ANKLE AND FOOT: NERVE IMAGING

Indications
- Referral [appropriateness] criteria
- Standardized documentation
- Typical US findings in typical clinical situations

Investigation
- Your diagnosis, please

Interpretation
- Your diagnosis, please

US: number 1, followed by MRI

Indications for US imaging

- Morton neuroma

Retinacula and fasciae: anatomic structures predisposing to nerve entrapment

- The nerves of the foot
  - Tibial nerve: medial
    - Medial plantar nerve
    - Lateral plantar nerve
  - Deep peroneal nerve: ventral
  - Superficial peroneal nerve: ventral
  - Sural nerve: dorsal-lateral

Tarsal tunnel: each tissue component may be involved

- Medial: tibial nerve injury
  - Numbness or pain in the foot, plantar paresthesias
  - Tension stress on nerve without morphology, pes cavus deformity
  - Space occupying lesions: tenosynovitis, varicose veins, distal end of muscle belly, flexor digitorum accessorius longus, posttraumatic bone deformity
  - Direct nerve injury after penetrating trauma, fractures with or without posttraumatic neuroma

Tibial nerve compression due to venous engorgement

- 50 yrs female with tarsal tunnel syndrome

Intimate relationship between nerve branches and vessels may cause compression

Tarsal tunnel: anatomic details

- Retinaculum subdivides tarsal tunnel
  - Tom, Dick and nervous Harry: tibial nerve is next to artery and veins
  - Tibial nerve divides into three branches: medial plantar nerve, lateral plantar nerve (with Baxter nerve), small calcaneal branch

Intimate relationship between nerve branches and vessels may cause compression

Tibial nerve: normal size 0.12-0.16 mm²

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**Ganglionic cyst**
- originate from joint or tendon sheath
- fluid is squeezed into soft tissues or into nerve
- US-guided aspiration + obliteration of neck of ganglion may relieve symptoms

**Ganglionic cysts**
- patient with tarsal tunnel syndrome

**Nerve imaging = muscle imaging**
- thickening
- loss of fascicular structure
- impingement during flexion or extension
- US-guided Tinel’s test (local paresthesia due to probe or finger compression)

**Tibial nerve abnormality: US findings**
- thickened nerve due to compression

**Jogger’s foot: entrapment of medial plantar nerve on Henry’s knot**
- “Tom, Dick, and nervous Harry”
- “Posticus” Tendovaginitis
- “Tom hates Dick”

**Thickened retinaculum after surgery**
- patient hit by a piece of glass, impaired extension of greater toe (due to paresis of extensor hallucis brevis muscle)

**Tom, Dick, and nervous Harry**
- M. tibialis posterior
- M. flexor digitorum longus
- M. flexor hallucis longus

**Tibial nerve abnormality: US findings**
- flexor hallucis longus anomaly

**Deep peroneal nerve injuries are rare**
- patient with shin splints (chronic form) after ankle sprain: anterior capsular disruption of upper ankle joint causes intraneural ganglion along articular branch of nerve

**Deep peroneal nerve is not running really deep**
- running between tendons of tibialis anterior and extensor hallucis longus
- below extensor retinacula

**Deep peroneal nerve**
- patient hit by a piece of glass, impaired extension of greater toe (due to paresis of extensor hallucis brevis muscle)

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Supraveolar peroneal nerve: anatomy
- runs superficially to extensor retinacula and extensor hallucis longus tendons
- pierces the fasciae of lower leg and dorsum of foot

Nerve sheath tumors: DDx is with US may be improved with better equipment
- target sign
- fusiform contact to nerve
- may be biopsied – take care of severe pain

Sural nerve: a lateral superficial structure
Sural nerve anatomy
- lateral Achilles tendon margin and small saphenous vein as anatomic landmarks
- posttraumatic soft tissue edema may cause impairment

DDx Neuralgia vs Neuroma is a clinical decision
- Morton's neuroma
- Morton neuralgia: without space occupying lesion intermetatarsal bursitis

Diabetic neuropathy
Diabetic foot syndrome
- Soft tissue abscess
- Foreign bodies

Indirect signs of nerve damage
- edema: posttraumatic with subsequent nerve injury
- nerve edema due to dysfunction
- muscle atrophy: denervation
- Soft tissue mass: neuroma, solid tumors

Schwannoma: US findings
- target sign
- fusiform contact to nerve
- may be biopsied – take care of severe pain

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# ANKLE AND FOOT: NERVE IMAGING

**Indication**
US for the 1st line diagnostic workup

**Investigation**
vessels and tendons: important structures for orientation
retinaculae and fasciae: important anatomic landmarks of
the osteo-fibrous tunnels and fascial holes

**Interpretation**

Images from:
- Stummvoll G, Pretterklieber M, Kainberger F (eds.):
  Motion and Performance, Facultas-Publishers, Vienna
- modified afterPrimal Pictures Ltd.

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