

Ultrasound of Common Wrist and Hand Pathology

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Disclosures

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

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Fundamentals of Musculoskeletal Ultrasound are
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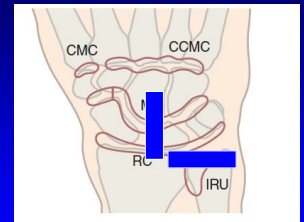
Outline

- Joint effusion / synovitis
- De Quervain tenosynovitis
- Carpal tunnel syndrome
- Gamekeeper's thumb
- Pulley abnormalities
- Ganglion

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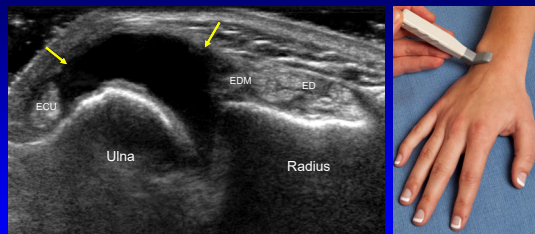
Joint Assessment: dorsal

- Wrist:
 - Radiocarpal joint (RC)
 - Midcarpal joint (MC)
 - Distal or inferior radioulnar joint (IRU)
- Hand:
 - MCP and PIP joints
 - 1st CMC (if symptomatic)



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Joint Effusion: distal radioulnar joint

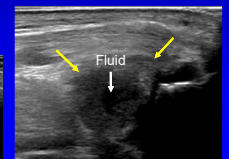
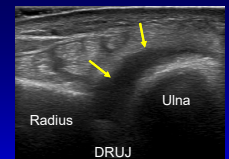
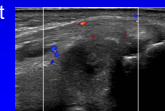


Transverse

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Joint Effusion vs Synovial Hypertrophy

- Anechoic: fluid
- Hypoechoic:
 - Effusion vs. synovial hypertrophy
 - Compressible: fluid
 - Internal hyperemia: synovitis
 - *flow may be absent



AJR 2000; 174: 1353

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Inflammatory Arthritis: role

- Identify synovitis and erosions
 - Prior to initiating treatment
- Determine activity: hyperemia
- Aspirate or inject
- Follow-up after therapy
 - Decreased hyperemia
 - Decreased synovial thickness

Radius
Lunate
Capitate

Rheumatoid Arthritis

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Arthritis: synovitis

- Synovial locations:
 - Joint recess, bursa, tendon sheath
- Hypoechoic compared to adjacent subcutaneous fat
 - May be isoechoic or hyperechoic
- Hyperemia: variable
 - Represents activity of inflammation
 - Decreased: treatment (even NSAIDS)

5th PIP

Backhaus M, Arthritis and Rheum 1999; 42:1232

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Synovitis: MCP joint

MC2
PP

Sagittal Plane: 2nd MCP Joint

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Pitfall Alert! Normal Joint Capsule Appearance

- Dorsal capsule thickness:
 - MCP 1: 6 mm
 - MCP 2: 4 mm
 - MCP 3-5: 3 mm
 - RC joint: 4 mm
 - MC joint: 3 mm
- Do not interpret as abnormal synovial hypertrophy

MCP2
PP

Radius
Lunate
Capitate

*Note normal echogenic triangular fibrocartilage (white arrow)

*Falkowski A et al. Eur J Radiology 2020; 124

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Erosions

- Disrupted cortex in 2 planes
- Ultrasound not very good for erosions:
 - Better than radiographs
 - 40% sensitivity¹, 29% false positives²: wrist/hand compared with CT
 - Very non-specific, time consuming
- Adjacent synovitis adds specificity
- Correlate with radiographs, labs, distribution

2nd PIP

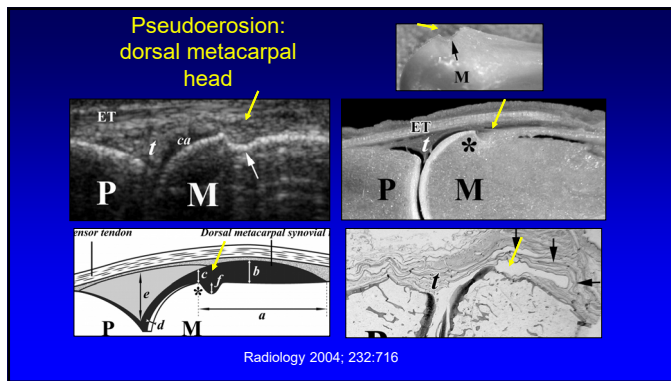
¹Dohn UF M, Arthritis Res Ther 2006; 8:1
²Finzel S. et al. Arth Rheumatism 2011; 63:1231

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Rheumatoid Arthritis

2nd MCP

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Pitfall Alert! Pseudoerosions Are Everywhere!

- 200 hands/wrists
- Pseudoerosions: 100%
- Metacarpal heads: all
 - 2nd: 92%
 - 3rd: 86%
- Carpal bones:
 - Lunate: 82%
 - Triquetrum: 84%
 - Distal ulna: 22%

**Unpublished Data*

**Note lack of adjacent synovitis*

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Osteoarthritis: ultrasound

- Osteophytes
- Joint effusion
- Minimal synovial hypertrophy
- Variable hyperemia
- Possible intra-articular bodies

First CMC Joint: Thumb

Sagittal Plane: dorsal
 Note: osteophytes (arrow) and intra-articular body (open arrow)

Keen HI et al. Radiol Clin N Am 2009; 47:581

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Synovitis: screening (<10 minutes)

- Hand and wrist: (5 joints per side)
 - Radiocarpal, midcarpal, distal radioulnar (dorsal)
 - MCP2 and 3 (dorsal): transverse and sagittal
 - Any symptomatic site
 - Cine: flexor and extensor tendons (short axis)
- Ankle and Foot:
 - Ankle joint
 - MTP5 (dorsal and plantar)
 - Any symptomatic site

Rosa J et al. J Clin Rheumatol 2016; 22: 179

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Outline:

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- Carpal tunnel syndrome
- Gamekeeper's thumb
- Pulley abnormalities
- Ganglion

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de Quervain Tenosynovitis

- Stenosing tenosynovitis
 - Overuse, primary care givers
- 1st dorsal wrist compartment:
 - Extensor pollicis brevis + abductor pollicis longus
- Ultrasound findings:
 - Thick synovial sheath
 - Tendinosis
 - Cortical irregularity, hyperemia

J Ultrasound Med 1997; 16:685

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Outline

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Carpal Tunnel Syndrome:

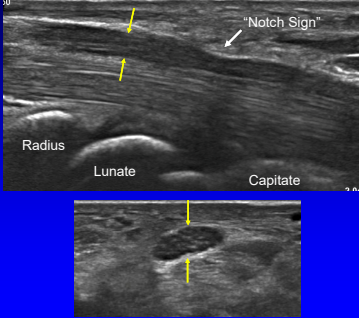
- Proximal median nerve swelling
 - Area: circumferential trace
 - Normal: <9 mm²
 - Borderline: 9 – 12 mm²
 - Abnormal: > 12 mm²
 - 12.8 mm² = moderate (83% sens, 95% spec)
 - 14.0 mm² = severe (77% sens, 100% spec)



Klauser AS et al. Sem Musculoskel Rad 2010; 14:487
Ooi et al. Skeletal Radiol 2014; 43:1387

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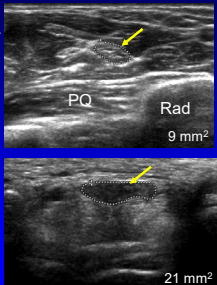
Carpal Tunnel Syndrome



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Carpal Tunnel Syndrome

- Compare areas:
 - Proximal: pronator quadratus
 - Distal: carpal tunnel
- = or >2 mm² = carpal tunnel syndrome
- 99% sensitivity
- 100% specificity

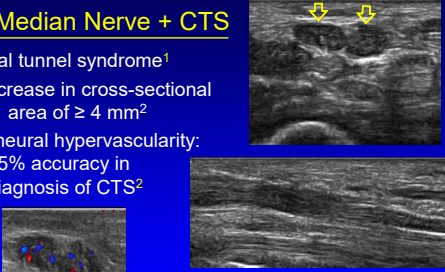


Klauser AS. Radiology 2009; 250:171

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Bifid Median Nerve + CTS

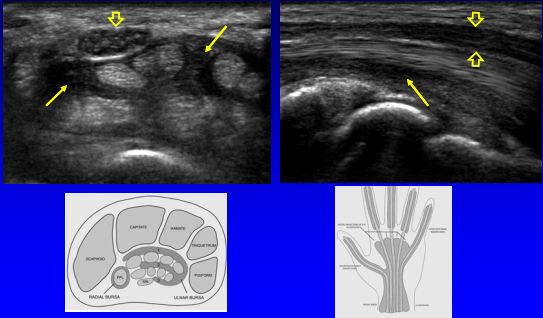
- Carpal tunnel syndrome¹
 - Increase in cross-sectional area of ≥ 4 mm²
- Intraneural hypervascularity: 95% accuracy in diagnosis of CTS²



¹Klauser et al. Radiology 2011; 259; 808
²Mallouhi et al. AJR 2006; 186:1240

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Carpal Tunnel Syndrome: ulnar bursa distention

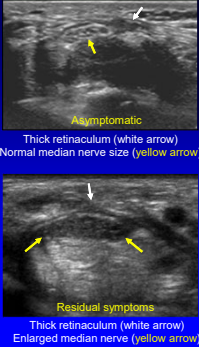


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Postoperative Carpal Tunnel

- Discontinuous or thickened transverse carpal ligament
- Anterior displacement of transverse carpal ligament¹
- Median nerve size:
 - May decrease²
 - Does not correlate with success³

¹Lee CH et al. Ann Plast Surg 2005; 54:143
²Abicalaf CA et al. Clin Radiol 2007; 62:891
³Naranjo A et al. Scand J Rheum 2010; 39:49



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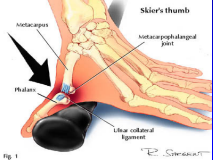
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Gamekeeper's or Skier's Thumb

- Injury: ulnar collateral ligament of first MCP joint
- Chronic (gamekeeper's thumb): historically in Scottish gamekeepers
- Acute (skier's thumb): acute hyperabduction



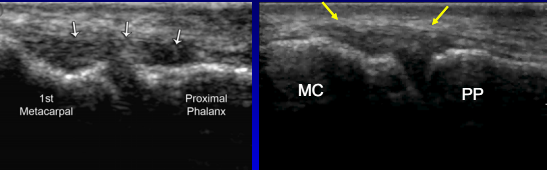
Acute Mechanism



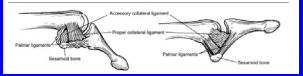
Chronic Mechanism

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Ulnar Collateral Ligament: thumb

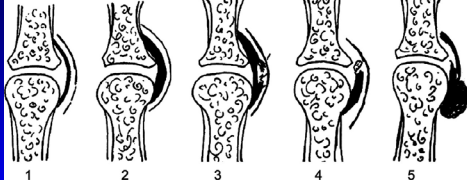


Note: sliding of adductor aponeurosis with isolated interphalangeal joint flexion




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Ulnar Collateral Ligament: thumb



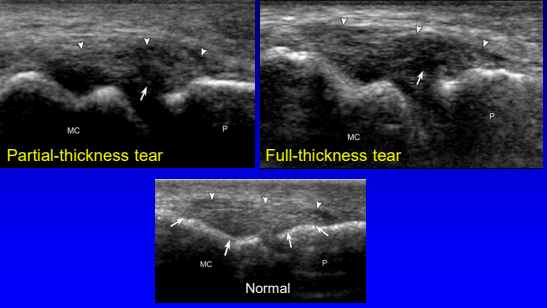
1 Normal 2 Sprain 3 Partial Tear 4 Nondisplaced Complete Tear 5 Displaced Complete Tear (Stener Lesion) (+ fracture)

RadioGraphics 2006;26:1007



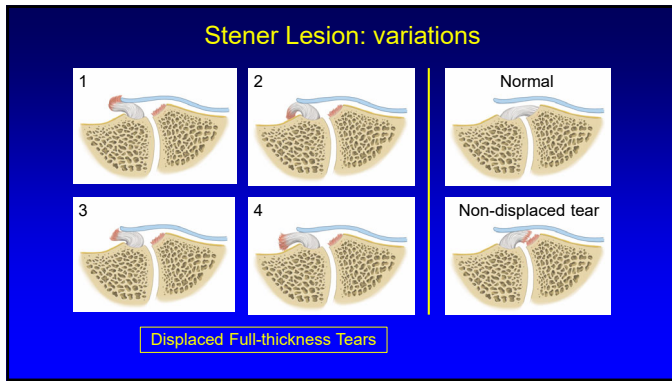
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UCL: tears

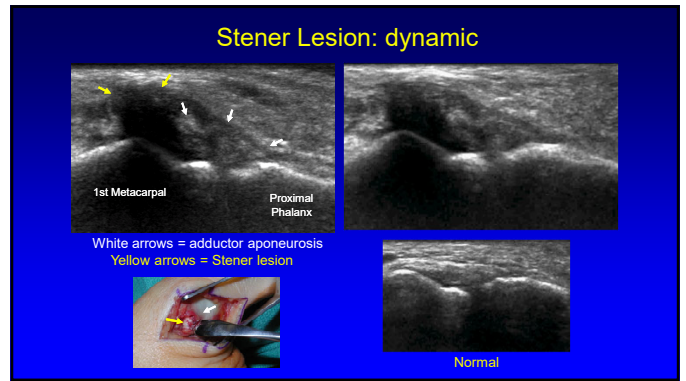


Partial-thickness tear Full-thickness tear Normal

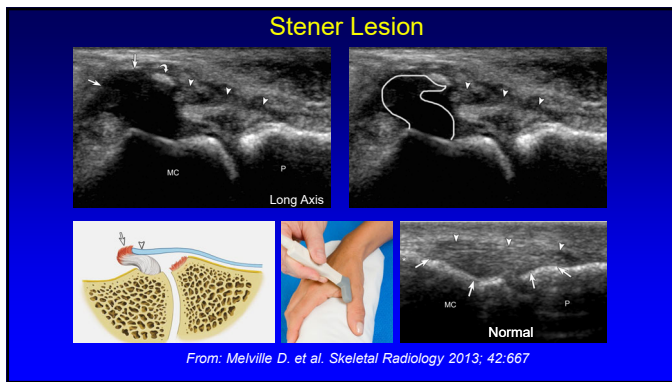
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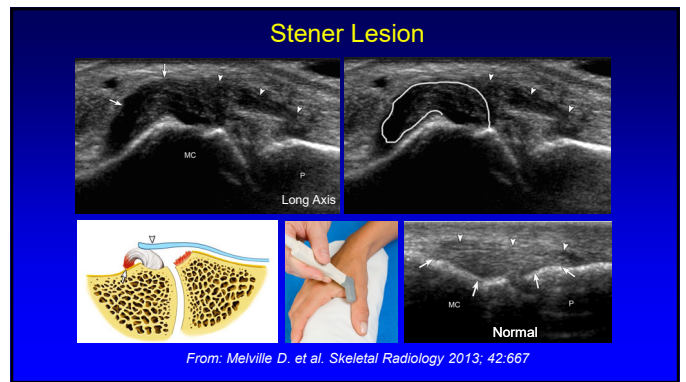
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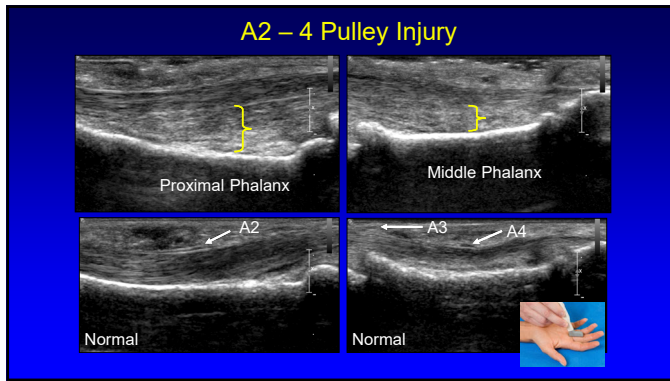
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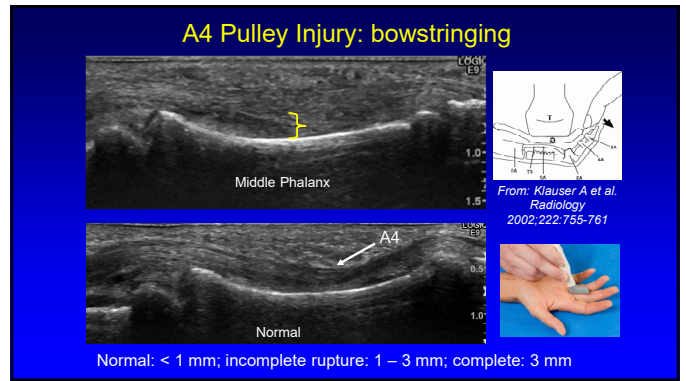
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- ### Pulley Tear
- A2 and A4 pulleys: most important
 - Sagittal image
 - Bowstringing
 - Hypochoic edema / hemorrhage
 - Dynamic evaluation*
-
- A5 C3 A4 A2 A1
- A5 C3 A4 A2 A1
- *Radiology 2002; 222:755
Radiology 1998; 206:339

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Trigger Finger

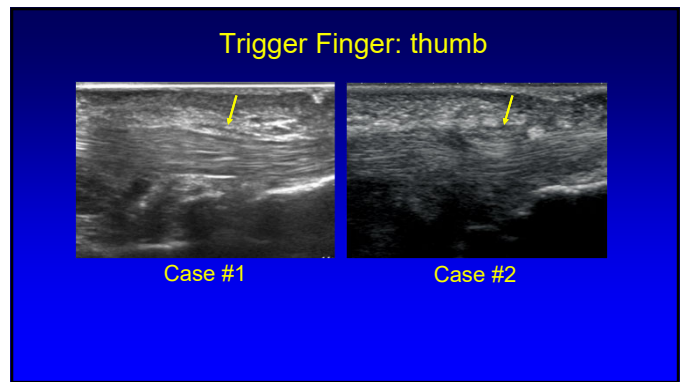
- Stenosing tenosynovitis: A1 pulley
- Thick and hypochoic pulley
- Hyperemia: 91%
- Tendinosis: 48%
- Tenosynovitis: 55%

Guerini et al. J Ultrasound Med 2008; 27:1407

Case #1

Case #2

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Soft Tissue Mass: wrist ganglia

- Most wrist masses are ganglion cysts
- Volar (69%): radial artery & flexor carpi radialis
 - Proximal from radioscaphoid joint capsule
- Dorsal: scapholunate ligament
 - Not compressible (unlike joint recess)

Zhang A et al. J Ultrasound Med 2019; 38:2155

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Ganglion: wrist

- Anechoic or hypoechoic
- Multilocular (except digits)
- Non-compressible
- Joint or tendon sheath communication
- <10 mm: hypoechoic without posterior acoustic enhancement

*Wang et al. J Ultrasound Med 2007; 26:1323

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Ganglion: dorsal

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Ganglion vs Dorsal Recess

Ganglion: not compressible Recess: compressible

Sagittal with Wrist Flexion

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Ganglion: volar

Radial Artery

Flexor Carpi Radialis

Radius

Axial color Doppler

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Take Home Points:

- Arthritis: emphasize synovitis
- De Quervain: separate sheaths
- Carpal tunnel syndrome:
 - 2 mm² enlargement
- Gamekeeper: Stener lesion
- Pulley: bowstringing
- Ganglion: multilocular, location

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Thank you!

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

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