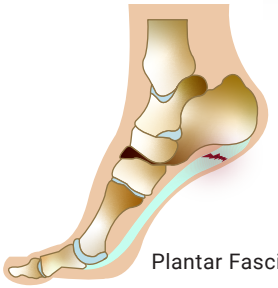
Plantar Fasciitis

Plantar Fascia also known as the plantar aponeurosis is a strong layer of fibrous connective tissue under the superficial tissue and skin of the foot. This fibrous band supports the foot anatomy and helps in transmitting weight and shock absorbtion. The plantar aponeurosis has two layers. Superficial layer helps in reducing shear forces is part of the dermis. The deep layer is more extensive and originates from the calcaneum, divides into 5 strong sections which attach to the metatarsal heads. The plantar fascia helps give form and support to the medial longitudinal arch.


Plantar Fasciitis

Plantar fasciitis is the chronic inflammation of the plantar fascia causing pain over the bottom of the foot, mostly early in the morning when you take your first steps after getting up from bed or after a period of rest or inactivity.

It is most common in age between 45- 65 years, both gender, increases in overweight and obese and is seen in both athletic and sedentary population. Risk factors for injury or degeneration to the fascia are recurrent overload causing microtear of the fascia, shortening of calf muscles, overweight, inactivity, standing for prolonged period of time, deformity of foot, calcaneal/ heel spurs post trauma, foot overpronation and reduced ankle dorsiflexion. Chronic plantar fasciitis leads to balance impairment as a result of biomechanical changes and functional modification adapted by the patient.

Risk Factors For Plantar Fasciitis

Intrinsic Risk Factors		Extrinsic Risk Factors	
Anatomic	Obesity Pes planus (flat feet) Pes cavus (high-arched feet) Shortened Achilles tendon	Environmental	Poor biomechanics or alignment Deconditioning Hard surface Walking barefoot Prolonged weight bearing Inadequate stretching Poor footwear
Biomechanical	Overpronation (inward roll) Limited ankle dorsiflexion Weak intrinsic muscles of the foot Weak plantar flexor muscles		

Diagnosis of plantar fasciitis is made post detailed history and physical examination of the patient. Pain is located at the medial side of the heel. Imaging techniques like X-Ray and MRI to rule out heel spurs. Ultrasonography is helpful in detecting soft-tissue injury. The difference in thickness of (~ 2mm) the plantar fascia from the non-affected limb is diagnostic and is found by ultrasonography or MRI.

As the symtoms of plantar fasciitis are similar to other conditions, the following may need consideration

Differential Diagnosis For Heel Pain

Types	Diagnosis	Common Findings
Neurologic	Tarsal tunnel syndrome: posterior tibial nerve impingement Neuropathy such as from diabetes	Burning sensation in the plantar region worsened by dorsiflexion Paresthesias in plantar region
Skeletal	Acute calcaneal fracture Calcaneal stress fracture Sever disease: calcaneal apophysitis Systemic arthritides such as rheumatoid	Likely after hard landing on heel. Most likely seen in runners Seen in pediatric patients with open physes. Expect pain in multiple joints along with heel
Soft tissue	Fat pad atrophy Fat pad contusion Achilles tendinitis Retrocalcaneal bursitis Posterior tibial tendinitis	More common in elderly people More likely associated with hard landing on heel Posterior calcaneal tenderness and tendon pain Pain in retrocalcaneal bursa Pain along posterior tibial tendon and at insertion mid foot at the arch

Treatment Of Plantar Fasciitis Has Many Approaches

Pharmacological

- NSAIDS, corticosteroids, botulinum toxin are given to deal with the inflammation and pain

Conservative Therapy

- Rest, icing, massage, and stretching are prescribed to relieve from pain and prevent further damage

Physiotherapy

- Stretching exercises for the plantar fascia and the Achilles tendon are performed. Both active and passive stretching exercises are helpful. Active range of motion exercises like the ankle toe movements help the improving the range of motion and retain the benefits of stretching exercise
- Strengthening exercises for intrinsic foot muscles and extrinsic muscles (gastro-soleus and peroneus muscles) using resistance bands, body weight (heel raise exercise) and isometric exercises using towel as resistance. Toe curling exercises, and picking up pebbles or marbles with your toes are other exercises which help in increasing function and strength of the small foot muscles.
- For pain management, therapeutic ultrasound at a dose of 0.7- 1.5 W/cm2 and 1MHz probe at continuous mode for 6 minutes is over the heel is helpful
- Kinesio Taping is also effective in reducing pain and in chronic cases improving balance
- Iontophoresis and Phonophoresis also help in reducing pain and inflammation and can be used in acute conditions

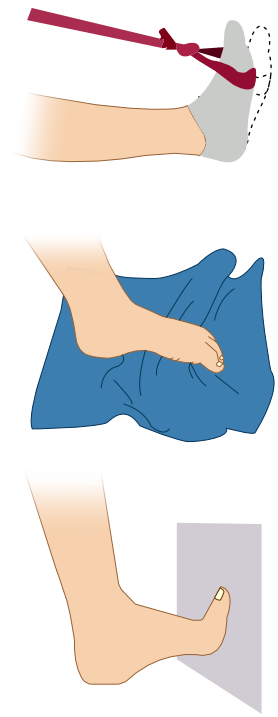
Orthotics

- Prefabricated and custom insoles are widely used for support and management of plantar fasciitis
- Night splints are prescribed to allow constant dorsiflexion position of the ankle
  Examples: Arch support and heelpads are readily supplied orthotics

Surgery

- Extracorporeal shock wave therapy
- Plantar fasciotomy

Foot Exercises



Diagnosis Using Plantar Pressure Measurement

Plantar Fasciitis can cause changes on the plantar pressure distribution. Several changes are noticeable while conducting plantar pressure examinations in Bipedal mode, Stabilometry and Dynamic Gait analysis

- Plantar pressure distribution is impaired in plantar fasciitis. Pain on the hindfoot region on weight-bearing results in reduced heel contact time and pressure over the heel area
- Plantar fasciitis causes higher plantar pressure in both acute and chronic cases
  In acute plantar fasciitis the hindfoot has lower maximum pressure in comparison to chronic cases
- Maximum pressure, pressure time integral, contact time and contact area is evidently raised in plantar fasciitis in compared to controls
- Medial longitudinal arch height is represented by the arch index, and can be predicted by using pedobarography
- Foot pronation predicts increased plantar pressure in patients having plantar fasciitis

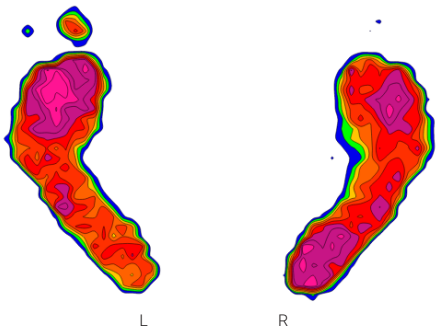


Fig: Plantar pressure distribution of a 28 years old obese female with complaint of heel pain since 3 weeks showing early signs of plantar fasciitis

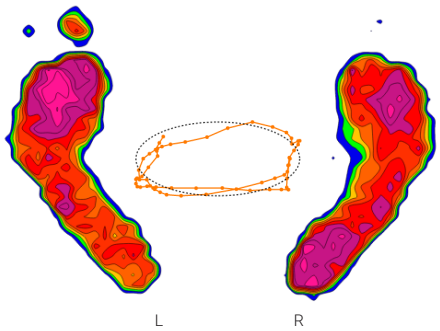


Fig: COP movement on static bipedal stance test on a patient with plantar fasciitis

1. Charles Cole, Craig Seto, And John Gazewood. Plantar Fasciitis: Evidence-Based Review of Diagnosis and Therapy. American Family Physician, volume 72, Number 11 www.aafp.org/afp
2. Geiseane Aguiar Gonçalves, Danilo Harudy Kamonseki, Bruna Reclusa Martinez, Maythe Amaral Nascimento, Império Lombardi Junior, Liu Chiao Yi. Static, Dynamic Balance And Functional Performance In Subjects With And Without Plantar Fasciitis– 2017, SciEco Brazil.
3. Veena Kirthika. S, Selvaraj Sudhakar, Padmanabhan K, Mohan Kumar G., Senthil Kumar N., Vijayakumar M, Bharaneedharan T. Effectiveness of Kinesio Taping on Balance and Functional Performance in Subjects with Plantar Fasciitis. Research Journal of Pharmacy and Technology. 11 (10) 2018, 0974-360X
4. Ana Paula Ribeiro, Silvia M.A Joao, Roberto Dianto, Vitor Tessutti. Dynamic Patterns of Forces and Loading Rate in Runners with Plantar Fasciitis: A cross- sectional study. PLOS ONE, 2015; Doi: 10.1371/journal.pone.0136971
5. Erica Bartolo, Cynthia Formosa and Alfred Gatt. The Relationship Between Plantar Fasciitis and Plantar Heel Pressure. European Journal of Podiatry, 2017; 3(1): 1-7; http://dx.doi.org/10.17979/ejpod.2017.3.1.1741
6. Ribeiro AP, Sacco ICN, Dinato RC, João SMA. Relationships between static foot alignment and dynamic plantar loads in runners with acute and chronic stages of plantar fasciitis: a cross-sectional study. Braz J Phys Ther. http://dx.-doi.org/10.1590/bjpt-rbf.2014.0136

KAN INNOVATIONS PVT. LTD.
B-2, Shri Gajanan CHS,
Lt Dilip Gupte Rd, Mahim, Mumbai 400016. INDIA