Entrapment Neuropathies of the Foot and Ankle

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Entrapment Neuropathies of the Foot & Ankle:

Objectives

At the completion of this session, participants will be able to:

1. List common causes of neuropathic foot and ankle pain in runners
2. Identify specific entrapment neuropathies
3. Describe a systematic approach to the diagnosis and management of entrapment neuropathies
Electrodiagnostic Studies

- Confirmatory and Severity
- Eval for other causes
- 80-90% Sensitive
- Only one small report that study post running helpful
- Radiculopathy
- Sciatic n
- Tibial n
- Medial Sural Cutaneous n
- Medial calcaneal n
- MPN
- LPN
- Common Peroneal n
- Deep Peroneal n
- Superficial Peroneal n
- Femoral/Saphenous n
- Lateral Femoral Cutaneous n
- Obdurator n
Radiculopathy

**KEY MUSCLES**

- **Elbow flexors**
- **Wrist extensors**
- **Elbow extensors**
- **Finger flexors** (distal phalanx of middle finger)
- **Finger abductors** (little finger)

- **0**: Total paralysis
- **1**: Palpable or visible contraction
- **2**: Active movement, gravity eliminated
- **3**: Active movement, against gravity
- **4**: Active movement, against some resistance
- **5**: Active movement, against full resistance
- **NT**: Not testable

**Muscles**

- **Hip flexors**
- **Knee extensors**
- **Ankle dorsiflexors**
- **Long toe extensors**
- **Ankle plantar flexors**

**Voluntary areal contraction (Yes/No)**
Sciatic n.

- Piriformis syndrome
- Hamstring syndrome
- Divides to Tibial + Common Peroneal
Tibial n

- Soleal Sling Syndrome
- Medial sural cutaneous n
- Medial calcaneal n
- MPN
- LPN
Common Peroneal n

• Lateral sural cutaneous
• Superficial peroneal (lateral leg)
• Deep peroneal (Fibular head, anterior ankle)
Femoral n + Saphenous
Obdurator n
Lateral Femoral Cutaneous n
Entrapment Neuropathies of the Foot & Ankle

- Anterior Tarsal Tunnel
- Tarsal Tunnel Syndrome
- Medial Plantar Neuropathy
- Lateral Plantar Neuropathy
- Medial Calcaneal Neuropathy
- Interdigital Neuritis/neuroma
- Joplin’s Neuritis
Anterior Tarsal Tunnel

• Deep peroneal nerve at the anterior ankle, usually under ext. retinaculum
  (vs the EDB, shoe, key, ganglia, osteophyte)
• Dorsal midfoot pain radiating to first web space
Anterior Tarsal Tunnel

- + Tinel sign, decreased sensation
- EMG/NCS can be confirmatory
- EDB atrophy may be present if compression at superior retinaculum
- Footwear changes to avoid direct pressure (lacing), NSAIDs, Neuromeds, ankle stability, injection/hydrodissection, surgery correct specific compression
Tarsal Tunnel Syndrome

- Space formed by flexor retinaculum, medial calcaneus, posterior talus, distal tibia
- Extends from distal tibia to navicular bone
- Contents: PT, FDL, a, v, Tibial N, FHL
- Tibial N. divides into MPN and LPN in tarsal tunnel; nerves separate at the origin of the AHM
Tarsal Tunnel Syndrome

Etiologies:

• **Trauma:** Contusion, shoe wear

• **Biomechanics:** excessive pronation, joint hypermobility (hyperpronation increases AHM tension and may cause compression of plantar nerves)

• **Space Occupying lesions:** ganglia, tenosynovitis, accessory muscle, varicosities, venous stasis, osteophytes, tumors

• **Systemic Disease**

• **Idiopathic**
Tarsal Tunnel Syndrome

Presentation

• Medial ankle pain
• Cramping, burning, tingling to plantar foot
• Symptoms worsened with running, pronation
• Tinel or Villeix sign
• True weakness or sensory loss uncommon and indicate more advanced cases
• Imaging may identify compressive lesions
• Edx studies helpful; advanced cases with denervation; eval for other causes
Tarsal Tunnel Syndrome

Treatment

• Majority non-operative
• Activity modification, NSAIDs, physical therapy, biomechanical intervention, neuro meds, injections, surgery
Tarsal Tunnel Syndrome

Treatment

• Correct functional deficits (include Achilles flexibility, intrinsic and medial arch strengthening, lower kinetic chain rehabilitation, dynamic joint instability)
• Pronation control (shoes, inserts, arch, heel wedges)
• Injections: perineural vs. hydrodissection vs. peritendonous
• Surgical decompression
First Branch LPN: “Baxter’s Neuropathy”

- Branches from LPN or TN in Tarsal Tunnel
- Pierces AHM, courses between AHM and QP, then to lateral foot
- 3 terminal branches supplying FDB, medial calcaneal periosteum, long plantar lig, ADQ
- Common site entrapment between AHM and QP
- Believed to occur in up to 15-20% cases chronic plantar fasciitis
First Branch LPN: “Baxter’s Neuropathy” (cont)

- Maximal pain tends to be superior to plantar fascia origin
- No sensory deficit; medial heel numbness suggests medial calcaneal n
- Edx may demonstrate LPN neuropathy but < 50% sensitive
- Rx similar to plantar fasciitis: NSAIDs, proper shoewear, PT to maximize strength/stability, correction of kinetic chain and gait dysfunctions, injections, neuro meds. Surgical release in refractory cases
Medial Plantar Nerve: “Jogger’s Foot”

• Exits TT, enters canal between AHM and spring ligament.

• Passes superficial to FDL at Master Knot of Henry and courses distally along FHL.

• Provides sensation to medial sole, plantar toes 1-3 + part 4 and motor to AHM, FHB, FDB and 1st lumbrical
Medial Plantar Nerve

- Compression from shoes/orthoses; hyperpronation; foot/ankle instability. In cases of hallux rigidis AHM and FDB contract to minimize DF of great toe and may cause compression MPN
- Neuropathic pain along medial arch to plantar aspect medial toes
- RX: Correct potential compression (shoes, insert modification esp if rigid); Great toe mobility if indicated, dynamic foot and ankle stability, correct overpronation, injection, hydrodissection, surgery
Interdigital neuroma

- Perineural fibrosis of interdigital nerve
- Repetitive pinching at met heads or entrap at deep transverse metatarsal ligament
- Tight shoes, excessive dorsiflexion (hills)
- Pain at metatarsal heads with radiation to toes
- Squeeze test reproduces symptoms and Mulder’s click
- Wide toe box shoe, rocker bottom, intrinsic strengthening, NSAIDs, injection (+/- US)
Interdigital neuroma
Medial Hallucal Nerve: “Joplin’s Neuritis”

• Compression of terminal branch of MPN providing sensation to medial great toe
• Numbness/tingling medial great toe, MTP pain
• Etiologies: Poor shoewear, hallux valgus, AH tendinitis, prominent medial hallux sesamoid
• RX: Wide toe box shoes, Bunion shield with toe spacer, anti-inflammatories, Turf toe insert, injection
Medial Calcaneal Nerve

- Branches from TN (or LPN or MPN/LPN bifurcation)
- Entrap above or in tarsal tunnel, often where it pierces flexor retinaculum
- Cutaneous innervation to plantar, medial, posterior heel (no motor)
- Direct compression and excessive pronation contributory
- Neuropathic pain medial heel, + Tinel’s, EMG/NCS
- Proper footwear, Correction of functional deficits, pronation control, injection/hydrodissection
- Surgical resection often needed if “lamp cord sign”