Rare Arteriovenous Malformation as a Cause for Tibial Nerve Impingement at the Tarsal Tunnel: Case Report

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Statement of Purpose

Tarsal tunnel syndrome (TTS) is a form of entrapment neuropathy of the tibial nerve at the level of the fibro-osseous tunnel of the laciniate ligament [1]. With tarsal tunnel, patients can present with a variety of symptoms with the most common of pain, tingling, and numbness. Neurovascular impingement at the tarsal tunnel is usually associated with varicose veins. The purpose of this case study is to highlight a rare arteriovenous malformation causing tarsal tunnel syndrome and requiring external neurolysis.

Literature Review

Vascular causes of impingement at the tarsal tunnel is usually associated varicose veins and rare compared to other forms of entrapment neuropathy [2].

This case report presents a rare arteriovenous malformation at the tarsal tunnel of a 41 year old woman requiring external neurolysis of her left tarsal tunnel. We systematically reviewed published literature regarding vascular causes of tarsal tunnel syndrome with regards to methods of diagnosis, causes, and functional outcomes. Publications were collected from Pubmed, The Journal of Foot and Ankle Surgery, the journal of Neurosurgery, and vascular journals. Tarsal tunnel syndrome is a well reviewed form of entrapment neuropathy but arteriovenous malformations causing impingement are not found in current literature. The articles reviewed mention varicose veins and thrombosis, but none reviewed show a direct cause of tarsal tunnel syndrome due to an arteriovenous malformation intertwining the tibial nerve and posterior tibial artery requiring external neurolysis.

Case Study

The patient is a forty-one year old female who was seen in the office after being referred by her primary care physician for pain to her left plantar medial arch and numbness to her toes. Various conservative treatments were attempted to include modifications of shoes, a steroid injection, and compression.

During the conservative treatment period, a left ankle MRI was obtained (Figure 1). The patient had continued pain and numbness to the medial left foot after failing conservative treatment for 5 months. She opted for surgical intervention.

We made a curvilinear incision along the medial foot and ankle (Figure 2). Layered dissection was performed to reveal extensive entanglement of vessels surrounding the tibial nerve and posterior tibial artery. The tortuous vessels were carefully resected distally to the abductor muscle belly and proximally to the posterior aspect of the medial malleolus. Branches were tied off prior to severance. The engorged structures were sent for pathology. The pathology report was confirmed as dilated vascular structures consistent with arteriovenous malformation.

After resecting all impeding structures and the nerve was freed through the length of the incision. The nerve was wrapped with Amniofix graft. Deep closure was obtained using a braided absorbable suture. Cutaneous closure was performed with a non-absorbable monofilament. A wound VAC was applied over the incision site. The patient tolerated the procedure well with minimal postoperative pain. A compressive dressing was applied. The patient was weightbearing as tolerated in a surgical shoe.

She was seen post operatively for VAC and suture removal. The patient has since returned to activity with no limitations or pain present to the medial ankle.

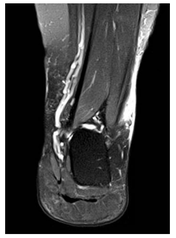

Figure 1 (left): A tubular T2 hyperintense structure along the plantar surface of the foot demonstrating a branching morphology located deep to the abductor hallucis and flexor digitorum brevis muscle bellies and superficial to the quadratus plantae and accessory flexor muscles.

Analysis and Discussion

There are idiopathic, intrinsic, and extrinsic causes of tarsal tunnel syndrome. One article described a distribution-rate up to 54% of venous causes exclusively [6]. Venous causes of TTS are most often varicose veins [3]. Our case is the first highlighted in current literature that describes both an arterial and venous component of malformation as the underlying source of TTS.

The symptoms of TTS usually presents with pain over the tarsal tunnel with radiation to the plantar foot. Pain at the medial ankle while exercising and pain at the tarsal tunnel can also present [1]. Reliable tests in helping make the diagnosis of TTS include MRI, Ultrasonography, and electromyography. MRI is a technique that can be used to assess peripheral nerves in the tarsal tunnel [9]. Ultrasonography can be used to detect compression elements in vivo while taking the ankle and foot through range of motion [7,8]. Electromyography can be helpful to confirm a diagnosis of TTS but use of solely electromyography can lead to false-positives. Data of false positive cases up to 43% are described by Falck and Alaranta [10]. We chose MRI for our diagnostic test of choice. The MRI described a hyperintense structure along the plantar surface of the foot located deep to the abductor hallucis and flexor digitorum brevis muscle bellies. The MRI however, failed to indicate any extensive varicosities surrounding the tibial nerve and artery. On surgical dissection, multiple varicosities were encountered that extended distally to the abductor muscle belly and just proximal to the posterior aspect of the medial malleolus. Loupes were required to carefully resect the multiple tortuous vessels surrounding and intertwining with the tibial nerve and posterior tibial artery. A mid-calf tourniquet was deflated during the case to adequately differentiate the posterior tibial artery from veins and to adequately ligate any bleeders.

When TTS is caused exclusively by varicosities, ligation and coagulation of the compressing vein is advised to prevent growth and compression of the nerve [2].

In our case report, the clinical picture and etiology was different than what was indicated on MRI. We were able to treat the direct source of impingements through external neurolysis and careful resection of vascular impingements. Conservative measures were contraindicated in this scenario and patient has gone on to full recovery with resolution of symptoms.

Figure 2 (right): Medial ankle/foot incision with layered dissection for visualization of the tarsal tunnel with entrapped nerve structures

Disclosure statement:
The authors declare that they have no competing interests.This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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