Introduction to Ultrasound Examination of the Hand and upper

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Ultrasound of upper ext. Upside

- Convenient
- Opens another exam dimension
- Can be like a “stethoscope”
- Helps “3-D visualization”
- Allows Dynamic, Functional exam

Up side

- Immediate, and more practical than MRI
- Great patient pleaser

Intraoperative use

- Available in OR (Anesthesia work room)
- Loose body

Down side

- New technology
- Time: 5-10 min/pt. or more
  - Less with more experience
- Learning curve:
  - Take a course
  - Pattern Recognition
  - But we are the ones who know the anatomy who else?

Musculoskeletal Ultrasound

- Special high resolution transducer
- Expense
  - $30-80K
  - More functions more money!
- Room in the office
- “The new fluroscan”
- Image Handling
Ultrasound in Upper extremity

Shoulder/arm
- Rotator cuff pathology
- Biceps distal and proximal

Elbow
- Triceps attachment
- Collateral ligaments
- Ulnar nerve location, subluxation
- Lateral and medial muscle attachments

Triceps attachment

Lateral elbow

Lateral elbow

Medial elbow
Hand and wrist UTS evaluation

- Mass
- Ligaments
- Tendon:
  - Location
  - Subluxation
  - Rupture
- Foreign Bodies
- Vessel:
  - Size
  - Location

Mass in the palm

Thumb MP Ligaments

UCL tear detection

- Journal Radiology May 2010
- M. Nozian, et al
- 69 UCL tear suspected and had US
- 43 had surgery
- 37 out of 43 had correct dx.
- 6 false positive
Transverse sonogram through the anatomic snuffbox shows the tendons of the first extensor compartment: the extensor pollicis brevis (EPB) and the abductor pollicis longus (APL).

Transverse sonogram shows the second extensor compartment, which contains the extensor carpi radialis brevis (ECRB) and longus (ECRL) tendons.

Transverse sonogram shows the extensor surface of the wrist at the level of the distal carpal row, with a normal small volume of anechoic synovial fluid in the tendon sheath between the tendons.

Anisotropy artifact.

Volar Wrist Ganglion and the artery

Transverse sonogram shows the extensor surface of the wrist at the level of the distal carpal row, with a normal small volume of anechoic synovial fluid in the tendon sheath between the tendons.

Figure 4A. Normal sonographic appearance of nerves.
Normal sonographic appearance of nerves.

Transverse sonogram shows the third extensor compartment, which contains the extensor pollicis longus (EPL) tendon, and its location between the neighboring extensor digitorum (ED) and extensor carpi radialis brevis (ECRB) tendons.

Figure 8. Transverse sonogram shows the fourth extensor compartment.

Figure 9. Transverse sonogram shows the third through the fifth extensor compartments.

Transverse sonogram shows the sixth extensor compartment, which contains the extensor carpi ulnaris (ECU) tendon and sheath.

ECU motion with supination

ECU subluxation

pronation   neutral   supination

Ulnar artery

Transverse sonogram shows the dorsal aspect of the proximal carpal row, just distal to the level of the Lister tubercle.

Figure 12. Transverse sonogram at the same level as Figure 11 but on the ulnar side of the dorsal carpus shows the echogenic dorsal aspect of the lunotriquetral ligament and, above it, the extensor digiti minimi (EDM) tendon.

Figure 13a. Sonographic examination of the ulnar surface of the wrist.

Figure 13b. Sonographic examination of the ulnar side of the wrist.
Wrist ligament and TFC tears

- Skeletal radiology 2003
- Finlay, K. et al from Canada
- 26 pt. with wrist pain with tri-comp. arthrog
- 10/10 S-L lig tear US and Arthrogram
- 2/8 lunotriq. and 7/10 TFC tears on UTS
- Intermediate accuracy for TFC tears
Normal sonographic appearances of the carpal tunnel.

Figure 17. Transverse sonogram of the carpal tunnel shows the location of the flexor carpi radialis (FCR) tendon within the lateral part of the flexor retinaculum.

Figure 18a. Sonographic appearance of the long flexor tendons in the palm.

Figure 18b. Sonographic appearances of the long tendons of the finger, the flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP).
Figure 19b. Sonographic appearances of the long tendons of the finger, the flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP).


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Figure 19c. Sonographic appearances of the long tendons of the finger, the flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP).


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Figure 20. Longitudinal sonogram shows the insertion site of the flexor digitorum superficialis tendon at the base of the middle phalanx.


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Figure 21a. (a) Longitudinal sonogram shows the insertion of the flexor digitorum profundus (FDP) tendon onto the base of the terminal phalanx.


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Figure 21b. (a) Longitudinal sonogram shows the insertion of the flexor digitorum profundus (FDP) tendon onto the base of the terminal phalanx.


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FDP and FDS at MP

- Repair side
- Normal contralateral

FPL repair 4 wks

Digital Annular Pulley
- Skeletal radiology 2000
- Martinoli, C. et al
- US detected 8/9 DAP rupture
- Indirect sign of volar bowstringing

FDP intact / laceration
- Intact
- missing

FDP at PIP level
- intact
- missing
Figure 22b. Transverse (a) and longitudinal (b) sonograms through the thenar eminence show the relationship of the echogenic flexor pollicis longus tendon to the short muscles of the thumb.

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Figure 23. Transverse sonogram of the Guyon canal, obtained by using the linear-array transducer in sector mode for a wider field of view, shows the presence of a normal variant accessory muscle that may be associated with compression of the adjacent ulnar nerve.

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Figure 24. Transverse sonogram at the level of the proximal part of the proximal phalanx shows the second annular pulley as a hypoechoic thickening of the flexor sheath that extends to the sides of the base of the proximal phalanx.

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Figure 25. Longitudinal sonogram of the finger at the level of the proximal phalanx shows the second annular pulley as a thin hyperechoic line (arrows) superficial to the long flexor tendons.

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Figure 26. Transverse sonogram of the finger at the level of the head of the middle phalanx shows the fifth annular pulley, which covers the flexor digitorum profundus (FDP) tendon at a point just proximal to the distal interphalangeal joint, as well as several vessels in a location superficial to the pulley.

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