

# Plantar fasciitis

## Treatment

### 1 Neural (tibial nerve) mobilisations



Figure 18-8.



Figure 18-9.

The tibial nerve (L4,5; S1 to S3) is brought under tension with the addition of **ankle dorsiflexion**. This is because its terminal branches, the medial and lateral plantar nerves, course along the plantar surface of the foot and are therefore stretched by dorsiflexing the ankle. **In addition** to hip **flexion, knee extension, and ankle dorsiflexion**, the tibial tract can be further sensitized **by everting the ankle, extending the toes, and stretching the plantar fascia (Figure 18-9)**. Butler states that **ankle dorsiflexion may be added first and then the limb lifted**, or performed at the limit of the SLR. The tibial nerve forms the largest component of the sciatic nerve in the thigh. Inferiorly, it descends through the popliteal space, passing between the heads of the gastrocnemius muscle to the dorsum of the leg, as the posterior tibial nerve, and into the ankle and foot. As the posterior tibial nerve traverses under the flexor retinaculum at the tarsal tunnel, it is subject to possible compression (ie, tarsal tunnel syndrome). As mentioned above, it then divides into the medial and lateral plantar nerves, which supply sensation to the sole of the foot and toes as well as supplying sensation to the foot joints and efferent

fibers to the small muscles of the foot. When adverse neural tension is present, neural mobilization is gently performed for 30 to 60 seconds.

## 2 Stretches

### a- Hamstrings

To carry out this stretch, stand with your weight on your left foot and place your right heel on a table or bench at or near waist height. Face straight forward with your upper body and keep both legs nearly straight. As you stand with your right heel on the table and your left foot on the ground, rotate your left foot outward (to the left) approximately 45 degrees, keeping your body weight on the full surface of your left foot (both heel and toes are in contact with the ground). You are now ready to begin the stretch.

Lean forward with your navel and shoulders until you feel a steady tension (stretch) in the hamstring of your right leg. Don't increase the stretch to the point of pain or severe discomfort, but do maintain an extensive stretch in your right hamstring while simultaneously rotating your right knee in a clockwise - and then counter-clockwise - direction for 20 repetitions. As you move the right leg in the clockwise and counter-clockwise directions, stay relaxed and keep your movements slow and under control. After the 20 reps, remove your right leg from the table and rest for a moment.

Then, lift your right leg up on to the table and repeat this clockwise and counter-clockwise stretch of the right hamstring, but this time keep the left (support) foot rotated inward (to the right) approximately 10 degrees as you carry out the appropriate movements. Perform 20 repetitions (clockwise and counter-clockwise) before resting.

Finally, repeat this entire sequence of stretches, but this time have the right foot in support and the left foot on the table for the repetitions (do 20 clockwise and counter-clockwise reps with the left foot on the table and the right [support] foot turned out 45 degrees, and 20 more reps with the right foot turned in).

Why is this stretch valuable? Tight hamstring muscles (which cross both the knee and hip joints on the back of the leg) can lead to limited extension and exaggerated flexion of the knee during the running stride (they tend to pull the lower part of the leg backward). This over-flexion at the knee actually increases the amount of dorsiflexion at the ankle during the landing phase of the running stride. (Remember that the entire leg functions as a kinetic chain; change one thing, in this case hamstring flexibility, and that

change will 'ripple' right down the leg to the ankle joint.) Increased flexion of the ankle creates an inordinate amount of stress on the Achilles tendon (the Achilles tendon's job during running is to control dorsiflexion of the ankle), which in turn pulls on the heel bone (calcaneus) and plantar fascia. The rotational hamstring stretch ensures that hamstring flexibility is developed in the transverse (rotatory) plane as well as the sagittal plane. The hamstrings undergo movement stresses in both of these planes during the running motion and therefore must have flexibility in both planes to avoid overstressing the plantar fasciae.

## b- Achilles

To carry out this stretching manoeuvre, stand with your feet hip width apart and your left foot in a somewhat forward position compared to your right foot (it should be about six to ten inches ahead). Shift most of your weight forward onto your left leg and bend your left knee while keeping your left foot flat on the ground. Your right foot should make contact with the ground only with the toes. You are now ready to begin the stretch.

Move your left knee slowly and deliberately to the left. As you do so, also attempt to 'point' the knee in a somewhat lateral direction. You should be able to feel this side-to-side and rotational action at the knee creating a rotational action in your left Achilles tendon. Bring the knee back to a straight-ahead position, and then move it toward the right. As you move the left knee to the right, again rotate the knee somewhat, this time to the right, creating more rotation at the Achilles tendon. When you bring the left knee back to the straight-ahead position, you have completed one rep (you should perform 20 total repetitions). Make sure that you keep most of your weight on the left leg while performing this exercise. Repeat the entire action described above for 20 reps, but this time with your right leg bearing your body weight and doing the side-to-side and rotational movements.

What is the value of this stretch? The Achilles tendon (also known as the heel cord) inserts directly into the heel bone on the back of the foot. The plantar fascia is attached to the heel bone on the underside (sole) of the foot. During the running stride each component of the body's support system (hip, thigh, lower leg and foot) is responsible for controlling and dissipating a portion of the impact force associated with landing. Insufficient flexibility in the Achilles tendon during the landing phase can lead to overstress of the plantar fascia, since the plantar fascia must then do more than its 'fair share' of the work as the body moves over the foot while the foot is on the ground (a

tight Achilles tendon tends to throw the foot forward onto the plantar fascia as impact is made with the ground, magnifying the stress on the plantar fascia). The frontal-plane and rotational movement of the knee during the tri-plane Achilles stretch forces the Achilles tendon to undergo rotation, and this rotational component of the stretch ensures that Achilles flexibility is developed in the transverse (rotatory) plane as well as the sagittal plane. The Achilles tendons, like the hamstrings, undergo movement stresses in both of these planes during running.

## c- Plantar Fasciia

Stand barefoot, with your feet hip-width apart and with your left foot in a slightly forward position - two to three inches ahead of your right foot. The bottoms of the toes of your left foot should be in contact with a wall in front of you (the wall should be creating a forced dorsiflexion of the toes, so that the sole of the left foot is on the ground but the toes are on the wall), and your left knee should be bent slightly. Keep your weight evenly distributed between your right and left foot to start the exercise (see note below). You are now ready to begin the stretch.

Slowly rotate your left foot to the inside (pronation) so that most of the weight is supported by the 'big-toe side' of the foot. Then, slowly rotate your left foot to the outside (supination), shifting the weight to the 'little-toe side' of your foot. Repeat this overall movement for a total of 15 repetitions.

Next, simply repeat the above sequence with your right foot. Note: As you become more comfortable with this exercise, gradually shift more of your weight forward onto the forward, 'stretched' foot and ankle. This shift in weight will increase the intensity of the stretch.

What is the value of this stretch? The plantar fascia runs the length of the foot from the heel bone (calcaneus) to the toes. During a running stride, the plantar fascia undergoes a rather sudden lengthening and then shortening during the landing phase - much like a rubber band that is suddenly stretched and then allowed to shorten. This 'elastic' event requires the plantar fascia to be sufficiently supple and strong to handle such stress without breaking down. Insufficient elasticity in the plantar fascia combined with the tendency to over-pronate (which puts extra stretch on the plantar fascia) is a nearly foolproof formula for pf problems. This plantar fascia stretch utilises both rotational and sagittal (front-to-back) stretching in order to develop flexibility in both the transverse and sagittal planes - the primary planes in which the structures of the foot

and lower leg function during running. Regular use of this stretch helps the plantar fascia better withstand the key twisting and lengthening forces which are placed on it.

## 3 Strengthening

### a- toe walking

Stand barefoot as tall as you can on your toes. Balance for a moment and then begin walking forward with slow, small steps (take one step every one to two seconds, with each step being about 10 to 12 inches in length). As you do this, maintain a tall, balanced posture. Be sure to dorsiflex the ankle and toes of the free (moving-ahead) leg upward as high as you can with each step, while maintaining your balance on the toes and ball of the support foot. Walk a distance of 20 metres for a total of three sets, with a short break in between sets.

Why is this exercise valuable? The muscles of the feet require good strength to control the forces associated with landing on the ground during the running stride. This toe-walking exercise helps to develop the eccentric (support) strength and mobility in the muscles of the foot and calf, as well as the plantar fascia and Achilles tendon (eccentric strength means hardiness as these structures are being stretched out). The exercise also works the foot and ankle through a broad range of motion, especially for the foot which is bearing weight on the ball and toes while the ankle is extended (is in plantar flexion). The exercise also improves balance and stability, which are critical factors for running athletes hoping to improve their efficiency of movement.

### b- toe grasping

To perform this exercise, stand barefoot with your feet hip-width apart. In an alternating pattern, curl the toes of your right foot and then your left foot down and under, as though you are grasping something with the toes of each foot. Repeat this action (right foot, left foot, right foot, etc.) for a total 50 repetitions with each foot. Rest for a moment, and then complete two more sets. Try pulling yourself across the floor (smooth surfaces work best) for a distance of three to six feet as you become more skilled at this exercise.

What is the value of toe grasping? It develops strength, coordination and flexibility in the muscles of the foot that run parallel to the plantar fascia and help support the longitudinal arch of the foot.