

Ultrasound of Lower Extremity Entrapment Neuropathy

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Disclosures

- Consultant: Bioclinica
- Advisory Board: Philips
- Book Royalties: Elsevier
- Not relevant to this lecture

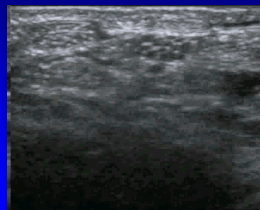
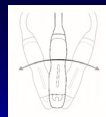


Syllabus PDF

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Normal Peripheral Nerve

- Ultrasound appearance:
 - Hypoechoic nerve fascicles
 - Hyperechoic connective tissue
- Transverse:
 - Honeycomb appearance



Silvestri et al. Radiology 1995; 197:291

Median Nerve

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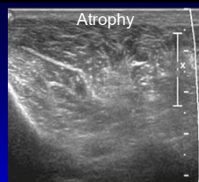
Nerve Entrapment

- US findings:
 - Nerve enlargement proximal to entrapment
 - Best appreciated transverse to nerve
 - Abnormally hypoechoic
 - Especially the connective tissue layers
 - Variable enlargement or flattening at entrapment site

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Denervation

- Edema: hyperechoic
- Fatty degeneration:
 - Hyperechoic
 - Echogenic interfaces
- Atrophy:
 - Hyperechoic with decreased muscle size
- Compare to other side!



J Ultrasound Med 1993; 2:73

Extensor Muscles: leg

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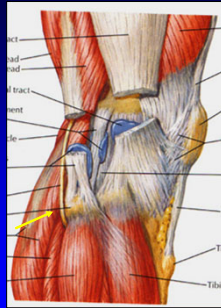
Nerve Entrapment Syndromes

- Peroneal:
 - Common peroneal
 - Superficial peroneal
- Tibial
- Interdigital neuroma

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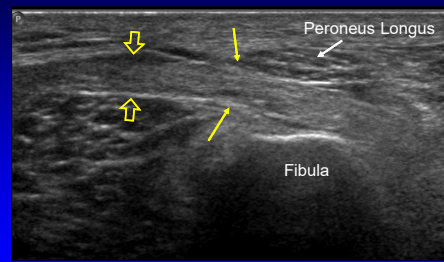
Common Peroneal Nerve

- Entrapment
 - Between fibula and peroneus longus
 - Swollen, hypoechoic nerve
- Injury:
 - Direct trauma, laceration
 - Fibular fracture



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Common Peroneal Nerve: entrapment



Long Axis

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Peroneal Intraneural Ganglion

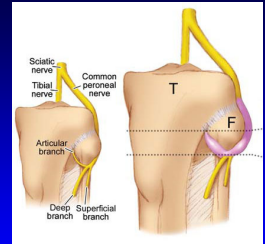
- Pain: knee or peroneal nerve distribution
 - Possible palpable mass, fluctuating course
- 18% of those with foot drop¹
- No identifiable etiology
 - Weight loss, trauma, leg crossing
- High body mass index²
 - Unlike other causes for peroneal neuropathy

¹Visser et al. Neurology 2006; 67:1473
²Young et al. Neurology 2009; 72:447

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Peroneal Intraneural Ganglion

- Joint fluid from proximal tibiofibular joint
 - Enters peroneal nerve via articular nerve branches
 - Shown at MR arthrography after exercise
 - Extends proximal via epineurial sheath¹

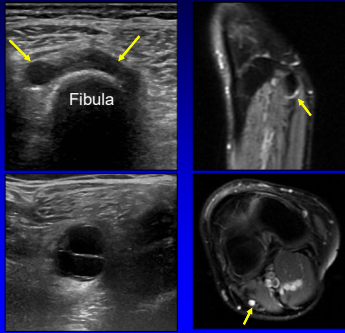


From: Spinner et al. Skeletal Radiol 2008;37:1091

Spinner et al. Clin Anatomy 2007; 20:826

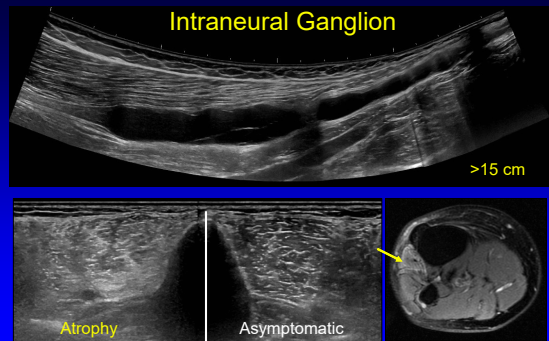
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Peroneal Intraneural Ganglion

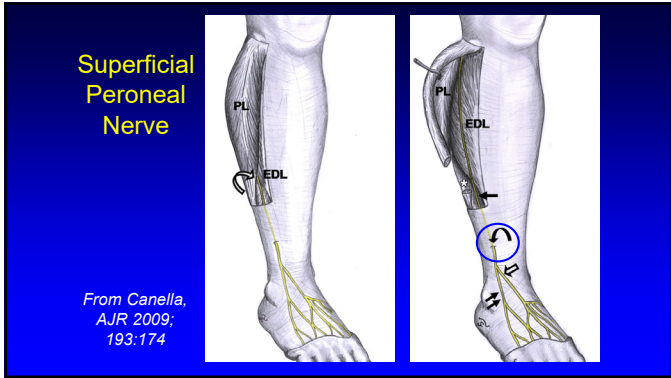


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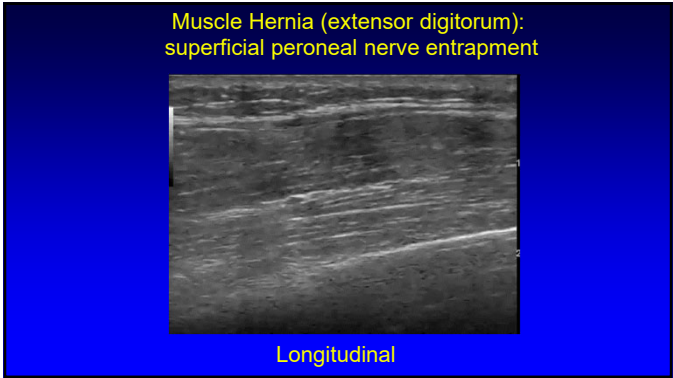
Intraneural Ganglion



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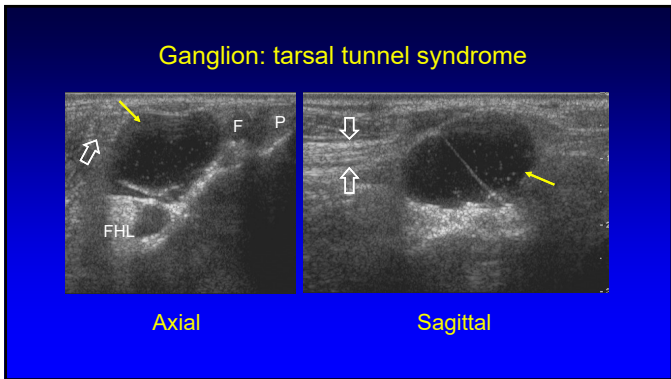
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- ### Nerve Entrapment Syndromes
- Peroneal:
 - Common peroneal
 - Superficial peroneal
 - Tibial
 - Interdigital (Morton neuroma)

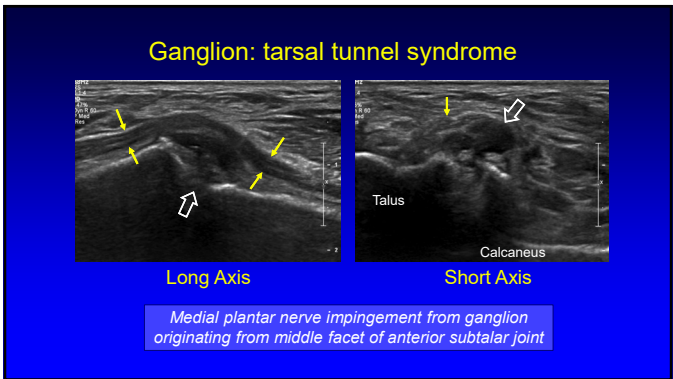
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- ### Tarsal Tunnel Syndrome
- Entrapment of tibial nerve
 - Ganglion: most common
 - Varicose veins, tenosynovitis
 - Trauma, deformity, coalition, idiopathic
 - Tibial nerve:
 - May appear normal
 - May be hypoechoic and swollen
-
- Nagaoka, J Ultrasound Med 2005;24:1035

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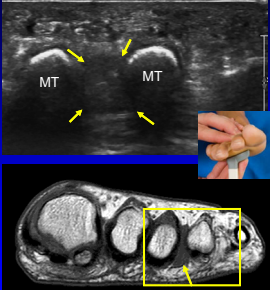
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Interdigital Neuroma

- Hypochoic 5 mm mass
 - Sensitivity: **100%** ; Specificity: **83%**
- Digital nerve continuity*
 - Excludes other causes for mass
- Compression:
 - Produces symptoms
 - Bursa (compressible) vs. neuroma (not compressible)

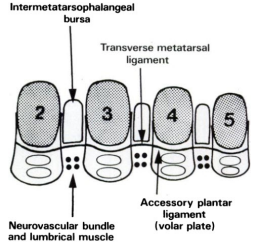


Redd et al. Radiology 1989; 171:415
Quinn et al. AJR 2000; 174:1723

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Anatomy

- At level of metatarsal heads:
 - Transverse metatarsal ligament
 - Attaches to plantar plates
 - Intermetatarsal bursa: dorsal
 - Neurovascular bundle: plantar

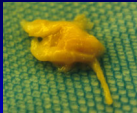


Zanetti M et al. Radiology 2014; 203:516

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Interdigital Neuroma

- Common plantar digital nerve entrapment
- Edema, fibrosis, necrosis
- 3rd intermetatarsal space > 2nd
- Sharp, burning pain to toes
- Females: pliable foot, high-heeled, narrow-toed shoes
- Asymptomatic neuromas in up to 33%
- Neuromas < 5 mm mediolateral: **often asymptomatic**



Zanetti M et al. Radiology 1997; 203:516

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Neuromas: eponyms

- Medial to first metatarsal: Joplin
- 1st webspace: Heuter
- 2nd webspace: Hauser
- 3rd webspace: **Morton**
- 4th webspace: Iselin

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Ultrasound Evaluation

- #1: plantar, short axis
 - With dorsal compression
- #2: plantar, long axis
 - With dorsal compression
- #3: Mulder maneuver
 - With side-to-side compression



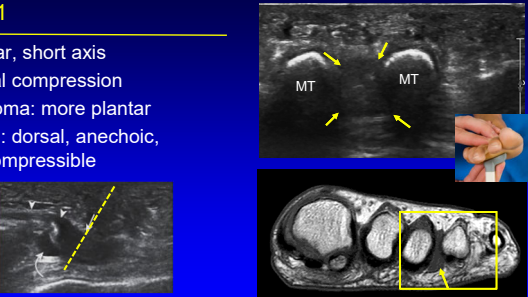
*Neuroma of 5 mm or larger: 100% sensitivity, 83% specificity

Redd et al. Radiology 1989; 171:415
Quinn et al. AJR 2000; 174:1723

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Step #1

- Plantar, short axis
- Dorsal compression
- Neuroma: more plantar
- Bursa: dorsal, anechoic, compressible

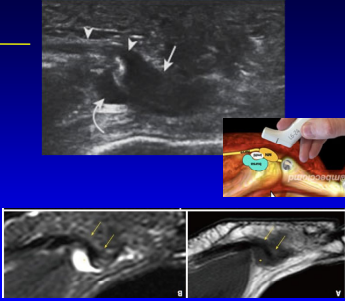


Note: coronal-oblique plane moving distal to metatarsal heads

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Step #2

- Plantar, long axis
 - Follow MT head curvature
- Dorsal compression
 - Move finger distal, proximal
 - See neuroma sliding over intermetatarsal ligament
- Neuroma: plantar, distal
- Bursa: curved arrow
 - Dorsal, proximal
 - Anechoic, compressible

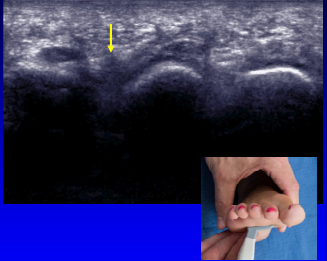


MRI flipped upside down to simulate US

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Step #3: Mulder's maneuver

- Transducer: plantar, short axis
- Squeeze foot side-to-side
- Neuroma moves plantar
 - Palpable click, elicits symptoms
 - Important to document
 - Improved accuracy, measurements
- Make sure to perform distal to intermetatarsal ligament
- Bursa: remains dorsal



Torriani M et al. AJR 2003; 180:1121


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Take-home Points

- Nerve evaluation: short axis
- Entrapment:
 - Characteristic locations
 - Hypoechoic, enlarged proximal
- Muscle denervation: hyperechoic
- Dynamic evaluation:
 - Muscle hernia
 - Interdigital neuroma

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Thank you!



Syllabus on line and other educational material:
www.jacobsonmuskus.com

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