Arterial Vasospasm Related to Lower Extremity Nerve Entrapment: A Case Study

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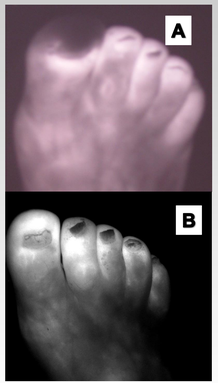
Purpose

A case is described where vascular dysfunction in the foot was found to be mediated and caused by lower extremity nerve entrapment. Following external neurolysis of the involved nerves, the patients symptoms improved. Vasospasm and its associated symptoms occurring secondary to nerve entrapment has not been reported in the foot and ankle literature.

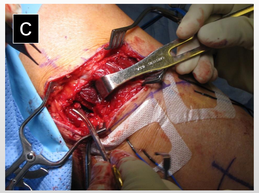
Case Study

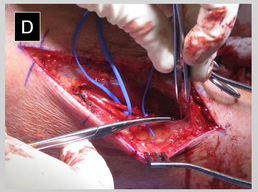
The patient presented as a 55 year old male current smoker, (1 pack per day for 13 years) who is not a diabetic and does not have a history of neuropathy. He was seen with dusky discoloration to the digits of the right foot and leg with accompanying right foot pain and chronic non-healing hallux ulceration. He was experiencing symptoms resembling leg claudication with ambulation and rest pain in the foot, with the hallux being the most symptomatic location. Due to his clinical appearance, the patient was referred to vascular surgery where he had ABIs performed, which were elevated with biphasic and triphasic flow to the dorsalis pedis and posterior tibial arteries respectively. Waveforms to the toes were severely dampened. CT angiography was performed without any occlusions found, prompting a podiatry referral for additional causes for the patient's symptoms. On exam, positive tinels signs were present to the tibial nerve, superficial peroneal nerve, deep peroneal nerve and common peroneal nerve. Given the exam findings and constellation of symptoms, the patient was diagnosed with a nerve entrapment syndrome with associated vasospasm.

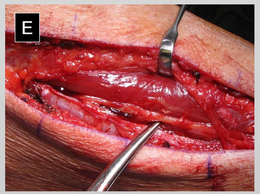
Fluorescent Angiography



A: Pre operative fluorescent angiography
B: Post operative fluorescent angiography
C: Post operative photograph







(A) Preoperative nerve monitoring (B) CPN incision (C) CPN release (D) SPN incision (E) SPN release (F) DPN incision (G) tibial nerve release

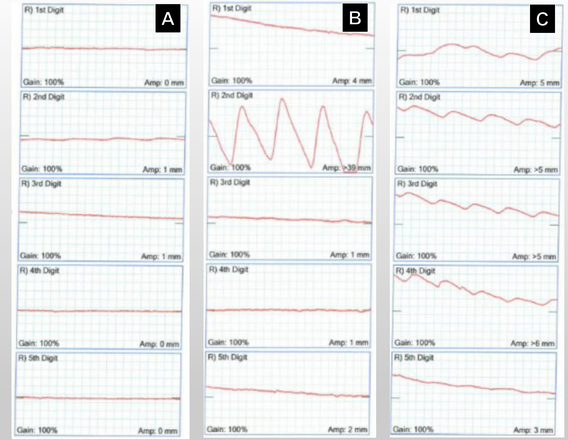
Procedure

The patient's tinels sign was marked at its most proximal location in the holding area. First, preoperative fluorescence angiography was performed showing increased time to blush, decreased perfusion to the right hallux and minimal inflammatory response. Second, preoperative nerve monitoring was performed to establish the amount of stimulus at the popliteal fossa required to produce a response in the EDB, abductor halluces and abductor digiti minimi at baseline. Next, external neurolysis of the common peroneal was performed. The surrounding fascial constraints, the posterior crural intermuscular septum, to peroneus longus fascia and the septum between the tibialis anterior and extensor halluces longus were released. The superficial peroneal nerve was released next and the overlying varicosities were tied off. The deep peroneal was then released. Compression was found where the EHB tendon crosses the nerve and this was released. Finally the tibial nerve was released at the tarsal tunnel extending distally to the septa between the medial and lateral plantar nerve as well as the fascia surrounding the abductor halluces. Following these procedures post operative nerve monitoring was performed showing a decreased stimulus required to produce a response in the foot. The amplitude of the response was also found to be increased. Postoperative fluorescent angiography was performed again following closure showing increased perfusion to the digits.

Results

- Fluorescent angiography studies were performed before and after the external neurolysis procedures. Examination of these studies showed real-time improvement in perfusion to the foot and toes. His preoperative time to blush was 40 seconds with decreased perfusion to the right hallux and lesser digits there was also a decreased local inflammatory response. Postoperatively there was increased perfusion to the right hallux. At follow up another study was performed showing increased perfusion was sustained and time to blush was 28 seconds.
- Preoperative vascular studies revealed waveforms to the digits were severely dampened. Postoperative vascular studies showed increased waveforms to the digits at 1 week and changes were reconfirmed at 2 weeks postoperatively (see images).
- Intraoperative nerve monitoring was also performed pre and post operatively. 90mA was required to produces an action potential preoperatively and only 45mA was required post operative. There was also a 3 times greater amplitude of response postoperatively as compared to preoperatively.
- The patient's wound healed and his claudication and rest pain symptoms resolved.

Digital Arterial Waveforms



A: Preoperative B: post operative week 1 C: post operative week 2

Discussion

This case describes a patient whose vascular symptoms appeared to be directly linked to the compressive nerve disorder in the leg. In literature involving the hand, infrared thermography has been used to show that the temperature increases following carpal tunnel release.[5] Another study on carpal tunnel showed there was no change in the diameter of the afferent or efferent capillaries when comparing the affected hand to the nonaffected hand.[8] It may be prudent in patients with vasospastic clinical presentations to be tested for underlying nerve entrapment syndromes. To our knowledge this relationship has not been well described in the foot and ankle literature, nor has circulation improvement been documented immediately after the neurolysis was performed.

References

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