

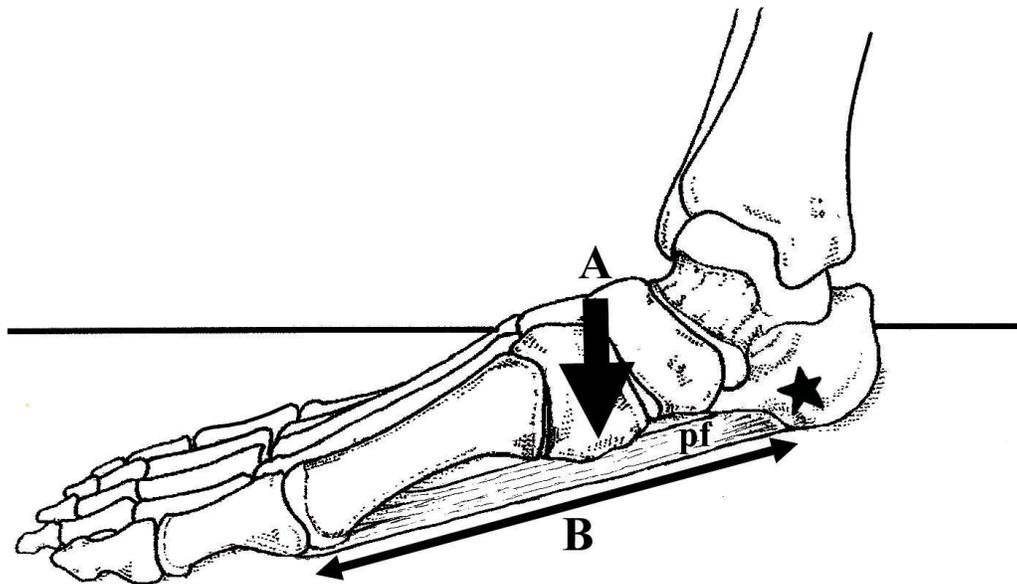
# New Techniques for Treating Plantar Fasciitis

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Plantar fasciitis is the most common cause of heel pain in runners, eventually affecting 10% of the running community (1). While running, the plantar fascia works with the Achilles tendon to store and return energy. Because of its powerful attachment to the base of the toe, the plantar fascia stabilizes the inner forefoot as forces peak during pushoff. Unlike bone spurs and stress fractures of the heel, plantar fasciitis tends to produce pain during the pushoff phase while running, not during initial contact. A simple way to tell if you have plantar fasciitis versus a heel spur/stress fracture is to walk on your toes: heel spurs and heel stress fractures feel better while you walk on your toes, while plantar fasciitis typically produces more discomfort when you shift your weight onto your toes.

Although plantar fasciitis may result from a variety of factors, such as repeat hill workouts and/or tight calves, many sports specialists claim the most common cause for plantar fasciitis is fallen arches. The theory is that excessive lowering of the arch in flat-footed runners increases tension in the plantar fascia and overloads the attachment of the plantar fascia on the heel bone (i.e., the calcaneus) (Fig. 1). Over time, the repeated pulling of the plantar fascia associated with excessive arch lowering is thought to lead to chronic pain and inflammation at the plantar fascia's attachment to the heel. In fact, the increased tension on the heel was believed to be so great that it was thought to eventually result in the formation of a heel spur.

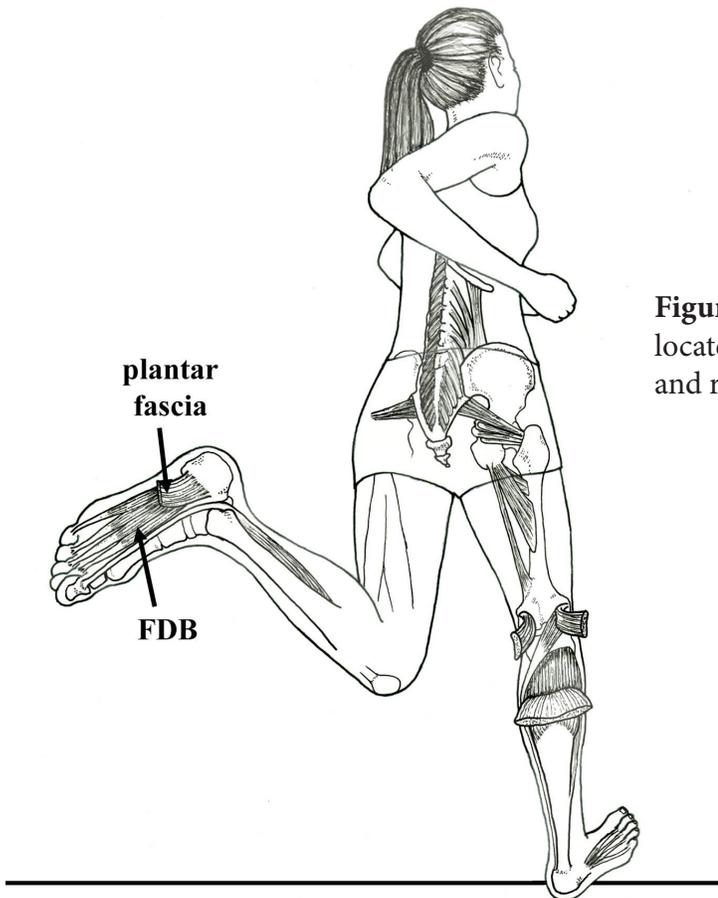


**Figure 1.** The plantar fascia (pf) is a thick fibrous band located along the bottom of the foot. Excessive lowering of the arch (A) is believed to increase tension in the plantar fascia (arrow B), producing heel pain by pulling on the plantar fascia's attachment (star).

While the connection between low arches, increased plantar fascial tension, and the development of heel spurs is generally accepted in the medical community, recent research proves that the plantar fascia is not responsible for the formation of heel spurs. A detailed study of 22 heel bones with spurs revealed that bone spurs form at the origin of a small muscle that goes to the toes (the flexor digitorum brevis muscle), not the plantar fascia (2) (Fig. 2).

This research emphasizes the important interactions occurring between the plantar fascia and the flexor digitorum brevis muscle (FDB): the plantar fascia functions passively to store and return energy, while the FDB muscle plays a more dynamic role in “variable load sharing.” Apparently, when tension in the plantar fascia gets too high (runners routinely expose the plantar fascia to up to 7 times body weight during the push-off phase), the FDB muscle tenses to distribute pressure away from the overworked plantar fascia. Some interesting research

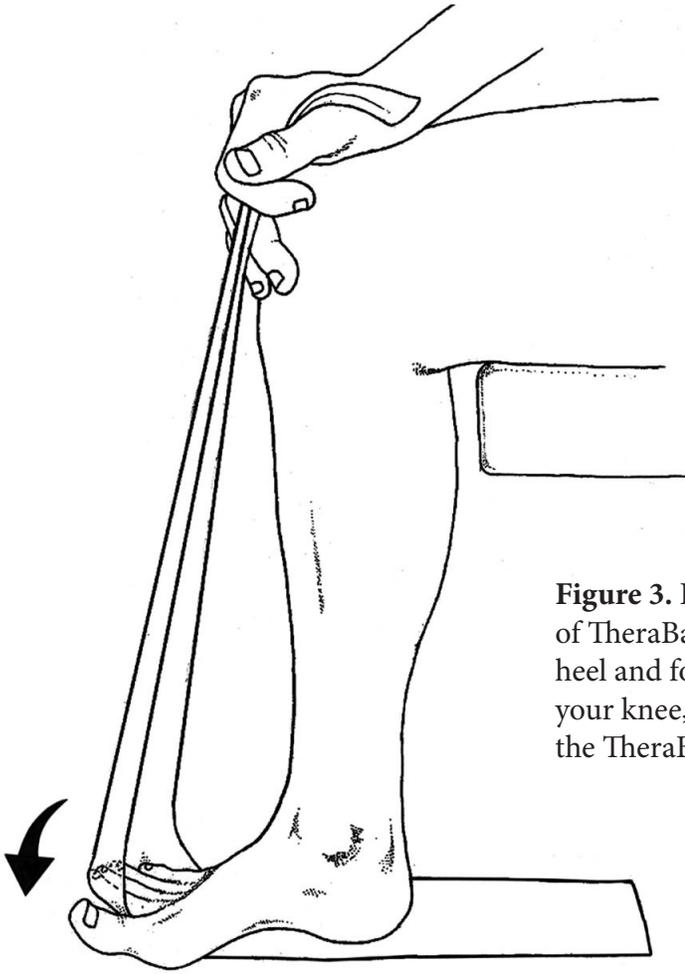
confirms that the best predictor of the development of plantar fasciitis is not the height of the arch, but the speed in which the toes move upward during the propulsive period (which occurs when the FDB is weak) (3).



**Figure 2.** The flexor digitorum brevis muscle (FDB) is located beneath the plantar fascia, which has been cut and reflected.

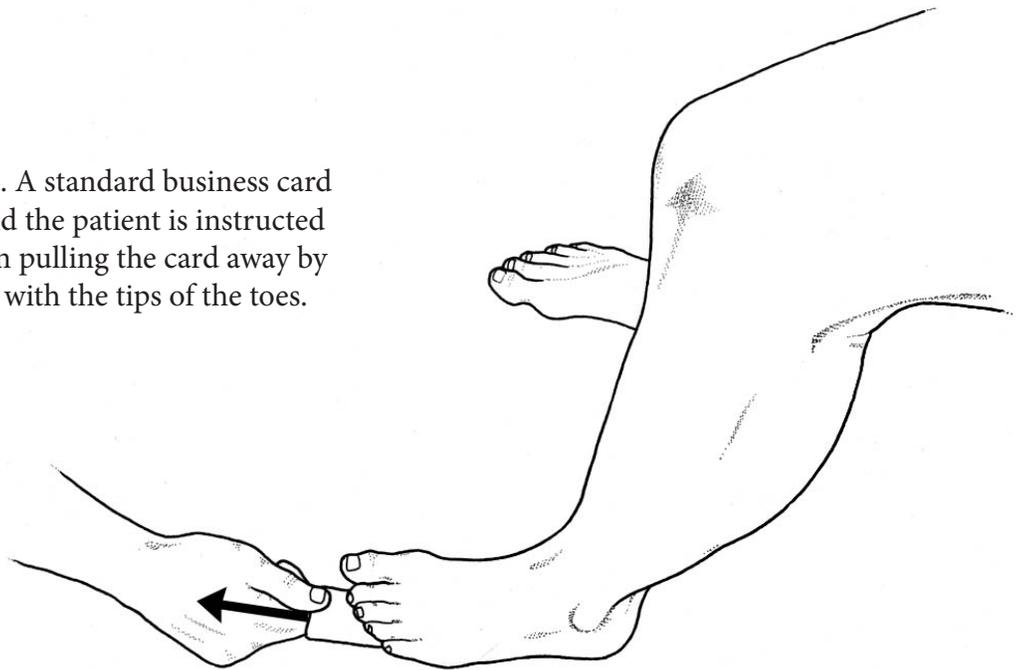
Because FDB plays an important role in distributing pressure away from the plantar fascia, successful treatment of plantar fasciitis almost always involves strengthening the FDB (Fig. 3). I recommend that runners with weak FDBs perform 4 sets of 40 repetitions daily. As you get stronger, you can gradually increase the resistance provided by the band.

The easiest way to determine if you need to perform this exercise is to look at the insoles of your running shoes: runners with strong FDBs have clear indents beneath their little toes. An alternate method to evaluate FDB strength is with the paper grip test. To do this test, sit in a chair with your hips, knees, and ankles positioned at 90° angles. Have a friend place a standard business card beneath your second through fifth toes while you try to stop the card from being pulled away by pushing down with the tips of your toes (Fig. 4). When flexor digitorum brevis is strong, your friend will have difficulty pulling the card out from beneath your toes. Conversely, runners with a weak FDB are surprised by how little force is needed to pull the card away. The paper grip test has been proven to reliably identify toe weakness (4).

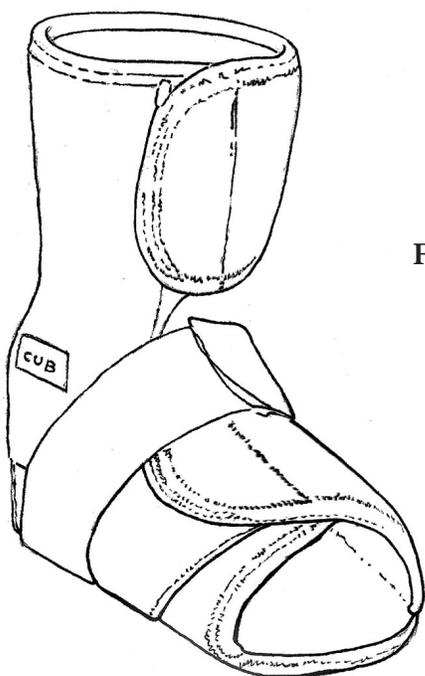


**Figure 3.** Flexor digitorum longus home exercise. Place a flat piece of TheraBand on the floor beneath your foot. Stabilize it with the heel and forefoot and pull the opposite end of the TheraBand to your knee, thereby lifting your toes. While maintaining tension on the TheraBand, force the toes downward (**arrow**).

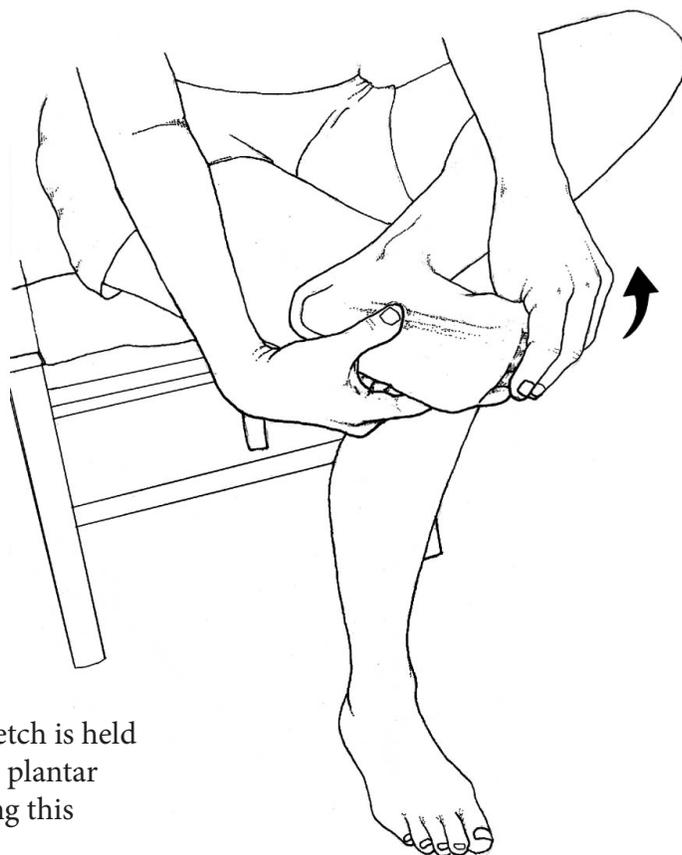
**Figure 4.** The paper grip test. A standard business card is placed beneath the toes and the patient is instructed to prevent the examiner from pulling the card away by vigorously grasping the card with the tips of the toes.



In addition to strengthening the toe muscles, chronic plantar fasciitis often responds well to the use of night braces to lengthen the calf muscles. As demonstrated in several studies, excessive calf tightness causes a premature lifting of the heel, which loads the plantar fascia excessively. As a result, maintaining calf flexibility is necessary to effectively manage chronic plantar fasciitis. The easiest way to do this is with a night brace (Fig. 5). I've noticed that runners who complain of significant morning pain tend to do the best with night braces. Because soft tissues immobilized in a lengthened position heal quicker (5), I recommend placing a small rolled-up washcloth beneath the toes while wearing the night brace. The added cloth should not produce discomfort. Besides stretching the calf, it is also important to stretch the plantar fascia. As demonstrated in a paper published in the Journal of Bone and Joint Surgery (6), an effective treatment for plantar fasciitis is to sit in a figure 4 position and pull your big toe back for 10 seconds (Fig. 6). This stretch is repeated 30 times per day. Compared to conventional treatments for plantar fasciitis, routinely stretching the big toe was associated with significantly better outcomes.

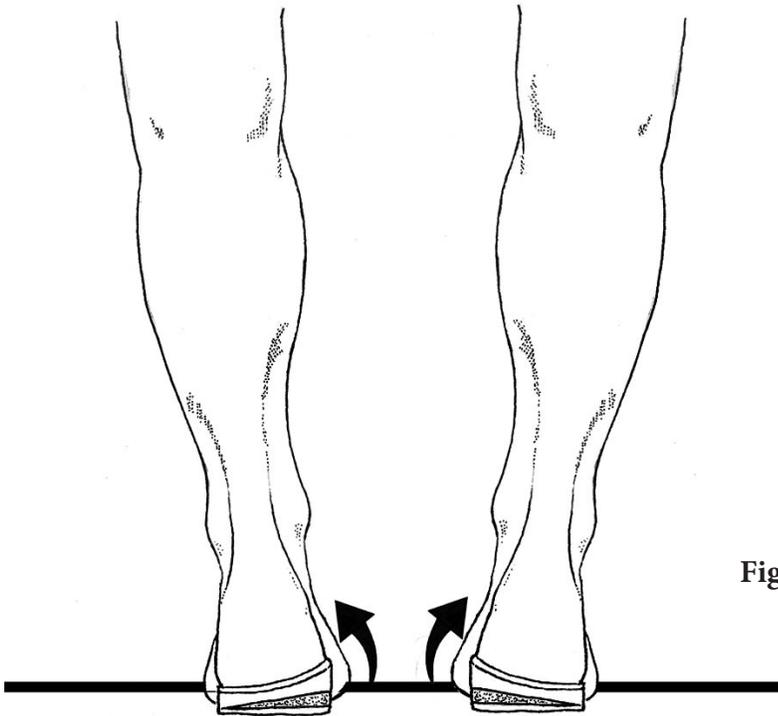


**Figure 5.** The plantar fascial night brace.



**Figure 6.** The plantar fascia home stretch. The stretch is held for 10 seconds and repeated 30 times per day. The plantar fascia should be lightly massaged while performing this stretch.

Another simple trick for managing plantar fasciitis is to place an angled wedge beneath the inner heel (Fig. 7). By surgically inserting strain gauges inside the plantar fascias of cadavers, researchers from the Orthopedic Bioengineering Research Laboratory in Illinois (7) noted that a small angled wedge placed beneath the inner heel significantly reduced plantar fascial strain when the foot was loaded to full body weight. Medial or varus wedges are available online and can be placed beneath the insole of your running shoe.



**Figure 7.** Varus posts elevate the inner heels.

Because the plantar fascia has the greatest stress on it during the propulsive period while running, runners with plantar fasciitis should avoid making initial ground contact with their mid or forefoot, since these strike patterns significantly increase tension in the plantar fascia. Almost always, a heel-first strike pattern is the preferred contact point and you should avoid running hills until the plantar fascial injury has resolved. It is also important to reduce your stride length and increase your cadence while waiting for the plantar fascial injury to resolve. While minimalist shoes can strengthen the arch and increase tone in the FDB muscle, they should be worn with caution in the early stages of managing chronic plantar fasciitis. In fact, transitioning into minimalist footwear too quickly is a common cause for plantar fascial injuries in runners. This is especially true for runners with tight calves.

Lastly, corticosteroid injections should almost always be avoided, since these injections increase the risk of rupturing the plantar fascia and/or damaging the heel's protective fat pad. Because surgery to cut the plantar fascia results in a gradual destruction of the medial arch (the plantar fascia is an important stabilizer of the arch and when it is surgically cut, the arch eventually collapses), surgical intervention should always be a last resort. Rather than cutting or injecting the plantar fascia with drugs that weaken connective tissue, an effective alternative is to perform deep tissue massage to the arch and calf. The efficacy of manual therapies for lessening plantar heel pain was proven in a randomized controlled trial in which the addition of trigger point massage to a conventional self-stretching protocol produced superior short-term outcomes compared to stretching alone (8). For the unfortunate runners who don't respond to conventional interventions, I've seen excellent outcomes with extracorporeal shock wave therapy (ECSWT). This intervention can be performed in-office by many sports podiatrists and unlike cortisone, it is theorized to stimulate repair and accelerate healing. Fortunately, the vast majority of runners respond favorably to less expensive interventions that can be done at home.

## References:

1. DeMaio M, Paine R, Mangine RE, Drez DJr. Plantar fasciitis. *Orthopedics* 1993; 16:1153-1163.
2. Abreu M, Chung C, Mendes L, et al. Plantar calcaneal enthesophytes: new observations regarding sites of origin based on radiographic, MR imaging, anatomic, and paleopathologic analysis. *Skeletal Radiol.* 2003;32:13-21.
3. Wearing S, Smeathers J, Yates B, et al. Sagittal movement of the medial longitudinal arch is unchanged in plantar fasciitis. *Med Sci Sports Exerc.* 2004;36:1761- 1767.
4. Menz H, Zammit G, Munteanu S, Scott G. Plantarflexion strength of the toes: age and gender differences and evaluation of a clinical screening test. *Foot Ankle Int.* 2006; 27:1103-1108.
5. Booth F. Time course of muscular atrophy during immobilization of hindlimbs in rats. *J Appl Physiol.* 1977; 43:656-661.
6. DiGiovanni B, Nawoczenski D, Lintal M, et al. Tissue-specific plantar fascia-stretching exercise enhances outcomes in patients with chronic heel pain. A prospective, randomized study. *J Bone Joint Surg.* 2003;85-A:1270–1277.
7. Kogler G, Veer F, Solomonidis S, Paul J. The influence of medial and lateral placement of orthotic wedges on loading of the plantar aponeurosis. *J Bone Joint Surg Am.* 1999;81:1403-13.
8. Renan-Ordine R, Albuquerque-Sendin F, Rodrigues De Souza D, et al. Effectiveness of myofascial trigger point manual therapy combined with a self-stretching protocol for the management of plantar heel pain: a randomized controlled trial. *J Orthop Sports Phys Ther.* 2011;41:43.