

Ultrasound of wrist & hand, elbow, and its most common pathology

1

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Introduction

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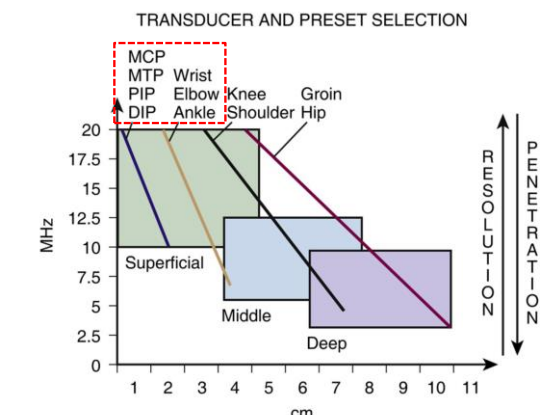
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Soft tissue echography

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- 超音波探頭 Real time – 5-13 MHz
 - 6-18 MHz
- 自動變頻 Auto-frequency
- Gray scale 灰階 (黑白)
- 2D 彩色都普勒
 - Color-flow Doppler
 - Power Doppler
- Elastography

3



4

EXTENDED REPORT

The 2017 EULAR standardised procedures for ultrasound imaging in rheumatology

Ingrid Möller,^{1,2} Justina Janta,³ Marina Backhaus,⁴ Sarah Ohmrdorf,⁵ David A Bong,^{1,2}

Box 1 General recommended procedures for MSUS assessment in RMD

- ▶ MSUS includes two principal modes: B-mode (or gray scale) that provides us with morphological information of the anatomic structures and Doppler mode (colour Doppler or power Doppler) that allows us to evaluate blood flow.
- ▶ MSUS should be performed with high-resolution linear transducers (ie, probes) with frequencies between 6 and 14 MHz for deep/intermediate areas to ≥15 MHz for superficial areas.
- ▶ Tissue harmonic imaging, spatial compound imaging, extended field of view (panoramic) and virtual convex imaging are some of the software capabilities that may be useful in MSUS.
- ▶ When scanning a joint, the probe should be oriented as perpendicular or parallel to the bony cortical surface (bony acoustic landmark) so that the cortical margin appears bright, sharp and hyperechoic.
- ▶ A dynamic scanning technique by means of slight movements of translation (side-to-side, back-to-front), angulation and rotation of the probe should be carried out in order to allow the best visualisation of the structure(s) of interest.
- ▶ MS structures should be evaluated as they move smoothly either actively or passively.

- ▶ To avoid anisotropy (ie, hyperechoic/anechoic appearance of a normally hyperechoic structure that mainly affects tendons) and the common pitfalls that accompany it, the probe should be continuously adjusted to maintain the beam perpendicular to the tendon fibres especially in insertional regions.
- ▶ When the long axis of the structure of interest corresponds to the cranial-caudal orientation of the anatomic position, the most proximal aspect of the structure is usually placed on the left-hand side of the screen. However, other options are acceptable as long as the movement of the image on the screen is kept parallel to the direction of the probe on the patient. Our preference for short axis is to align the structure of interest on the screen as if the observer is looking at the patient.
- ▶ Probe compression can be helpful in distinguishing a compressible liquid collection from a non-compressible solid. Little or no compression is important when performing Doppler examination to avoid cessation of flow in small vessels.
- ▶ A generous amount of gel should be used for superficial structures especially when little or no pressure is indicated. The machine setting for B-mode and Doppler mode should be properly adjusted to optimise the US image acquisition process.^{20,24}
- ▶ Note: MSUS, musculoskeletal ultrasound; RMD, rheumatic and musculoskeletal disease.

5

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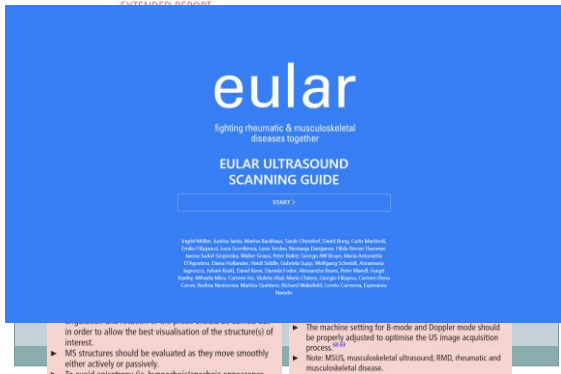
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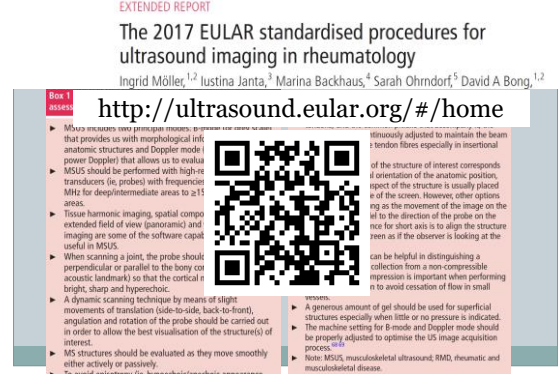
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More gel, more expert

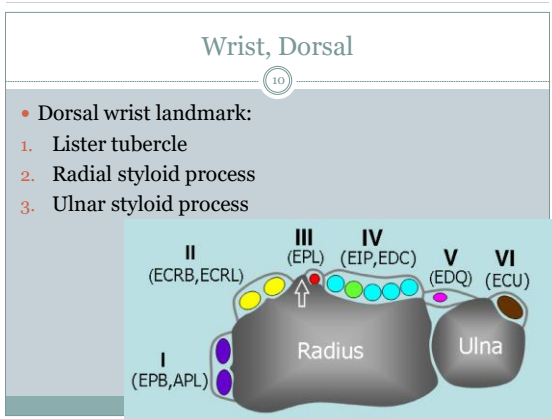
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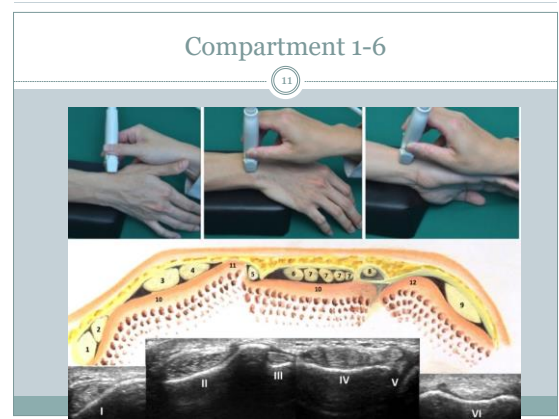
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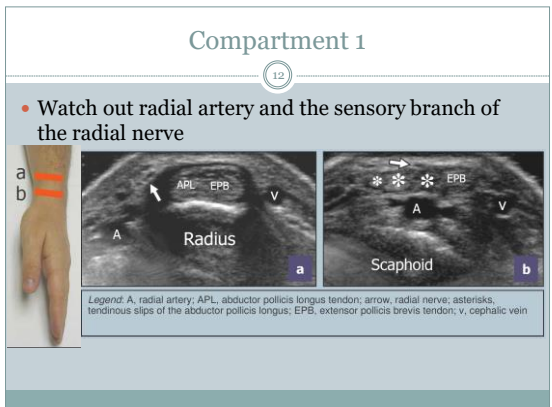
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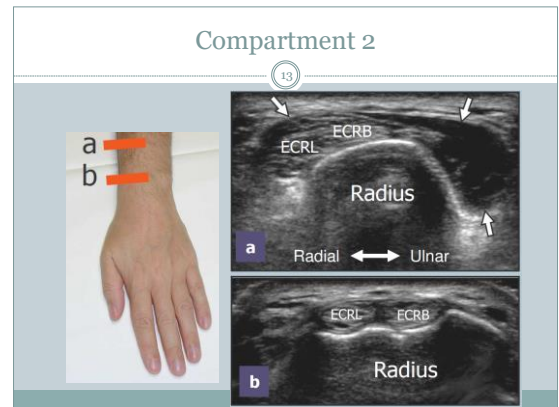
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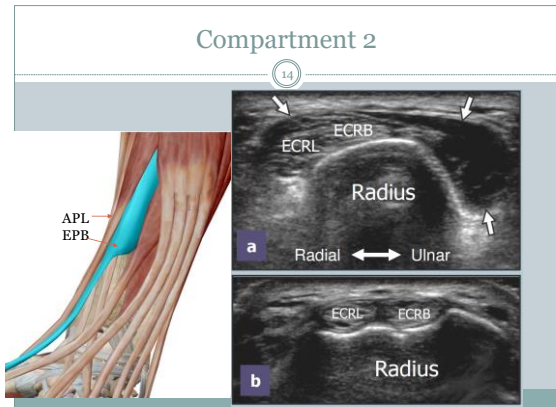
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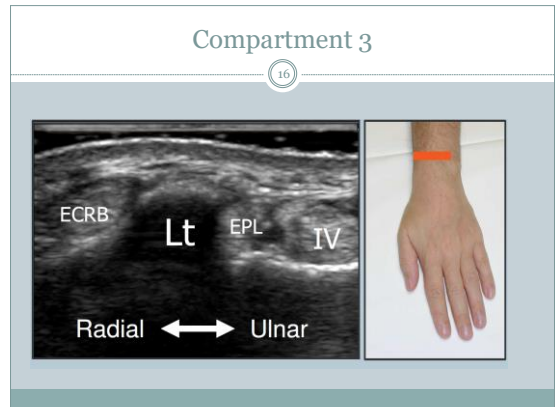
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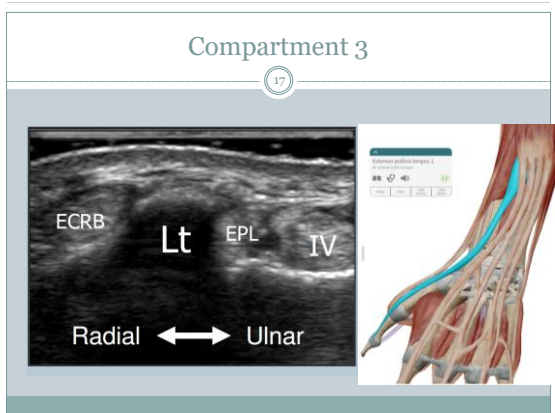
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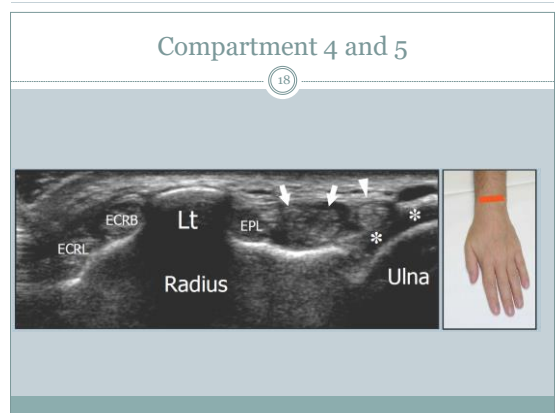
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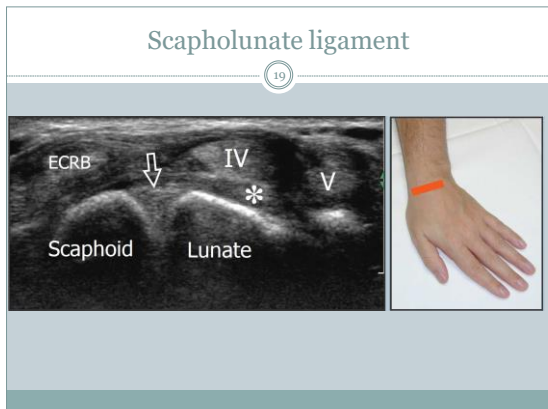
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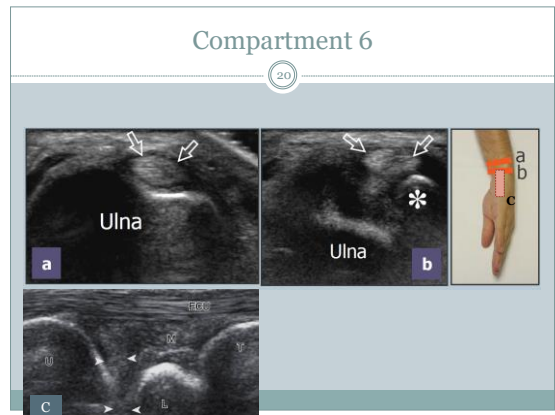
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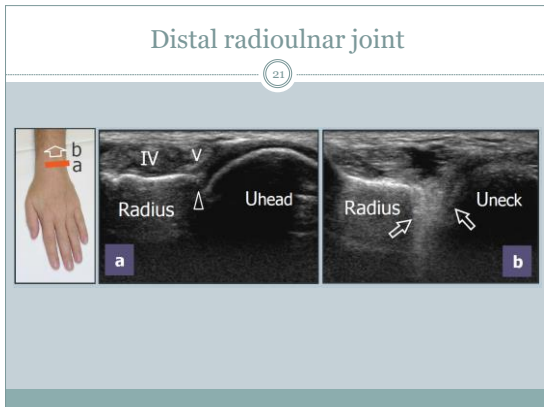
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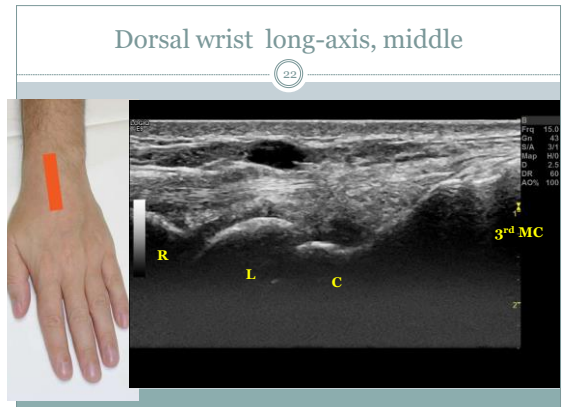
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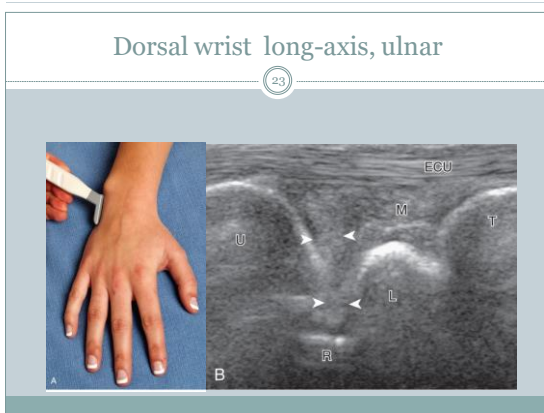
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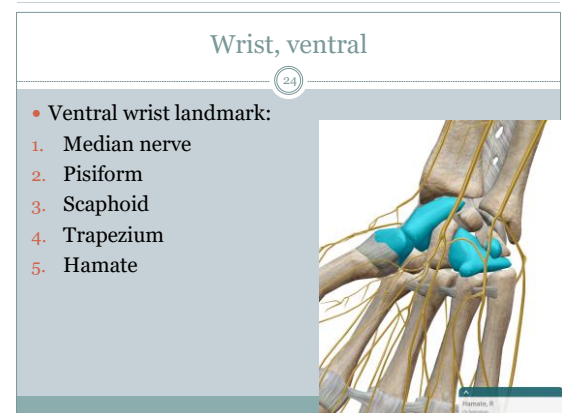
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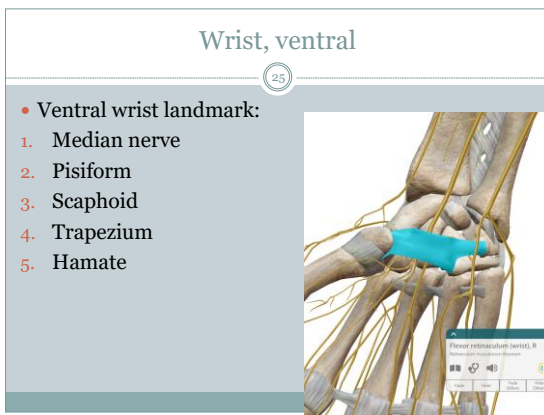
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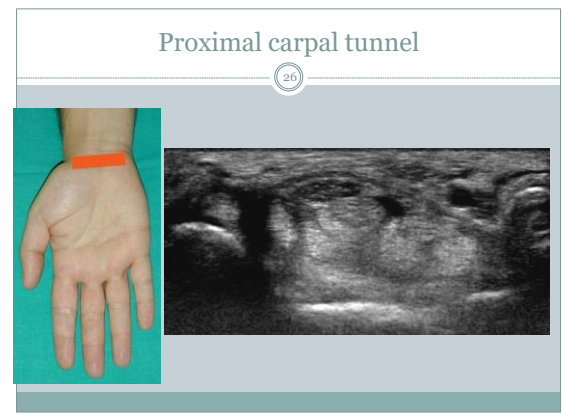
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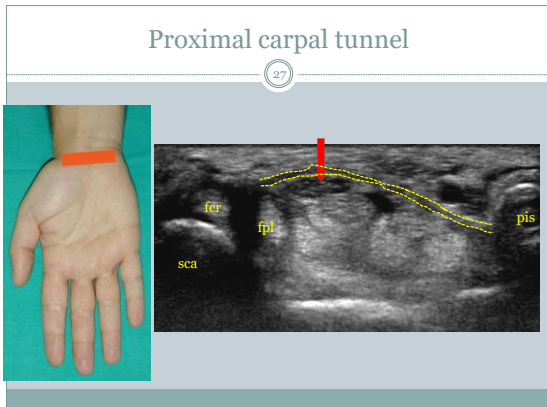
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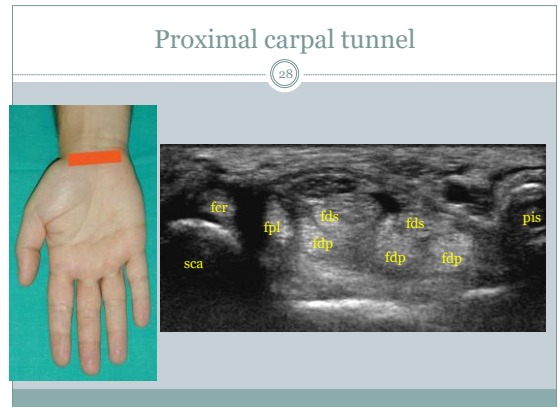
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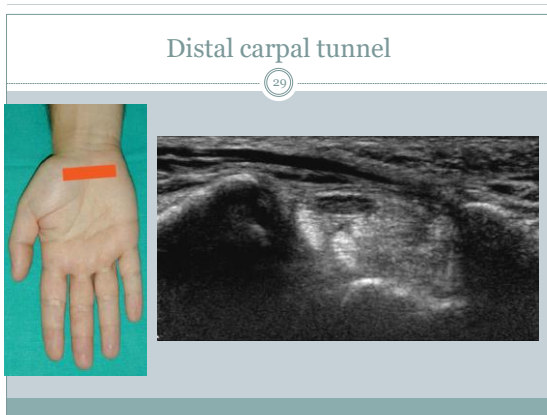
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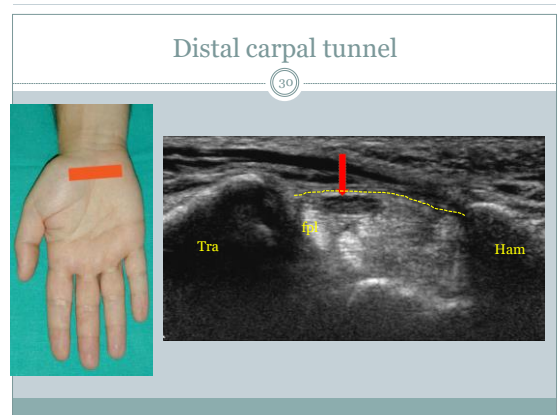
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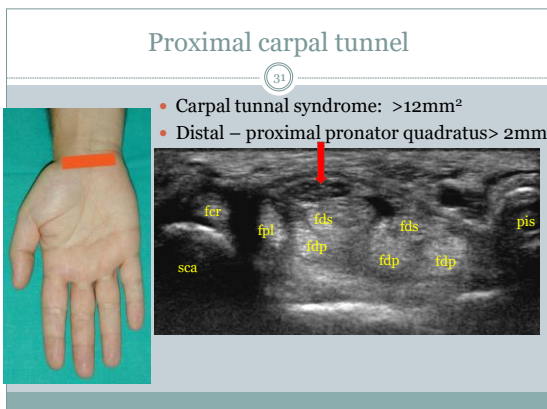
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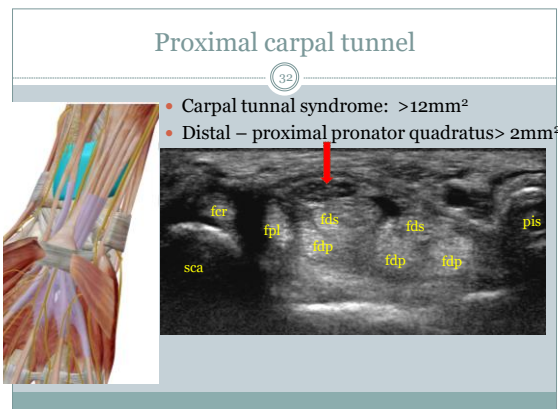
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Guyon tunnel and ulnar nerve

33

- superficial sensory branch
- deep motor branch

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Volar wrist long-axis planes

34

34

Bifid median nerve

35

35

Finger, ventral(volar)

36

MCP=metacarpal joint; PIP=proximal interphalangeal joint; DIP=distal interphalangeal joint; VP=volar plate; FDP=flexor digitorum profundus; FDS=flexor digitorum superficialis

36

Finger, ventral(volar)

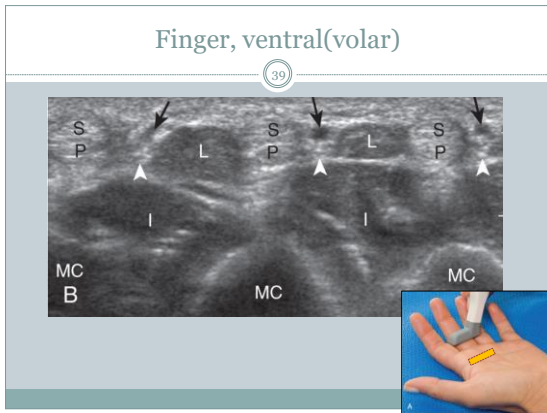
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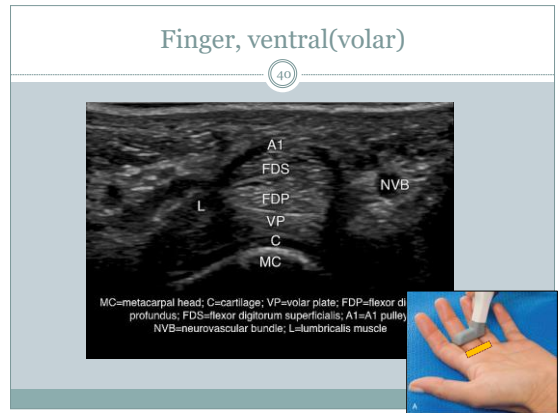
Finger, ventral(volar)

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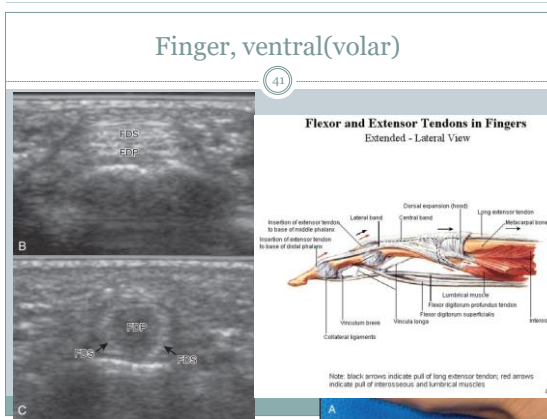
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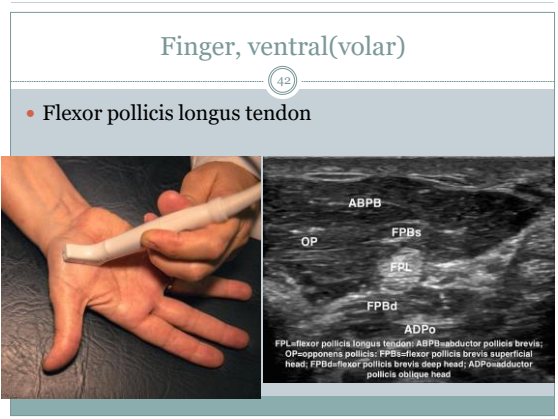
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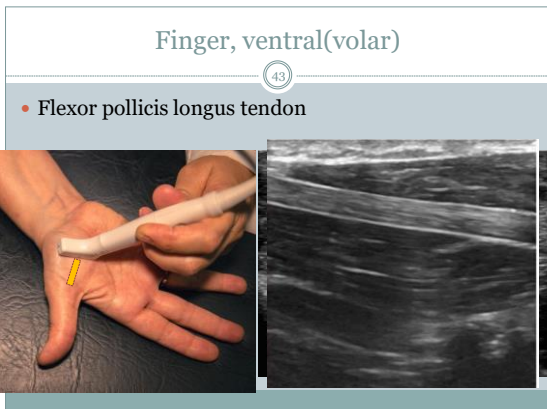
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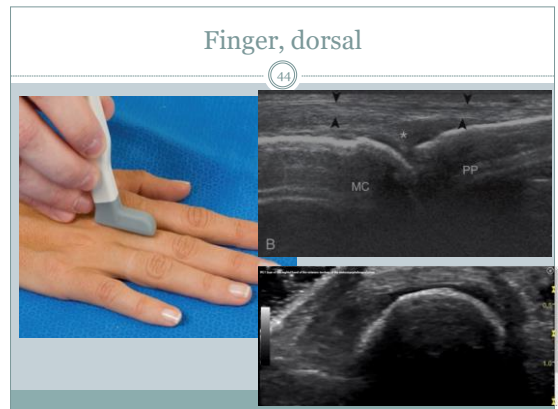
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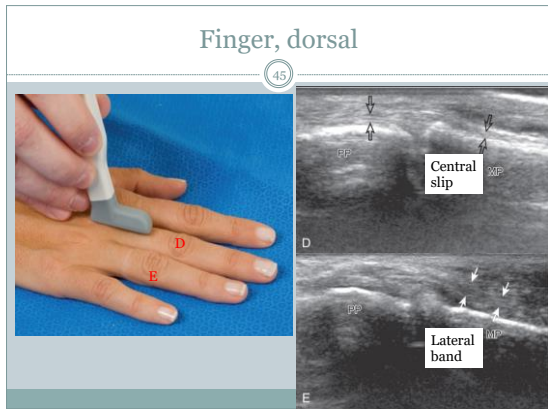
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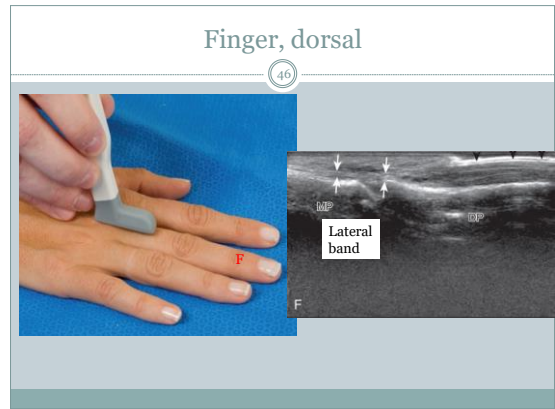
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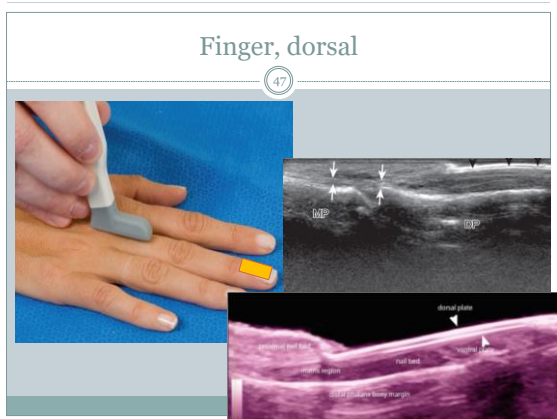
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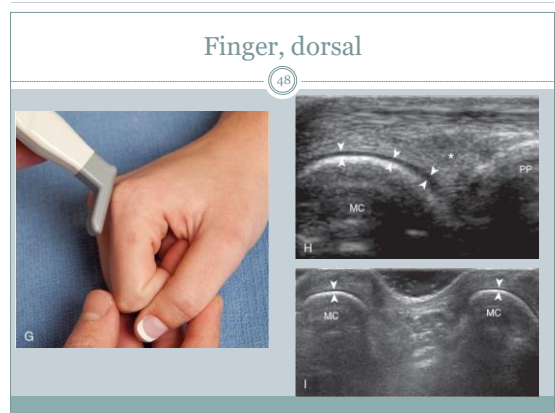
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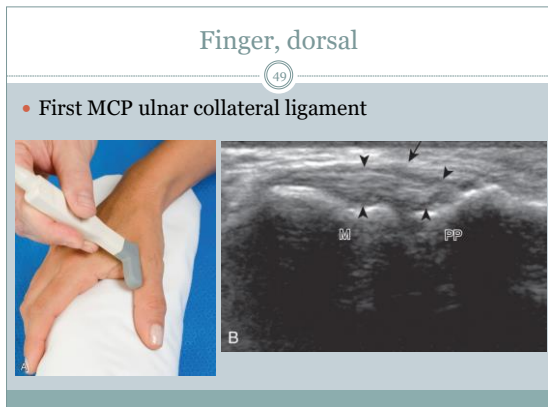
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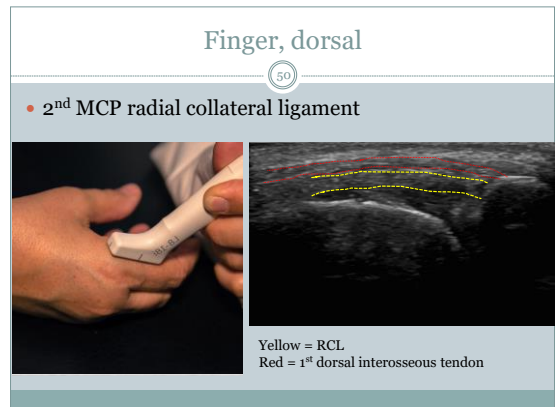
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Finger, dorsal

51

- 5th MCP ulnar collateral ligament

51

Elbow

52

- Elbow :

 1. Anterior
 2. Lateral
 3. Medial
 4. Posterior

52

Elbow, anterior

53

- Anterior elbow landmark:

 1. Brachial artery
 2. Biceps tendon
 3. Humerus: capitellum, trochlea

53

Elbow, anterior

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- Anterior elbow :

 1. Distal biceps tendon

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Elbow, anterior

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- Anterior joint recess :

 1. Capitellum
 2. Trochlea

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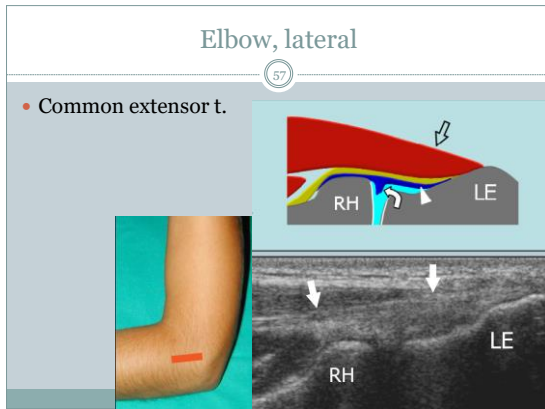
Elbow, anterior

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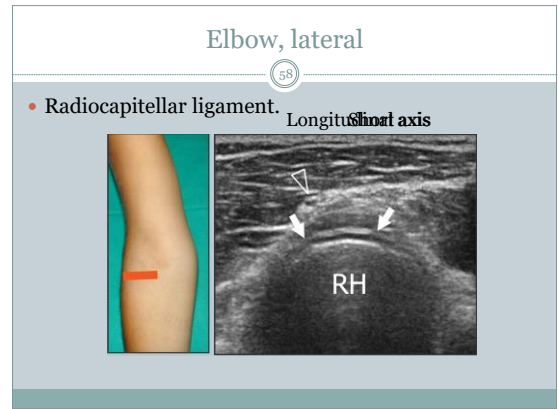
- Radial nerve

 1. Posterior interosseous nerve
 2. Supinator muscle
 3. Arcade of Fröhse

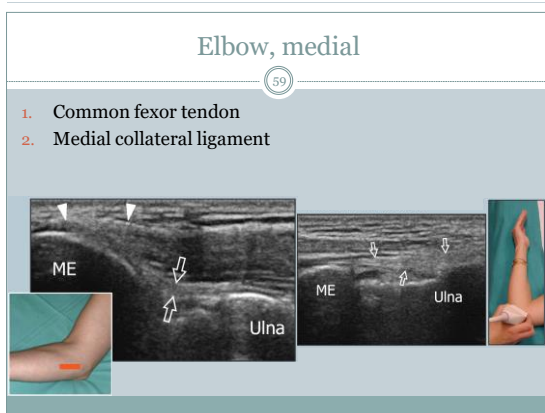
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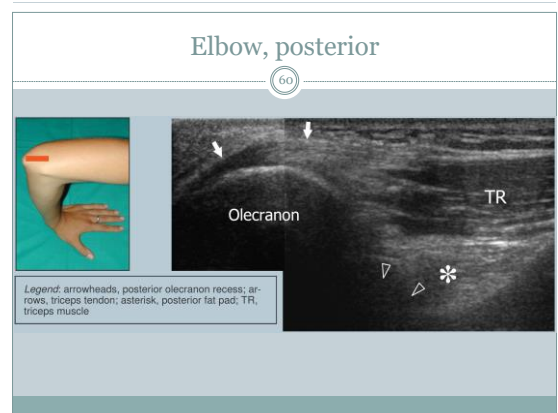
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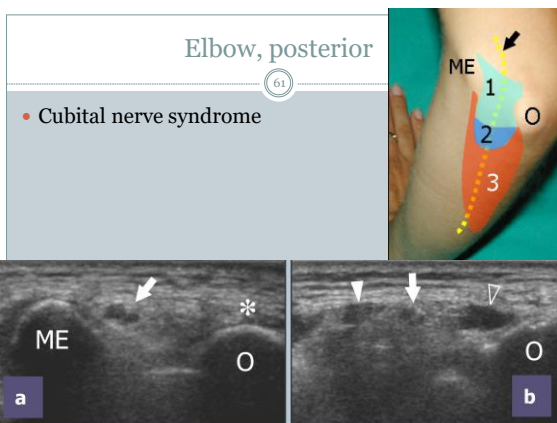
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59



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61



62

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Online Supplementary Table 6. Elbow abnormalities

Structure	Abnormality
Anterior humeroradial and humeroulnar joints, coronoid and radial fossae, annular recess	Synovitis/effusion Hyaline cartilage abnormalities Bone erosions Osteophytes
Posterior joint recess	Synovitis/effusion Crystal deposition
Distal biceps tendon	Bicipito-radial (cubital) bursitis
Common extensor tendons of the forearm	Tendinopathy/tendinitis/tear Enthesopathy Calcification Enthesophytes
Common flexor tendons of the forearm	Tendinopathy/tendinitis/tear Enthesopathy Calcification Enthesophytes
Triceps tendon and muscle	Enthesopathy Tendinopathy/tendinitis Calcification Crystal deposition
Ulnar nerve	Enthesophytes Instability, compression

63

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Online Supplementary Table 7. Wrist abnormalities

Structure	Abnormality
Radiocarpal, midcarpal, distal radio-ulnar, carpometacarpal joints	Synovitis/effusion Ganglia/cysts Bone erosions Osteophytes Crystal deposition
Triangular fibrocartilage complex	Crystal deposition (CPPD disease)
Extensor tendons of the wrist and hand	Tenosynovitis Tendinopathy/tendinitis Tear Ganglion/cyst
Flexor tendons of the wrist and hand	Rheumatoid nodules Tenosynovitis Tendinopathy/tendinitis Tear Ganglion/cyst
Median nerve	Carpal tunnel syndrome

CPPD, calcium pyrophosphate deposition

64

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Online Supplementary Table 8. Hand abnormalities

Structure	Abnormality
MCP, PIP, DIP joints	Synovitis/effusion Synovial cyst Luxation/subluxation Bone erosions Osteophytes Foreign bodies Crystal deposition Damage
MCP cartilage	Crystal deposition
Annular pulleys	Trigger finger (thickening, cyst)
Finger extensor tendons	Paratenonitis Tear Enthesopathy Tenosynovitis
Finger flexor tendons	Tear Enthesopathy Tendinopathy/tendinitis Ganglion/cyst

MCP, metacarpophalangeal; PIP, proximal interphalangeal; DIP, distal interphalangeal

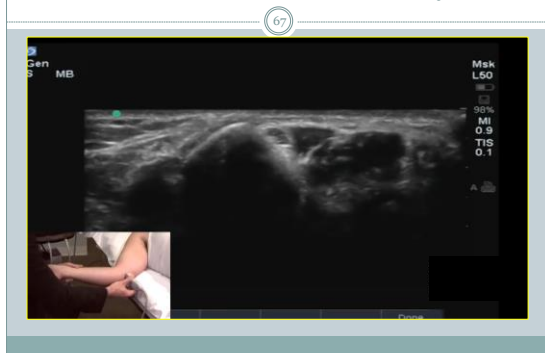
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Elbow, posterior

• Ulnar nerve instability

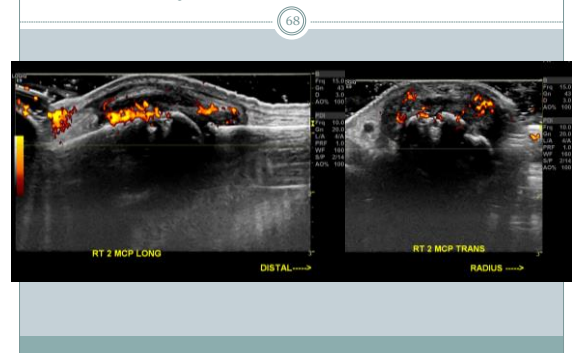
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Elbow, Ulnar nerve instability



67

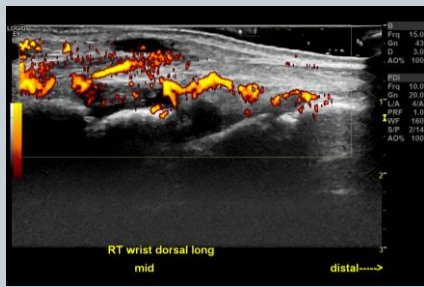
Synovitis and erosions



68

Synovitis and erosions

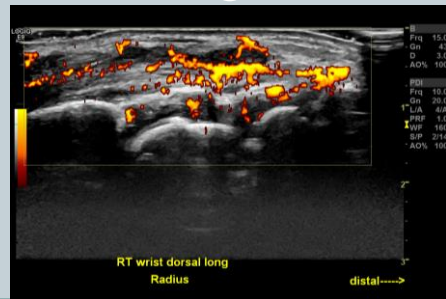
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ECR tenosynovitis

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ED tenosynovitis

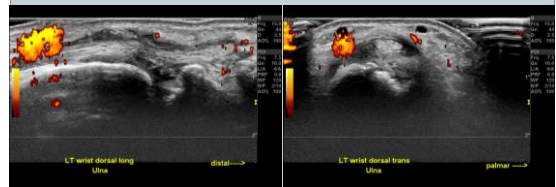
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ECU tenosynovitis

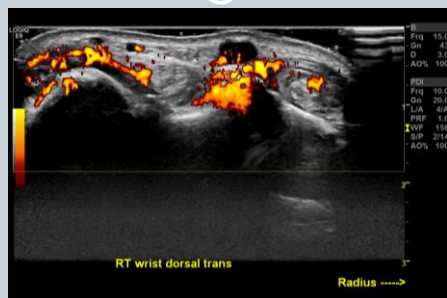
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72

Radioulnar joint arthritis

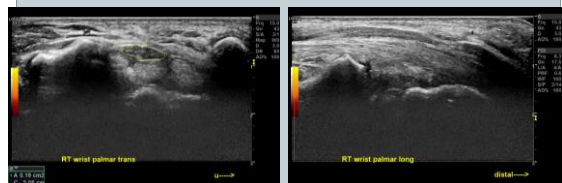
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73

Carpal tunnel syndrome

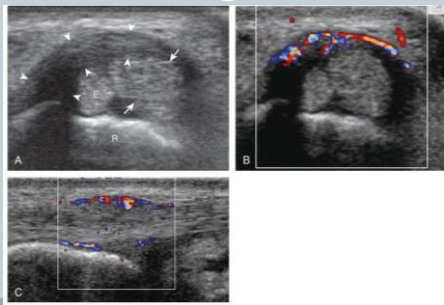
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DeQuervain's tenosynovitis

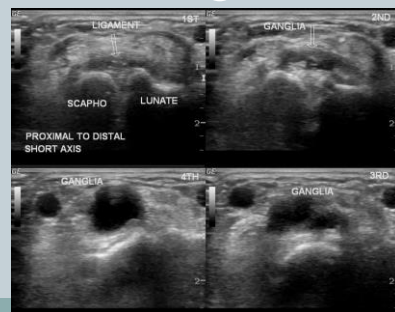
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Scapholunate ganglion cyst

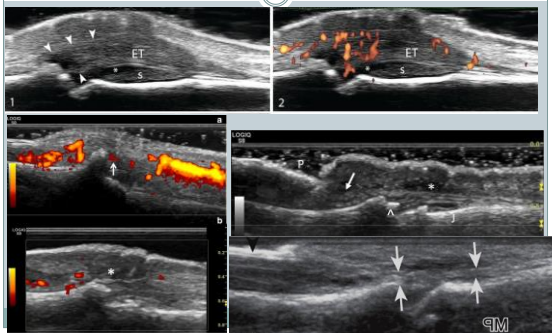
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76

Enthesitis

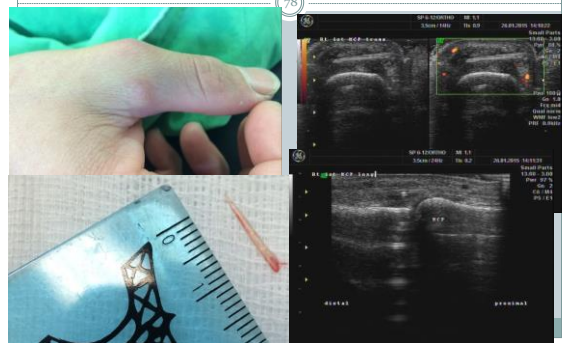
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77

Foreign body

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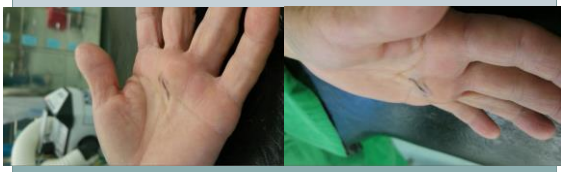


78

Neurogenic tumor

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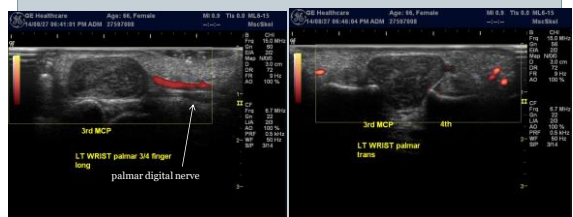
- This 69 y/o woman with type 2 DM for 10 years had left palm progressed mass for 3 years



80

Neurogenic tumor

81



81

Neurogenic tumor

82

Schwannoma, from palmar digital nerve



82



83



84