Challenges in Diagnosis of Plantar Fasciosis (Fasciitis)

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Abstract

Heel pain is a common complaint presenting to a general orthopedic clinic, with plantar fasciosis (PF) accounting for about 80% of these cases [1]. It is estimated that about 2 million Americans are affected with PF every year and it affects as much as 10% of the population over the course of a lifetime. There are other causes for heel pain which can be mistakenly diagnosed as PF. Non-steroidal anti-inflammatory drugs (NSAIDs), stretching and corticosteroids have historically been used to treat PF. The evidence of benefit versus likelihood of harm from injected corticosteroids is not clearly known. A major concern is that administration of corticosteroids may cause plantar fat-pad degeneration which can lead to chronic heel pain that is very difficult to treat [2]. The following will discuss the differential diagnosis and evaluation of PF.

ABBREVIATIONS
PF: Plantar Fasciosis

INTRODUCTION

Clinical presentation

Plantar fascia is a tough layer of connective tissue that supports the arch of the foot by tightly attaching the heel to the ball of the foot as shown in (Figure 1). From the proximal attachment on the calcaneus to the distal attachment on the proximal phalanges of the five toes (embracing the flexor tendons of the toes). Stretch tension from the plantar fascia prevents the spreading of the calcaneus and the metatarsals and maintains the medial longitudinal arch [3]. During the propulsive phase of the gait the toes go into dorsiflexion, this causes the winding up of the plantar fascia like a tight rope because of the attachment to the proximal phalanges of the toes. This tension in the plantar fascia shortens the distance between the calcaneus and the metatarsal heads elevating the medial arch of the foot (Figure 2). This is called the windlass mechanism [3].

While the exact etiology of plantar fasciosis is not clear, it is thought to be caused by an over loading of the fascia due to prolonged standing, walking, and running. These stressors cause the overloading and repetitive “micro-traumas” to the fascia [4]. Though there is no clear published evidence for the exact etiology, the evidence is becoming more in favor of a chronic degenerative process rather than an acute inflammatory one [5]. Clinically, PF usually presents as a painful spot in the heel at the medial calcaneal tuberosity (Figure 3). Generally, the pain is worse with the first few steps in the morning. It may improve slightly with walking and then return at end of the day with the increased daily activity. Increased pain in the morning is a classic finding which is due to the fact that during the night the fascia is relaxed and tension free allowing it to tighten up. With the first few steps in the morning, the sudden stretch on the already degenerated fascia causes a lot of pain [1]. Runners are particularly prone to developing to this condition because of repeated micro trauma caused by heel strikes with the foot in a pronated position [2]. PF can also be triggered by over-exercising suddenly after a sedentary life style. Other risk factors include female gender, age over 40, overweight, poorly fitted shoes along with hard or flat soled shoes [4].

PHYSICAL EXAMINATION AND RADIOLOGY

On clinical examination look for a flat foot (pronated foot) [6, 7], tenderness over the attachment of plantar fascia to the
calcaneus on the medial aspect of the heel that is exacerbated with dorsiflexion of the great toe as in (Figure 3). Radiographs of the foot may be helpful in ruling out other potential causes of heel or foot pain. An ultrasonic measurement of the thickness of plantar fascia at the calcaneal attachment of more than 4mm can confirm the diagnosis [8].

DIFFERENTIAL DIAGNOSIS

Though PF is one of the common causes of medial heel pain, there are other conditions which can mimic or be incorrectly diagnosed as PF. This can lead to repeated injections of the heel and atrophy of the fat pad of the heel [9]. (Figure 4) illustrates typical areas of pain for the potential differential diagnoses [6]. Patients with other etiologies might complain of pain at rest as well as with activity and this could be the clenching symptom to consider differential diagnosis for PF [6].

NEUROLOGICAL CONDITIONS

Neuropathies secondary to diabetes, Vitamin B12 deficiencies, renal failure and thyroid disorders can mimic PF. Checking labs, including a fasting glucose, renal function, B12 level and a thyroid function test, along with a detailed history and physical examination may be needed to help rule out peripheral neuropathies. Neuropathies are characterized by bilateral burning type of pain and pain may be present even at rest [10].

NERVE ENTRAPMENT

Tarsal tunnel syndrome

It can be a difficult condition to diagnose. The posterior tibial nerve courses into the foot behind the medial malleolus: entering the foot on the medial surfaces of the talus and calcaneus, and then it runs under the flexor retinaculum. Conditions which cause swelling in that area can cause compression in the tarsal tunnel resulting in symptoms. Stretching of the nerve due to pes planus or flat foot can lead to irritation of this nerve [6]. Heel pain accompanied by neuropathic features such as tingling, burning, or numbness may indicate tarsal tunnel syndrome. Pain and numbness often radiate to the plantar aspect of the heel and, in some cases, extends to the distal sole and toe [11].

The clinical examination includes a positive Tinel’s sign: percussion of the nerve within the tarsal tunnel causing a tingling sensation distally. Performing a special maneuver of dorsiflexion and eversion of the foot at the same time can reproduce symptoms as the posterior tibial nerve is stretched and compressed. Nerve conduction studies can be performed but are not necessarily a sensitive or specific test for this condition.

Entrapment of the first branch of the lateral plantar nerve

It is between the abductor hallucis muscle and the quadrates plantae muscle causes a burning sensation on the plantar aspect of the heel that is aggravated by daily activities and may even persist at rest. Digital pressure over this area may prove painful, with a tingling sensation (Figure 5). The same conservative modalities that are used to treat PF are effective in treating this condition [4].

Fat Pad Syndrome

The heel fat pad is made up of elastic adipose tissue, it usually degenerates gradually after the age of 40 and any injury or repeated stresses to the area can damage and quicken the degeneration. Obesity and footwear with poor cushion can contribute to it as well [7]. Management includes the use of ice (immersion of heel), NSAIDs, heel cup or cushion and avoiding walking barefoot at all times. Steroid injections can worsen or progress the atrophy [12].

Figure 2 Windlass mechanism of the plantar fascia.

Figure 3 Tenderness over the attachment of plantar fascia on the medial aspect of the heel that is exacerbated with dorsiflexion of the great toe.

Figure 4 Differential diagnosis and site of pain.
In summary, plantar fasciosis or “heel pain” is actually not one diagnosis but represents a number of conditions. When a inflammatory arthritis but are generally of no significance [6, 9].

**MANAGEMENT**

PF is usually a self-limiting condition with most symptoms subsiding by 8–10 weeks, 80% of patients report complete resolution of symptoms in 12 months period [2]. Sometimes, PF can progress to a chronic condition and can be difficult to treat; there are some articles which have reported high rate of recurrence of PF over a 6 year follow-up in conservatively managed patients, but this could be due to failure to correct the biomechanical factors causing the PF (Table 1) [7]. Initial treatment consists of the PRICE principles: protection, rest, ice, compression and elevation [5]. No clear evidence of benefit has been shown for using anti-inflammatory medications [14]. Protection and rest usually involves avoiding aggravating activities like running and prolonged standing. Use of ice is an important part of the initial management. It is important to stress to the patient that ice can treat the pain effectively. This can be easily done by freezing a sponge soaked in water, once the water becomes ice, the patient may massage the block of ice along the origin of the plantar fascia for approximately 10 to 15 minutes. Ice immersion works well with a bowl filled with ice, and water and sitting the heel in the bowl for 10 minutes. Icing is most helpful after activities or at the end of the day [5]. Compression by way of applying an elastic wrap around the foot may offer some comfort. Soft gel heel cups placed in the patient’s shoes can cushion the heel and also give a bit of compression from the sides [9, 11-13, 15]. Patients can be encouraged to do stretching of the plantar fascia. This can be done by firmly grasping the toes and simultaneously dorsiflexing the toes and foot [6-13, 15, 16].

Diagnosis and correction of biomechanical factors leading to this condition should be a mainstay of treatment (Table 2) [12]. Steroid injections are not recommended as evidence of long term benefits have not been demonstrated. Cortisone has an unexplained short term effect but is often accompanied by a significant symptom rebound in the long term [17]. Repeated steroid injections should definitely be avoided, as they can cause fat pad atrophy and rupture of the plantar fascia which are difficult conditions to treat [6-13, 15]. More than 90% of patients with PF are cured with conservative measures and rarely require surgical partial release of the plantar fascia from the calcaneus origin [7, 15-22]. Table (3) lists common treatments for plantar fasciosis. For the prevention of symptoms, patients can be advised to obtain “stress mats” for prolonged standing on a hard floor [6]. To help prevent recurrence, it is important to stress appropriate footwear and supports for regular use. Surgical intervention may be indicated in the small percentage of patients who have failed conservative treatment after several months [6].

<table>
<thead>
<tr>
<th>Table 1: Possible associated factors contributing to plantar fasciosis [1-4].</th>
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<tbody>
<tr>
<td>1. Obesity (body mass index of 30 or more)</td>
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<td>2. Age over 40</td>
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<td>3. Runners, prolonged standing and walking occupations</td>
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<td>4. Pes planus (Excessive foot pronation)</td>
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<td>5. High arched foot (pes cavus)</td>
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<td>6. Ill-fitting shoes or hard soles in the shoes</td>
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<td>7. Leg length discrepancy</td>
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<td>8. Weakness of the Tibialis Posterior or Tightness of Achilles tendon</td>
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**Rupture of the Plantar Fascia**

Rupture of the plantar fascia is a rare condition which can occur after a physical trauma. Severe pain in the arch of the foot with patients often recalling a snapping sensation felt within the foot at the time of the injury is consistent with the problem [2,10]. Examination may reveal a palpable lump and tenderness in the plantar fascia. Treatment is immobilization of the foot for several weeks followed by a stretching program [2-4].

**Calcaneal Fracture**

Calcaneal fractures can mimic PF with a gradual onset of pain as with any stress fracture caused by a recent increase in daily exercise or activities without enough rest. Calcaneal fractures can also occur with a sudden impact as with a fall. Patients with this condition often report increased pain when the heel bone is squeezed along the medial and lateral aspects rather than from palpating the plantar aspect of the heel [8].

**Radiculopathy/Sciatica**

Heel pain can occur when there is increased pressure or injury to the L5-S1 nerve root in the lumbar spine. L5–S1 nerve roots provide segmental innervation to the posterior thigh, gluteal region, anterior/posterior and lateral lower leg muscles, as well as sensation to the heel. Patients with sciatica often report sharp pain radiating down the buttocks and the posterior aspect of the thigh and leg and even into the heel. A straight leg raise will reproduce pain in the foot. Spinal stenosis in some patients can cause foot pain as well [13].

**Systemic Causes**

Rarely heel pain can be caused by underlying medical conditions such as rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, Reiter’s syndrome, gout, Behçet’s syndrome and systemic lupus erythematosus. Patients with Reiter’s syndrome may also present with chronic diarrhea, urethritis and conjunctivitis. Rheumatoid, lupus and psoriatic arthritis usually involve polyarthritis. An x-ray of the heel might show a calcaneal spur [6, 9-11]. These spurs are can be associated with...
Clinician separates out the various etiologies of heel pain and a more specific diagnosis is made, there is a much greater chance that conservative treatment will be successful. Newer evidence has indicated that the use of corticosteroids as the main treatment option for these conditions should be reconsidered.

ACKNOWLEDGEMENTS

Linda M. Savage, SIU Primary Care Sports Medicine Fellowship Coordinator.

REFERENCES


Table 2: Differential Diagnosis [1-6, 8, 9].

<table>
<thead>
<tr>
<th>COMMON CAUSES</th>
<th>Check for:</th>
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<tbody>
<tr>
<td>Neuropathies</td>
<td>Causd by Diabetes, Vitamin B12, alcohol abuse and thyroid</td>
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<tr>
<td>Fat Pad Syndrome</td>
<td>Heel fat pad degenerates gradually after age 40. Injury or repeated stresses to area can damage</td>
</tr>
<tr>
<td>Heel Contusion or Calcaneal Fracture</td>
<td>Direct fall on heel with bone/fat pad pain</td>
</tr>
<tr>
<td>Calcaneal Stress Fracture</td>
<td>Gradual onset of pain, sudden plantar heel pain and bruising</td>
</tr>
<tr>
<td>Plantar Fascia Rupture</td>
<td>L5-S1 Nerve Root Radiculopathy</td>
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<tr>
<td></td>
<td>Burning sensation in medial plantar region</td>
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<tr>
<td>Tarsal Tunnel Syndrome</td>
<td>Posterior Tibial Tendinitis</td>
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<td></td>
<td>Posterior medical ankle/foot pain</td>
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<tr>
<td>Retrocalcaneal bursitis</td>
<td>Pain in the retrocalcaneal region</td>
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<tr>
<td>Achilles Tendinitis</td>
<td>Tendon pain posterior to calcaneus</td>
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<tr>
<td>UNCOMMON CAUSES</td>
<td>Calcaneal Apophysitis (Sever Disease)</td>
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<td>Common in adolescent, seen in x-ray</td>
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<td>Systemic Arthritides (e.g.</td>
<td>Systemic signs apart from plantar pain; x-ray might show calcaneal spur</td>
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<td>rheumatoid arthritis, Reiter</td>
<td>Entrapment of the first branch of the lateral plantar nerve</td>
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<td>syndrome, psoriatic arthritis)</td>
<td>between the abductor hallucis muscle and quadratus plantae muscle</td>
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<td></td>
<td>Burning sensation on the plantar aspect that is aggravated by daily activities; pain present at rest</td>
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<tr>
<td>Calcaneal Tumor</td>
<td>Deep bone pain, pain at rest and night</td>
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</table>

Table 3: Treatment of plantar fasciitis [21].

- Resting the foot and stretching of plantar fascia
- Loss of weight, if obese
- Orthotics for pes planus, if present
- Advise to run on a softer surface
- A laced sports shoe gives good support; updating shoes regularly
- Ice for acute pain
- Wearing orthotics such as night splints and gel heel cups in shoes

Daniels et al. (2016)