



# Treatment of anterior tarsal tunnel syndrome through an endoscopic or open technique



Mustafa Yassin, Avraham Garti, Moshe Weissbrot, Eyal Heller, Dror Robinson\*

Hasharon Hospital, Rabin Medical Center, Affiliated with Tel Aviv University School of Medicine, Israel

## HIGHLIGHTS

- Endoscopic technique is used to visualize and decompress the nerve.
- Indications for endoscopic procedure are a well-defined imaging abnormality.
- Typical imaging pathologies are osteophytes, ganglions or localized synovitis.

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## ABSTRACT

Anterior tarsal tunnel syndrome is often underdiagnosed, due to lack of clinical awareness and vague clinical presentation. Most often patients complain of pain located to the dorsum of the foot. The present study is a consecutive series of 13 patients treated according to a fixed protocol followed for a minimum of 24 months. A total of 12/13 cases presented with a bulge in the anterior part of the ankle or the dorsal foot and Tinel's sign was positive over it. Only half had decreased sensation. Surgical technique was either endoscopic or open. Endoscopy is preferable when compression is due to an osteophyte (4/13) or an isolated ganglion (2/13). In other cases presenting with synovitis (5/13) or unknown etiology (2/13) performing open surgery was deemed as safer.

The American Orthopedic Foot and Ankle Society (AOFAS) hindfoot scores improved from an average of  $55 \pm 8$  to  $83 \pm 11$  at 12 months after surgery and  $88 \pm 10$  at 24 months after surgery.

The anterior tarsal tunnel syndrome accounts for approximately 5% of cases complaining of feet numbness, which undergo electromyographic and nerve conduction testing. Reports in the scientific literature are scarce, perhaps due to underdiagnosis, while it is amenable to surgical management. Clinical diagnosis supported by imaging studies demonstrated osteophytes, ganglions or localized synovitis. Endoscopic treatment can be performed safely provided a clear-cut single compressing element is identified.

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## 1. Introduction

Anterior tarsal tunnel syndrome (ATTS) is a chronic entrapment neuropathy involving the deep peroneal nerve beneath the thin inferior extensor retinaculum [1], at the front of the ankle, or more distally as the lateral and medial terminal branches [2], over the talo-navicular and calcaneo-cuboid joint. The inferior extensor retinaculum forms the roof of the anterior tarsal tunnel covering the deep peroneal nerve at the ankle. Its floor is the fascia overlying the talus and navicular bones. Thus, often the cause of nerve compression is related to the swelling outward on the tunnel floor. Another

cause of nerve compression can be dilatation of the venous vessels (anterior tibial veins) that accompany the dorsalis pedis artery [3]. This is an unusual cause of nerve compression encountered sometimes in various locations [4,5].

Several factors may contribute to the development of ATTS. The most common cause of compression is either acute trauma or micro-trauma to the dorsum of the foot, which could cause local fibrosis or modify the configuration of the "tunnel". ATTS may also be related to talo-navicular bone spurs [6], due to use of tight fitting shoes, localized edema, long-standing abnormal posture and ganglions.

Apparently an under-recognized cause of dorsal foot pain, ATTS causes dull ache, numbness and paresthesias on the dorsum of the foot, radiating to the first interdigital space. These symptoms may increase in certain positions (plantar flexion of the foot) or by inactivity, or they could have nocturnal exacerbation and proximal

\* Corresponding author at: Head of Foot and Ankle Unit, Hasharon Hospital, Rabin Medical Center, Petah Tikva, Israel. Tel.: +972 3 9372233; fax: +972 8 9206013.  
E-mail address: [dror61@gmail.com](mailto:dror61@gmail.com) (D. Robinson).

radiation. Motor symptoms are generally mild because of muscle redundancy allowing several muscles to perform similar motor function. The anterior tarsal tunnel syndrome accounts for approximately 5% of cases complaining of feet numbness, which undergo electromyographic and nerve conduction testing. Reports in the scientific literature are scarce, perhaps due to underdiagnosis, while it is amenable to surgical management [3].

One of the reasons for the under-diagnosis of this syndrome is that special techniques should be utilized during electromyography (EMG) in order to diagnose the condition and distinguish it from lumbo-sacral radiculopathy [7,8]. Thus, the diagnosis is often based on clinical findings and patient complaints.

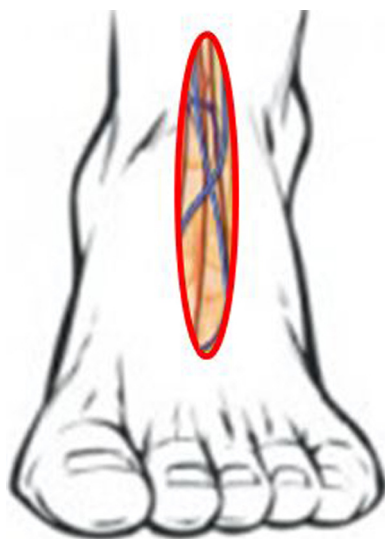
Treatment of the syndrome can be conservative with footwear modification, physiotherapy and local injections; in persistent cases surgery is performed. The current series reports the results of surgical treatment of the nerve entrapment using an open or arthroscopic approach.

## 2. Methods

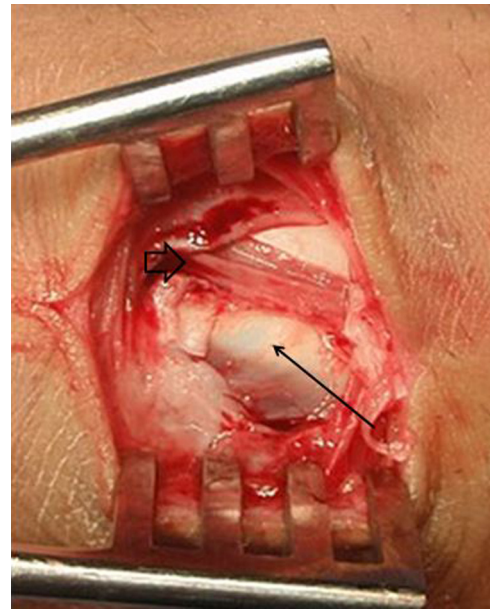
A consecutive series of 13 patients that underwent surgical release of anterior tunnel syndrome is reported. These surgeries were performed over a 5-year period beginning in 2007 in a single center and consisted about 1% of the total foot and ankle case load during that time period. Inclusion criteria: presence of dorsal foot pain unresponsive to conservative treatment of at least 3 months. Tinel sign or pressure evoked pain on the dorsum of the foot. Exclusion criteria: recent trauma; intraarticular tibio-talar pathology; inflammatory arthropathy; elevated uric acid levels; abnormal sensation over the plantar aspect of the foot.

The following studies were performed in all cases: weight-bearing radiographs to assess presence of osteophytes, bone scan to rule out articular inflammatory process, Ultrasound to define any ganglion or cysts and attempt to assess the peroneal nerve. EMG was not routinely required as the reliability of its performance is debatable. A CT scan was performed in order to assess possible osteophytes in 7 out of 13 patients and was not required in order to operate on a patient.

Patients were assessed pre-operatively and one to two years after operation using the American Orthopedic Foot and Ankle Society (AOFAS) hindfoot score [9].



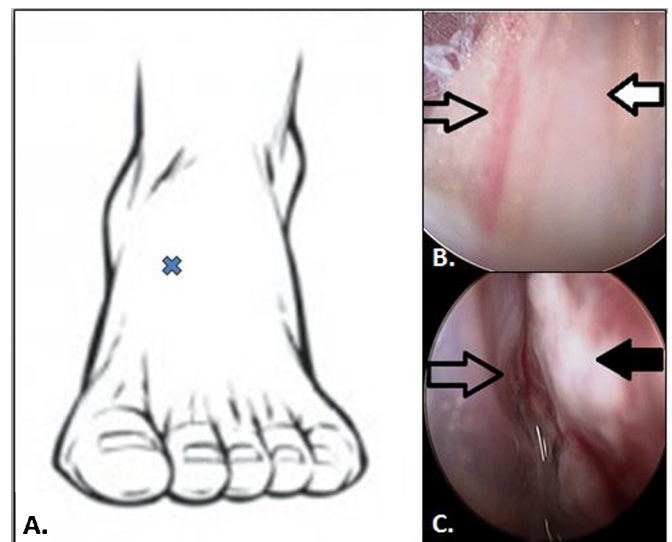
**Fig. 1.** Exposure of the superficial peroneal nerve branches immediately deep to the superficial venous vessels.



**Fig. 2.** An intra-operative view of the deep peroneal nerve surrounded by two venous vessels (outlined arrowhead) compressed by a distal talar head bony prominence (arrow).

### 2.1. Surgical technique

Either an open or an arthroscopic technique was employed. Due to the common presence of engorged venous vessels, it is recommended to perform the surgery without tourniquet, in order to enable recognition of the swollen veins. The open technique involves a dorsal incision approximately 8 cm long (Fig. 1). The dissection requires careful displacement of the superficial venous vessels and splitting of the superficial extensor retinaculum. Beneath it is the deep peroneal nerve that is often compressed by swollen venous vessels (Fig. 2). Outward swelling of the floor of the anterior tarsal tunnel may be due to osteophytes or soft tissue swelling such as synovitis.



**Fig. 3.** (A) The endoscopic visualization portal is located about 2 cm distal to the first metatarsal base at the first web space (X). (B) Endoscopic view of the deep peroneal nerve in the tarsal tunnel with its associated vasa nervosum (outlined arrowhead), and engorged vein (black arrowhead). (C) The nerve has been moved to the left with a probe, the engorged venous vessel clipped (lower part of picture) and coagulated (outlined arrowhead). A prominent osteophyte is exposed (black arrowhead).

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