



Tortuosity and Pulsatility of the Tibial Artery – Two Case Reports of a Rare Etiology of Tarsal Tunnel Syndrome

Márcio Luís Duarte^{1,*}, Mayara Oliveira da Silva², Ocacir de Souza Reis Soares³

ABSTRACT

Tarsal tunnel syndrome is a neuropathic compression of the tibial nerve and its branches on the medial side of the ankle. It is a challenging diagnosis that constitutes symptoms arising from damage to the posterior tibial nerve or its branches as they proceed through the tarsal tunnel below the flexor retinaculum in the medial ankle, easily forgotten and underdiagnosed. Neural compression by vascular structures has been suggested as a possible etiology in some clinical conditions. Tibial artery tortuosity is not that rare, but only that it affects the nerve can cause tarsal tunnel syndrome. Therefore, a study care must be taken to avoid false-positive errors.

KEYWORDS

Nerve Compression Syndromes; Tarsal Tunnel Syndrome; Tibial nerve; ultrasonography; diagnosis

AUTHOR AFFILIATIONS

¹ Radiology professor at Universidade de Ribeirão Preto Campus Guarujá, Guarujá-SP, Brazil

² Biomedical at Universidade Federal de São Paul, Santos-SP, Brazil

³ Radiologist at Clínica Radiológica Ocacir Soares, Presidente Prudente, São Paulo, Brazil

* Corresponding author: Universidade de Ribeirão Preto Campus Guarujá. Avenida Dom Pedro I, 3300 Guarujá-SP, Brazil.

ZIP CODE: 11440-003; e-mail: marcioluisduarte@gmail.com

Received: 3 June 2023

Accepted: 2 February 2024

Published online: 2 April 2024

Acta Medica (Hradec Králové) 2023; 66(4): 161–164

<https://doi.org/10.14712/18059694.2024.12>

© 2024 The Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

INTRODUCTION

The tibial nerve passes through the medial side of the ankle and branches into the medial plantar nerve, lateral plantar nerve and medial calcaneal branch (1). This area is called the tarsal tunnel and is composed of the posterior tibial tendon, long flexor tendon of the fingers, neurovascular bundle and flexor hallucis longus tendon (medial to lateral) (1, 2). Therefore, small changes in this space can easily result in neuropathy (2).

Tarsal tunnel syndrome (TTS) is a neuropathic compression of the tibial nerve and its branches on the medial side of the ankle and, although descriptions of TTS symptoms vary, most authors consider symptoms of acute pain, pain when standing in standing or walking for a long time, numbness, paresthesia or burning sensations involving the foot (1, 3). It occurs for various etiologies and the frequency of different etiologies varies in the literature and the cause of compression is detected in about 60–80% (2, 3). The causes of tarsal tunnel syndrome can be (3):

- Bone disorders: talocrural and subtalar arthritis; arthropathy with synovitis and talocalcaneal synostosis; stalk support; fracture sequelae; change in static foot posture.
- Tendon disorders: tendinopathy and flexor tenosynovitis.
- Vascular disorders: tibial artery tortuosity, venous aneurysms, and varicose plantar veins.
- Idiopathic.
- Expansive lesions: ganglion cysts, particularly epineural, soft tissue tumors, including intracanal lipoma, and tumors of neural origin.
- Muscle
 - Supernumerary muscles: accessory soleus muscle, medial fibulocalcaneus muscle and, mainly, accessory digital flexor muscle.
 - Muscle hypertrophy: abductor hallucis muscle or flexor hallucis muscle.
- Trauma: bone diseases, ligament injuries, flexor retinaculum thickening, hematoma, fibrosis and iatrogenic nerve damage

Tarsal tunnel syndrome is a challenging diagnosis that constitutes symptoms arising from damage to the posterior tibial nerve or its branches as they proceed through the tarsal tunnel below the flexor retinaculum in the medial ankle, easily forgotten and underdiagnosed (4). According to electrophysiological investigations, the prevalence of tarsal tunnel syndrome is registered 0.4–0.5% (5).

We demonstrate two cases of tarsal tunnel syndrome caused by tibial artery pulsatility and tortuosity, a situation first reported by Kim et al. (2) in 2010.

CASE REPORT 1

A 62-year-old woman reported pain, tingling and numbness in the medial region of the ankle for a year, with worsening for two months, worsening when walking or standing for a long time. She reports pain on palpation in

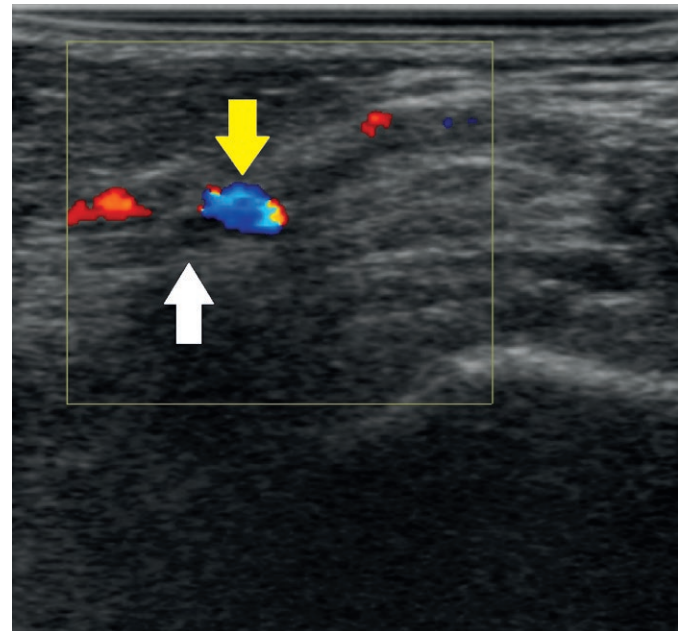


Fig. 1 Color Doppler ultrasound showing tibial artery tortuosity (yellow arrow) compressing the tibial nerve (white arrow) characterizing tarsal tunnel syndrome caused by tibial artery pulsatility and tortuosity.

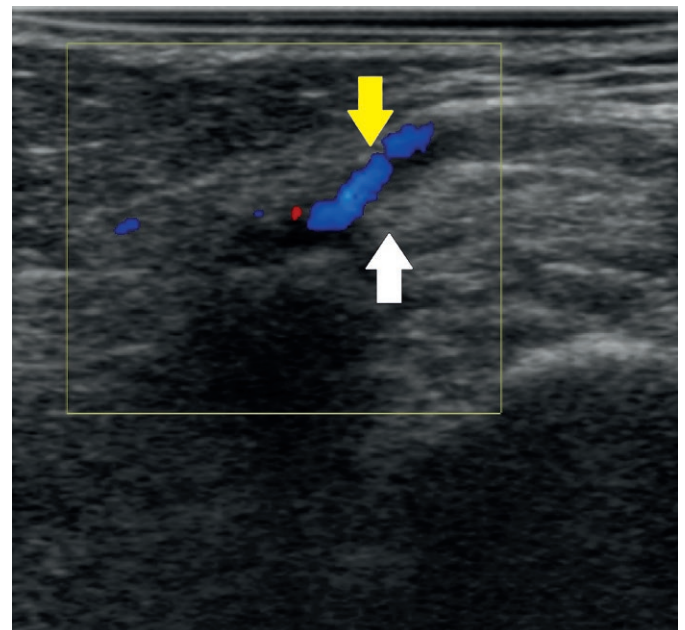


Fig. 2 Color Doppler ultrasound showing tibial artery tortuosity (yellow arrow) compressing the tibial nerve (white arrow) characterizing tarsal tunnel syndrome caused by tibial artery pulsatility and tortuosity.

the region, limiting the variety of shoes, using only sneakers. Denies diabetes mellitus. On physical examination, she has no limitation in movement of the joint, but has a positive Tinel's sign.

Ankle ultrasound detects the tortuous tibial artery in contact with the tibial nerve and compressing it according to its pulsation, characterizing tarsal tunnel syndrome caused by the pulsatility and tortuosity of the tibial artery (Video; Figures 1 and 2). The ultrasound also detects tibial

nerve thickening cross-sectional area of the tibial nerve was 0.20 cm².

She was treated with physiotherapy for four months reporting great improvement of numbness and pain (informs about 80%), but still having some episodes of tingling. She also reports wearing a variety of shoes that she was unable to use.

VIDEO

Video is available at: <https://youtu.be/WxbyzIfzY4M>. Color Doppler ultrasound showing tibial artery tortuosity compressing the tibial nerve characterizing tarsal tunnel syndrome caused by tibial artery pulsatility and tortuosity.

CASE REPORT 2

A 55-year-old woman reported pain, tingling and numbness in the ankle for two months. Refers worsening when standing for a long time and walking. Informs difficult in wearing shoes due to pain in the region. Denies diabetes mellitus. On physical examination, she has no limitation in movement of the joint, but has a positive Tinel's sign.

Ankle ultrasound detected the tortuous tibial artery in contact with the tibial nerve and compressing it according to its pulsation. Also, is detected compression of the tibial nerve by varicose plantar veins. Both causes of compression characterizes causes of tarsal tunnel syndrome (Figures 3 and 4). The ultrasound detects tibial nerve thickening cross-sectional area of the tibial nerve was 0.20 cm². Doppler ultrasound of lower limbs confirmed the varicose plantar veins.

The patient started treatment muscle strengthening, physiotherapy and compression socks and after three weeks she has no symptoms. She also reports wearing shoes that she stopped to use.

DISCUSSION

Reliable diagnosis requires confirmation of focal pathology of the tibial nerve in the tarsal tunnel (6). Due to the superficial location of the tunnel, the resolution obtained with ultrasonography is considerably better than that obtained with magnetic resonance imaging (MRI) (6). When the syndrome of the tarsal tunnel is suspected, ultrasonography should be performed routinely (1, 3). Ultrasonography with the Tinel test should be performed by touching the nerve to induce symptoms, as if positive, it suggests the diagnosis of tarsal tunnel syndrome (3).

Neural compression by vascular structures has been suggested as a possible etiology in some clinical conditions (2). Tibial artery tortuosity is not that rare, but only that it affects the nerve can cause tarsal tunnel syndrome (3). Therefore, a study care must be taken to avoid false-positive errors (7). As dynamic analysis is possible with ultrasonography, arterial pulsation is easily assessed (7). Nerve compression is worsened by plantar flexion, and it is attributable to the shift in the deformed angle of the

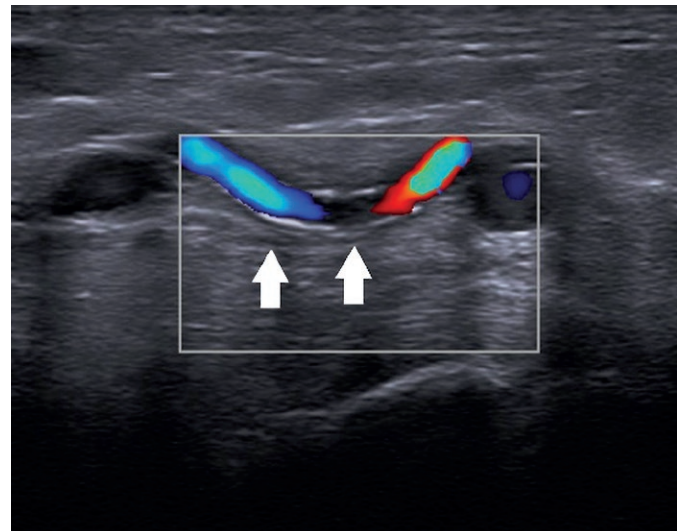


Fig. 3 Color Doppler ultrasound showing tibial artery tortuosity compressing the tibial nerve (white arrows) characterizing tarsal tunnel syndrome caused by tibial artery pulsatility and tortuosity.

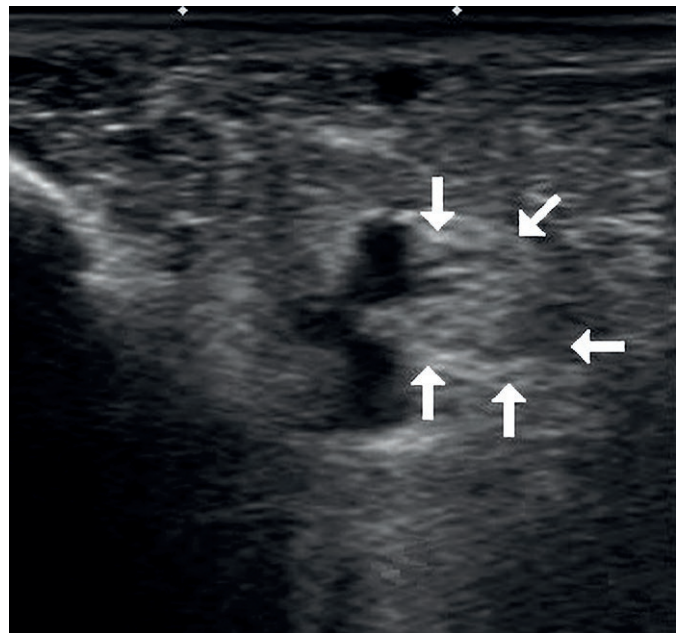


Fig. 4 Grayscale ultrasound showing varicose plantar veins compressing the tibial nerve (white arrows).

posterior tibial artery (8). This type of information is useful in determining the positional relationships of expansive lesions in the tarsal tunnel and the tibial nerve (1).

A burning sensation or numbness in the feet is a disorder frequently encountered by physicians (2). Patients often complain of sensory disturbances, localized or radiating pain, burning pain, paresthesia, and abnormal temperature perception (2). The most common differential diagnosis is plantar fasciitis (7). Plantar fasciitis usually presents a pain and symptoms not related to neural compression (7). To avoid a trap, one must keep in mind the cause of tarsal tunnel syndrome is one that compresses, displaces or touches the nerve (7).

Several causes of tarsal tunnel syndrome can be assessed by ultrasound with the patient static, such as

accessory ossicles, synovitis, ganglion cysts, gout, muscular hypertrophy, foreign bodies, and postoperative changes. However, vascular causes, as in the case depicted, require dynamic assessment, and in the case of talar dislocation, there is a need for assessment with the patient in orthostasis. If these evaluations are not carried out, the diagnosis of the cause of tarsal tunnel syndrome will not be made (7).

There is no accurate treatment for tarsal tunnel syndrome caused by a pulsatile tibial artery. Performing conservative treatment helps to establish a good relationship with the patient and allows the surgeon to evaluate the patient for a period to see improvement and observe adherence (9). The objective of conservative treatment is to reduce pain and inflammation and relieve strength, compressive in the tibial nerve (9). The medication often used consists of oral non-steroidal anti-inflammatory drugs (NSAIDs) or analgesic paracetamol in many situations (9). Gabapentin, pregabalin, and tricyclic antidepressants are other oral options for pain relief, and topical medications, including NSAIDs and lidocaine may be helpful (9). Calf muscle strengthening and stretching exercises can aid tissue mobility and nerve mobility/gliding, as demonstrated in one of our cases (9). If conservative measures are not effective, surgical release treatment should be instituted (9). In cases of association with varicosities, the use of compressive socks aids to solve the symptoms, as shown in one of our cases.

Kim et al injected 0.5 mL of 0.5% lidocaine under ultrasound guidance at the site of nerve compression by the tibial artery (2). After the injection, the patient reported immediate resolution of the spontaneous paresthesia (2). However, this effect lasted a few minutes, with a gradual return of the usual symptoms (2). Six months later, she continued to have the same degree of mild paresthesia, without any worsening or improvement (2).

For all etiologies of tarsal tunnel syndrome, conservative treatment (rest, walking boot, shoe wear modifications, physical therapy, ice application, anti-inflammatory medication, strengthen the intrinsic and extrinsic muscles of the foot, anti-neuropathic pain medications, heat, and ultrasound) should be initiated before surgery. Also, weight loss for obese patients. In cases of nerve compression with a space-occupying lesion, surgical decompression is indicated. Timing of surgical intervention is also relevant, as chronic nerve compression leads to axonal loss and intraneural fibrosis, which can be responsible for muscle wasting (10). Endoscopic tarsal tunnel decompression is a safe procedure has a low rate of recurrence

or failure despite allowing for near immediate ambulation (11).

CONCLUSION

The reported cases demonstrate two cases of tarsal tunnel syndrome caused by vascular problems, pulsatility and tortuosity of the tibial artery and varicose plantar veins, two commonly misdiagnosed etiologies which needs the attention of the sonographer to diagnose the cause of tarsal tunnel syndrome and offer the adequate treatment.

FUNDING

No funding was received for this study.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

1. Nagaoka M, Matsuzaki H. Ultrasonography in tarsal tunnel syndrome. *J Ultrasound Med* 2005; 24(8): 1035-40.
2. Kim E, Childers MK. Tarsal tunnel syndrome associated with a pulsating artery: effectiveness of high-resolution ultrasound in diagnosing tarsal tunnel syndrome. *J Am Podiatr Med Assoc* 2010; 100(3): 209-12.
3. Fantino O. Role of ultrasound in posteromedial tarsal tunnel syndrome: 81 cases. *J Ultrasound* 2014; 17(2): 99-112.
4. Tawfik EA, El Zohiery AK, Abouelela AAK. Proposed sonographic criteria for the diagnosis of idiopathic tarsal tunnel syndrome. *Arch Phys Med Rehabil* 2016; 97(7): 1093-9.
5. Khodatars D, Gupta A, Welck M, Saifuddin A. An update on imaging of tarsal tunnel syndrome. *Skeletal Radiol* 2022; 51(11): 2075-95.
6. Samarawickrama D, Therimadasamy AK, Chan YC, Vijayan J, Wilder-Smith EP. Nerve ultrasound in electrophysiologically verified tarsal tunnel syndrome. *Muscle Nerve* 2016; 53(6): 906-12.
7. de Souza Reis Soares O, Duarte ML, Brasseur JL. Tarsal Tunnel Syndrome: An Ultrasound Pictorial Review. *J Ultrasound Med* 2021; 41(5): 1247-72.
8. Tajiri T, Kim K, Isu T, Fujihara F, Kitamura T, Takahashi T, Suzuki T, Isobe M, Inoue T. Impact of Dynamic Change of Meandering of Parallel Artery to the Idiopathic Tarsal Tunnel Syndrome. *Neurol Med Chir (Tokyo)* 2023; 63(4): 165-71.
9. Nelson SC. Tarsal Tunnel Syndrome. *Clin Podiatr Med Surg* 2021; 38(2): 131-41.
10. Doneddu PE, Coraci D, Loreti C, Piccinini G, Padua L. Tarsal tunnel syndrome: still more opinions than evidence. Status of the art. *Neurol Sci* 2017; 38(10): 1735-9.
11. Gkotsoulas EN, Simonson DC, Roukis TS. Outcomes and safety of endoscopic tarsal tunnel decompression: a systematic review. *Foot Ankle Spec* 2014; 7(1): 57-60.