing these two approaches, it was found that plantar fascial specific stretching showed the greatest improvement; however, both groups demonstrated an overall decrease in pain.¹⁹ Thus, patients may receive the greatest benefit with a stretching program consisting of exercises specific to the plantar fascia mixed with traditional calf stretching. These exercises should be performed multiple times per day, especially upon awakening or after sitting for extended periods of time. An excellent handout for patients and practitioners is available from the American Orthopaedic Foot and Ankle Society (<http://www.aofas.org/footcaremd/conditions/ailments-of-the-heel/Pages/Plantar-Fasciitis.aspx>).

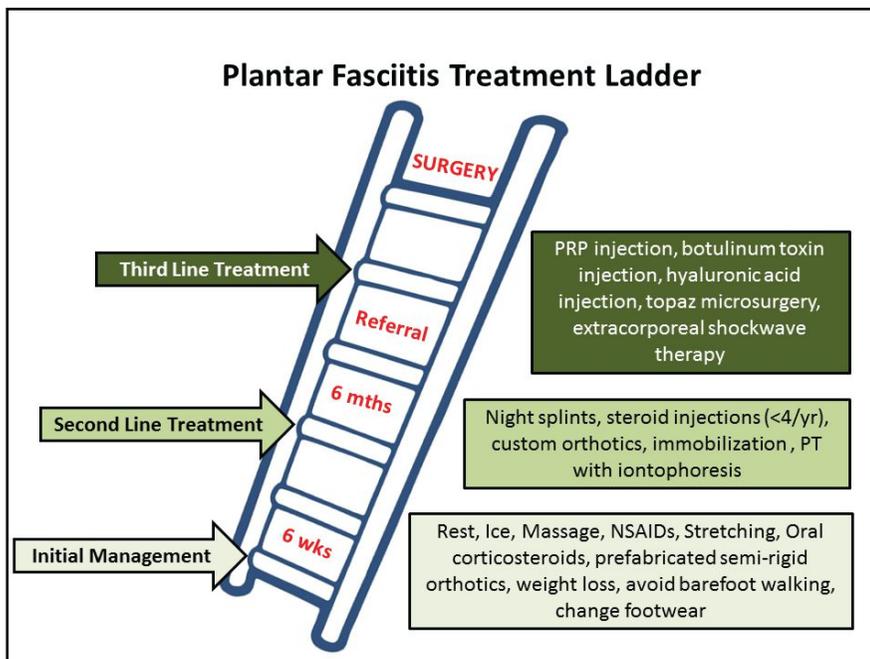
Table 1: Summary of Plantar Fasciitis Treatments

Stretching	Calf/Achilles tendon stretching and plantar specific stretching have been shown to provide improvement in pain relief and muscle flexibility.
Ice	Apply ice for 5-15 minutes after performing stretching exercises
Heel cups	Accommodative therapy has been shown to be inferior to functional orthotics and taping.
Athletic Taping	Low Dye taping (Table 3) has been shown to provide pain relief
Orthotics	Have been shown to provide a reduction in pain and an improvement in function. Be sure to choose an appropriate orthotic that conforms to the arch.
NSAIDs	Useful as an adjunctive treatment with other conservative modalities, best to keep trial to 2-3 weeks to avoid adverse side effects
Steroid Injections	May provide good short term outcomes, but steroid injections are associated with fascia rupture and fat pad atrophy
Night Splints	Typically reserved for patients not responding to other conservative treatment modalities
Extracorporeal Shock Wave Therapy (ESWT)	Reserved for patients not responding to more conservative therapies.
Surgery	Usually permanent solution but reserved for conservative treatment refractory patients

Table 2: Stretching

Calf Stretch (towel)	Grab a rolled towel at both ends while holding it under the ball of your foot. Gently pull the towel toward you while keeping your knee straight. Hold this position for 10 seconds. Repeat 3 times. ⁴⁵
Calf Stretch (standing)	Put your hands against the wall at about eye level. Keep the injured leg back, the uninjured leg forward, and the heel of your injured leg on the floor. Turn your injured foot slightly inward as you slowly lean into the wall until you feel a stretch in the back of your calf. Hold for 15 to 30 seconds. Repeat 3 times. ⁴⁵
Achilles Tendon Stretch	Stand on a step and slowly let your heels down over the edge of the step as you relax your calf muscles. Hold the stretch for about 10 seconds, then tighten your calf muscle a little to bring your heel back up to the level of the step. Repeat 3 times. ⁴⁵
Plantar Fascia Stretch	Perform this exercise while sitting and crossing the affected leg over the contralateral leg. The hand on the affected side of the body is positioned with the fingers across the plantar aspect of the toes just distal to the metacarpalphalangeal joints to pull the toes back toward the ankle and shin until feeling a stretching sensation in the arch of the foot. The tension in the plantar fascia should be confirmed by palpation. The stretch should be held for a count of 10 and repeated 10 times. The exercise should be performed three times each day. ¹⁹

Figure 2: Plantar fasciitis treatment ladder. Treatment options are considered based on the duration of patient symptoms and length of treatment (times in red). Generally, those patients presenting with shorter duration of symptoms will respond more quickly to the initial / first tier treatments (light green). Those patients with longer duration of symptoms may benefit from the addition of second line treatments (green). Patient referral with a consideration of third line (dark green) and surgical treatment options are considered with the onset of chronic symptoms not responding to the incremental closed treatment protocols presented.



Non-steroidal anti-inflammatory drugs have been shown to help mitigate pain, especially when combined with the other conservative treatment modalities. A randomized trial evaluating the efficacy of the addition of NSAIDs to traditional conservative therapy (stretching, heel cups, night splinting) showed a trend of increased pain relief in the NSAID

treatment group.²⁰ The general consensus is to prescribe a short-term trial of NSAIDs of two to six weeks, as long-term use of NSAIDs is associated with an increased frequency of gastritis, interstitial nephritis, and GI bleeding.^{15,20,21}

Accommodative therapy with over the counter heel cups/inserts is used to decrease the impact on the calcaneus by providing an

elevated soft cushion. One study comparing the efficacy of heel cups to functional orthotics (prefabricated and custom) showed only those treated with functional orthotics produced significant improvements in function and pain.²² Thus, heel cups alone are generally not recommended for treatment.

The literature shows mixed results when comparing custom to over the counter prefabricated orthotics. In a study comparing their efficacy, it was noted that 80% of patients treated with prefabricated orthotics showed improvement compared with 68% of patients treated with custom orthotics.²³ Other studies show prefabricated and custom orthotics to be equally effective.^{24,25} Due to the ambiguity of the literature, it is generally recommended to initiate treatment with an over the counter prefabricated orthotic and move to a custom orthotic if the patient fails treatment, as prefabricated orthotics are less expensive.¹⁶

Taping can provide direct arch support by preventing excessive pulling of the plantar fascia at its insertion on the calcaneus. It is typically applied in the office, lasts 1-2 days, and requires a specific technique in order to be effective (Table 3). In a study evaluating the effectiveness of low-dye taping for relieving pain associated with plantar fasciitis, the investigators found a significant reduction in pain when compared with placebo.²⁶ Studies performed by Martin²⁵ and Lynch²⁷ utilized a combination of

Table 3: Low Dye Taping

A strip of adhesive tape (the metatarsal strip) is applied in a circumferential fashion at the level of the metatarsal heads. A second strip of tape is started at the lateral aspect of the plantar surface of the metatarsal strip, and applied diagonally across the sole, around the heel, along the lateral border of the foot, and ends on the metatarsal strip. The third and fourth strips are started at the lateral aspect of the metatarsal strip, are carried around the heel, and end on the metatarsal strip near the base of the great toe.¹⁶

taping and functional orthotics and demonstrated significant improvement, thus low dye taping is typically recommended in most treatment protocols.

Night splinting is another treatment modality frequently cited in the literature. Night splints keep the ankle dorsiflexed; this puts the plantar fascia in an optimal anatomic position to facilitate healing. Although several studies show night splinting to be an effective treatment²⁸⁻³⁰, they are usually considered uncomfortable and patient compliance may be an issue.²⁵

Injections, Surgery, Shockwave therapy

Corticosteroid injections are frequently used to treat tendinopathies, however the literature is mixed with respect to their role in PF treatment and they are considered a second line treatment option. (Figure 2) The general consensus is that steroid therapy can provide good short-term outcomes, however long term efficacy is less clear.³¹ It is important to note that steroid injections are associated with complications such as fat pad atrophy and plantar fascia calcification, which may cause long-term discomfort.⁹ We therefore recommend limiting steroid injections to no more than 4 per year. Third line treatment options (Figure 2) include additional injections, microsurgery and shock wave therapy.

Platelet rich plasma (PRP) is a blood-derived product with elevated platelets and varying concentrations of growth factors. It is hypothesized that when PRP is injected into injured tissue, it modulates collagen synthesis, decreases inflammation,

and promotes tissue healing.³² PRP injections have been shown to be effective in the treatment of various musculoskeletal conditions. In particular, it has exhibited promising results in the treatment of chronic plantar fasciitis. Several studies show significant improvements in pain and function, and one particular study demonstrated long-term superiority over steroid injections.³³⁻³⁵ However, its place in PF therapy is still contentious. PRP should be considered as an alternative to surgery in refractory cases unresponsive to more conservative treatment modalities and is a third line treatment option.³²

Extracorporeal shock wave therapy (ESWT) has been used to treat a variety of musculoskeletal disorders including plantar fasciitis. It is hypothesized that shock waves targeted to the plantar fascia promote angiogenesis leading to tissue regeneration.^{36,37} However, the clinical trials evaluating ESWT yield mixed reviews.³⁶⁻³⁹ Thus, ESWT is generally reserved as salvage therapy after failure of traditional conservative treatment.

Radiofrequency microtenotomy (Topaz in Figure 2) is a minimally invasive procedure that utilizes radiofrequency energy to increase blood flow and facilitate healing.⁴⁰ When compared to traditional plantar fascia release, this procedure provides the surgeon with a more precise and targeted approach while preserving the plantar aponeurosis.⁴¹ RF microtenotomy has been studied in the treatment of rotator cuff tendinosis, tennis elbow, and plantar fasciitis with promising results.⁴⁰⁻⁴³ Thus, it is a viable alternative to traditional

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surgical procedures, with the added benefit of a less invasive approach and a shorter recovery time.⁴¹

Surgery is typically reserved for patients who have not responded to conservative management after 6-12 months. It involves release of the plantar fascia and possible lengthening of the posterior muscle group. As mentioned earlier, plantar heel spurs are not removed. Surgery is usually curative, but patients may require up to 6 months of recovery time. The procedure can either be open, mini-open or endoscopic, with minimally invasive procedures being associated with more rapid recovery and a decreased rate of complications.^{18,44}

Conclusion

Plantar fasciitis is a painful condition and the most common cause of plantar heel pain. At risk populations include those individuals whose occupations demand long periods of standing without support (waitresses, nurses, teachers, factory workers, retail etc.). PF is commonly seen in primary care and it can greatly affect activities of daily living. This condition is typically self-limiting and around 90% of the time can be appropriately managed with conservative treatment, such as taping, stretching, and over the counter orthotics, using the treatment ladder approach presented. The literature suggests it is best to utilize a combination of several treatment modalities.

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