

Plantar Fasciitis, an Overview of Causes and Treatment Options

by Olivier D'hose, LMP

Quite often clients come to my office with intense, stabbing pain in one or both feet. The pain is generally located by the heel, is more pronounced in the morning or after a long period of inactivity (such as sitting) and sometimes diminishes during exercise. There is also a decrease in dorsiflexion of the ankle, clients having difficulty bending the foot 'upward' so that the toes are closer to the shin.

All these symptoms may point to a very common condition: Plantar Fasciitis.

Plantar Fasciitis is the inflammation of the plantar fascia and affects millions of Americans every year. It seems most common between the ages of 40 and 60, affects women more often than men, and is often linked to certain types of activities and occupations that place a lot of stress on the feet and heels (such as long-distance runners, teachers and wait staff for example).

A little anatomy and physiology lesson:

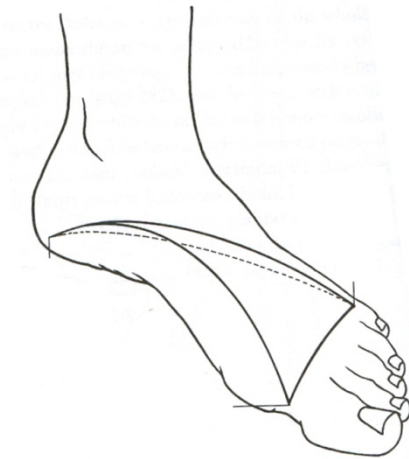


Figure 1 - Arches of the foot

Technically, the plantar fascia is a dense band of connective tissue (or an aponeurosis) running from the calcaneus (the large bone of the heel) to the base of each toe (or more accurately to the proximal phalanx of each toe). To understand the role of the plantar fascia, it is important to understand the physiology of the foot. The foot supports the weight of the body and distributes it to the ground. The foot does not rest flat on the ground. To allow for better flexibility, shock absorption and weight distribution, the structural arrangement of bones, ligaments and tendons of the foot results in three arches, two longitudinal arches running one from the heel to big toe (the medial arch) and the other from the heel to the fifth toe (the lateral arch) and a transverse arch (see figure 1). These arches create a vault, distributing the weight of the body on three distinct points, the

heel at the back and the edges of the ball of the foot at the front.

The plantar fascia is essentially a tension cable between the heels and the toes and is critical in the structural integrity of the longitudinal arches. When standing, the plantar fascia helps maintain the foot's vault. When in movement, the foot becomes essentially a stiff springⁱⁱ as the muscles acting on it become taut. The plantar fascia acts as a recoil spring, preventing the toes from hyperextending and offering some support for a forward thrust, like starting blocks for a track and field sprinter.

To complete the picture, we need to add the Achilles tendon. In a Structural Integration bodyworker's view of the world, the plantar fascia is understood as being continuous (by means of the periosteum, the membrane surrounding the bone of the heel) with the Achilles tendon and

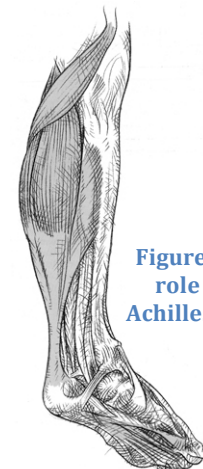


Figure 2 - The role of the Achilles tendon

its associated muscles in the calfⁱⁱⁱ, namely the gastrocnemius and the soleus. These powerful muscles are responsible for plantarflexion of the ankle or pointing the foot (and therefore the toes) 'down'.

Plantar Fasciitis occurs when excessive tension is placed on the plantar fascia, leading to repetitive stretching and eventually micro tearing (and beyond). This irritation or inflammation often happens at the junction between the fascia and the periosteum of the heel bone, the calcaneus, where the tension on the tissue is the highest.

Bones are surrounded by a layer of connective tissue called the periosteum. This membrane is interwoven with the different tendons and ligaments, providing the anchor for muscles or other bones and in this case the plantar fascia. When the plantar fascia is under abnormal stress, it may cause the periosteum to be pulled away from the bone. This pocket created between the membrane and the bone itself is then filled with mineral matter producing a bone spur, commonly referred to in this case as heel spurs. It is also interesting to note that the periosteum is one of the most pain sensitive tissues in the body^{iv}.

Causes and aggravating factors:

Plantar Fasciitis used to be an ailment known primarily by athletes such as runners and dancers. The symptoms often occur after a major or rapid adjustment to a training program, due to overtraining or poor technique^v.

With the amount of stress exerted on the feet by everyday activities, it is easy to consider the primary cause of Plantar Fasciitis as an overuse or repetitive stress injury for non-athletes as well. While this is not an incorrect theory, it is a bit simplistic. The human body's anatomy has evolved to respond to the demands of our lives. If anything, activities of daily living have become more sedentary than before, putting less stress on our feet. So why the increase in Plantar Fasciitis in non-athlete populations?

From a biomechanical point-of-view, a major cause of Plantar Fasciitis is an over-pronation of the foot. Pronation is a natural movement of the ankle. It is the action of rolling the body's weight to the inside of the foot, along the medial longitudinal arch. Think of it as collapsing your ankle towards the midline of the body or inward.

Two major factors contribute to over-pronating the foot; compromised foot arches and shortened calf muscles.

Footwear providing inadequate arch support is a common predisposing factor for Plantar Fasciitis. The worse culprit is probably long walks in flip flops. People sometime argue that many populations travel very long distances on foot with almost no shoes without problems. While this is true, it needs to be pointed out that these populations rarely walk primarily on surfaces as hard as concrete or stone and have been walking without shoes for most of their lives, especially during their early childhood years when so much of the biomechanical structure of the feet are shaped by their first steps. People with no arches (flat feet or pes planus) and people with really high arches (pes clavus) are particularly at risk of developing Plantar Fasciitis when wearing footwear with inadequate support.

Chronic shortened calf muscles (i.e. gastrocnemius and soleus) are increasingly common in our society. They are a result of keeping the foot pointed down repetitively or for long period at a time (such as wearing high-heels, driving, or in activities like running and

dancing) which creates tension on the calcaneus (heel bone) by way of the Achilles tendon. This also increases the tension in the plantar fascia.

It is interesting to note that a sudden weight gain (in pregnancy, for example) increases the tension on the plantar fascia and therefore the risk of Plantar Fasciitis.

If not treated, plantar fasciitis will change the way an individual distributes their weight on their feet and their walking motion. This in turn may lead to knee, hip and low back problems.

What to do to help prevent Plantar Fasciitis?

First and foremost, wear appropriate footwear for the activity you engage in. Proper cushioning and adequate arch support is particularly important if you are going to walk or stand for long period at a time. Walking barefoot is a good way to strengthen the muscles, providing the tensile strength supporting arches in the feet, but should be undertaken if not in moderation, with great awareness of your feet and body's strength and weaknesses.

If you are a runner, remember to change your shoes regularly (about every 500 miles or so). Running shoes lose their support and cushioning as they age. Also, buy a pair that provides the adequate support for your foot type. Specialized shoe stores can help to determine this.

If you wear high heels, remember to stretch your calf muscles every day and switch shoes with more support as soon as possible. Going from high heels to barefoot can be very hard on the calf muscles and plantar fascia.

Stretch your calf muscles regularly, especially the deeper soleus muscle. Ask your massage therapist or personal trainer for the best stretching techniques. Also, consult Bob Anderson's excellent resource book on stretching^{vi}.

If you are participating in an athletic event such as a long running event, using proper foot support in addition to stretching before and after the event is critical. Athletic taping can help provide additional support for the race.

How to help the healing of Plantar Fasciitis?

First, to help minimize the pain in the morning, take a few minutes to heat up the bottom of the foot and the muscles in the calf by massaging the area before the first step of the day. A hot water bottle will help with this too.

Avoid walking barefoot while the plantar fasciitis pain persists. Having adequate arch support at all times helps relieve tension on the plantar fascia. Note that most slippers don't qualify as adequate support footwear.

Control the inflammation by using natural anti-inflammatory creams and ointments such as arnica-based creams or castor oil. Taking non-steroidal anti-inflammatory drugs under the supervision of your primary care physician may ease the pain but will not treat the underlying problem. Also, hydrotherapy techniques such as contrast therapy (alternating heat and ice) are a great way to reduce the inflammation. Talk to your massage therapist about the best way to perform this technique.

Identify which activities create the highest stress on your feet and wear different footwear at those times. It is important to allow for complete recovery before returning to the previous footwear, if ever!

Stretch your calf muscles, in particular gastrocnemius and soleus as often and as completely as possible. Here again, work with a knowledgeable bodyworker or personal trainer for the best way to stretch without creating further injury.

Athletic taping can also provide additional support for the arches and help reduce the tension on the plantar fascia.

Therapeutic massage such as orthopedic massage and myofascial massage can dramatically speed up the recovery process. More aggressive types of bodywork can also be applied to treat heel spurs quite effectively.

In more extreme cases, you may be advised to wear night splints fitted to your calf and foot while you sleep. These are designed to keep the plantar fascia and Achilles tendon in their normal resting length and help relieve the tension on the tissue. Additionally, a corticosteroids injection might be delivered to the area to help relieve the pain. In extremely rare cases, surgery may be performed to detach the plantar fascia from the heel. This procedure is a last resort as it will compromise the biomechanical integrity of the foot and create other problems.

Conclusions

Plantar Fasciitis is a common ailment in athletic and increasingly non-athletic populations. It is an inflammation of the plantar fascia due to improper biomechanical tension on the feet. While very painful, it is preventable and highly treatable through proper stretching, adequate footwear and of course, regular massage 😊!

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ⁱ Plantar fasciitis by Mayo Clinic Staff - <http://www.mayoclinic.com/health/plantar-fasciitis/DS00508>

ⁱⁱ Whitney W. Lowe - "Orthopedic Massage - Theory and technique" - Mosby Elsevier, 2003 - page 86

ⁱⁱⁱ Thomas W. Myers - "Anatomy Trains" - Churchill Livingstone, 2001, page 67

^{iv} Whitney W. Lowe - "Orthopedic Massage - Theory and technique" - Mosby Elsevier, 2003 - page 87

^v Fiona Rattray, Linda Ludwig - "Clinical Massage Therapy" - Talus, 2000 - page 418

^{vi} Bob Anderson - "Stretching" - Shelter, 2000

Figure 1: Foot arches, reproduced from "Anatomy of Movement" by Blandine Calais-Germain - Eastland Press, 1993

Figure 2: Muscle of the calf in relation to the plantar fascia, reproduced from "Anatomy Trains" by Thomas W. Myers - Churchill Livingstone, 2001.