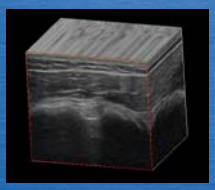
High Frequency Ultrasound for Assessment of Carpal Tunnel Syndrome



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Learning Objectives

- Understand the Fundamental Principles and Utility of Imaging Peripheral Nerves with High Frequency Ultrasound.
- Become Familiar with the Echogenic Appearance of Median Nerve and Surrounding Structures in the Carpal Tunnel.
- Learn Some Clinical Scenarios in Which Soft Tissue Imaging Assisted with the Diagnosis of Median Neuropathy at the Carpal Tunnel.

Why Image Nerves with High Frequency Ultrasound?

- Rule out musculoskeletal “mimics” and concomitant problems.
- Assess for tumors, ganglia and other compressive masses.
- Assess for dynamic compressions or subluxations.
- More precise localization of pathology.
- Functional Axonotmesis vs Neurotmesis

MSK Ultrasound

*useful for anatomic correlation
In peripheral nerve entrapments

MSK Ultrasound

Anatomy ≠ Physiology

Outline

- Basic Terms and Appearance
- Ultrasound Appearance of the Median Nerve and Measurement Techniques.
- Review Clinical Cases of Various Median Nerve Pathology.

Goals for Carpal Tunnel Sonography

- R/O ganglia and tenosynovitis
- R/O rheumatoid and amyloid synovitis from the radial/mid-carpal joint
- R/O tophi/hydroxyappetite crystals
- R/O other tumors or other masses

Identify Cross Sectional Area

*Per Von Holsbeek

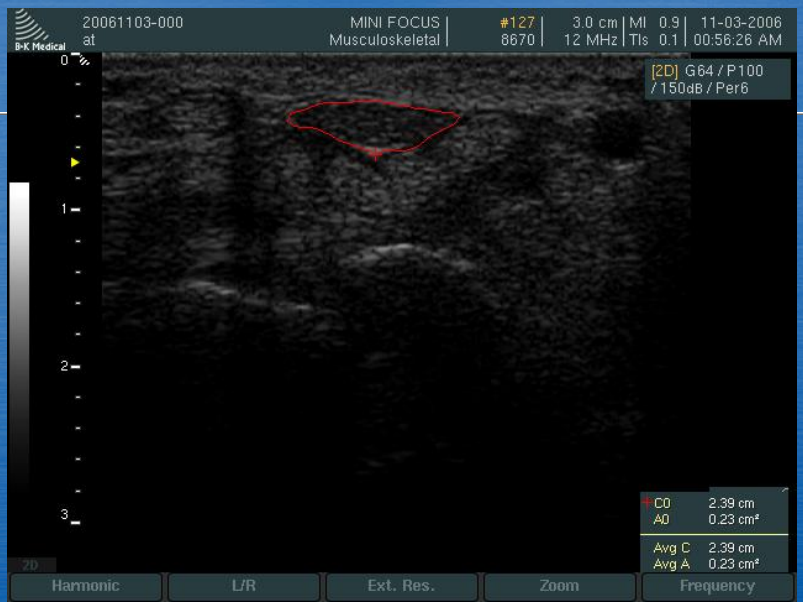
- >15mm^2 diagnosis established
- <15mm^2 --->EMG

Criteria for median neuropathy at the wrist (CTS)

1. Duke
   1. Area of ≥14 mm² @distal wrist crease
   2. Wrist-to-Forearm (WFR) ≥1.5
2. Wake Forest
   1. Area of ≥14 mm² @distal wrist crease
3. Universita Cattolica
   1. Area of > 10 mm² @ distal wrist crease
   2. Wrist-to-Forearm (WFR) ≥1.5
   3. Correlates with NCS values for CTS

1&2: Hobson-Webb, Padua in Muscle & Nerve July 2009

3: Wiesler, et al in Jl of Hand Surgery May-June 2006



Other Anatomic Considerations

- Flattening ratio (<3:1) *Buchberger
- Proximal swelling and tapering at the entrapment site
- Forearm to wrist cross-sectional area change
- Relative dynamic excursion

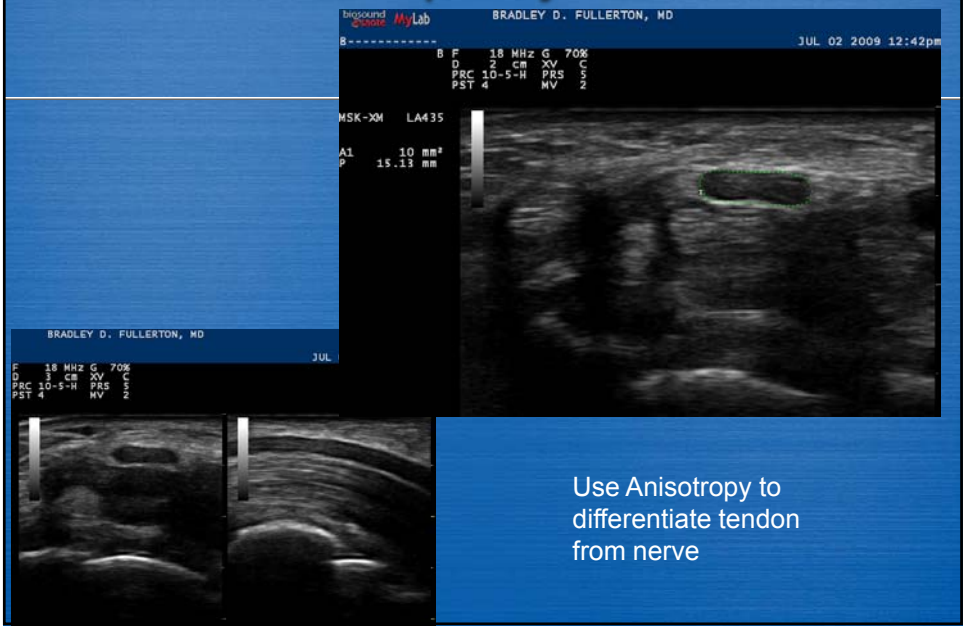
Assess for Anatomic Variants

- Bifid median nerves
- Persistent median artery
- Subluxing FDS muscle
- Encroaching lumbrical (rare)
- Post-operative changes

Median Nerve

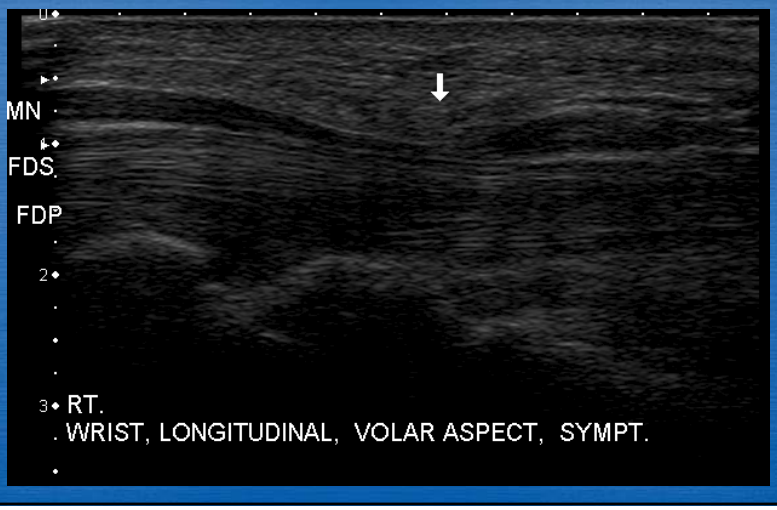
Median Nerve with Movement

Median neuropathy at the wrist

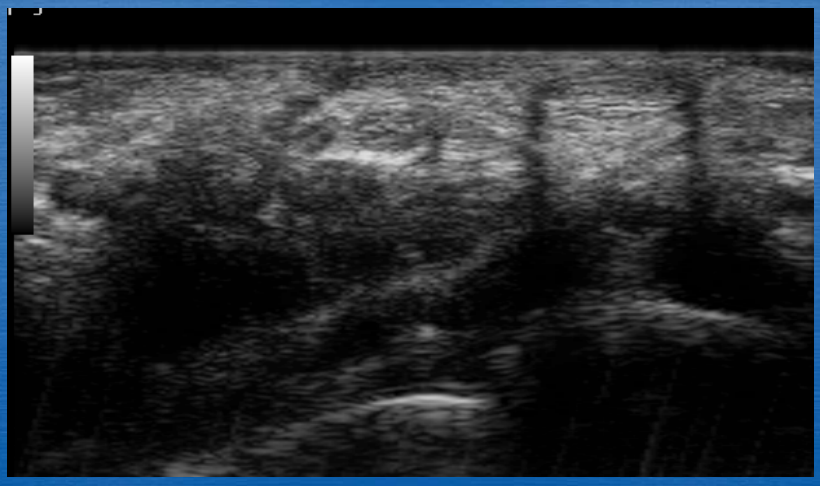


Use Anisotropy to differentiate tendon from nerve

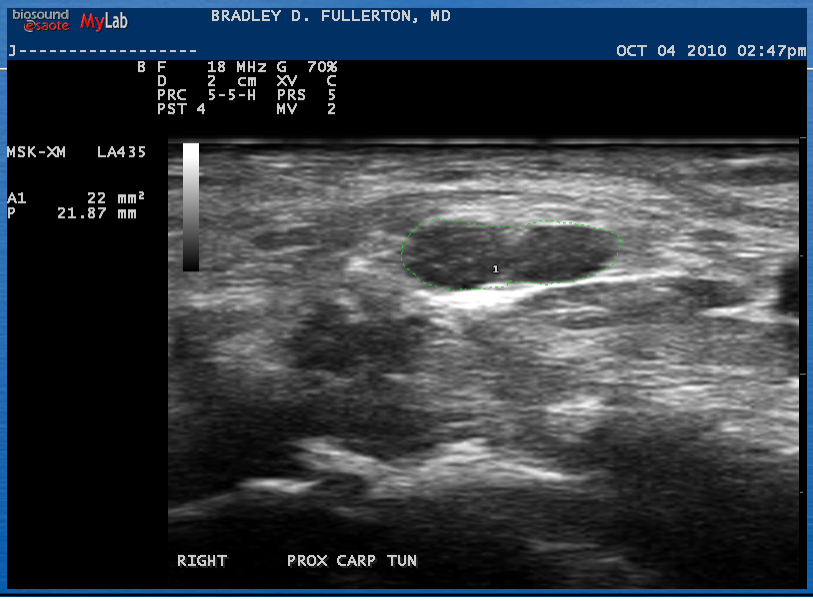
Longitudinal View



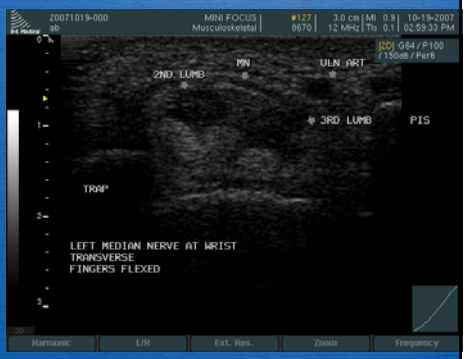
Bifid Median Nerve



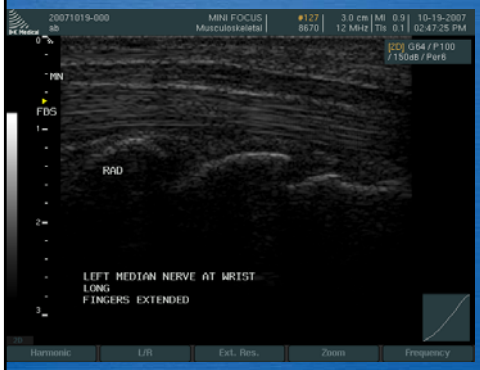
Severe Median neuropathy

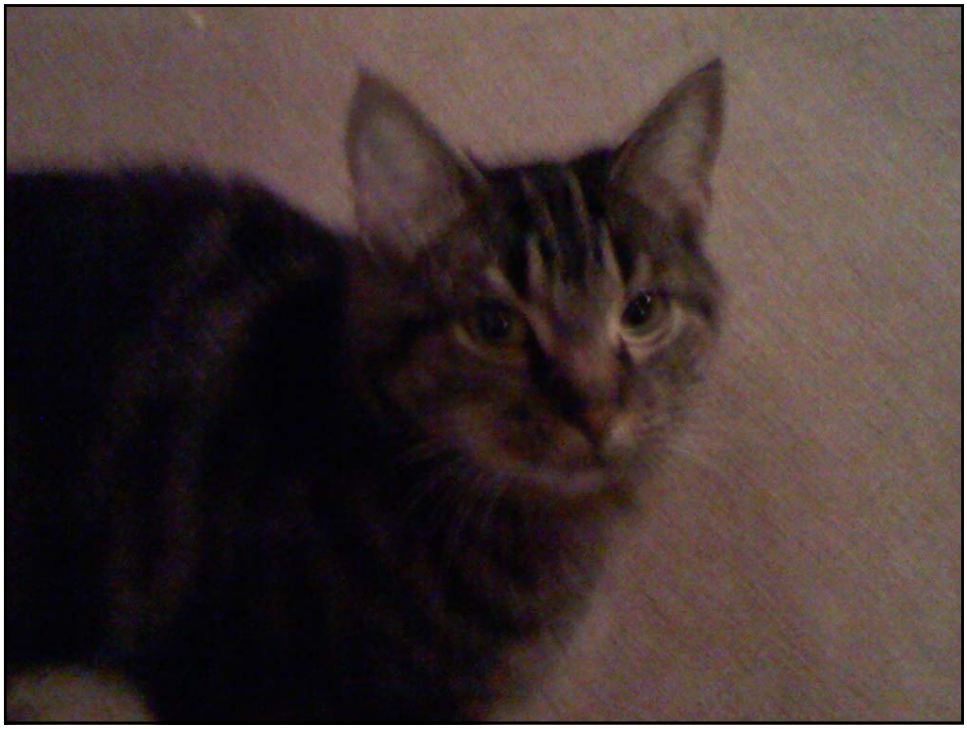


Encroaching Lumbricals



Encroaching Lumbricals-Long





Nerve Mobility

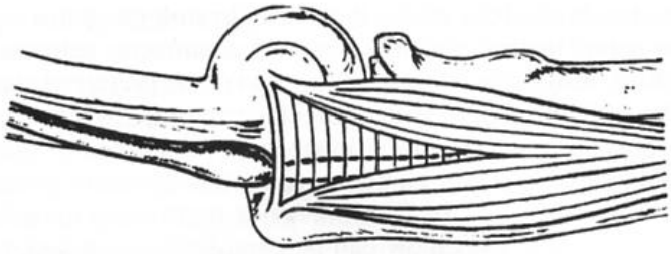
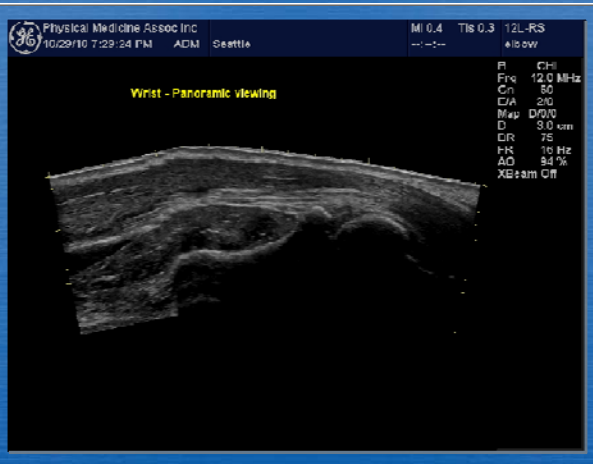
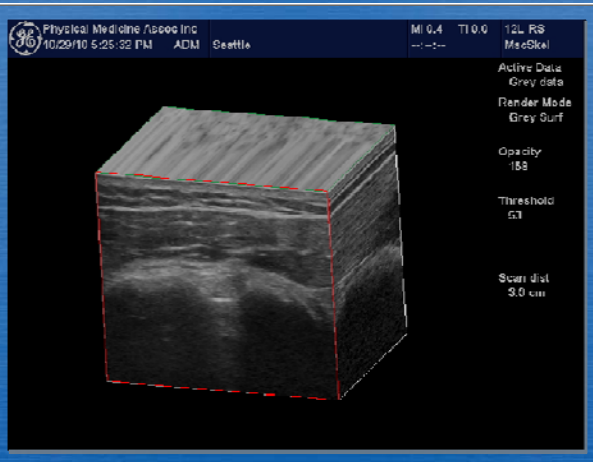


Figure 24-22. **Ulnar nerve compression.** The ulnar nerve is shown to be compressed at the proximal edge of the cubital tunnel beneath the arcuate ligament with subsequent bulging of the nerve. (From Osborne GV: Compression neuritis of the ulnar nerve at the

Panoramic



3D Imaging



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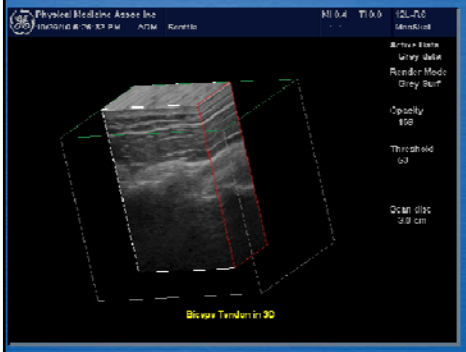

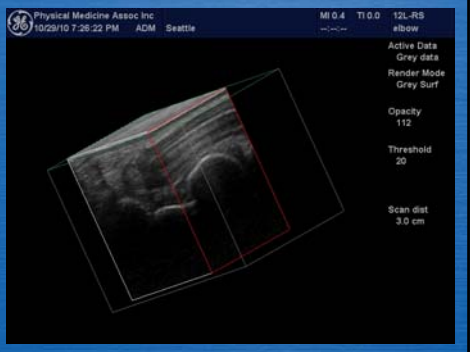

3D Imaging