The posterior tibial nerve neuropathy

- Possible mechanism of traction due to the foot skeletal structures -

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COI Disclosure

• The presenting author has no financial COI to disclose concerning the presentation.
Introduction

• Although plantar pain can be caused by various factors, some are due to neuropathy. Entrapment such as tarsal tunnel syndrome has been considered to be the main mechanism. However, tarsal tunnel syndrome is also a disease caused by various pathologies.

• Because of the anatomical variations in the course of the posterior tibial nerve at the foot, nerve traction due to foot skeletal structures may have the role for neuropathic pain.

• In this study, we investigated surgical findings of the patients showing plantar pain to understand the possible mechanisms of traction neuropathy.
Materials

- From 2015 to 2017, we performed surgery for the posterior tibial nerve neuropathy at the foot in 10 cases (16 feet).
  - 3 males and 7 females
  - aged from 65-85 y/o
    (mean 74.2)

- All cases showed tenderness along the course of the posterior tibial nerve and presented with radiating pain to the periphery.
- Almost all cases showed toe extension caused plantar forefoot pain.
- Three cases (6 feet) needed additional surgery for the metatarsophalangeal joint (MTPJ) site because of recurrent pain.
Surgical technique (under local anesthesia)

① Right foot

② Medial malleolus
Dissected flexor retinaculum
AHM

③ Detached AHM from navicular bone
AHM

④ A: Septum connected to flexor retinaculum, immediately below it
B: Deep fascia just below attachment of abductor hallucis muscle (AHM) to navicular bone

Many nerves are covered with abundant adipose tissue.

These procedures enabled transfer of the posterior tibial nerve and the medial plantar nerve from deep sites to the surface areas.

Surgery of the MTPJ consisted of dissection of the deep transverse metatarsal ligament and upward transfer of the digital nerve.
Most of cases showed good alleviation of plantar pain after surgery. However, pain recurred in 3 cases at the more distal site. These cases underwent surgery of the MTPJ and obtained good relief.

NRS : Numerical Rating Scale

Level of satisfaction
- Excellent: 60%
- Moderate: 20%
- Poor: 20%

Mean postoperative observation period: (28-55)
Result (Evaluation of foot skeletal structures)

- Analysis of the preoperative hallux valgus angle (HVA), digitus minimus varus angle (DMVA), and foot arch ratio (FAR) using radiographs revealed trends of high-HVA/DMVA or/and low-FAR in most cases.
- Many of these cases trended to have a better opstoperative course.
The positional relationship between medial plantar nerve and AHM may have influenced the postoperative course. It may be improved by shifting deeply running nerve to the shallow layer.

After the operation, the nerve had been transferred to the shallow layer by about 6mm from the original position.
Discussion

① Navicular bone position decreases with flattening of foot arch. (↓)

② The deep fascia of abductor hallucis muscle changes its structure as shown above, and the nerve is forced to drive deep. (↓)

③ The nerve is covered with abundant adipose tissue, so loses mobility. An environment where traction neuropathy is likely to develop is created.
Conclusion

- So called tarsal tunnel syndrome includes various pathological conditions. The patients with abnormal foot structures and deep running course of the nerve tended to show good postoperative pain control after our surgery.
  - However, there are limitations such as few cases and gender differences.
- Distortion of the course of the nerve by the surrounding foot structures including the deep fascia may induce traction neuropathy and influence the mechanisms of plantar pain.