

Ultrasound of Common Wrist and Hand Pathology

Jon A. Jacobson, MD FACR
*Professor of Radiology
 Section Chief, Musculoskeletal Imaging*



1

Disclosures:

- Consultant: Bioclinica
- Book Royalties: Elsevier
- Advisory Board: Philips
- Not relevant to this talk

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

*Note: all images from the textbook
 Fundamentals of Musculoskeletal Ultrasound are copyrighted
 by Elsevier Inc.*

2

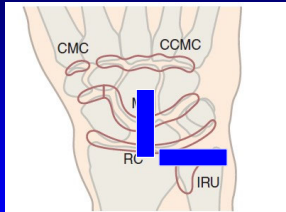
Outline

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

3

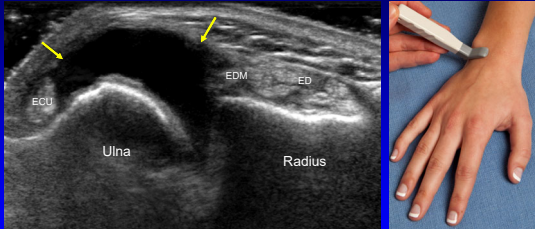
Joint Assessment: dorsal

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



4

Joint Effusion: distal radioulnar joint

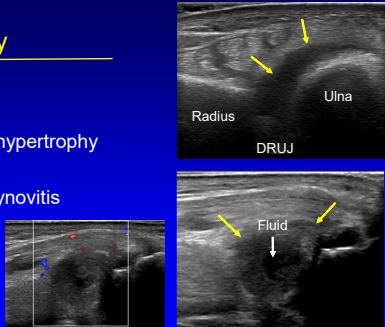


Transverse

5

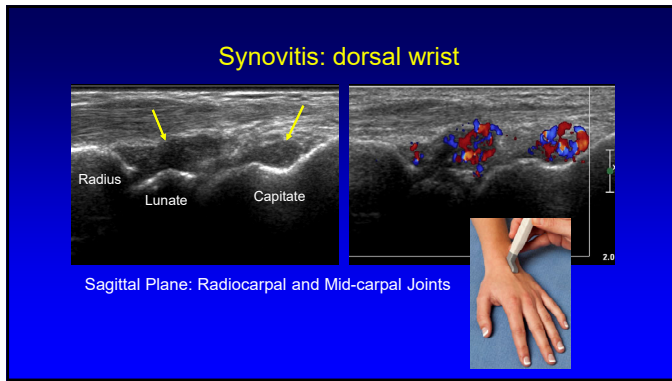
Joint Effusion vs Synovial Hypertrophy

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

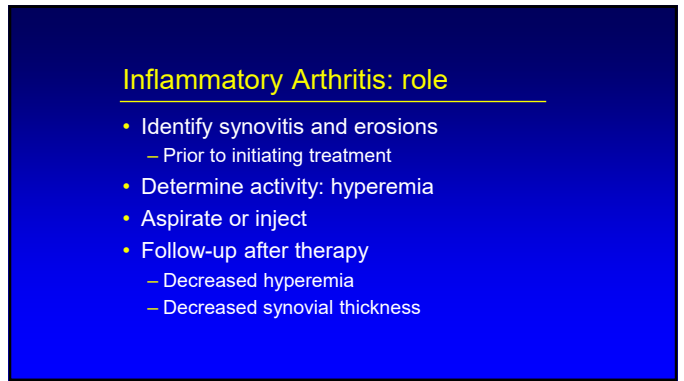


AJR 2000; 174: 1353

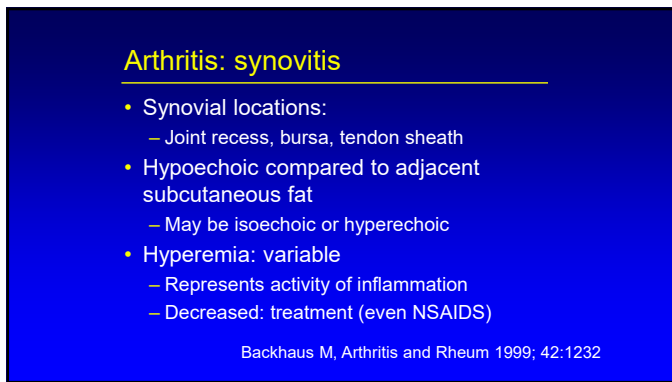
6



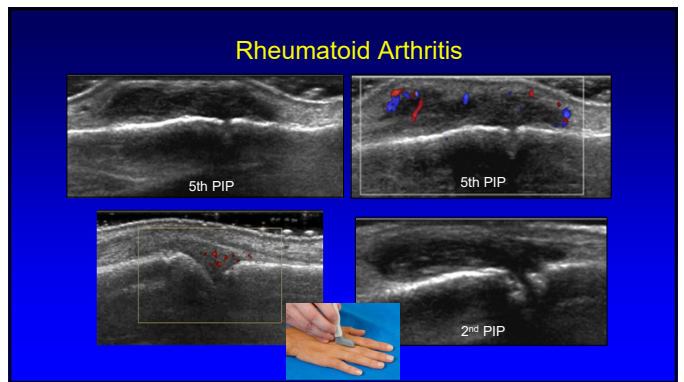
7



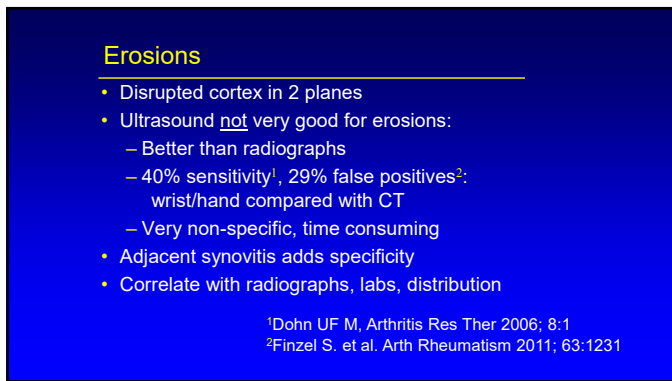
8



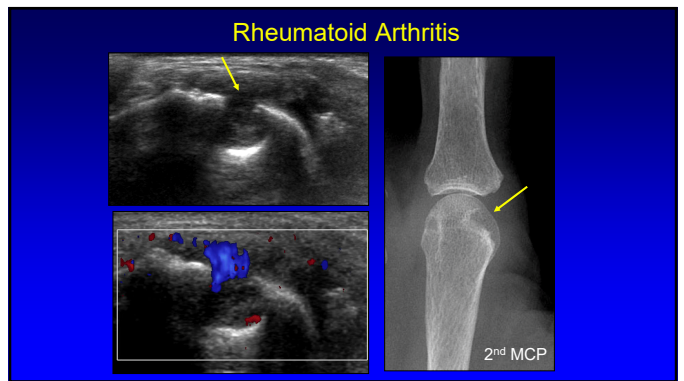
9



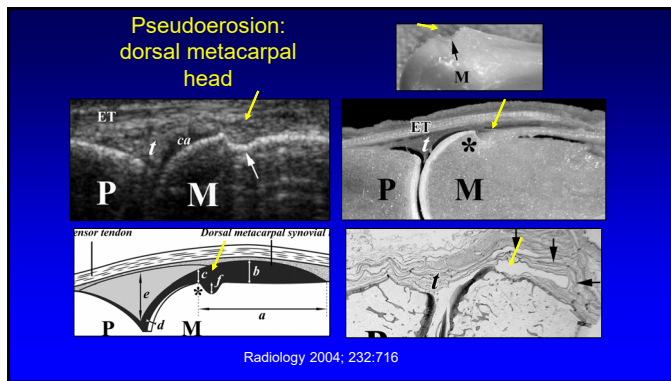
10



11



12



13

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*

14

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

15

Inflammatory Arthritis: screening

- Hand:
 - MCP (dorsal): especially 2nd
 - PIP (dorsal, volar)
- Wrist:
 - Radiocarpal, midcarpal, distal radioulnar (dorsal)
- Foot:
 - MTP (dorsal): 5th most common

16

Outline:

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

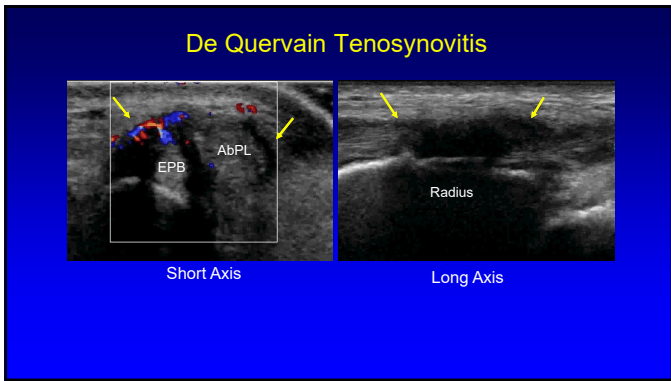
17

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

18



19

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

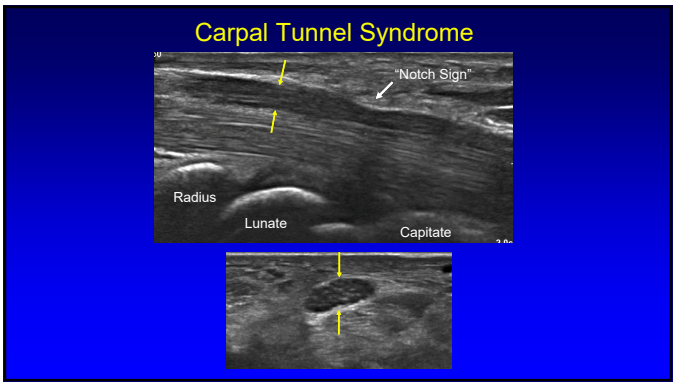
20

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

21



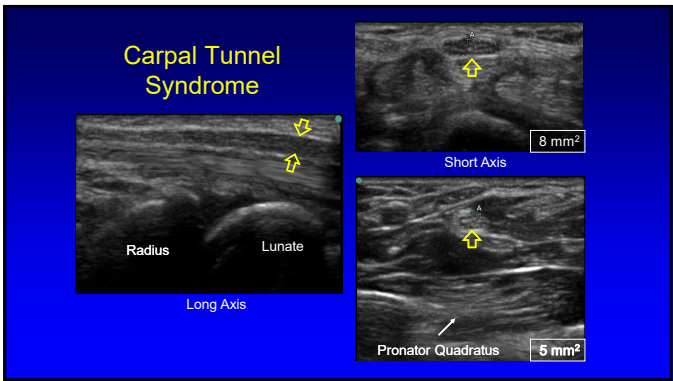
22

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

23



24

Bifid Median Nerve + CTS

- Carpal tunnel syndrome¹
 - Increase in cross-sectional area of $\geq 4 \text{ mm}^2$
- Intraneural hypervascularity: 95% accuracy in diagnosis of CTS²

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

25

Carpal Tunnel Syndrome: ulnar bursa distention

26

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

27

Outline:

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

28

Gamekeeper's Thumb

- Injury of the ulnar collateral ligament (UCL) of the thumb
 - Historically, chronic injury in Scottish gamekeepers
 - Frequently, due to acute MCP joint hyperabduction
 - Skier's thumb: up to 86% of thumb base injuries

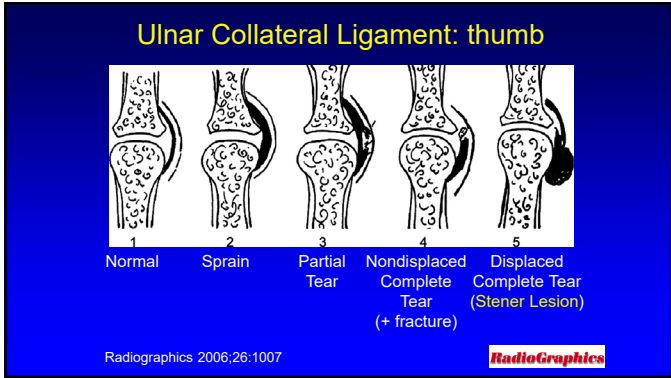
Acute Mechanism **Chronic Mechanism**

29

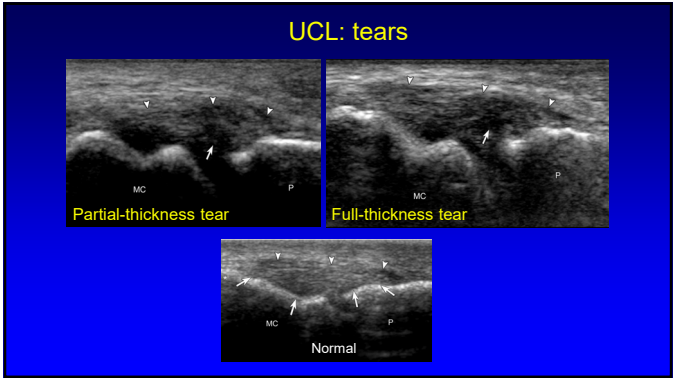
Ulnar Collateral Ligament: thumb

Note: sliding of adductor aponeurosis with isolated interphalangeal joint flexion

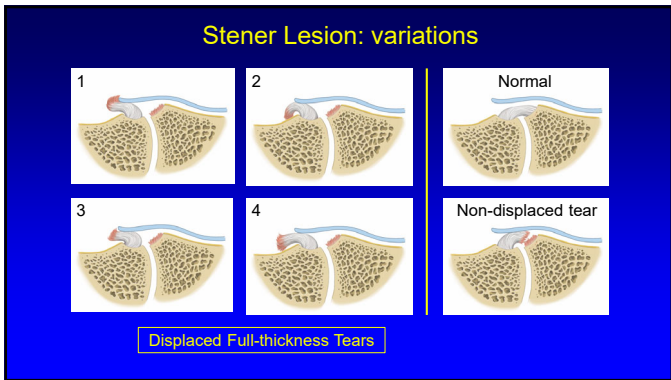
30



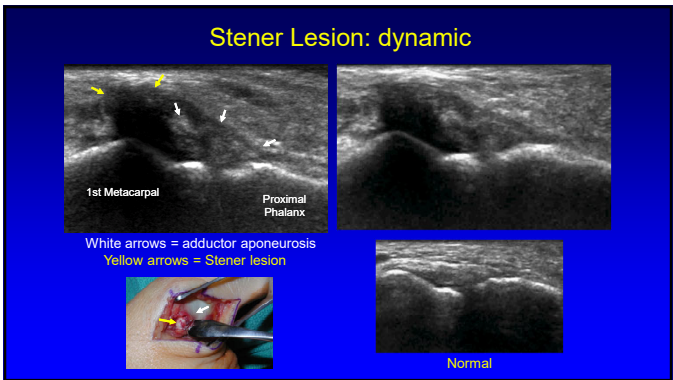
31



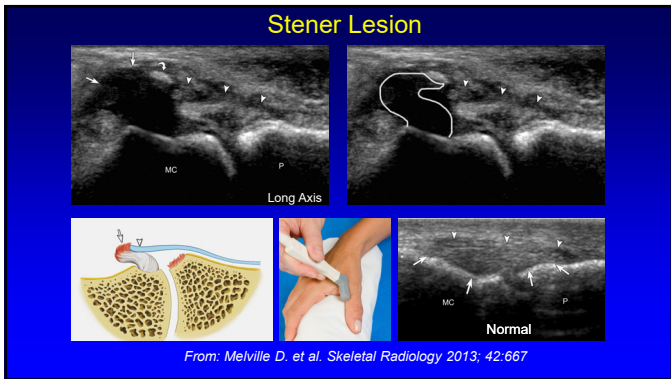
32



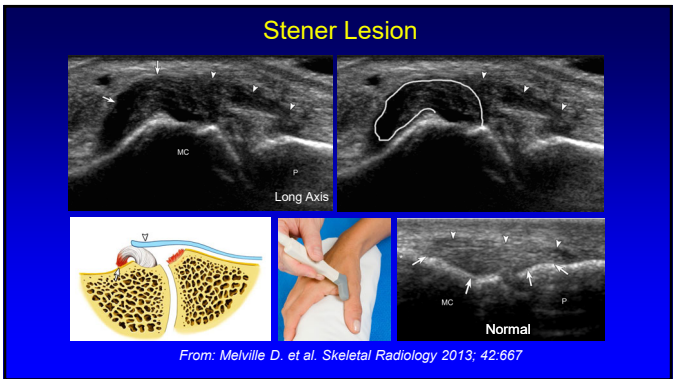
33



34



35



36

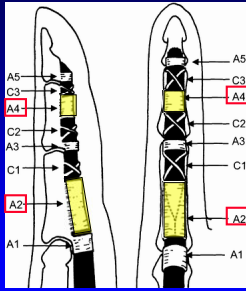
Outline:

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

37

Pulley Tear

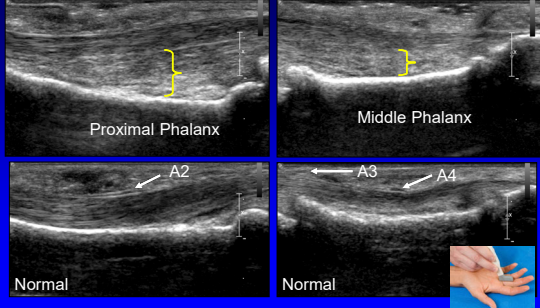
- A2 and A4 pulleys: most important
- Sagittal image
 - Bowstringing
 - Hypochoic edema / hemorrhage
- Dynamic evaluation*



*Radiology 2002; 222:755
Radiology 1998; 206:339

38

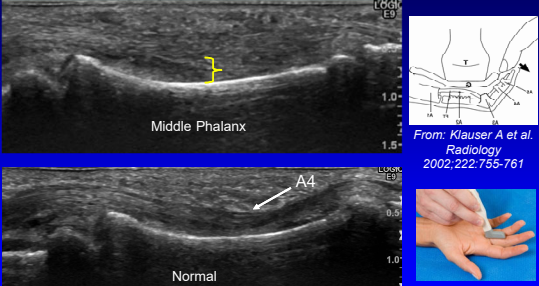
A2 – 4 Pulley Injury



Proximal Phalanx Middle Phalanx
Normal Normal

39

A4 Pulley Injury: bowstringing



Middle Phalanx Normal

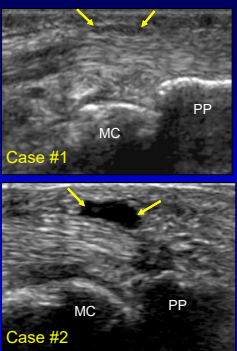
From: Klausner A et al. Radiology 2002;222:755-761

Normal: < 1 mm; incomplete rupture: 1 – 3 mm; complete: 3 mm

40

Trigger Finger

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

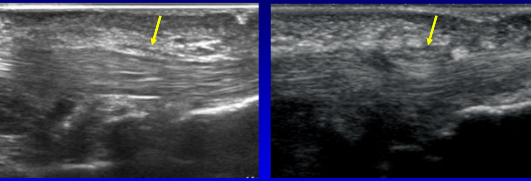


Case #1 Case #2
MC PP MC PP

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

41

Trigger Finger: thumb



Case #1 Case #2

42

Outline:

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

43

Soft Tissue Mass: wrist ganglia

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

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

44

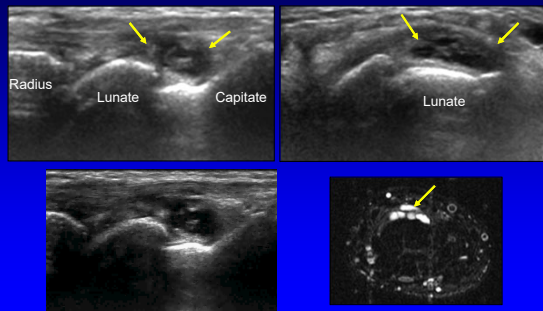
Soft Tissue Mass: wrist ganglia

- 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

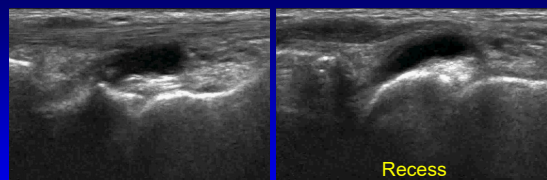
45

Ganglion: dorsal



46

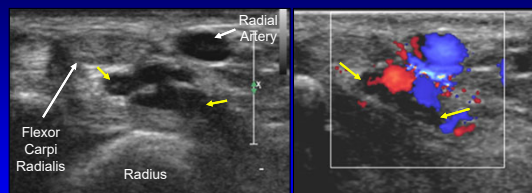
Ganglion vs Dorsal Recess



Ganglion: not compressible Recess: compressible
Sagittal with Wrist Flexion

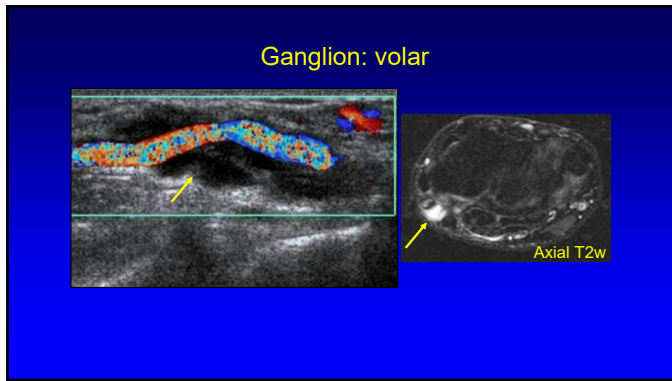
47

Ganglion: volar

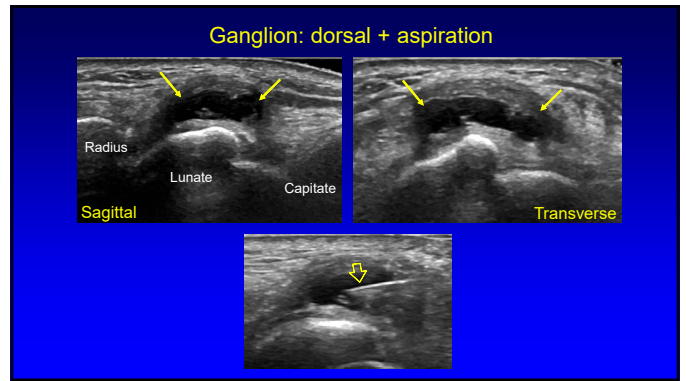


Axial color Doppler

48



49



50

Take Home Points:

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

51

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

Twitter handle: @jjacobsn

52