Disclosures

- **Grants**: NBA/GE, Mitek
- **Research**: Supersonic Imagine
- **Royalties**: Elsevier
Objectives

- Show that ultrasound is well-suited to evaluate the normal structures of the wrist
- Discuss the normal US appearance and dynamic movement of the ECU
- Demonstrate common pathology involving the wrist
Bone Anatomy

- 8 Carpal Bones
- 2 Carpal Rows
- Radiocarpal Jt
- DRUJ

PA View

- Trapezium
- Scaphoid
- Lunate
- Triquetrum
- Pisiform
- Trapezoid Capitate
- Hamate
Carpal Tunnel View

- Pisiform
- Hook of the Hamate
- Trapezium Ridge
Intrinsic Ligaments

MRI T2-W

MRI PD-W
Three Compartments

1. Radiocarpal Joint
2. DRUJ
3. Midcarpal Joint
Musculoskeletal Ultrasound

- **Indications**
  - Focused but complete exam
  - Characterize soft tissue mass
    - Cyst or Solid
- **US-Guided Procedures**
  - Injection
  - Aspiration
Flexor Tendons
Volar Wrist: Technique

- Median Nerve
- Flexor Tendons
  - FCR & Radial Artery
  - Occult Ganglia
- Volar Joint Recesses
Volar Wrist

Radial ➔ Ulnar
Volar Wrist: Flexor Carpi Ulnaris

- No synovial sheath
Normal Peripheral Nerve

- US Appearance
  - Hypoechoic Fascicles
  - Hyperechoic Conn Tis
- Transverse
  - Honeycomb
- Minimal Anisotropy

Volar Wrist: Median Nerve

Take home point: Tendons more susceptible to anisotropy!!
Volar Wrist: CTS

- Proximal Enlargement of Median Nerve
  - > 10mm$^2$ cross-sectional area$^1$
  - > 9mm$^2$ circumferential$^2$
  - Measure at level of pisiform
- Distal Nerve Compressed
- Bowing of the Flexor Retinaculum

1 Chen et al. AJR 1997; 168:533
2 Duncan et al 199; 173:681
Median Nerve - Carpal Tunnel

Scaphoid

Radial → Ulnar

Pisiform
Median Nerve - Proximal
Median Nerve
Cross-Sectional Area Measurement

- CSA of the median nerve
  - Carpal Tunnel (C)
  - Pronator Quadratus (P)

- Mean CSAC in normals = 9.0 mm²
- Difference of CSA to normalize

\[ \Delta \text{CSA} = \text{CSAC} - \text{CSAP} \]

Threshold of 2 mm²
Sensitivity = 99%
Specificity = 100%

Klauser A. Radiology 2009;250:171
Ulnar Nerve – Guyon Canal
Radial Nerve – Superficial Branch

Linda D. Radiographics 2010;30:1373
Volar Wrist: Joint Recesses

- Anechoic: Simple fluid
- If not anechoic
  - Compressible
  - Noncompressible
  - Hyperemia
- Cannot differentiate sterile from septic joint fluid
Dorsal Wrist: Extensor Tendons

Radius

Ulna
Wrist Ganglia

- Most common wrist mass
- Not compressible!!
- Dorsal
  - 70%
  - Originates from Scapholunate ligament
- Volar
  - Identify between radial artery and FCR
  - Proximal to the radiocarpal joint capsule
De Quervain’s Tenosynovitis
Dorsal Wrist: Extensor Tendons

ECRB, LT, EPL, ECRL
Extensor Tendons: Tenosynovitis

Can be hyperechoic!
Dorsal Wrist: EPL Tear

Use Dynamic Imaging!!
6th Extensor Compartment

- Extensor Carpi Ulnaris Tendon (ECU)
  - Own fibro-osseous tunnel
  - Stabilizer of the DRUJ: own subsheath
  - Overlying extensor retinaculum
  - Instability of the ECU: a difficult clinical diagnosis

Spinner and Kaplan, 1970
6th Extensor Compartment

Pratt et al, 2004
US - MRI Correlation

Pronation

Neutral

Supination

Lee KS. AJR 2009;193:651
Normal Movement of the ECU

Supinated - Radial

Supinated - Ulnar

Supinated - Ulnar

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Summary

- Ultrasound is well-suited for evaluating common wrist pathology
  - Tendons – Extensors and Flexors
  - Dynamic – ECU
  - Nerves – Median, Ulnar, Radial
Thank You