

## ANTERIOR TARSAL TUNNEL SYNDROME

Basically, the *anterior tarsal tunnel* comprises the space lying beneath the inferior extensor retinaculum. It is a Y-shaped ligamentous band placed on the anterior aspect of the ankle joint. The stem of the Y is attached laterally to the proximal surface of the calcaneus, just anterior to the interosseus talocalcaneal ligament depression. From this anchorage, it passes medially as a double ligamentous layer, one layer passing anteriorly, the other posteriorly to the peroneus tertius and extensor digitorum longus tendons. At the medial borders of the extensor digitorum longus tendon, these two layers join, forming a compartment or sheath in which the tendons are enclosed. From the medial extremity of this sheath the two limbs of the Y separate. One limb proceeds proximally and medially, to attach to the tibial malleolus, after passing over the extensor hallucis longus, but enclosing the tibialis anterior by a splitting of its fibers. The other limb extends distally and medially, passing over the tendons of the extensor hallucis longus and tibialis anterior to attach to the border of the plantar aponeurosis. Under both these limbs pass the collection of the vessels and nerves that cross the anterior aspect of the ankle. These mainly include the anterior tibial artery, anterior medial malleolar artery, dorsal metatarsal arteries, and the deep peroneal nerve.

Classically, the *Anterior Tarsal Tunnel Syndrome* is defined as an entrapment of the terminal branches of the deep peroneal nerve beneath the inferior extensor retinaculum, resulting in a compression neuropathy at this location. The syndrome may be partial or complete depending upon whether the motor or sensory branch of the nerve is involved. If the branch of the motor nerve is involved, muscle atrophy and weakness of the extensor digitorum brevis may be present. If the sensory branch is involved, numbness and paresthesias in the web between the first and second toes may occur, but more commonly patients complain of an ache or a sensation of tightness over the ankle and dorsum of the foot. These symptoms are generally said to be more severe at night or after prolonged inactivity. Some minor swelling is often present over the anterior tarsal tunnel, with more extensive swelling just behind the lateral malleolus and sometimes around into the lateral sub-malleolus area. In the latter case, the swelling is generally more pronounced in the morning following bed rest, but can also increase after prolonged sitting.

The *Anterior Tarsal Tunnel Syndrome* usually results from trauma associated with fractures, exostosis, ankle sprains or strains, chronic edema, or external compression from tight shoes or boots.

The *anterior tarsal tunnel syndrome* is usually associated with inflammation of the soft tissues associated with the inferior extensor retinaculum and may be ascertained through DSR survey with the ankle in the relaxed, passively plantar flexed position.

### **Treatment**

Treat the inflamed tissues to decrease inflammation and pressure in the anterior tarsal tunnel.

### **Application:**

- Place a negative electrode over the anterior tarsal tunnel and a positive electrode over the rectus femoris muscle. The patient's involved foot should be flat on the floor to prevent cramping of the calf muscles. Preset an electrical stimulation unit to deliver a medium frequency current, with a duty cycle of 10 seconds on and 10 seconds off, sufficient to produce a near tetanic contraction of the involved muscles. Stimulate for 10 minutes.
- Manipulate the soft tissues in and around the anterior tarsal tunnel to eliminate any adhesions that may be present.
- Preset the ultrasound unit to deliver a 1 MHz pulsed waveform, at  $1.5 \text{ W/cm}^2$ . With the ankle in the relaxed, passively plantar flexion position, ultrasound the inflamed zone, utilizing an effective non-steroidal anti-inflammatory as a coupling agent, for 6 minutes.
- Preset the electrical stimulation unit to deliver a visible contraction at 7 Hz. Place a negative electrode over the gastrocnemius muscle and a positive electrode over the anterior tarsal tunnel. The patient's feet should be elevated to chest level, either lying down or seated and reclined. Stimulate for 20 minutes.
- Mechanically vibrate the plantar surface of the foot, for 2 minutes (preferably with a foot vibrator), to further increase capillary circulation and to desensitize the involved tissues.

***The following treatment form has also been effective.***

### **Variation:**

- Preset an ultrasound unit to deliver a 1 MHz pulsed waveform, at  $1.8 \text{ W/cm}^2$ . Ultrasound the inflamed zone, utilizing an effective non-steroidal anti-inflammatory as a coupling agent, for 6 minutes. This procedure is also designed to soften the adhesions that may be present.

- Manipulate the tissues in and around the inflamed zone to eliminate any adhesions that may be present.
- Cold laser the inflamed zone, for 2 to 5 minutes. This is performed to denature or destroy **all** the remaining inflammatories.
- Mechanically vibrate the plantar surface of the foot, for 2 minutes (preferably with a foot vibrator), to further increase capillary circulation and to desensitize the involved tissues.

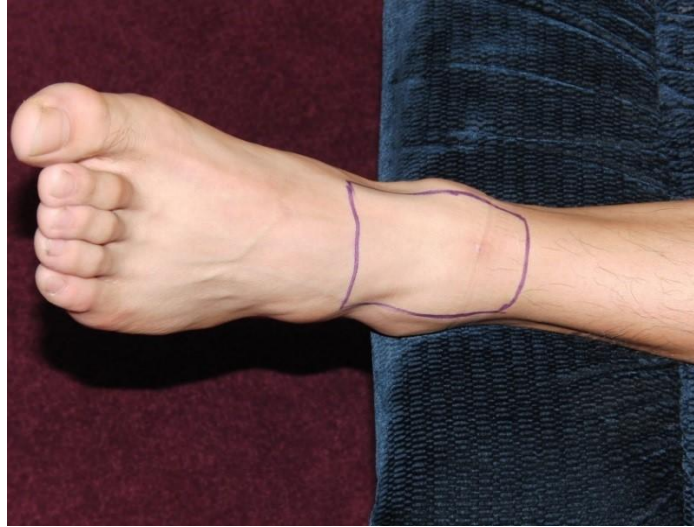
Effective treatment generally relieves this condition, pain and swelling included, in one or two sessions.

#### **Post Treatment Suggestions:**

Long term success, of course, depends upon the patient avoiding further trauma to the anterior tarsal tunnel, including external blows, turning the ankle, tight footwear (shoes that are laced too tight), and positions which place the deep peroneal nerve on stretch (avoid high heeled shoes for two weeks).

#### **Trigger Points**

The following is a list of trigger point formations which may, singly or in combination, imitate or contribute to the pain associated with the *Anterior Tarsal Tunnel Syndrome*: Anterior tibialis, Long toe extensors, and Short toe extensors.



**The high skin resistance pattern commonly associated**

**with inflammation of the Anterior Tarsal Tunnel**

### **TIBIOTARSAL JOINT SYNDROME**

The ankle joint is a hinge joint. The structures making up this joint include distal end of the tibia and its malleolus, the malleolus of the fibula, and the inferior transverse ligament. These together form a mortise for the reception of the proximal convex surface of the talus and its medial and lateral facets. The articular capsule, deltoid, anterior talofibular, posterior talofibular, and calcaneo fibular ligaments connect the bones.

An osteoarthritic condition can develop within the articulation between the tibia and talus. The patient may complain of sharp pain in the ankle joint when weight is put on the foot, or of a continual aching pain. This aching pain is generally restricted to the joint but may also radiate into the proximal instep. Swelling is generally moderate and usually confined to the area over the joint.

The inflammation involved may be determined through DSR zone finding over the joint, with the foot dorsiflexed to neutral.



**The high skin resistance pattern commonly associated with the Tibiotarsal (arthritic) Joint Syndrome (ankle dorsiflexed)**

**Treatment**

The inflamed tissues should be treated to decrease inflammation and pressure in the joint.

**Application:**

- Place a negative electrode over the tibiotarsal joint, and a positive electrode over the rectus femoris muscle. The patient's involved foot should be flat on the floor to prevent cramping of the calf muscles. Preset an electrical stimulation unit to deliver a medium

frequency current, with a duty cycle of 10 seconds on and 10 seconds off, sufficient to produce a near tetanic contraction of the involved muscles. Stimulate for 10 minutes.

- Manipulate the soft tissues in and around the tibiotarsal joint to eliminate any adhesions that may be present.
- Preset an ultrasound unit to deliver a 1 MHz pulsed waveform, with a pulse rate of 50% at  $2.0 \text{ W/cm}^2$ . With the ankle dorsiflexed to the neutral position, ultrasound the tibiotarsal joint, utilizing an effective non-steroidal anti-inflammatory as a coupling agent, for 6 minutes.
- Preset the electrical stimulation unit to deliver a visible contraction at 7 Hz. Place a negative electrode over the gastrocnemius muscle and a positive electrode over the tibiotarsal joint. Elevate the patient's foot to chest level, either lying down or seated and reclined in a reclining chair. Stimulate for 20 minutes.
- Mechanically vibrate the plantar surface of the foot, for 2 minutes (preferably with a foot vibrator), to further increase capillary circulation and to desensitize the involved tissues.

***The following treatment form has also been effective.***

**Variation:**

- Preset an ultrasound unit to deliver a 1 MHz pulsed waveform, with a 50% pulse frequency, at  $2.0 \text{ W/cm}^2$ . With the ankle dorsiflexed to the neutral position, ultrasound the tibiotarsal joint ultrasound, utilizing an effective non-steroidal anti-inflammatory as a coupling agent, for 6 minutes. If the patient begins complaining of an aching pain in the

joint, reduce the amplitude level to  $1.8 \text{ W/cm}^2$ . If the patient is still uncomfortable, reduce the level to  $1.5 \text{ W/cm}^2$ .

- Manipulate the tissues in and around the inflamed zone to eliminate any adhesions that may be present.
- Ten minutes after the first ultrasound application, ultrasound the inflamed zone again, as previously.
- Manipulate the tissues in and around the inflamed zone to eliminate any adhesions that may be present.
- Cold laser the inflamed zone, for 2 to 5 minutes. This is performed to denature or destroy **all** the remaining inflammatories.
- Mechanically vibrate the plantar surface of the foot, for 2 minutes (preferably with a foot vibrator), to further increase capillary circulation and to desensitize the involved tissues.

Effective treatment generally relieves this condition in one to six sessions.

### **Trigger Points**

**The following is a list of trigger point formations which may, singly or in combination, imitate or contribute to the pain associated with the *Tibiotarsal Joint Syndrome*: Anterior tibialis, Long toe extensors, and Short toe extensors.**