

## The Wrist and Hand– Scanning Protocol



## Diagnostic Imaging of the Wrist and Hand: Introduction

Examination of the wrist and hand will be dependent upon the specific structure and pathology suspected from a thorough clinical examination. Based on this examination it would be normal to scan one or two specific structures. In addition to static scanning dynamic imaging should be included particularly when imaging tendons and ligaments to fully assess the patency of these structures.

Imaging includes:

### Wrist Joint - Volar:

- Flexor retinaculum
- Median nerve
- Flexor pollicis longus tendon
- Flexor digitorum profundus and superficialis tendons
- Flexor carpi radialis longus tendon and radial artery
- Guyon's canal and the Ulnar nerve and artery
- Flexor carpi ulnaris tendon

### Wrist Joint - Dorsal:

- The 6 dorsal compartments & extensor retinaculum
- Proximal radiocarpal and mid-carpal joints
- Scapholunate joint and ligament

### Fingers and Thumb:

- Metacarpophalangeal, proximal interphalangeal, and distal interphalangeal joints
- Pulley system (A1 to A5)
- First carpometacarpal joint of the thumb
- Ulnar collateral ligament of the thumb

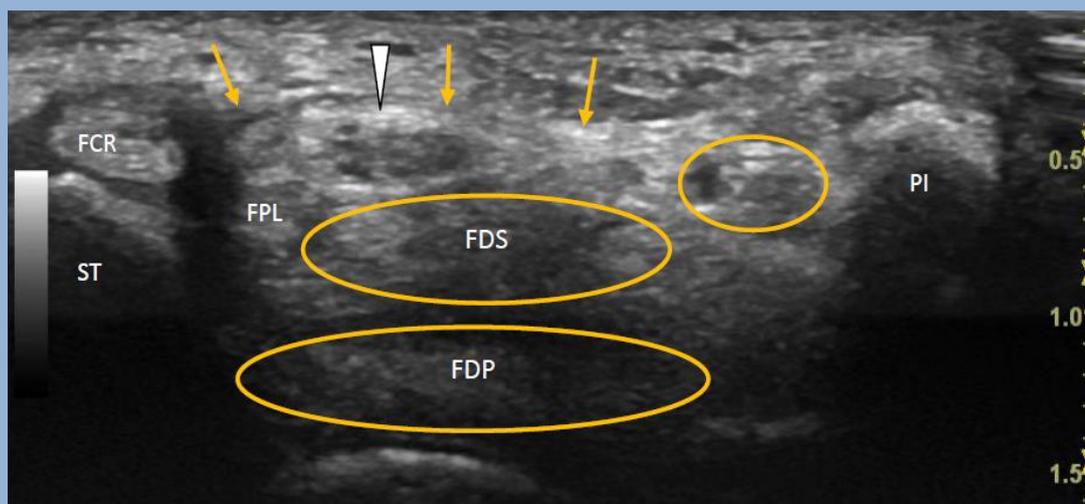
# 1. Wrist Joint – Volar

## Carpal Tunnel: Transverse Scan

The patient is seated facing the clinician with the forearm supinated and hand facing upwards resting on a table. The probe is placed so that it rests transversely at the level of the distal palmer crease in the axial plane over the flexor tendons and wrist joint.



*Legend: PI-pisiform; ST-scapoid tubercle; Yellow arrows-flexor retinaculum; Small yellow ellipse- guyon's canal; FCR-flexor carpi radialis; FPL-flexor pollicis longus; White arrowhead-median nerve; FDS-tendons of Flexor digitorum superficialis; FDP-tendons of Flexor digitorum profundus.*



## Guyon's Canal: Transverse Scan

As for the carpal tunnel the probe is placed so that it rests transversely at the level of the distal palmer crease in the axial plane. The probe may be aligned more medially to ensure suitable visualisation of Guyon's canal at the ulnar aspect of the carpal tunnel.

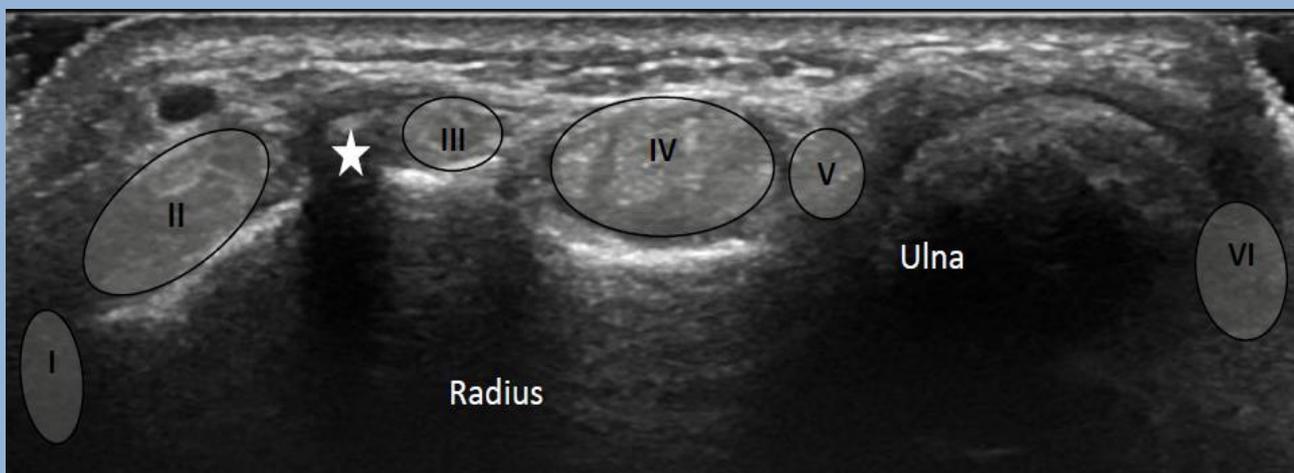
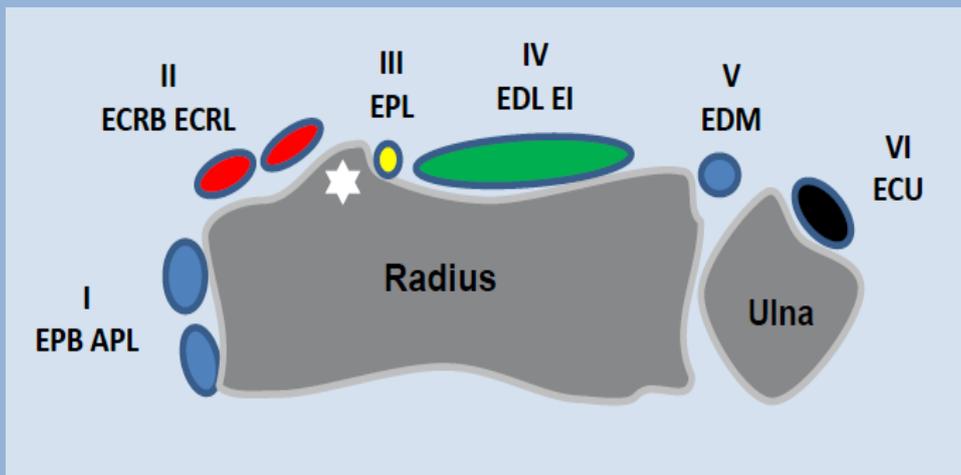


*Legend: PI-pisiform; Yellow arrows-flexor retinaculum; White star-ulnar artery; White arrowhead-ulnar nerve; Curved arrow-tendon of flexor carpi ulnaris.*

## 2. Wrist Joint – Dorsal:

### Dorsal Wrist - Overview of the Six Dorsal Compartments

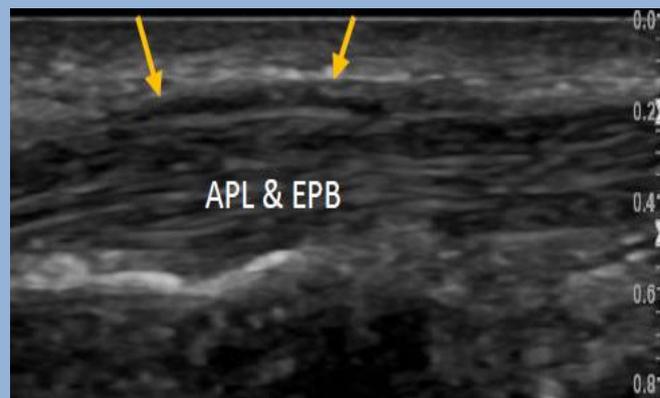
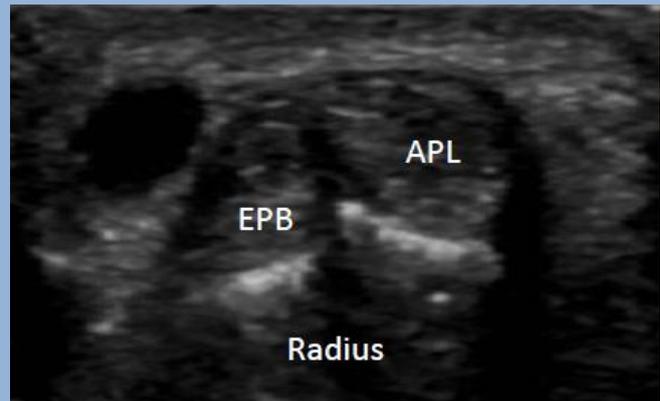
The patient is seated facing the clinician with the forearm resting on a table. The probe is placed so that it rests transversely over the dorsal compartment to be assessed. The clinician should identify each tendon within its specific compartment from dorsal compartment one through to six transversely and then longitudinally. The patient should be asked to actively move the wrist and fingers appropriate to each compartment to allow the clinician to further dynamically assess the tendons.



**Legend:** White star-lister's tubercle; I-extensor pollicis brevis (EPB) and abductor pollicis longus (APL); II-extensor carpi radialis brevis (ECRB) and extensor carpi radialis longus (ECRL); III-extensor pollicis longus (EPL); IV-extensor digitorum longus (EDL) and extensor indicis (EI); V-extensor digiti minimi (EDM); VI-extensor carpi ulnaris (ECU).

### Dorsal Compartment I Abductor Pollicis Longus and Extensor Pollicis Brevis

The patient's forearm is positioned so that it is halfway between supination and pronation with the thumb facing upwards. The probe is placed transversely over the first dorsal compartment at the level of the radial styloid. A smaller hockey stick probe may be useful when examining the individual dorsal compartments. As for all the dorsal compartments the tendons should first be identified and examined using a transverse view and then further evaluated in longitudinal view.



**Legend: APL-abductor pollicis longus; EPB-extensor pollicis brevis; Yellow arrows-extensor retinaculum.**

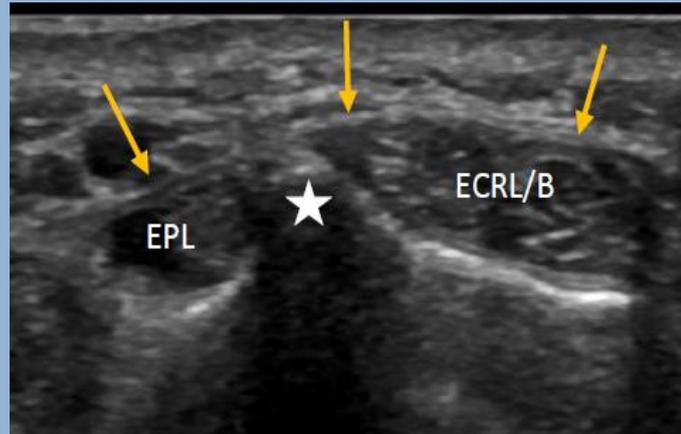
### Dorsal Compartment II

### Extensor carpi radialis longus & Extensor carpi radialis brevis

### Dorsal Compartment III

### Extensor pollicis longus

The patient's forearm is positioned in pronation. The probe is placed transversely over the second and third dorsal compartments at the level of Lister's tubercle. As for all the dorsal compartments the tendons should first be identified and examined using a transverse view and then further evaluated in longitudinal view.

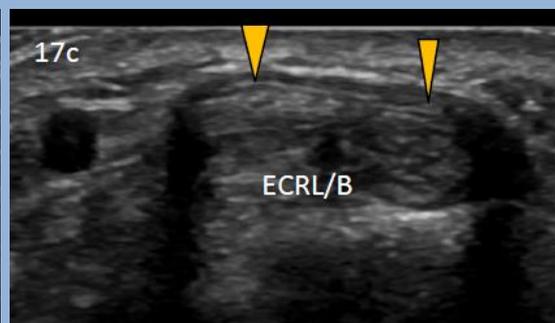
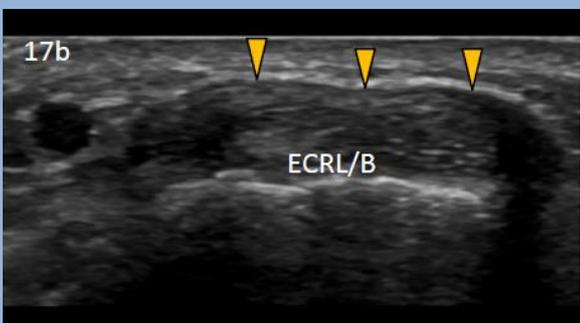


### The Distal Intersection



#### Distal Intersection

With the probe in a transverse orientation move distally to below Lister's tubercle (white star). The tendon of extensor pollicis longus (EPL & yellow arrowhead) can be seen to turn radially and run superficially over the tendons of extensor carpi radialis longus and brevis (ECRL/B).

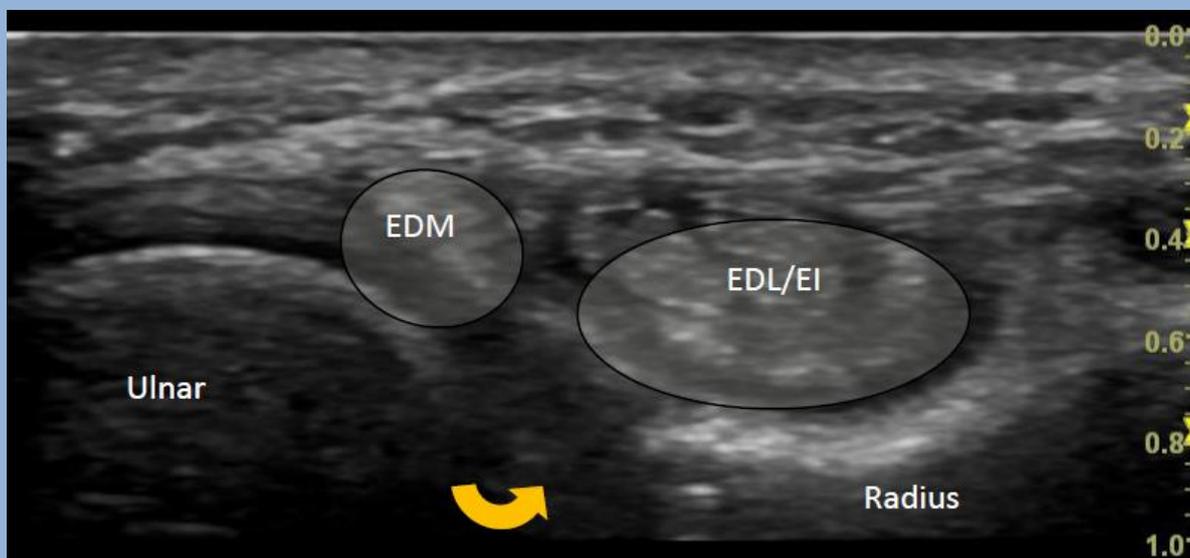


**Legend:** EPL & yellow arrowhead- extensor pollicis longus; ECRL-extensor carpi radialis longus; ECRB-extensor carpi radialis brevis; Yellow arrows-extensor retinaculum; White star-Lister's tubercle.

### Dorsal Compartment IV Extensor digitorum longus and extensor indicis

### Dorsal Compartment V Extensor digiti minimi

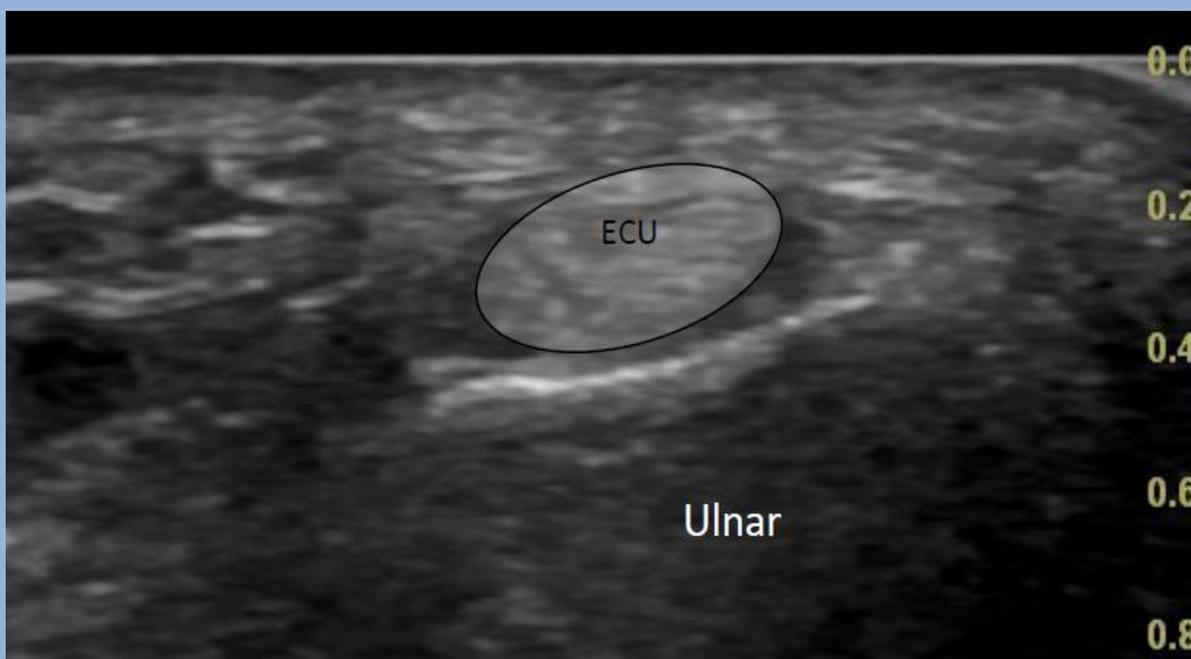
The patient's forearm is positioned in pronation. The probe is placed transversely over the fourth and fifth dorsal compartments at the level of and to the ulnar side of Lister's tubercle. As for all the dorsal compartments the tendons should first be identified and examined using a transverse view and then further evaluated in longitudinal view.



*Legend: EDL- extensor digitorum longus; EI- extensor indicis; EDM-extensor digiti minimi; Curved arrow- distal radioulnar joint.*

### **Dorsal Compartment VI Extensor Carpi Ulnaris**

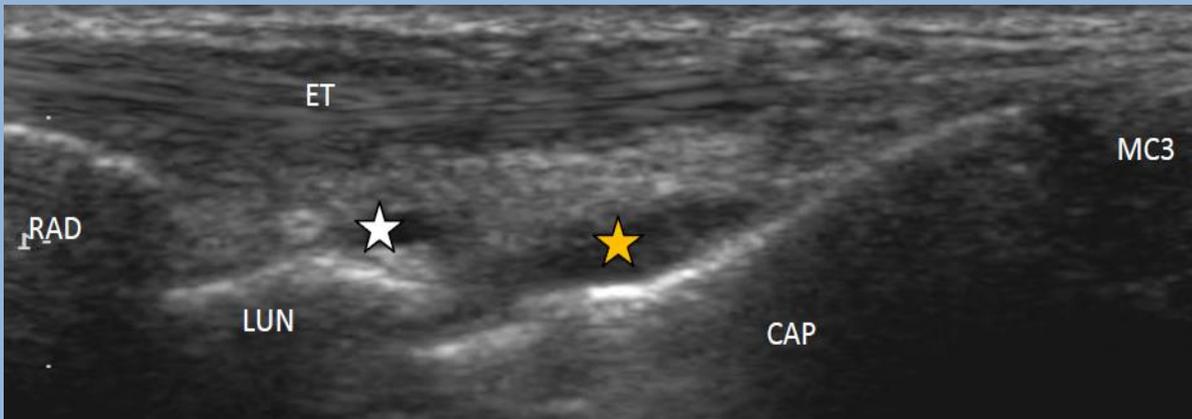
The patient's forearm is positioned in pronation. The probe is placed transversely over the sixth dorsal compartment situated along the ulnar border of the wrist at the level of the ulnar styloid. As for all the dorsal compartments the tendons should first be identified and examined using a transverse view and then further evaluated in longitudinal view. Dynamic scanning is of particular use to evaluate for tendon subluxation.



*Legend: ECU-extensor carpi ulnaris*

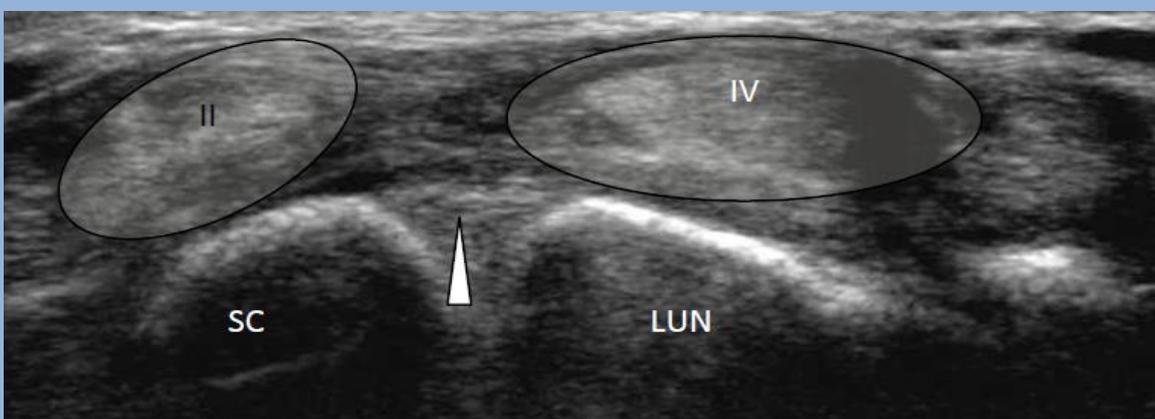
### Dorsal Wrist: Proximal Radiocarpal and Midcarpal Joints.

The patient's forearm is positioned in pronation resting on a table in front of the clinician. The probe is placed in the sagittal plane longitudinally over the dorsum of the wrist joint to allow imaging of the radiocarpal and midcarpal joints. The use of a large foot-print linear probe allows visualisation of both joints.



### Scapholunate Joint

To scan the scapholunate joint the probe is moved through 90 degrees so that it is positioned transversely over the dorsum of the wrist joint. Lister's tubercle maybe used as a landmark with the scapholunate joint laying immediately distal to this.

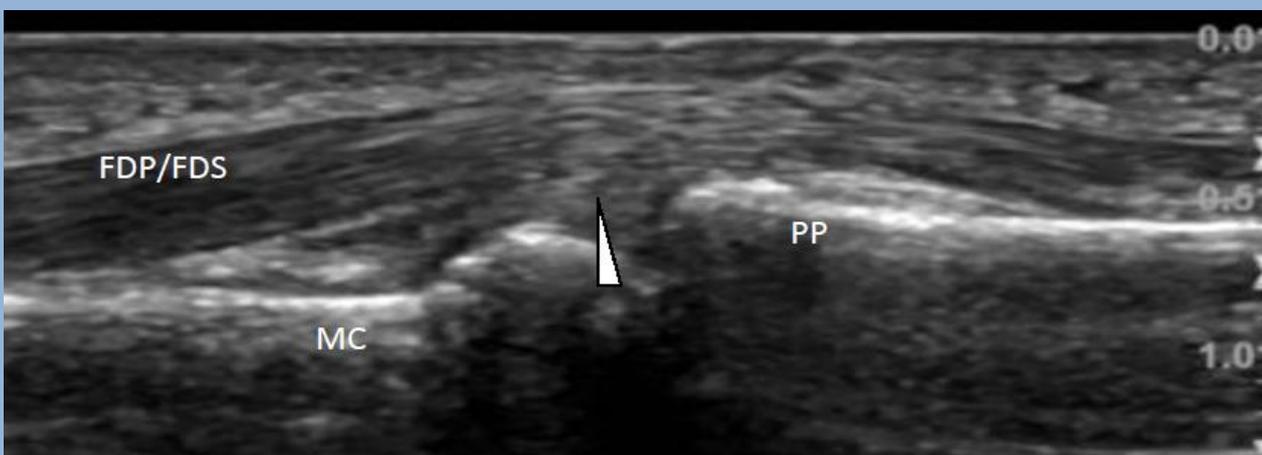


**Legend:** MC3-base of third metacarpal; CAP-capitate; LUN-lunate; RAD-radius; SC-scaphoid; ET-extensor tendons in the fourth dorsal compartment; White star-radiocarpal joint recess; Yellow star-midcarpal joint recess; White arrowhead-scapholunate ligament

### 3. Fingers and Thumb

#### The Fingers: Metacarpophalangeal, Proximal Interphalangeal and Distal Interphalangeal Joints

The patient's forearm is positioned in supination with the hand resting on a table in front of the clinician. The probe is placed in the sagittal plane longitudinally over the volar aspect of the joint to be assessed either the metacarpophalangeal, the proximal interphalangeal or the distal interphalangeal joints. The use of a small foot-print linear probe (Hockey stick) allows better visualisation of these small joints.



**Legend: MC-metacarpal; PP-proximal phalanx; FDP/FDS-flexor digitorum profundus and superficialis; White arrowhead-volar plate.**

*The scan and image shown above demonstrate assessment of the volar aspect of the metacarpophalangeal joint. The approach for the proximal and distal interphalangeal joints is the same only the probe is positioned more distally for each. The dorsal aspect of each joint should also be examined if indicated. In addition both the radial and ulnar collateral ligaments may be assessed at the proximal and distal interphalangeal joints. This is not possible at the metacarpophalangeal joints other than the radial collateral ligament of the index finger and the ulnar collateral ligament of the little finger.*

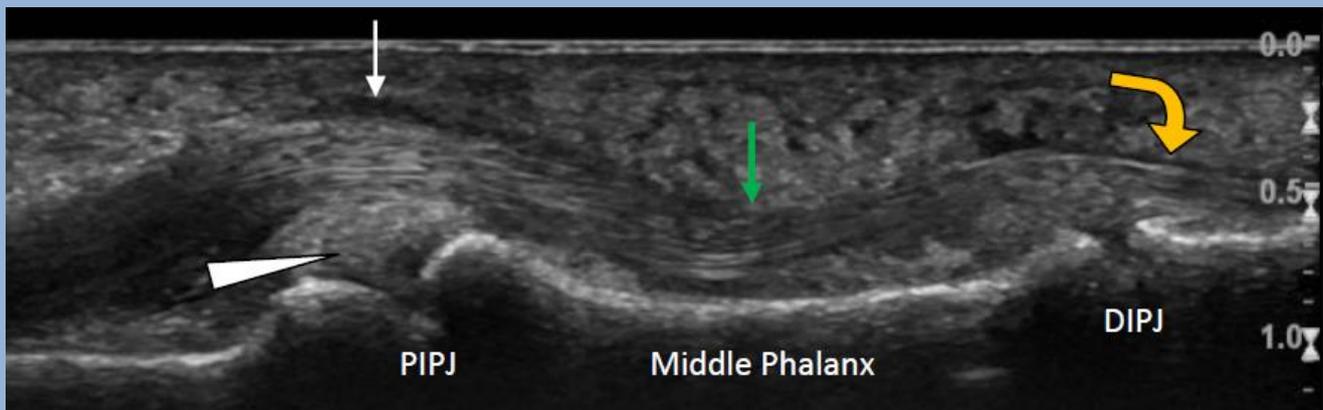
## The Fingers: Flexor tendons and Pulley System – A1 to A5

### Longitudinal & Transverse Scan

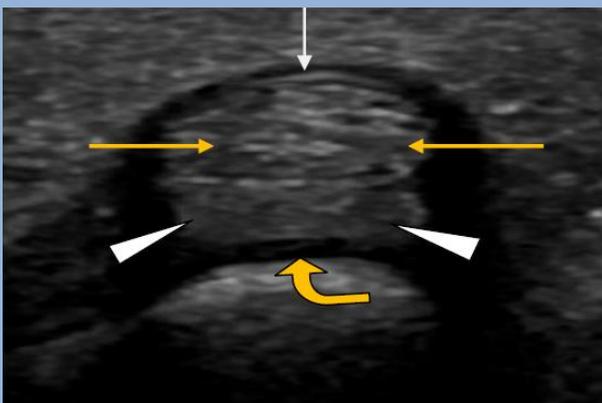
The patient's forearm is positioned in supination with the hand resting on a table in front of the clinician. The probe is placed in the sagittal plane longitudinally over the volar aspect of the finger at the level to be assessed. The image below demonstrates a longitudinal view from the proximal interphalangeal to distal interphalangeal joints. To image transversely the probe is moved through 90 degrees to lie in the axial plane.



*Legend: PIPJ-proximal interphalangeal joint; DIPJ-distal interphalangeal joint; White arrow-A3 pulley; Green arrow-A4 pulley; Curved arrow-A5 pulley.*



- A1 pulley 0.5cm proximal and distal to the metacarpophalangeal joint.
- A2 pulley mid shaft of the proximal phalanx.
- A3 pulley level of the proximal interphalangeal joint
- A4 pulley mid shaft of the middle phalanx.
- A5 pulley level of the distal interphalangeal joint.



*Legend: MCH-metacarpal head; White arrowheads-volar plate; Yellow arrows- tendons of flexor digitorum profundus and flexor digitorum superficialis; White arrow-A1 pulley; Curved arrow articular cartilage.*

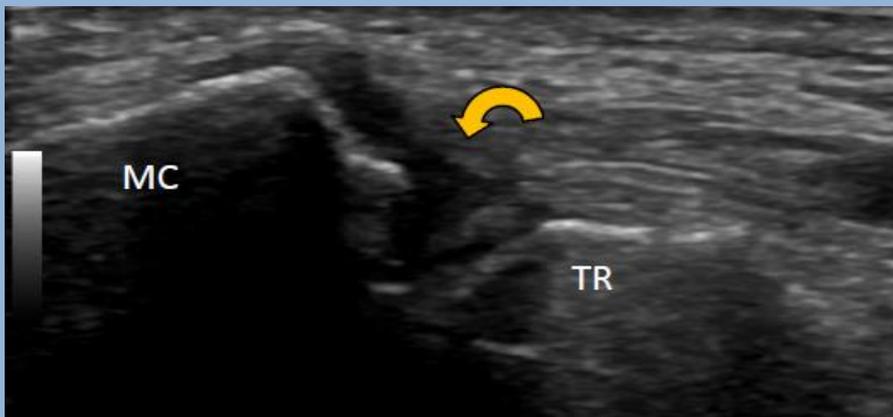
### The Thumb: First Carpometacarpal Joint

The patient's forearm is positioned in neutral with the hand resting on a table in front of the clinician. The patient is asked to clench their flexed thumb in their hand helping to gap the joint while at the same time stabilising the thumb allowing better visualisation of the joint.

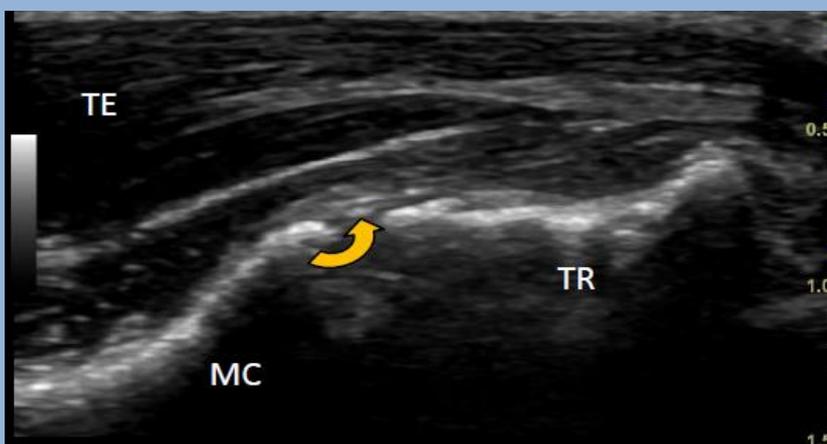
The probe is placed in the coronal plane longitudinally over the dorsal aspect of the carpometacarpal joint. A small foot-print linear probe allows much better visualisation of the joint.



*Legend: Curved yellow arrow-first carpometacarpal joint; MC-base of the first metacarpal; TR-trapezium; TE-thenar eminence.*

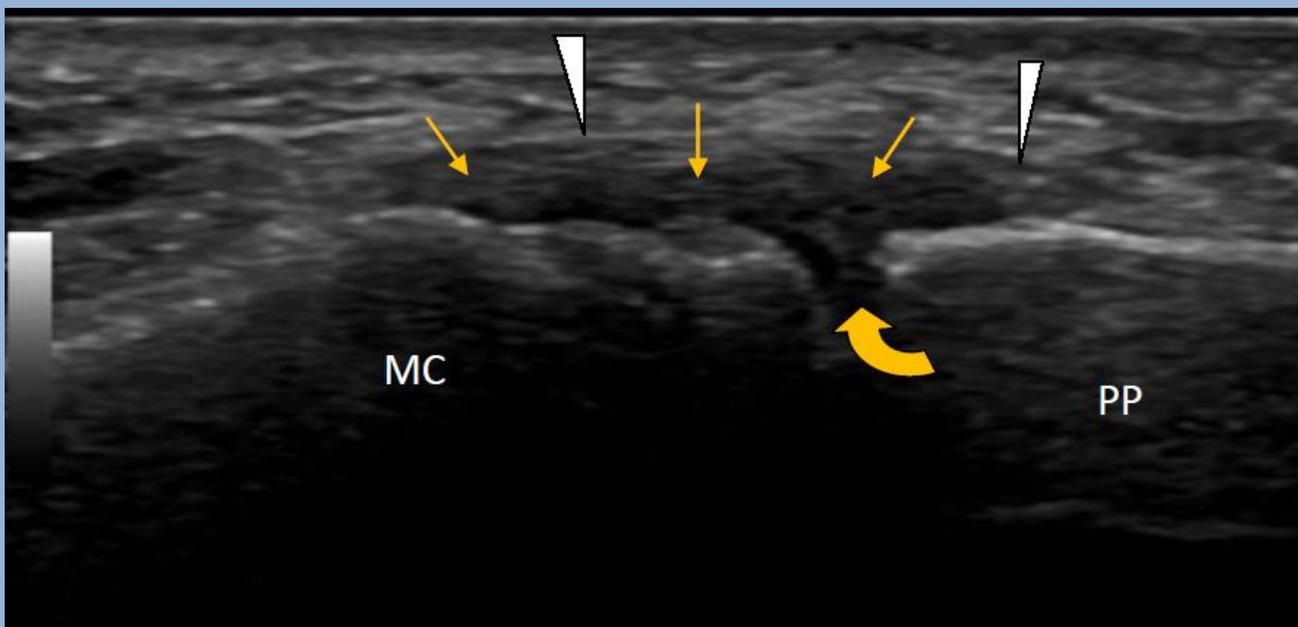


In addition to imaging the carpometacarpal joint from the dorsal aspect the joint may also be imaged from its volar side through the thenar eminence.



### **The Thumb: Ulnar Collateral Ligament**

The patient's forearm is positioned in pronation with the hand resting on a table in front of the clinician. The thumb is positioned in extension. The probe is placed in an oblique-sagittal plane longitudinally over the ulnar collateral ligament at the metacarpophalangeal joint of the thumb. The use of a small foot-print linear probe allows better visualisation of the ligament. Assessment of the ligament should include a careful study of the ligament's patency through dynamic scanning.



*Legend: MC-metacarpal; PP-proximal phalanx; Curved arrow-metacarpophalangeal joint; Yellow arrow-ulnar collateral ligament; White arrowhead-adductor aponeurosis.*