Tarsal Tunnel Syndrome

The foot is subjected to forces hundreds of times the bodyweight, thousands of times in a day. The ankle is a complex structure that makes weight bearing possible. It allows the foot to flex and extend and absorb the shock of the compressive forces when walking, running and jumping. The ligaments, tendons, nerves and blood vessels travel over and through the ankle joint to the foot.

The posterior tibial nerve runs down from the leg and behind the medial malleolus, the bump on the inside of the ankle, down into the foot. This nerve is protected by a fibrous sheath, called the flexor retinaculum. The flexor retinaculum, along with the bones of the ankle, forms a tunnel for this nerve (and tendons, arteries, veins) that runs through the foot. This tunnel is the tarsal tunnel. The ligament over the tunnel is meant to protect the components underneath, but if it becomes inflamed or a foreign body obstructs the tunnel, then it can become part of the problem.

What is Tarsal Tunnel Syndrome?

Tarsal Tunnel Syndrome, like Carpal Tunnel Syndrome in the wrist, is a compression of the nerve inside the tunnel. It is less common than its counterpart in the wrist and is sometimes simply wrapped into the foot neuropathy diagnosis. The pressure can come from injuries resulting in deformities, inflammation of the protective sheath, tumours, or other impingements on the nerve. The compression on the nerve interferes with the signals sent through the nerve, causing pain and other neuropathy in the foot.
Anatomy Involved
The ankle is formed by the tibia, fibula and talus. The medial malleolus of the tibia and the flexor retinaculum form the walls of the Tarsal Tunnel. The tibial nerve passes through the tunnel into the foot. The tunnel also houses the tendons, veins and arteries that run down into the foot on the medial (inner) side. The bones, ligaments and tendons in the foot innervated by the tibial nerve are also involved in this condition.

What Causes Tarsal Tunnel Syndrome?
Tarsal Tunnel Syndrome has many possible causes and in some cases doctors cannot pinpoint the exact cause. People with flatfeet may develop this condition due to the strain placed on the structures of the feet and a change in the course of the nerves and tendons running into the feet. This could cause pressure on the tibial nerve. A cyst or tumour in the area may also produce pressure on the nerve. Other abnormalities in the area that may cause this condition include varicose veins, a swollen tendon, or a bone spur.

Systemic disease processes, such as rheumatoid arthritis or diabetes, may also cause, or increase the likelihood of, this condition. The inflammation of the joint caused by arthritis will decrease the space available for the nerve, thereby increasing pressure. The veins and arteries passing through may become enlarged due to higher glucose content in diabetics, also causing more pressure on the nerve. Individuals that are overweight or obese may be prone to this condition due to excessive pressure on the posterior tibial nerve.
Injury to the ankle, due to swelling in and around the joint, may also cause pressure on the tibial nerve. Fractures or dislocations may cause the tunnel to shift slightly, or close up. A bone chip in the area of the medial malleolus may also become lodged in the tarsal tunnel, causing an impingement upon the nerve.

**Signs and Symptoms**

The most common symptom of this condition is pain, burning, or tingling along the inside of the ankle and down into the foot. The pain can vary from prickly points in the foot to severe burning pain along the entire foot and ankle area. The pain generally gets worse with activity, especially prolonged walking or standing and improves with rest. Pain upon palpation of the nerve may also be noted. Loss of sensation may be experienced if the condition is allowed to progress. A change in gait (a limp and overpronation) may also result if not treated promptly.

The symptoms may occur suddenly, but are often made worse by extended periods of activity. The earliest signs of pain are often ignored and the condition is allowed to progress until the nerve is compromised more severely.

**Prevention**

Prevention of tarsal tunnel syndrome starts with the knowledge of what causes it and avoiding those circumstances.

- Rest for the foot in between long bouts of standing or walking is important. Trying to sit down, or at least change position, during extended periods of standing or walking will help reduce the stress on the tarsal tunnel and tibial nerve.
- A proper warm up activity before beginning strenuous workouts will also help prevent injuries to the structures in and around the nerve, reducing the likelihood of compression.
- Wearing properly fitted shoes and orthotics if necessary, will reduce the strain placed on the area. Shoes that are tied incorrectly, or too tightly, can cause damage to this area, also.
- Using wraps or bracing while engaging in athletic pursuits, especially on uneven surfaces or involving sudden direction changes in traffic, may reduce the chances of an ankle injury, which could cause tarsal tunnel syndrome.
- A good strengthening program will keep the supporting muscles of the lower leg strong and reduce leg and ankle injuries. These muscles will also reduce the stress and impact on the joint with each step or landing.
• Flexibility in the muscles of the lower leg will help keep the foot in proper alignment and reduce the pull on the tendons during rest. Flexible muscles are also less likely to be injured.

What you should do if you have Tarsal Tunnel Syndrome

Reducing pain and inflammation:

• Rest. This may mean complete rest, staying off the foot with the aid of crutches or it may mean simply modifying normal training activities. It really depends how severe the pain and injury is. Switching from running to swimming or cycling for a while may be sufficient.
• NSAID's (non-steroidal anti-inflammatory drugs) such as ibuprofen may help in reducing inflammation and pain. Always check with a doctor before taking any medication. Asthmatics should not take ibuprofen.

Correction of biomechanical dysfunction

• If the athlete over pronates or the foot rolls in when running or walking then this may aggravate the condition. If they were to rest and not correct any possible causes then the injury is likely to return when normal training resumes.
• For mild over pronation a motion control shoe may be sufficient. These are running shoes which have a dual density midsole. The harder material on the inside of the sole helps prevent the foot from rolling in.
• For greater pronation control an orthotic device may be required. These can be purchased off the shelf from most chemists or more specifically made to measure by a sports injury therapists.

Stretching and strengthening:

• The muscles of the back of the lower leg and the foot require stretching. This is particularly important if dorsiflexion of the foot (pushing the foot and toes upwards) reproduces pain.
• Stretching can be done three times a day, and should be done on a regular basis for a period of weeks - not just days.
• The small intrinsic muscles of the foot and the arch supporting muscles should be concentrated on.
• Surgery may be indicated when the diagnosis is definite and the athlete has endured several months of problems and has not responded to the conservative treatment above.
• Diagnosis is firm when the following factors are present; foot pain and numbness, a positive Tinel's sign (tapping on the nerve produces pain) and electrodiagnostic testing (for nerve injury) is positive.
• Following surgery symptoms may improve after 6 weeks, although complete recovery may take 6 months or more.

**Stretching**

**Gastrocnemius muscle stretch**

- This is done by placing the heel of the back leg on the floor and stretching forwards.
- Hold for ten seconds, repeat three to five times and repeat the set three times a day.
- Gradually hold the stretch for longer (up to 45 seconds).

**Soleus muscle stretch**

- In addition to the above stretch this one will stretch the Soleus muscle lower down in the back of the leg.
- The same principles apply but it is important to bend the stretching leg at the knee.
- This takes the Gastrocnemius muscle which attaches above the knee out of the stretch.
Stretching on a step

• Stretch by standing on the edge of a step and allowing the heel to drop.
• Hold for at least 15 seconds.
• You should feel a gentle stretch.

Plantar fascia stretch

• This can be done by pulling up on the bottom of the foot as shown opposite.
• Hold the stretch for about 30 seconds. Repeat five times and aim to stretch 3 times a day.
• Remember stretching is a long term process. It will need to be maintained long after you feel the injury has healed.

Plantar fascia stretch by rolling

• The plantar fascia can be stretched by rolling it over a round or cylindrical object such as a ball, bar or rolling pin.
• Roll the foot repeatedly over the ball applying downwards pressure.

Strengthening

The following guidelines are for information purposes only. We recommend seeking professional advice before beginning rehabilitation.

Exercises for the small muscles of the foot:
Static toe flexion

- With the feet flat on the floor, press the toes downwards into the floor.
- Do not allow them to curl, or the ankle to move whilst performing the exercise.
- Hold for the count of 3, repeat 10 times.
- Perform this exercise 3 times a day if possible.
- Progress the exercise by holding the contraction for longer.

Spreading the toes

- Place feet flat on the floor.
- Spread the toes as far as they will go and then return them together.
- Repeat this 10 times, rest and perform a further 2 sets of 10 repetitions.
- Aim to repeat this exercise 3 times a day, as above.

Toe lifting

- Place feet flat on the floor and try to lift each toe up in turn.
- Aim to keep the others flat on the floor - not easy, is it?
- Perform three sets of each toe.
- Try to perform this exercise twice a day - at least once.
Pencil lifting

- Pick up a pencil in the toes.
- Hold for count of 6, repeat 10 times.
- Aim to perform this exercise 3 times a day.
- An alternative version of this is to repeatedly scrunch up a towel in the toes.

Functional strengthening exercises:

Walking on the toes

- Simply walk about on tip toe.
- Do not wear shoes but perform the exercise barefoot.
- Aim for 8 sets of 15 to 20 seconds with 20 seconds rest between.
- Complete the exercise 2 times a day. Progress by increasing the duration of the walks.

Walking on the heels

- As above but walk on the heals.
- Aim for 8 sets of 15 to 20 seconds with 20 seconds rest between.
- Complete the exercise 2 times a day. Progress by increasing the duration of the walks.