



## PLANTAR FASCITIS: A CONCISE REVIEW

## Orthopaedics

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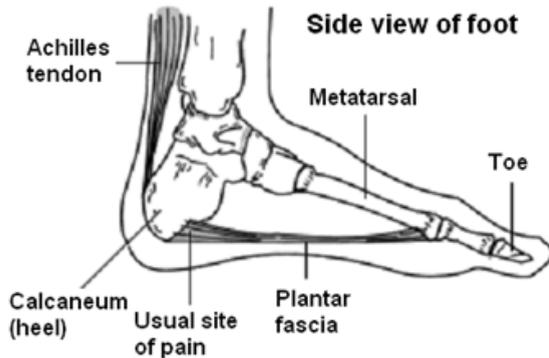
## ABSTRACT

plantar fasciitis is not uncommon condition affecting Indian population and chief complaint is heel pain while walking, it is estimated that 10-15% population requires medical treatment. Recurrence is also very common despite of treatment. This article includes etiology, knowledge of mechanism, diagnosis, current available treatment.

## KEYWORDS

plantar fasciitis, heel pain, orthotics.

Plantar fasciitis is common orthopedic problem mainly amongst men between the ages of 40 and 70 years and chief complaint is heel pain while walking in Indian population. Plantar fasciitis also affects athletes, especially runners. It is estimated that 10-15% population requires medical treatment. Recurrence is also very common despite of treatment. It is very difficult to correlate and quantify the factor responsible for plantar fasciitis. Arch support is mainly contributed by plantar fascia and aponeurosis.<sup>2,3</sup> also plantar fasciitis have shown strong evidence of importance in stability of foot documented by many in vitro studies.<sup>4-7</sup> The exact cause of this disease is unknown. However, several factors may be involved: inflammation of the plantar fascia due to traumatic events that involve traction or shearing forces,<sup>8</sup> avulsion of the plantar fascia, stress fractures of the calcaneus, and compressive neuropathy of the plantar nerves,<sup>9</sup> plantar spurs of the calcaneus and senile atrophy of the plantar fatty pads.



In the presence of these risk factors, excessive tensile forces may cause micro-tears in the plantar fascia. Repetitive trauma to the plantar fascia exceeding the fascia's ability to recover may lead to degenerative changes and an increased risk of injury.<sup>10-12</sup>

Implementation of a conservative treatment and preventative protocol has been shown to be effective in resolving or reducing the symptoms associated with plantar fasciitis.<sup>13,14</sup>

## ANATOMY OF THE PLANTAR FASCIA AND THE MEDIAL LONGITUDINAL ARCH OF THE FOOT

The plantar fascia is a thick, fibrous, relatively inelastic sheet of connective tissue originating from the medial heel, where it then passes over the superficial musculature of the foot and inserts onto the base of each toe.

The plantar fascia is the main stabilizer of the medial longitudinal arch of the foot against ground reactive forces and is instrumental in reconfiguring the foot into a rigid platform before toe-off.<sup>15,16,17</sup> When the foot is on the ground a large amount of force (weight of our body) is on the plantar fascia.

This can lead to stress on the plantar fascia where it attaches to the calcaneus (heel). Small tears of the tendon may result and are repaired by the body. Under normal conditions, the plantar fascia performs this function appropriately without incurring injury.

As the healing process repeats itself over and over, a bone spur forms as the body's response to try and firmly attach the fascia to the bone. This appears on an x-ray of the foot as a heel spur.

## Function of the Plantar Fascia

The plantar fascia works during the gait (walking) cycle when the heel on one side has lifted, but the heel on the opposite foot has not yet touched the ground. During this action, the foot will experience a higher reaction force than at any other time in the gait cycle. As the heel lifts, the plantar fascia will start to tighten. The higher the heel lifts, the tighter the plantar fascia will get.

After tightening the fascia it pulls the heel toward the forefoot. This will heighten the arch and resist the increasing body weight from flattening the foot. With premature heel lift from tight calf muscles, the plantar fascia will not properly raise the arch and resist the body weight from flattening the foot. This elongation will put tension on the fascia at its attachment. Over time, symptoms of overuse will occur.

## Clinical Presentation

A typical history of the condition begins with the patient describing the insidious onset of a sharp, stabbing inferior heel pain that localizes to the plantar medial aspect of the heel. The pain is at its greatest intensity when the patient takes the first few steps in the morning when arising from bed or from a chair after sitting for an extended period of time. The pain tends to lessen with activity, but worsens by the end of the day, especially after prolonged periods of weight-bearing.<sup>18,19</sup> The symptomatic patient will deny radiation of pain and will not usually have any associated paresthesia. Bilateral heel pain however, in conjunction with multiple sites of enthesopathy and joint pain, suggests a systemic rheumatologic disorder. Sudden increases in activity or training should lead the clinician to further investigate the possibility of a calcaneal stress fracture. Recent studies have suggested that only 50% of patients with heel pain will have heel spurs.<sup>20</sup> Further, cadaveric dissections have revealed the presence of the spur within the flexor digitorum brevis as well as the abductor hallucis, rather than the plantar fascia itself.<sup>21</sup> Thus, although heel spurs do indeed occur with heel pain, they are generally not considered the cause. The pain could be triggered upon dorsiflexion of the patient's pedal phalanges, which further stretches the plantar fascia (windlass mechanism)<sup>22</sup>

## Physical Examination

The foot and ankle physical exam should be thorough and include inspection of the patient's stance and gait.

A pes planus or pes cavus foot deformity can increase loading through the plantar fascia. Obesity and limited ankle dorsiflexion are also risk factors for the development of the condition.

A neurologic examination of the lower extremity and back should be done to explain paresthesias or abnormal sensation accompanying pain. The location of the pain is important in making the correct diagnosis. Pain associated with plantar fasciitis is most commonly linked with the origin of the plantar fascia in the area of the medial tubercle of the calcaneus.

However, patients may experience pain more distal to the origin as the plantar fascia extends into the medial arch or branches into the five digital bands. Although possible, variations of the typical clinical finding of plantar medial heel pain should warrant further investigation of another diagnosis. Lastly, the diagnosis can be further identified through dorsiflexion of the toes, which typically exacerbates the pain in patients with symptomatic plantar fasciitis.

#### Differential diagnosis:

The following differential diagnosis have been suggested for plantar fasciitis

- Cerebral stress
- Bone bruise
- Fat pad atrophy
- Tarsal tunnel syndrome
- Soft tissue primary or metastatic bone-tumors
- Paget's disease of bone
- Severs disease
- Referred pain as a result of SI joint-radiculopathy.

#### IMAGING:

Imaging plays a limited role for the diagnosis of plantar fasciitis, as a thorough history and physical exam usually leads to the cause of the plantar heel pain. Although conventional radiographs are rarely needed for the diagnosis of plantar fasciitis, standing AP and lateral radiographs of the heel provide information about the osseous structures of the foot, as well as specific details of the calcaneus.

A triple-phase bone scan may be warranted as an imaging study of choice when trying to differentiate plantar fasciitis from other plantar heel etiologies. This test can provide objective evidence of predictable increased uptake in the heel (medial calcaneal tubercle) that can differentiate the diagnosis of plantar fasciitis from calcaneal stress fracture.<sup>23</sup> Symptomatic improvement of the condition is also correlated with decrease in uptake over time.<sup>24</sup>

Magnetic resonance imaging (MRI) is seldom used for the confirmation of plantar fasciitis due to its low specificity. It will typically show increased signal intensity, thickening of the plantar fascia, and edema of surrounding structures. An MRI is useful, however, in excluding other causes of heel pain such as tumors and infection.

Ultrasound is less expensive than an MRI and has been shown to be equally as effective as using a triple-phase bone scan in the diagnosis of plantar fasciitis.<sup>12</sup> Ultrasound is also very quick and provides no radiation exposure, but is unfortunately user dependent. Typical findings include a thickened, hypoechoic

Plantar fascia with soft-tissue edema.

Laboratory, electromyography (EMG) and nerve conduction velocity (NCV) studies can provide additional information for the clinician in identifying a spinal radiculopathy, peripheral neuropathy as well as local nerve entrapment but are not routinely ordered. Laboratory studies are usually normal in the patient with plantar heel pain, but serum hematologic and immunologic testing can detect other systemic causes.

HLA-B27, complete blood count, erythrocyte sedimentation rate, rheumatoid factor, antinuclear antibodies, and uric acid can be considered in patients with bilateral or atypical heel pain.<sup>25</sup>

#### Conservative Treatment

Non-surgical treatment is the mainstay of treating plantar fasciitis, with an array of conservative strategies available to treat the condition. Non-surgical treatment is very effective, at a reported success rate of 85-90%.

**1. Patient education:** It is a self-limiting condition and the importance of combined multiple treatment regimens at the same time

**2. Stretching and Strengthening Exercises:** Stretching and Strengthening exercises play an important role in the treatment of PF and maintain the normal posture of the foot thereby reducing the recurrence of PF. Stretching exercises include wall stretch, stair stretch, slant board stretch, towel stretch, rolling the foot arch on a ball, etc. Strengthening exercises should include more of intrinsic muscles

of the foot also of which Exercises such as towel curls, toe taps, picking up marbles with toes etc should be included in the exercise program.<sup>26</sup> Strengthening of the tibialis anterior has also shown to be beneficial in treating PF.<sup>28,29</sup>

#### 3. Activity modification

The vast majority of patients recover without surgery Although the indolent course of this condition is often Frustrating. Patient education into the expectation and duration of treatment from the outset is important. Plantar fasciitis would appear to be an overuse phenomenon and in the first instance avoiding high impact activities seems sensible.

#### 4. Orthotic devices:

Orthotics helps in more permanent effect as compared to taping. It helps to reduce load on plantar fascia while weight bearing as it holds up the medial arch of the foot and reduces direct pressure on plantar fascia. Literature shows that the prefabricated and custom made insoles are equally effective in decreasing the pain.

There have been studies which have shown short term (3 months) effects of orthosis but long term effect has found to be ineffective.<sup>30</sup> Individuals with flat feet, there are options like motion control shoes or better longitudinal arch support have helped to reduce pain due to PF.<sup>31</sup> There has been a study where 14% patients showed improvement in pain by change of shoes<sup>32</sup>. Thus studies have shown that 90%-95% cases of plantar fasciitis resolve within 12-18 months of conservative Treatment<sup>33</sup>. Conservative treatment is the choice of treatment in most of the cases.

#### 5. Short-term non-steroidal anti-inflammatory drug (NSAID) therapy

They are helpful in decreasing both acute pain and swelling thus they decrease the pain temporary but not curatively. No studies were found evaluating the effectiveness of NSAIDS alone as it is a multifaceted approach<sup>34</sup>

#### 6. Night splint use

It is worn at night to hold the patient feet at maximum dorsiflexion with toes in an extension position, creating a constant mild stretch of the plantar fascia. This allows the feet to heal at a functional length, preventing contraction and stiffening of the fascia especially in the morning.

#### 7. Foot wear:

Shoes are also an important part while treating plantar fasciitis. Well fitted shoes are important; if they are ill fitted it may increase pain due to plantar fasciitis. Patient should be advice to avoid barefoot walking especially on hard surfaces. A laced sports shoe is better than an opened sandal and has support and cushioned heels.

#### 8. Immobilization via cast or boot

The walking cast provides rest for heel at heel strike, provide arch support and prevent tightening of the achillis tendon. The patient typically wears the cast for period of 3-4 weeks.

#### 9. Steroid injections

Traditionally, CSI injections are administer to those with chronic heel pain after 3 weeks with no improvement on conservative treatment. It is a good method for short-term pain relief. Cochrane database systematic review, based on 19 published controlled clinical trials of fair or good quality, in which pain improvement was noticed at 1 month, but not after 6 months of the procedure<sup>35</sup>

#### 10. Extracorporeal shock wave therapy

ESWT believe that the shockwaves cause micro disruption of the thickened plantar fascia resulting in an inflammatory response, revascularization and recruitment of growth factors and therefore a soft tissue reparative response.<sup>36</sup> ESWT should perhaps be regarded as an end stage treatment for those patients who have failed conservative measures and are reluctant to have open surgery.<sup>37,38</sup>

#### Operative Treatment

Conservative treatment should be offered and tried for 6 months to 1 year before surgical intervention is considered.

An open or endoscopic release of the plantar fascia remains a common method.

Decompression of the first branch of the lateral plantar nerve can be done along with partial plantar fascia release if suspicion of entrapment of the calcaneal branches of the tibial nerve exists. The success of partial plantar fascia release remains a topic of debate, as some studies show an acceptable success rate<sup>39</sup> whereas others show a long-term patient satisfaction rate after plantar fasciotomy of less than 50%.<sup>40</sup> Because of the high incidence of lateral foot pain and detrimental effects to the stability of the arch, it is recommended that less than 40% of the plantar fascia be released.<sup>41</sup>

A new, less-invasive surgical technique has been described that utilizes bipolar radiofrequency microtenotomy (Topaz Procedure) to treat recalcitrant plantar fasciitis.<sup>42</sup>

## CONCLUSION:

Plantar fasciitis is considered a self limiting condition and diagnosed mainly by clinically and typical history pattern given by patient. It is usually caused by mechanical strain to plantar fascia and short intrinsic muscles of foot. Many treatments available like change of footwear, rest, orthotics, night splints, anti-inflammatory agents, local steroid and surgery. conservative treatment is mostly considered to be treatment of choice in first instance.

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