

# Ultrasound of Nerve Entrapment: Lower Extremity

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## Disclosures

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

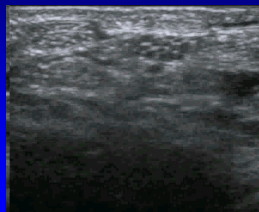
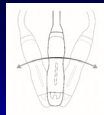
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Fundamentals of Musculoskeletal Ultrasound  
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## Normal Peripheral Nerve

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



Silvestri et al. Radiology 1995; 197:291

Median Nerve

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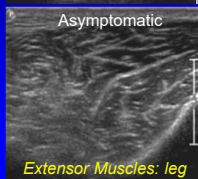
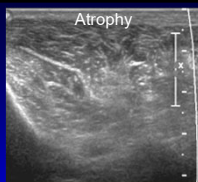
## Nerve Entrapment

- 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!



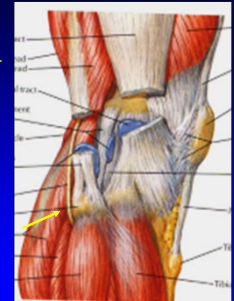
J Ultrasound Med 1993; 2:73

Extensor Muscles: leg

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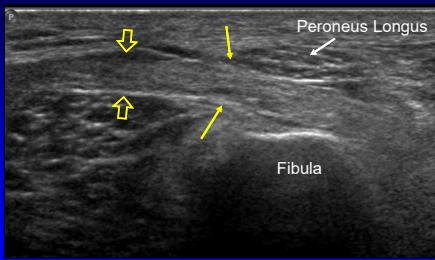
## Common Peroneal Nerve

- 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 drop<sup>1</sup>
- No identifiable etiology
  - Weight loss, trauma, leg crossing
- High body mass index<sup>2</sup>
  - Unlike other causes for peroneal neuropathy

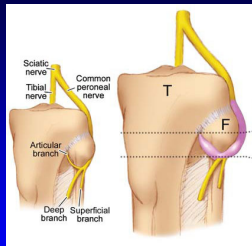
<sup>1</sup>Visser et al. Neurology 2006; 67:1473  
<sup>2</sup>Young et al. Neurology 2009; 72:447

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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 sheath<sup>1</sup>

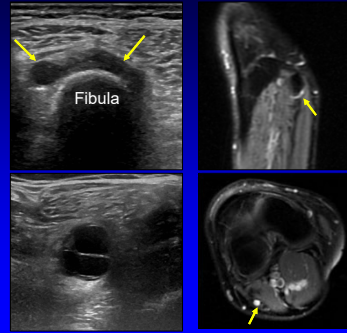
Spinner et al. Clin Anatomy 2007; 20:826



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

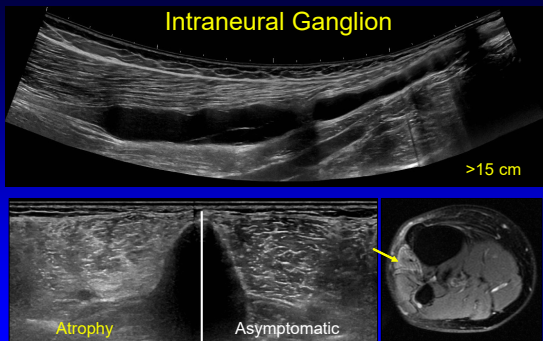
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### Peroneal Intraneural Ganglion



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### Intraneural Ganglion

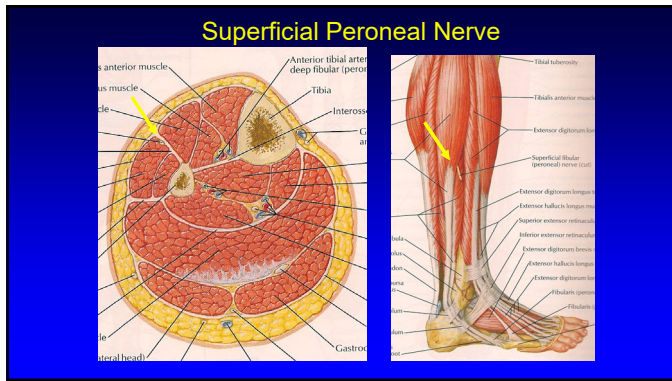


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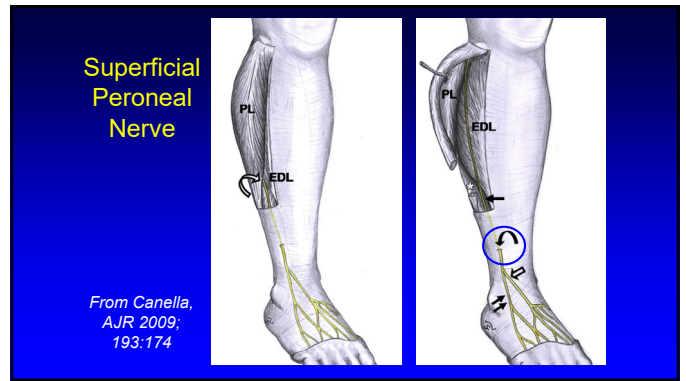
### Nerve Entrapment Syndromes

- Peroneal:
  - Common peroneal
  - Superficial peroneal
- Tibial
- Interdigital (Morton neuroma)

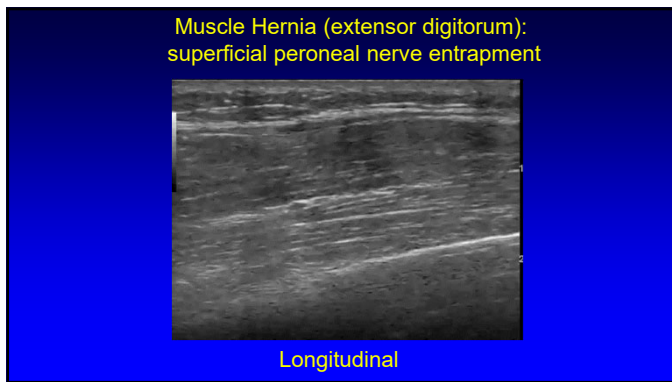
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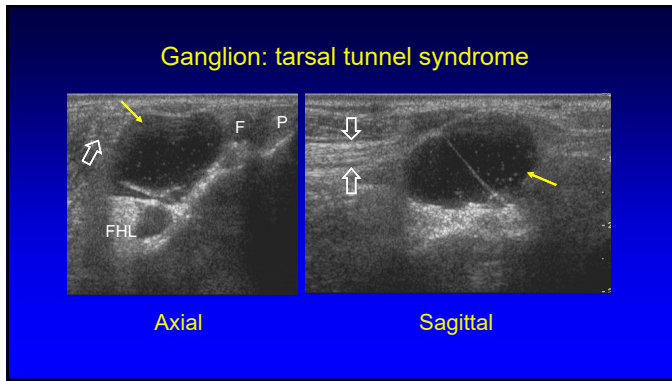
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- ### Tarsal Tunnel Syndrome
- Entrapment of tibial nerve
    - Ganglion cyst: most common
    - Varicose veins, tenosynovitis
    - Trauma, deformity, coalition, idiopathic
  - Tibial nerve:
    - May appear normal
    - May be hypoechoic and swollen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

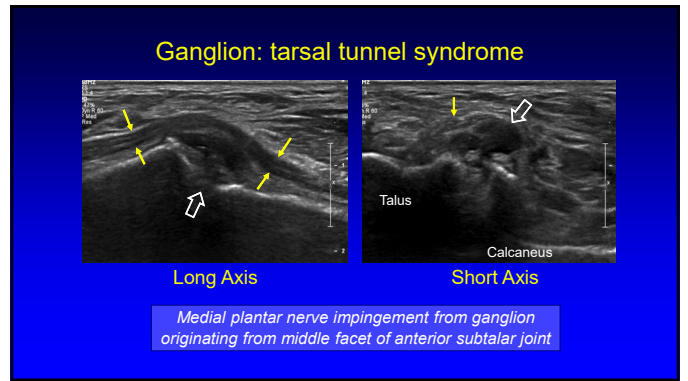
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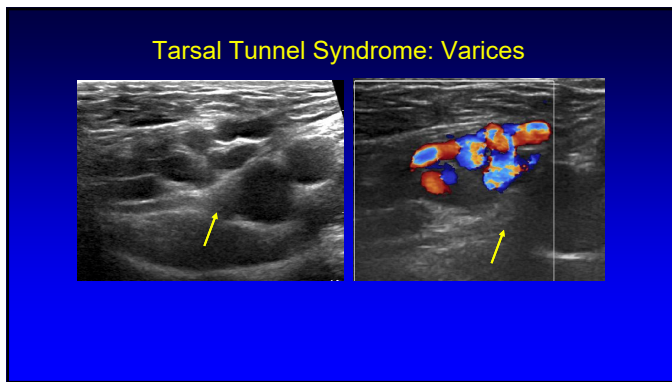
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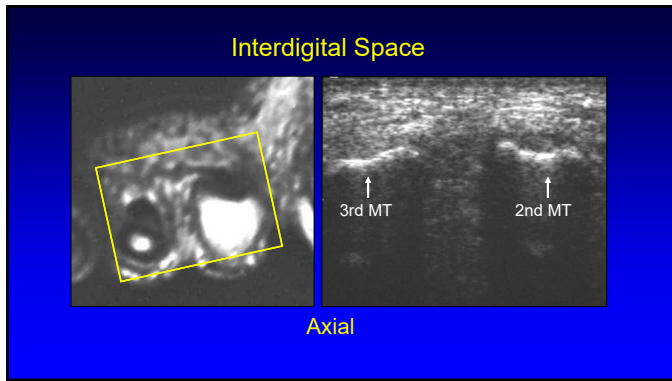
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- ### Morton Neuroma:
- Interdigital nerve entrapment
  - Edema, fibrosis, necrosis
  - 3<sup>rd</sup> intermetatarsal space > 2<sup>nd</sup>
  - Sharp, burning pain from metatarsal head to toes
  - Females: pliable foot, high-heeled narrow-toed shoes
- 
- From: Martinoli, RadioGraphics 2000; 20:S199

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- ### Technique:
- Interdigital space
    - Transducer:
      - Plantar
      - Dorsal
    - Normal digital nerve difficult to visualize
    - Correlate with symptoms
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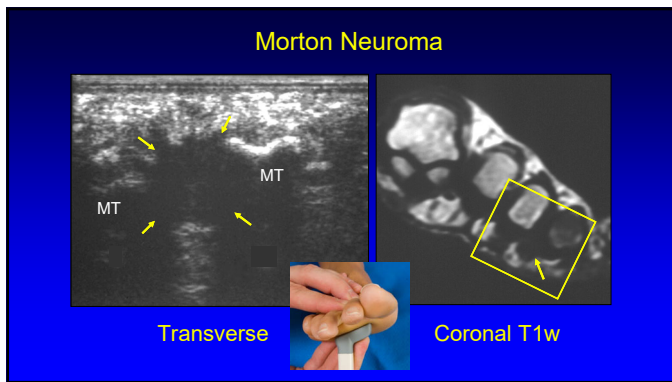
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### Morton Neuroma

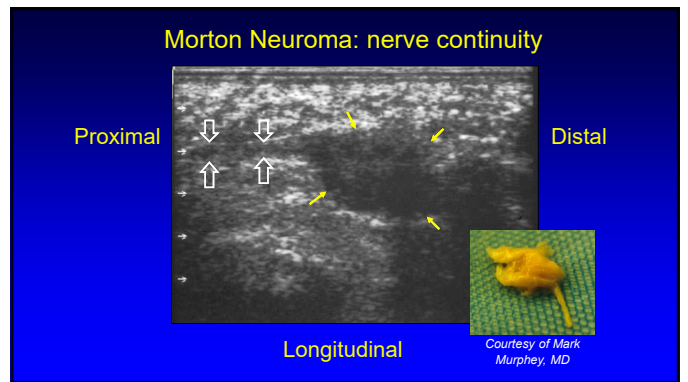
- Hypoechoic 5 mm mass
  - Sensitivity: 100% ; Specificity: 83%
  - Accuracy equal to MRI
  - Nerve continuity: sagittal plane
- Intermetatarsal bursa
  - Associated with neuroma
  - “Neuroma-bursal complex”

Quinn T et al. AJR 2000; 174:1723  
 Bignotti B et al. Eur Radiol 2015; 25:2254  
 Cohen SL et al. J Ultrasound Med 2016; 25:3191

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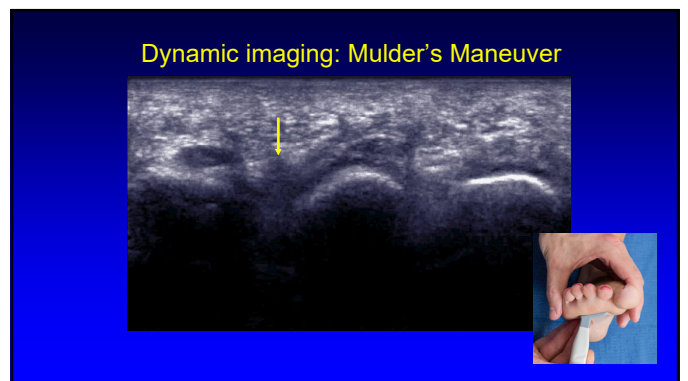
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### Dynamic Evaluation

- Compression
  - Between transducer and palpation
  - Bursae (dorsal) compress, neuromas (plantar) do not
- Sonographic Mulder Sign
  - Scan plantar: coronal plane
  - Neuroma displaces: plantar
  - Palpable click

Torriani M et al. AJR 2003; 180:1121  
 Zanetti M et al. Radiology 1997; 203:516

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### Take-home Points

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

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