

THE PLANTAR FASCIA: WHAT IT IS AND WHAT IT DOES

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The plantar fascia is a sheet-like 'aponeurosis' of pearly-white connective tissue situated deep to the skin and fat layers in the plantar foot.

The plantar fascia is formed in three main tracts or portions, all of which originate from the medial tubercle of the calcaneum. The lateral tract runs to the base, then the head of the 5th metatarsal and the proximal phalanx of the 5th digit. The medial tract is the thinnest of the fascial tracts, covering the Abductor hallucis and inserting into the proximal phalanx of the hallux. The central tract, 2-3mm thick is much the strongest structure, dividing into five bands at the midpoint of the foot, each band inserting into the proximal phalanx of each digit. All tracts put fibres into the flexor sheaths of the digits and the transverse ligament.

The plantar fascia has great tensile strength and only limited elasticity. A skeletal foot without a plantar fascia might elongate by as much as 10%. In cadavers, the fascial elongation has been measured as 4% (Wright & Rennels 1964), but *in vivo* the extension is limited to less than 2% (Benedict & Walker 1968).

The plantar fascia holds the forefoot to the rearfoot, behaving as a tie-bar to control the elongation of the foot that occurs on loading of the medial longitudinal arch. The ape foot lacks the central band of plantar fascia so that body weight on the heel is transmitted along the lateral foot and leaves by the 3rd and 4th toes – the midtarsal joint is also allowed to dorsiflex, whereas in humans the midtarsal joint remains plantarflexed. In the human, the medial arch is maintained so that laterally carried weight can be transferred to the medial foot and toe off occurs from the hallux and 2nd toe. This extends the stride and allows smooth, efficient and elegant bipedal gait.

Hicks (1954) described the action of the plantar fascia around the metatarsal heads as a 'windlass mechanism', the fascia drawing the heel towards the forefoot, thus shortening the foot, inverting the heel and externally rotating the tibia. Winding the windlass raises the medial arch, close-packing the bones of the tarsus and stabilising the foot when standing on the forefoot or toes. First ray plantarflexion is promoted, allowing free dorsiflexion of the hallux for unfettered 1st MPJ function.

Hyperpronation causes tension of the plantar fascia, as does obesity and long periods of standing. Certain occupations – particularly those that entail working on floors or low skirting boards where the toes are tucked under the foot (for instance, painters and decorators, electricians) – predispose to the development of plantar fasciopathies.

Excessive tension on the origin of the plantar fascia may induce an enthesiopathy where the fascia attaches to the periosteum of the medial tubercle of the calcaneum. Some fibres may become strained, or actually break. Inflammation is set up and pain is felt in the centre of the heel when the foot is loaded, especially at first load after resting, so central heel pain on first loading is diagnostic of *plantar fasciitis*. This is an acute condition where treatment aims at relieving the tension and reducing the inflammation.

Further or more extensive trauma may cause splitting, tearing or degeneration of the plantar fascia and the condition becomes chronic – *plantar fasciosis* – for which measures such as Extra-corporeal Shockwave Therapy (ESWT) and surgery may be deemed necessary.

Distally, the plantar fascia attaches to the bases of the proximal phalanges and the distal metatarsal shafts to form a *plantar plate* beneath the metatarsal heads. This plate prevents the metatarsal heads from protruding through the plantar surface, supporting and aligning the metatarsals and the metatarsophalangeal joints. Rupture of the plantar plate allows the metatarsal head to lose alignment, with attendant damage to the MPJ capsules. The result may be anything from MPJ disruption, capsulitis, bursitis, tendonitis, toe misalignments, retractions or generalised metatarsalgia.

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Your responses should be submitted on A4 paper and should be of sufficient length to demonstrate your understanding of the topic. Each answer requires a short essay (typically 500 words or 1/2 page A4).

Task 1

Describe the central portion of the plantar fascia in terms of its extent and attachments.

Task 2

Explain the functions of the plantar fascia and how the properties of the plantar fascia relate to those functions.

Task 3

How would you diagnose plantar fasciitis, and how, as a practitioner, would you differentiate plantar fasciitis from plantar fasciosis?

Task 4

Discuss the treatment strategies that might be employed in the treatment of plantar fasciitis.

Task 5

How is the plantar plate formed, what is its function, and what is its significance in forefoot pathologies?

Please sign the following declaration and submit it with your response:

"I certify that the work that I have submitted is my own original work, and that any previous work that I have drawn upon has been given due credit by showing reference to that work"

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