Arterial Anatomy of the Posterior Tibial Nerve in the Tarsal Tunnel

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My disclosure is in the Final AOFAS Program Book. I have no potential conflicts with this presentation.
Introduction

- Neurologic symptoms of the posterior tibial nerve in the tarsal tunnel can be multifactorial and several anatomic factors have been considered.
- A vascular etiology of tarsal tunnel syndrome has been proposed.
- The arterial anatomy supplying the posterior tibial nerve and its branches has not been well described.
- The purpose of this study is to provide a quantitative description of the arterial anatomy of the posterior tibial nerve in the tarsal tunnel.
Methods

- 40 adult cadaveric lower extremities (20 matched pairs) were amputated below the knee.
- Anterior tibial, posterior tibial, and peroneal arteries were injected with India Ink and Ward’s Blue Latex.
- 20 limbs were debrided with 6% sodium hypochlorite to expose arterial branches to the nerve to determine to macrovascular anatomy.
- In 20 limbs, the nerve was harvested and microvascular anatomy determined via the Spalteholz technique.
Results (Macroscopic)

- Average of 3 vessels entered PTN proximal to the bifurcation.
  - 1.0 cm, 2.7 cm and 4.2 cm, proximal to the medial malleolus
- MPN supplied by an average of 3 vessels.
- LPN supplied by an average of 2 vessels.
- Vessels supplying the MPN and LPN were concentrated at the abductor fascia.

PTN = posterior tibial nerve
MPN = medial plantar nerve
LPN = lateral plantar nerve
A = Achilles tendon
Ab = Abductor fascia (pulled back)
M = Medial Malleolus
* = location of entering vessels
Macroscopic

- PTN = posterior tibial nerve
- MPN = medial plantar nerve
- LPN = lateral plantar nerve
- A = Achilles tendon
- Ab = Abductor fascia (pulled back)
- M = Medial Malleolus
- * = location of entering vessels
Results (Microscopic)

- **Number and location of vessels**
  
  - PTN supplied by 2 \((2.1 \pm 0.8)\) vessels entering at \(2.3 \pm 0.8\) cm and \(4.9 \pm 0.9\) cm proximal to the bifurcation.
  
  - MPN supplied by 2 \((2.3 \pm 0.8)\) vessels entering \(1.9 \pm 1.2\) cm and \(4.1 \pm 0.7\) cm distal to the bifurcation.
  
  - LPN supplied by 2 \((2.4 \pm 1.0)\) vessels entering the nerve at \(1.4 \pm 0.8\) cm and \(3.8 \pm 0.9\) cm distal to the bifurcation.
  
  - Consistently a vessel supplying the MPN and LPN entered near the abductor fascia, with a mean distance of \(0.7\) cm and \(0.6\) cm from the fascia to the nearest vessel, respectively.

PTN = posterior tibial nerve  
MPN = medial plantar nerve  
LPN = lateral plantar nerve  
\* = location of entering vessels
Results (Microscopic)

- **Vascular Density**
  - PTN proximal to the bifurcation: 0.23 vessels/cm.
  - MPN: 0.29 vessels/cm
  - LPN: 0.32 vessels/cm

- Statistically significant difference in vascular density between the PTN and each of its branches (p<0.05)

PTN=posterior tibial nerve
MPN =medial plantar nerve
LPN= lateral plantar nerve
* = location of entering vessels

Location of abductor fascia
Discussion and Conclusions

- The posterior tibial nerve and its branches have an abundant arterial supply.
- A rich arterial network is concentrated at the abductor fascia.
- Vascular congestion of this dense arterial supply may cause nerve compression.
- A combination of vascular and fascial compression of branches of the medial and lateral plantar nerves may combine to elicit neurologic symptoms in tarsal tunnel syndrome.
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