

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ  
مَنْ يَتَّقِ اللَّهَ يَجْعَلْ لَهُ مَخْرَجًا  
وَيَرْزُقْهُ مِنْ حَيْثُ لَا يَحْتَسِبُ  
وَمَا يُلْقِ اللَّهُ شَيْئًا إِلَّا لِيُحْكِمَ  
أَلْيَمْرَئِكَ بِهِ وَيَجْعَلْ لِرُؤْيَا  
أَعْيُنِنَا ذِكْرًا وَلِلَّهِ الْغَنِيُّ  
وَالْحَمْدُ لِلَّهِ الْعَلِيِّ الْكَبِيرِ

# **Wrist Joint Tendons MRI**

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# **Tendons Anatomy**

- Tendons are best seen in the axial plane.

### **The flexor tendons**

- Most of them (9 tendons) pass through the carpal tunnel on volar aspect of the wrist.

### **The extensor tendons**

- Lie on the dorsum of the wrist.
- Stabilized on the dorsum of the wrist by an extensor retinaculum.
- Fascial septations form 6 dorsal compartments that contain the extensor tendons.

# Dorsal compartments of the wrist

## 1<sup>st</sup> compartment (2) (on radial side of the wrist)

- Abductor pollicis longus and extensor pollicis brevis tendons.

## 2<sup>nd</sup> compartment (2)

- Extensor carpi radialis longus & brevis tendons.

## 3<sup>rd</sup> compartment (1)

- Extensor pollicis longus tendon.

## 4<sup>th</sup> compartment (2)

- Extensor digitorum and extensor indicis tendons.

## 5<sup>th</sup> compartment (1)

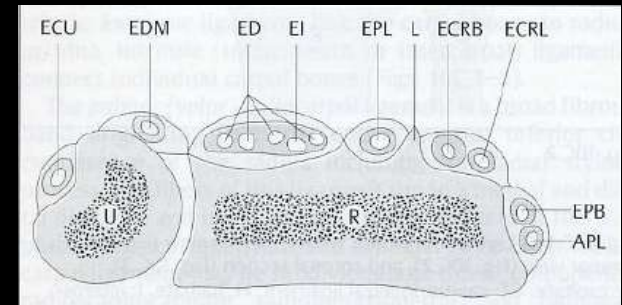
- Extensor digiti minimi tendon.

## 6<sup>th</sup> compartment (1) (in the ulnar notch)

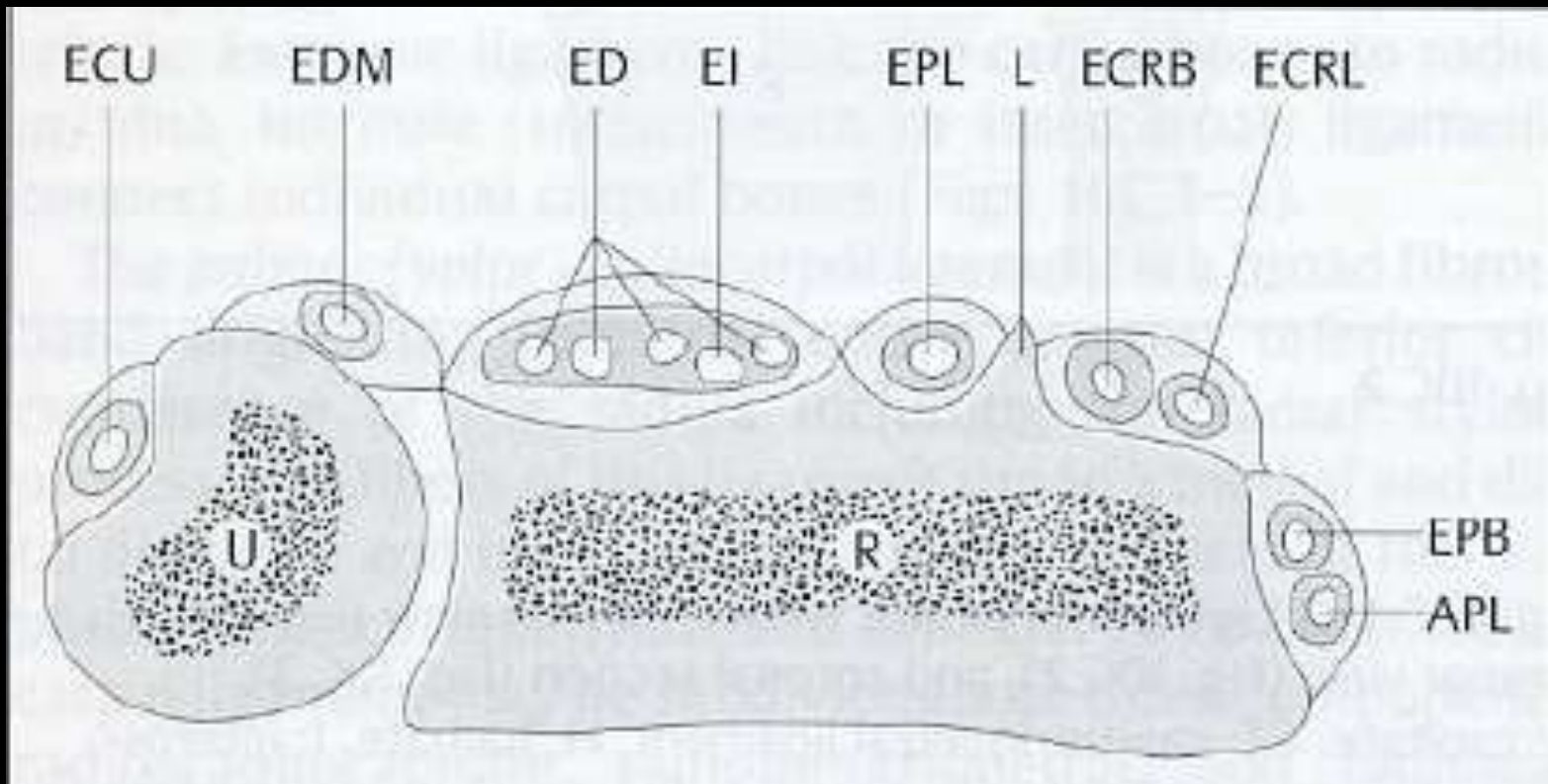
- Extensor carpi ulnaris tendon.

## Lister's tubercle

- Bony protuberance on the dorsum of radius.
- Separate tendons in 2<sup>nd</sup> form tendons in the 3<sup>rd</sup> compartments.







### Wrist extensor compartments

Compartment 1: **APL** = abductor pollicis longus, **EPB** = extensor pollicis brevis.

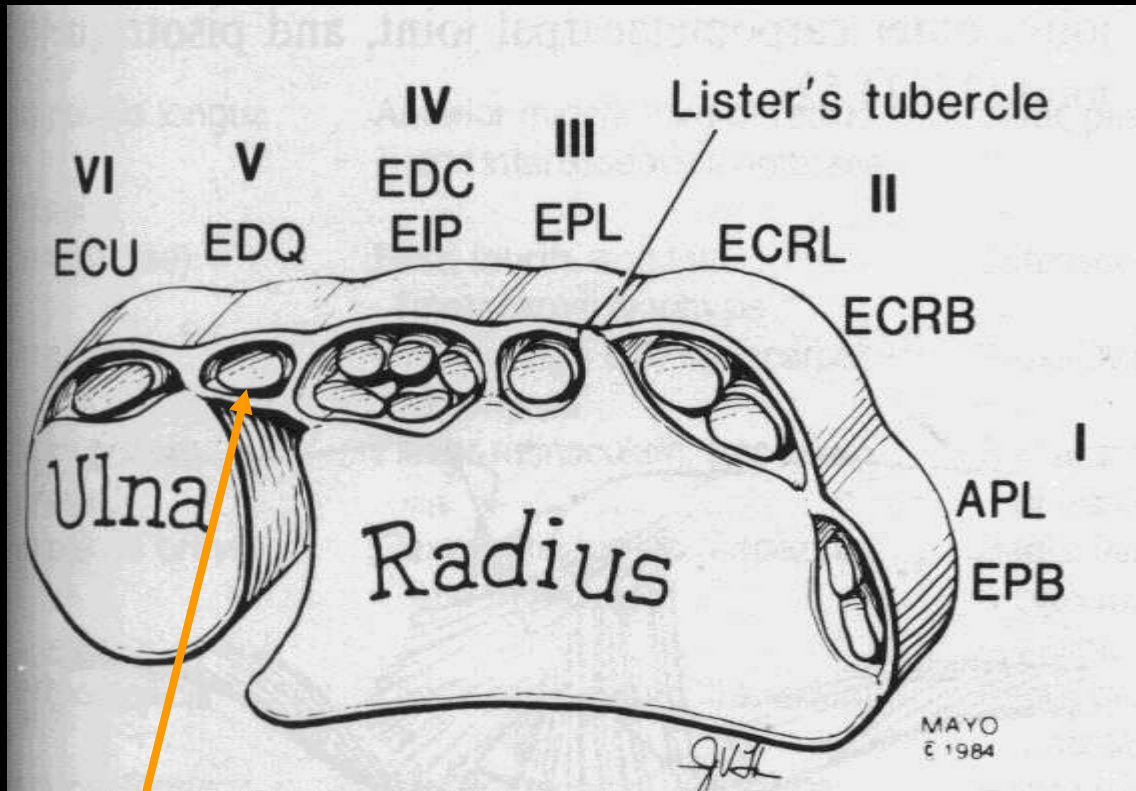
Compartment 2: **ECRL** = extensor carpi radialis longus, **ECRB** = extensor carpi radialis brevis.

Compartment 3: **EPL** = extensor pollicis longus.

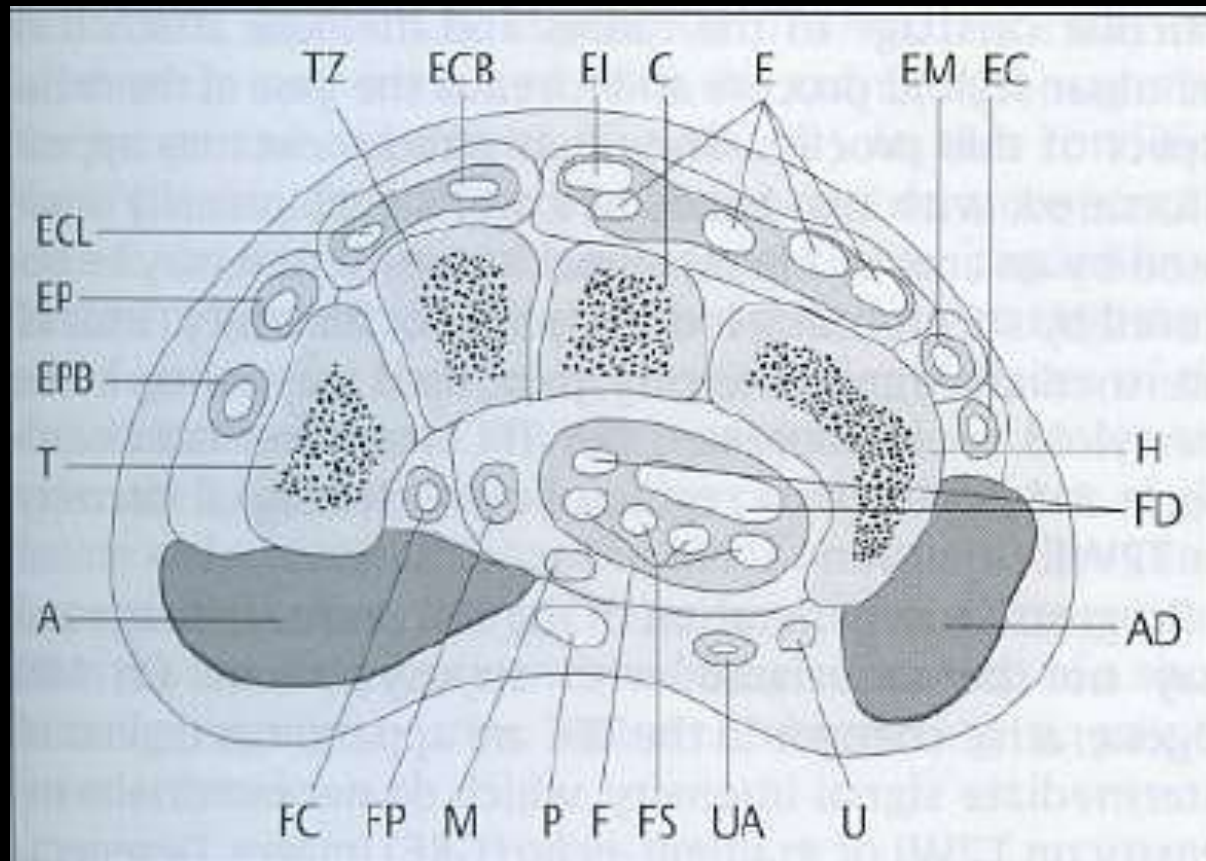
Compartment 4: **ED** = extensor digitorum, **EI** = extensor indicis.

Compartment 5: **EDM** = extensor digiti minimi.

Compartment 6: **ECU** = extensor carpi ulnaris, **L** = Lister's tubercle. **R** = radius, **U** = ulna.



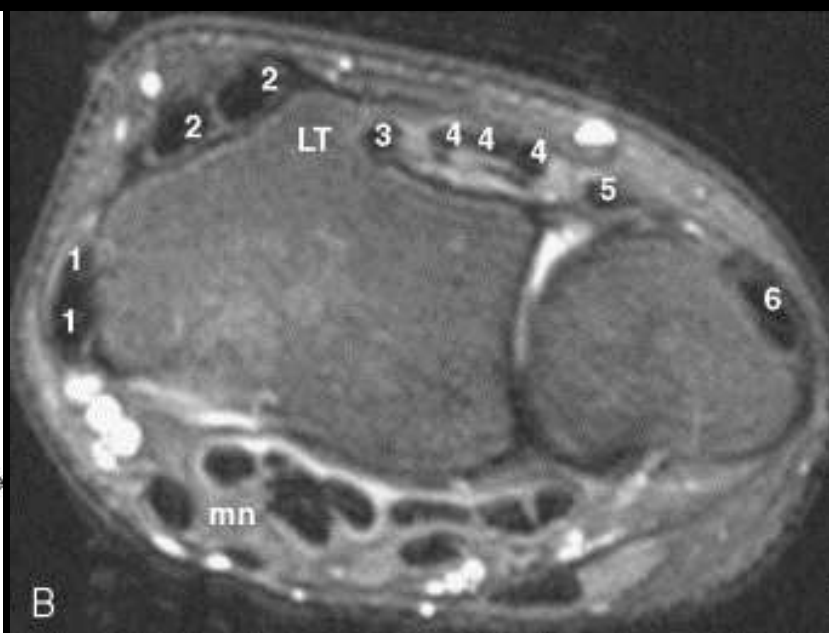
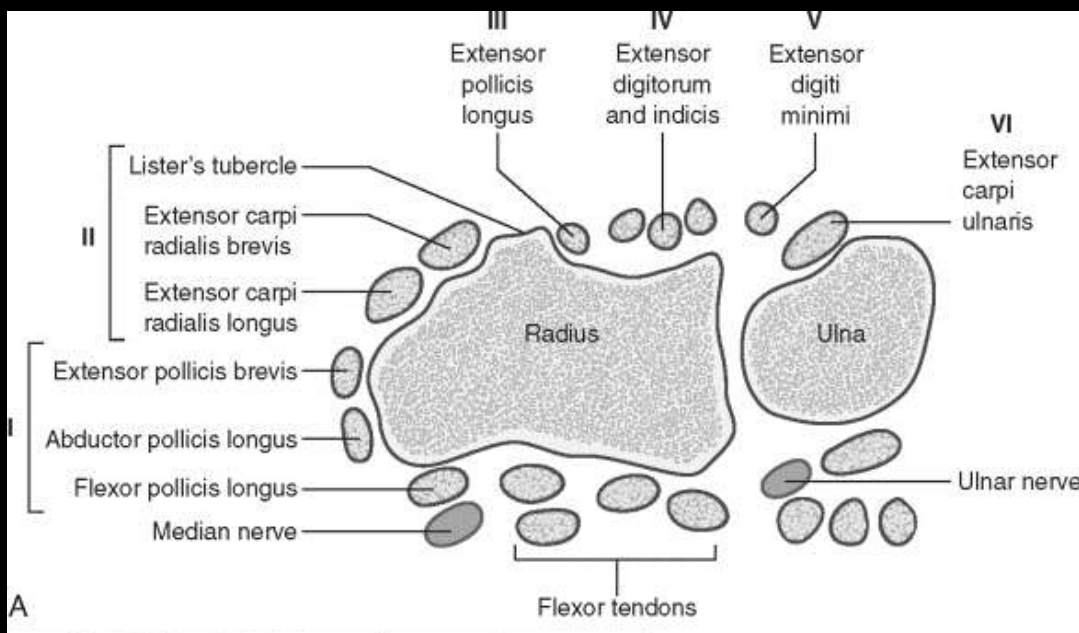
Extensor digiti quinti proprius= **EDQ**



## Carpal tunnel

**A** = abductor pollicis brevis, **AD** = abductor digiti minimi, **C** = capitate, **E** = common extensor digitorum tendon, **EC** = extensor carpi ulnaris, **ECP** = extensor carpi radialis brevis, **ECL** = extensor carpi radialis longus, **EI** = extensor indicis, **EM** = extensor digiti minimi, **EP** = extensor pollicis longus, **EPB** = extensor pollicis brevis, **F** = flexor retinaculum, **FC** = flexor carpi radialis, **FD** = flexor digitorum profundus, **FP** = flexor pollicis longus, **FS** = flexor digitorum superficialis, **H** = hamate, **M** = median N., **P** = palmaris tendon, **T** = trapezium, **TZ** = trapezoid, **U** = ulnar N., **UA** = ulnar A.

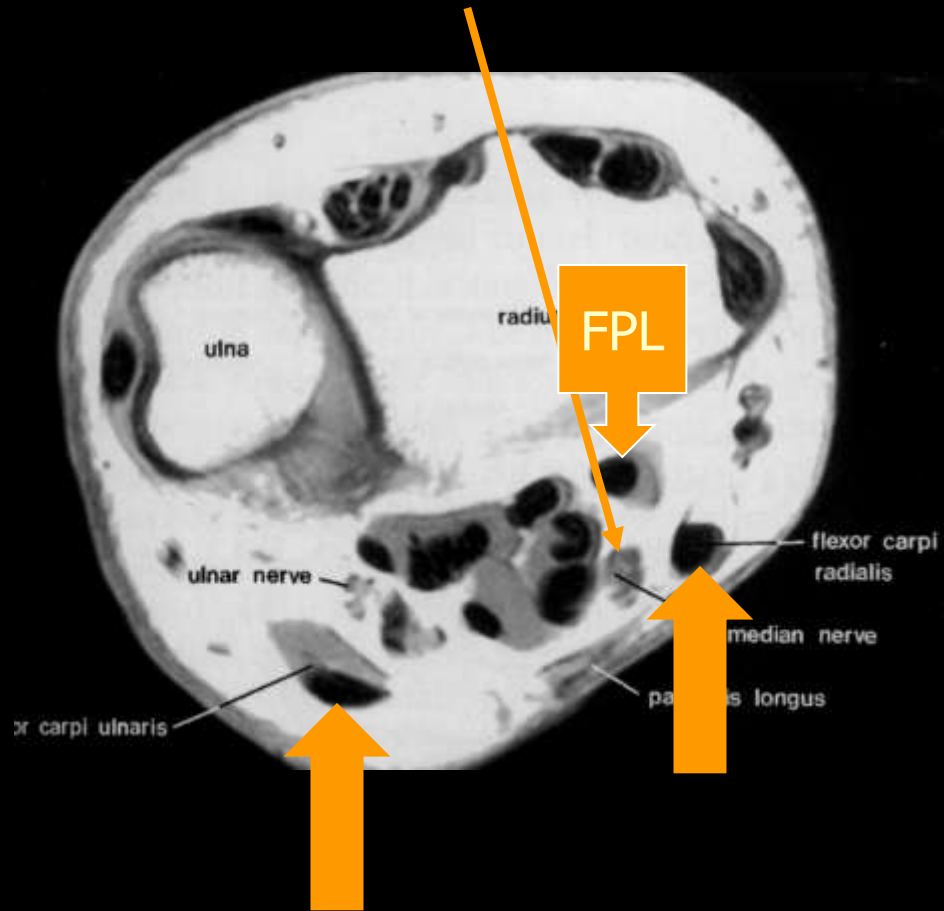


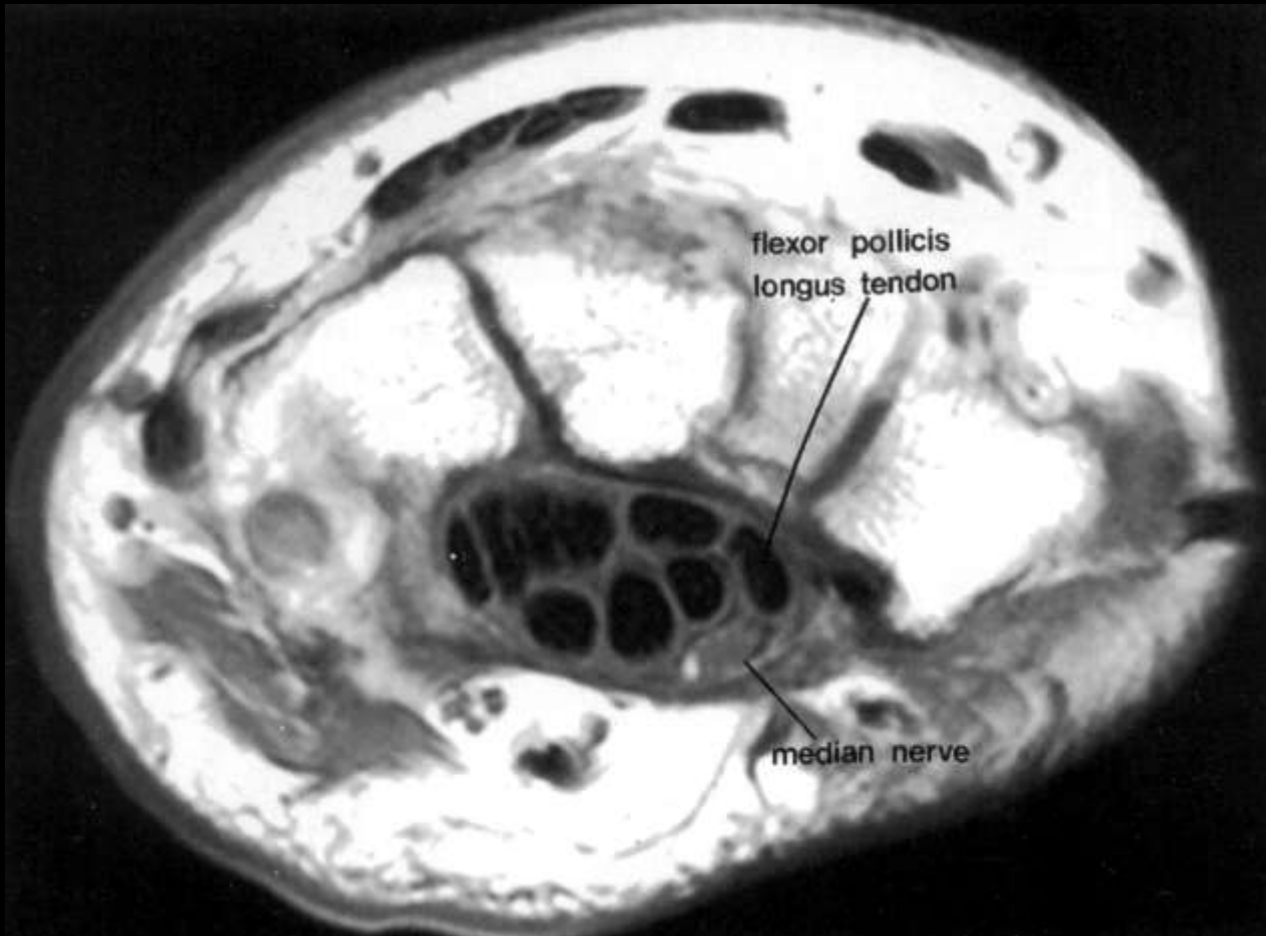


## Normal wrist tendons

**A**, Axial plane of wrist at level of distal radioulnar joint. This shows the 6 dorsal compartments that contain the tendons. The flexor tendons & median nerve lie volarly.

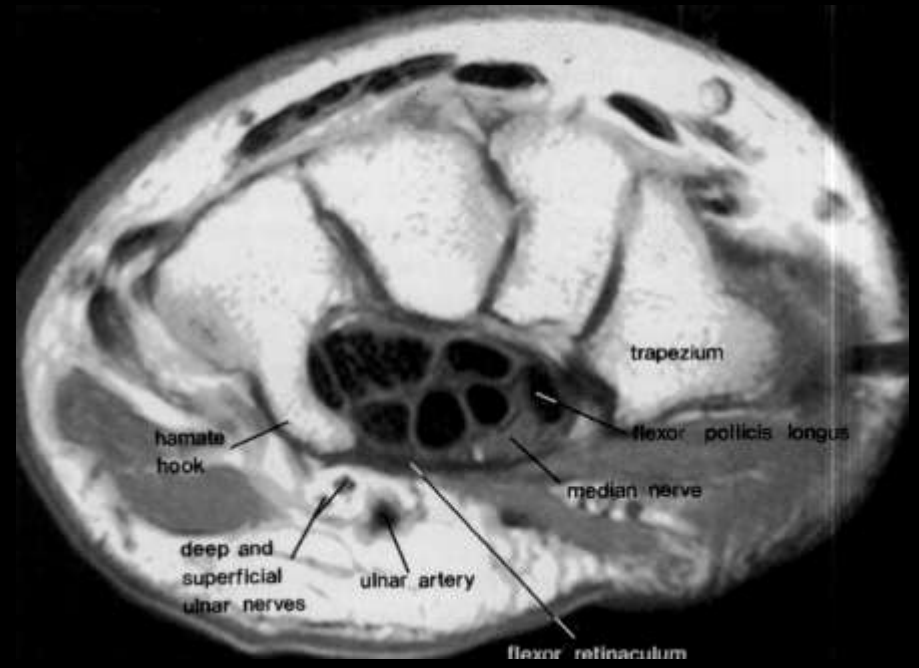
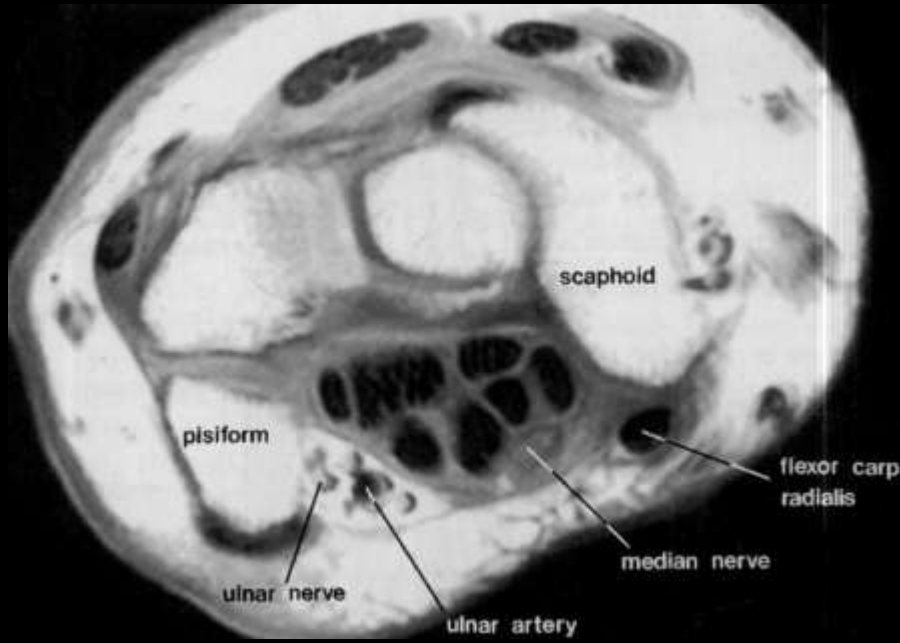
**B**, Axial FS T2 at distal radioulnar joint. The dorsal tendons are labeled with numbers that correlate with the dorsal compartments shown in the diagram in **A**. (1t) Lister's tubercle; (mn) median nerve.





flexor pollicis  
longus tendon

median nerve



## **Pitfalls in Wrist Tendons MRI**

- Tendons are oval-to-round low signal structures.
- The ECU tendon may normally have some high signal within it.

### **ECU tendon is considered abnormal if**

- Has fluid around it (tenosynovitis).
- Abnormally enlarged / thinned.

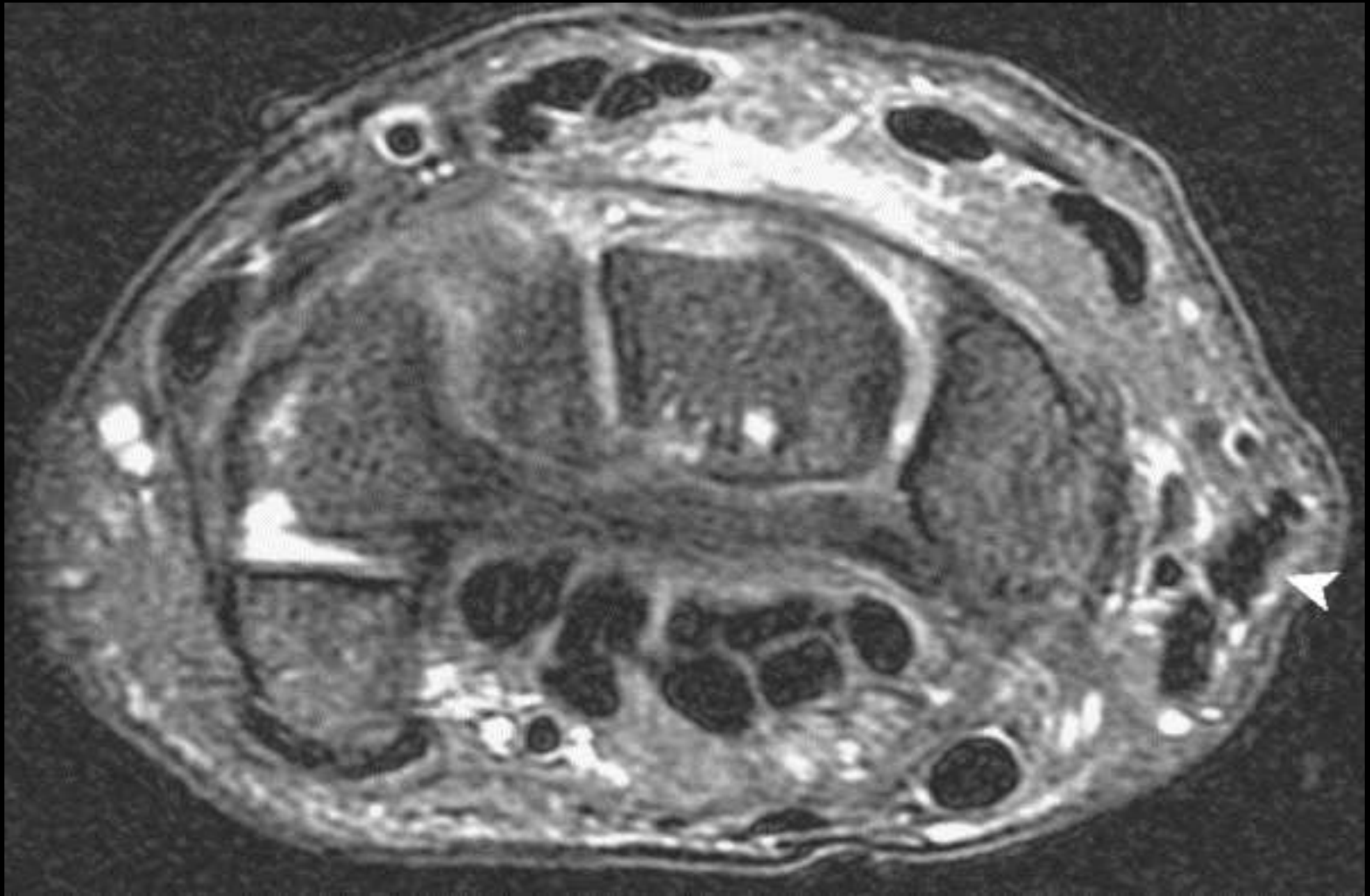
### **Fluid in tendon sheath**

- Small amounts of fluid in tendon sheaths are considered normal.
- Fluid is considered abnormal only if it completely surrounds the tendon.

### **Abductor pollicis longus tendon**

- Striations & heterogeneous signal may be noted in it (due to fat interposed between tendinous fascicles).
- May mimic longitudinal tear.





**Abductor pollicis longus striations (Axial FS T2)**

Image through proximal carpal row shows the normal appearance of the abductor pollicis (*arrowhead*). It can resemble a longitudinal split of the tendon, but the striated appearance is a result of fat interdigitating in the tendon.

# **Tendons Pathology**

## Abnormalities of the tendons

- Tenosynovitis.
- Degeneration.
- Tear.

# De Quervain's syndrome

- Entrapment / tenosynovitis of tendons in 1<sup>st</sup> dorsal compartment
  - Abductor pollicis longus.
  - Extensor pollicis brevis.

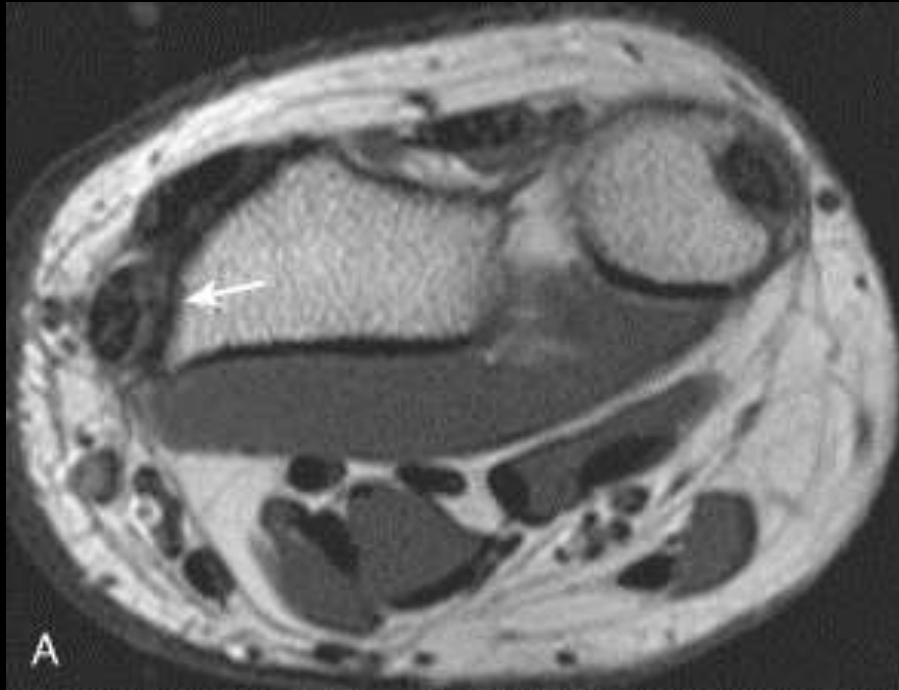
### MRI appearance

- Tendons size are normal / thickened.
- Tendons signal are normal / medium intratendinous signal (tear / degeneration).
- Obliteration of subcutaneous fat around the tendons.
- Abnormal signal around tendons:
  - low T1 & T2 (fibrosis).
  - low T1 & high T2 (tenosynovitis).

### D.D.

- Scaphoid fracture.
- Flexor carpi radialis tenosynovitis.
- Degenerative arthritis of 1<sup>st</sup> carpo-metacarpal joint.





### de Quervain's tenosynovitis

**A**, Axial T1, painful mass over the radial styloid process proved to be tenosynovitis of the extensor pollicis brevis and abductor pollicis longus tendons (*arrow*).

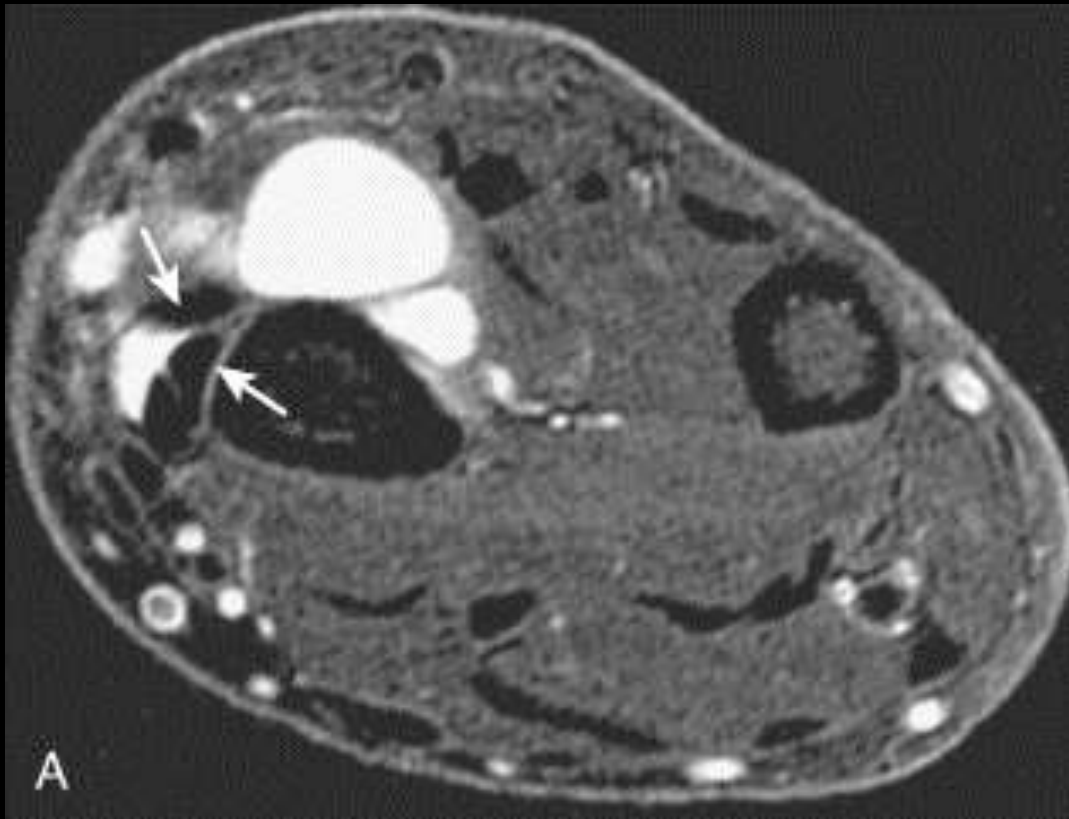
**B**, Axial T2, the tendons of the 1<sup>st</sup> dorsal compartment appear enlarged with fluid in the tendon sheath (*arrow*). The subcutaneous fat around the tendons are normal

# Intersection syndrome

- The tendons of 1<sup>st</sup> extensor compartment cross over tendons of the 2<sup>nd</sup> about 4 - 8 cm proximal to Lister's tubercle.
- It is due to peritendinosis of the 2<sup>nd</sup> extensor compartment.

## MRI

- Involvement of the 1<sup>st</sup> & 2<sup>nd</sup> extensor compartment tendons & tendon sheaths with abnormal signal begins at the crossover and extends proximally.



### Intersection syndrome

**A**, Axial FS T2 proximal to wrist joint shows fluid collections as tendons from the 1<sup>st</sup> & 2<sup>nd</sup> compartments cross (*arrows*).

**B**, Coronal FS T2 adjacent to tendons (inhomogeneous fat suppression) shows tenosynovitis at the location of the tendon crossing (*arrows*).

# **Extensor Carpi Ulnaris Tendon Lesions**



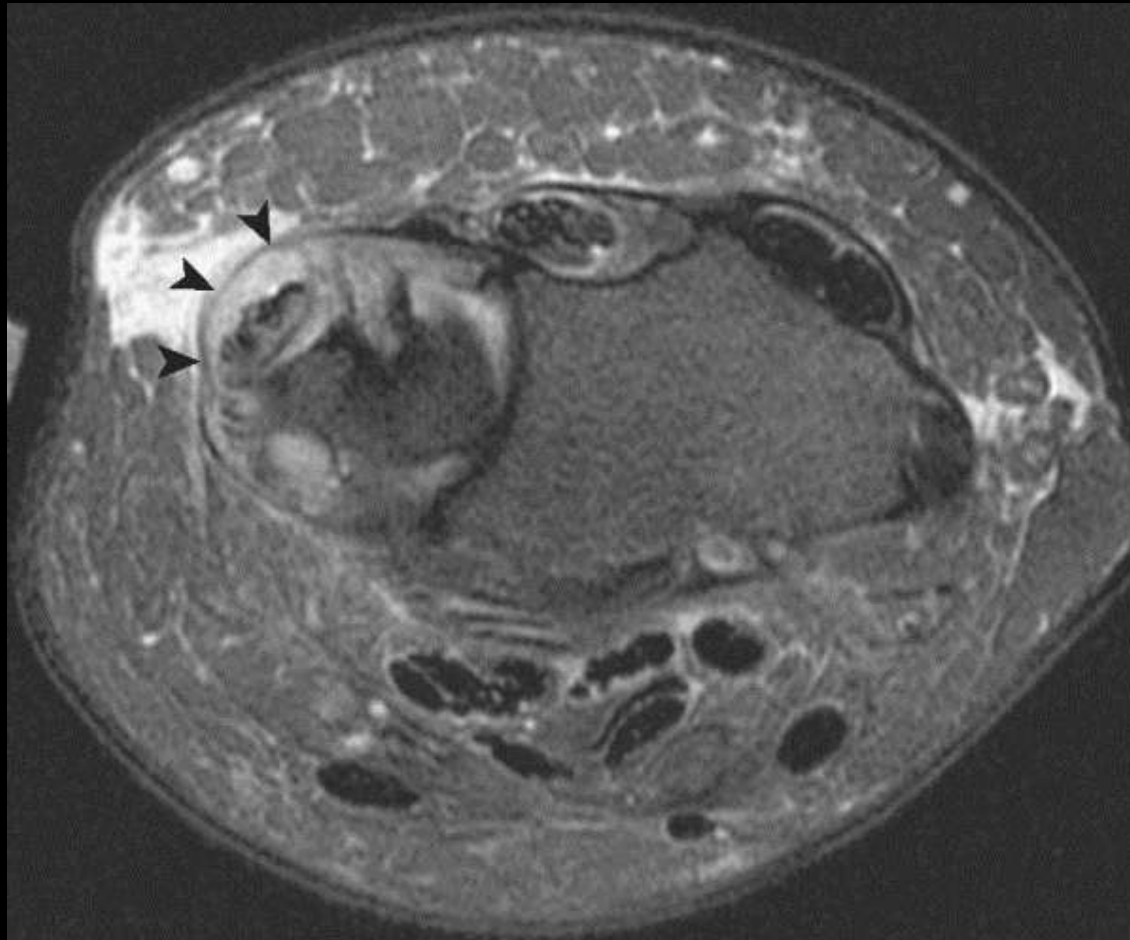
- Commonly involved with tenosynovitis / partial tears.

## MRI

- Tenosynovitis -- fluid around the entire tendon.
- Partial tear -- tendon is abnormally thick / thin.
- Tendon subluxation / dislocation -- the tendon is partially / completely dislodged from its groove on the dorsal aspect of ulna and is displaced medially (**ulnar direction**) (**best evaluated on axial images**).

## Pitfall

- High signal in this particular tendon is may be normal.



**Extensor carpi ulnaris tenosynovitis and partial tears (Axial FS T2)**

Extensive high signal from tenosynovitis in the soft tissues surrounding the extensor carpi ulnaris (*arrowheads*).

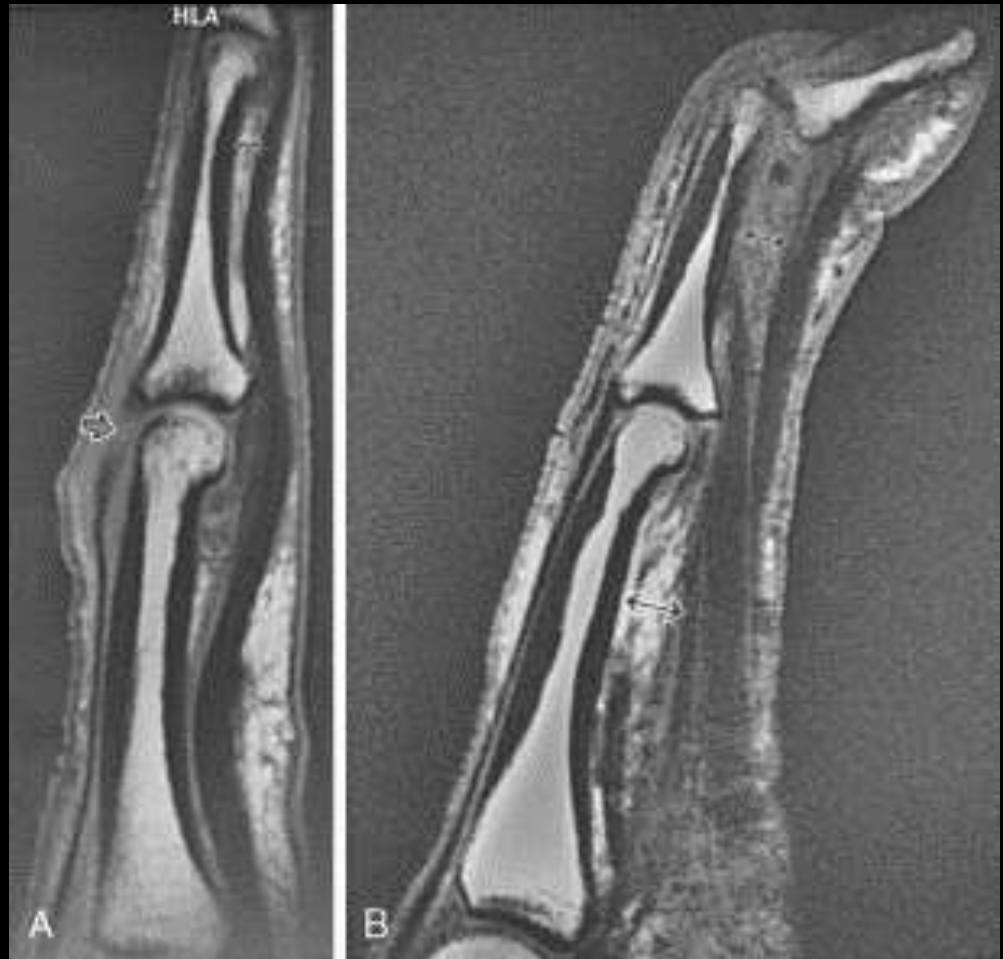
The extensor carpi ulnaris is slightly enlarged with more than the usual high signal within it, indicating partial tears.

# Bowstringing

- Normally, the flexor digitorum tendons in the fingers are closely apposed to the adjacent osseous structures.
- They are held in position by a system of pulley ligaments.
- Rupture of the pulley system ligaments -- tendons are displaced from the digit bones -- bowstring appearance.

## MRI

- Tendons are separated from the bone to a greater extent than normal (compared with the adjacent normal digits).



### Tendon abnormalities of the fingers

**A**, Sagittal T1, extensor tendon tear (*open arrow*), it is discontinuous, medium signal & thickened. The relationship of the normal flexor tendons to the phalanges is seen (*double-headed arrows*).

**B**, Sagittal T1, (different patient), bowstringing of flexor tendons seen as significant displacement (compare with **A**) of the tendons in a volar direction from the osseous phalanges (*double-headed arrows*). Scarring surrounds the tendons with partial obliteration of the volar subcutaneous fat. Also here is a mallet finger (flexion of the distal IPJ) due to rupture of the distal extensor tendon.





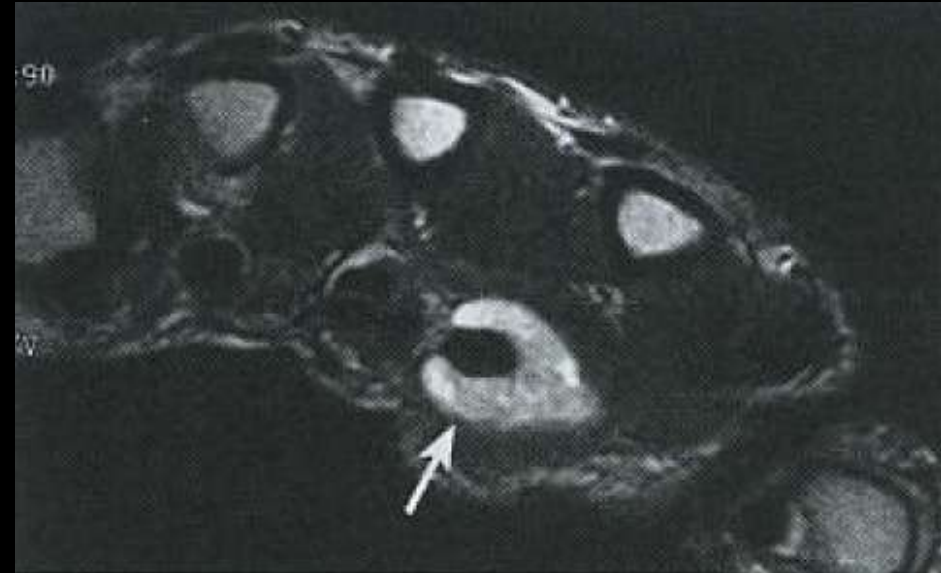
### Tendon abnormalities of the fingers

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**C**, Axial T1, (same pt), the large distance between the bone and flexor tendons is shown (*double-headed arrow*) in the middle finger from a bowstringing injury. The normal distance between bone and flexor tendons (*small double-headed arrows*) can be seen in the normal digits on either side of the injured finger.

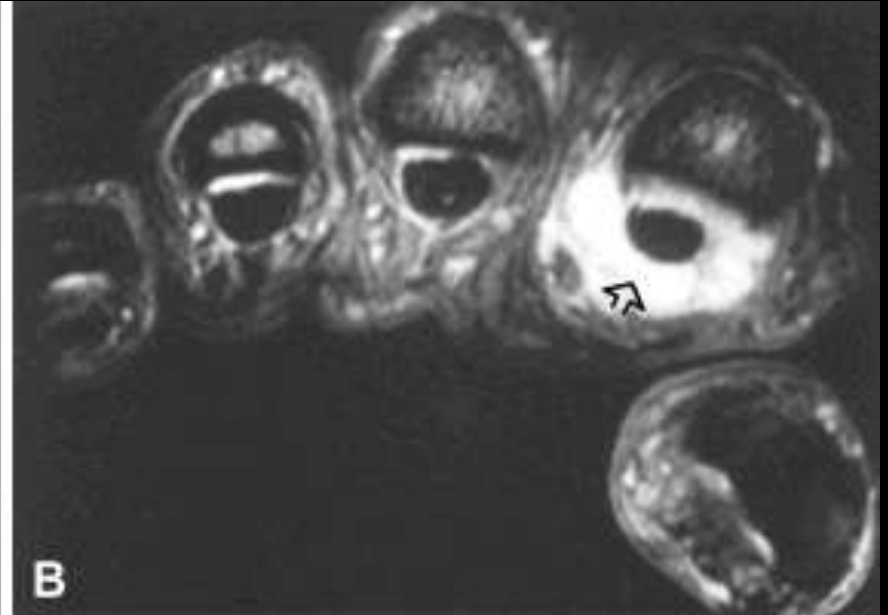
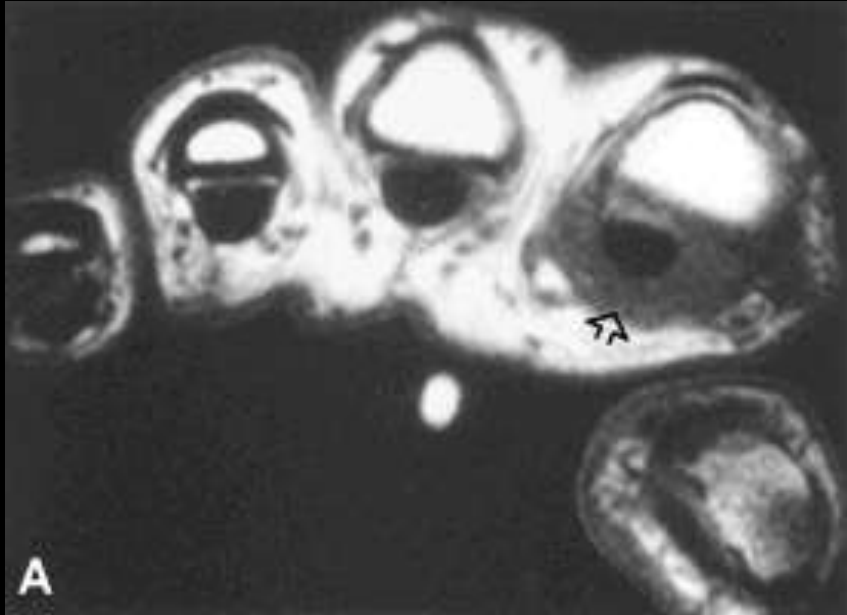
## **Other Tendons**

- Tenosynovitis.
- Partial / complete tear.
- Tenosynovitis of the flexor digitorum tendons in the carpal tunnel is a common cause of carpal tunnel syndrome.
- A distal flexor tenosynovitis can rapidly ascend into the flexor compartment affecting the median N. in the carpal tunnel and the other flexor tendons.

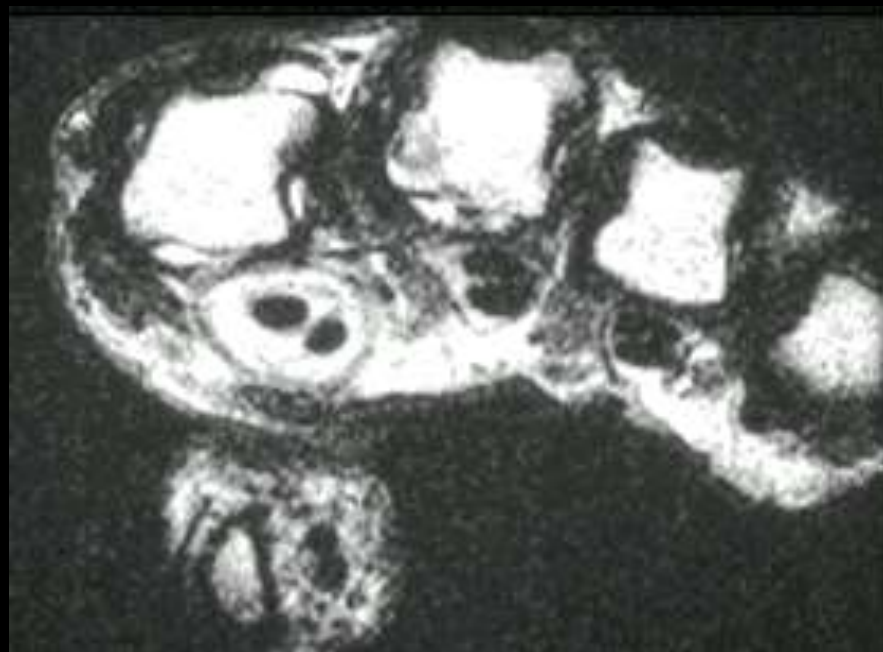
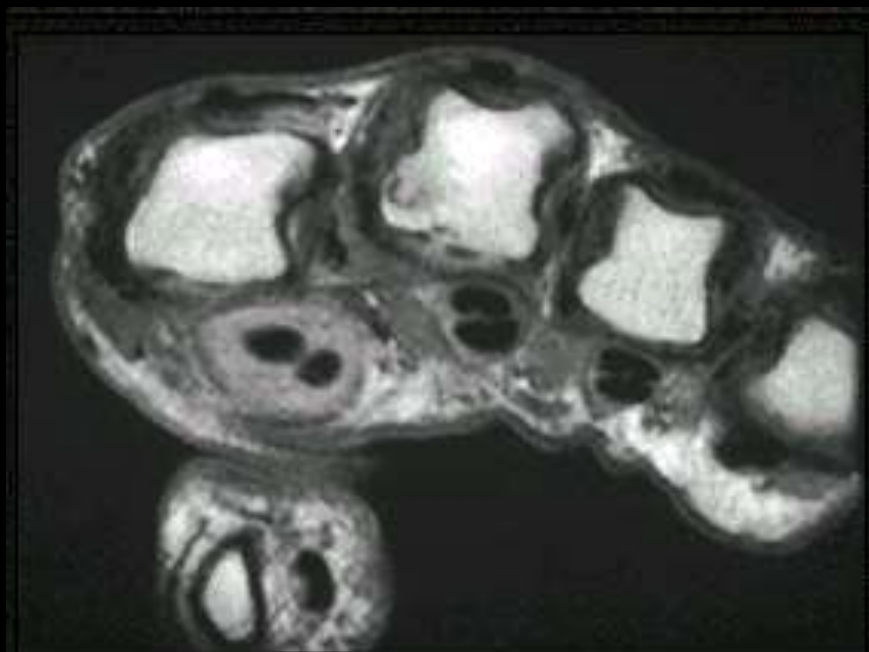


**Tenosynovitis (Axial PD & Axial T2)**

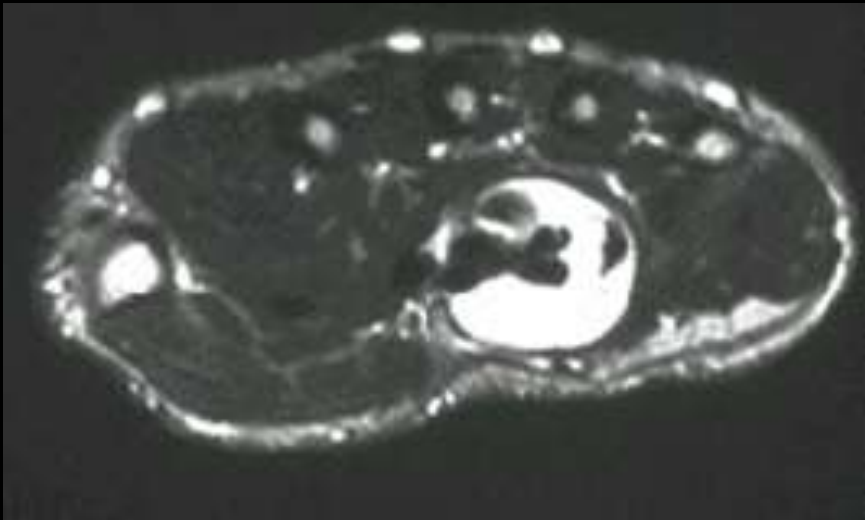
Fluid collection (arrow) surrounds the paired flexor tendon of the index finger.



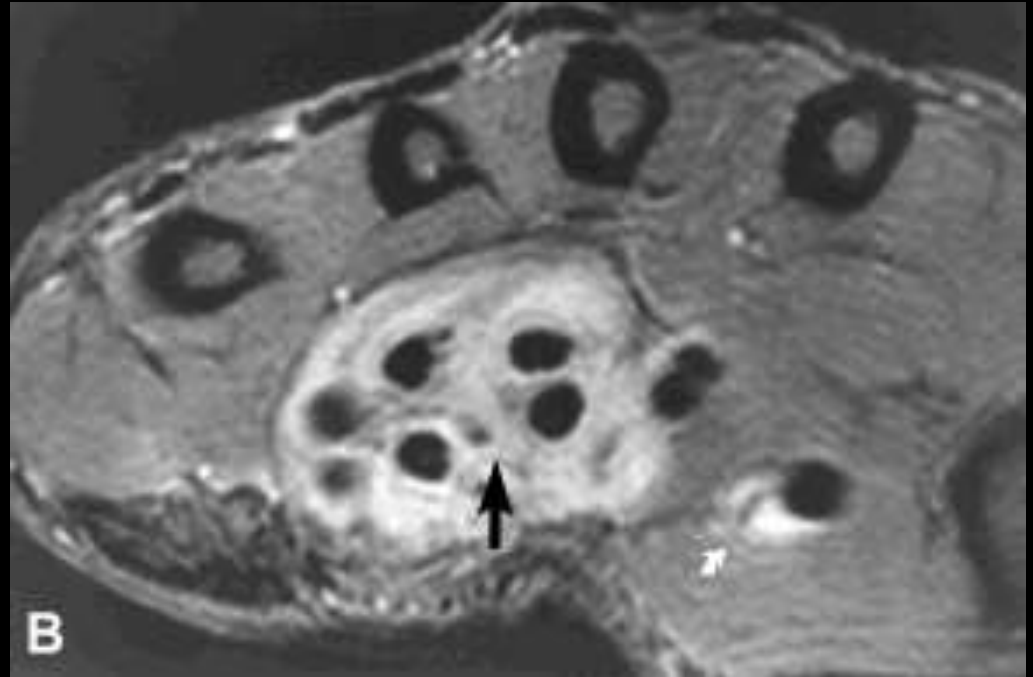
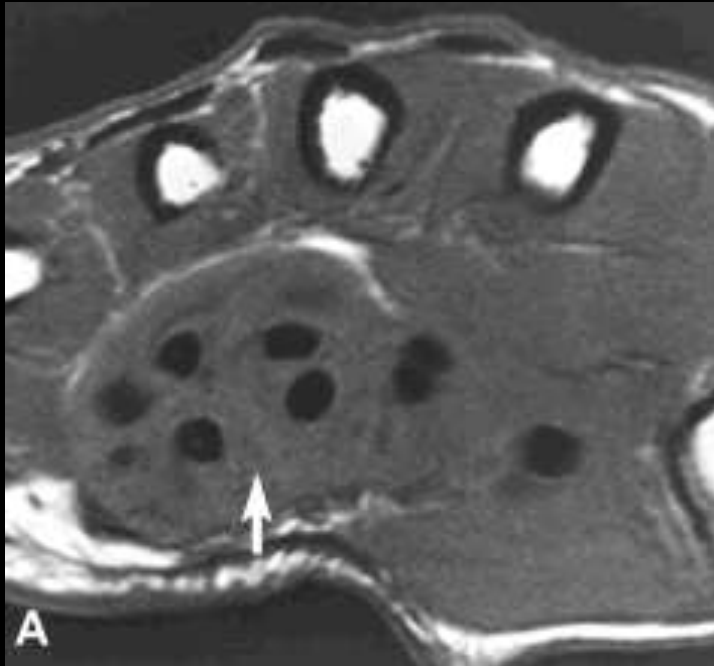
**Tenosynovitis of FDS & FDP**



**Tenosynovitis**



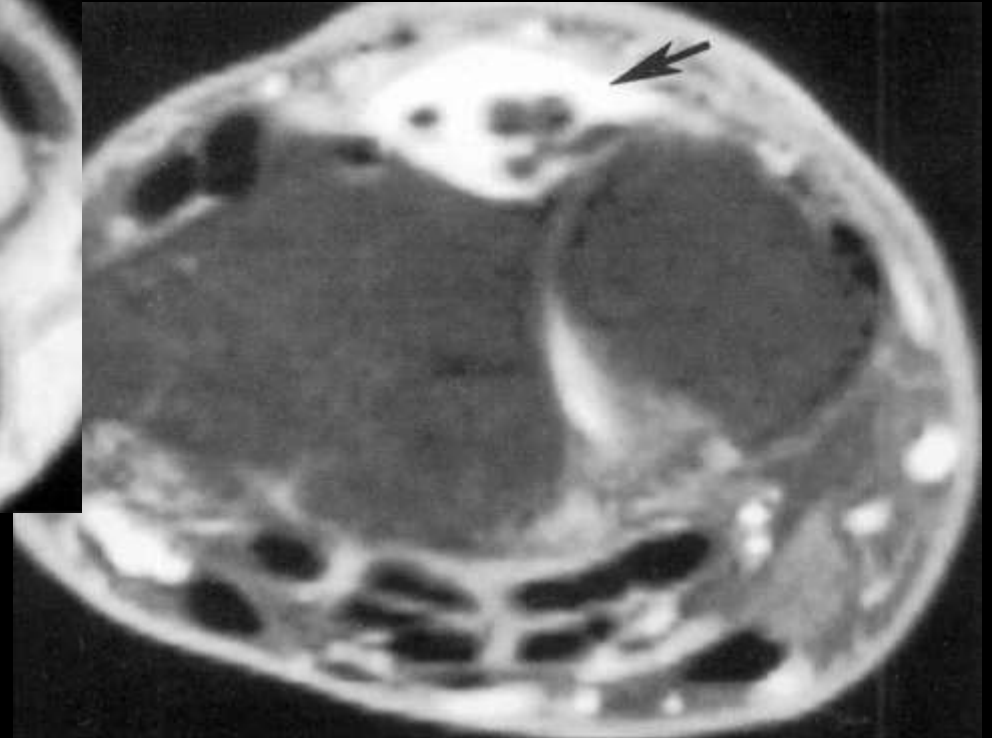
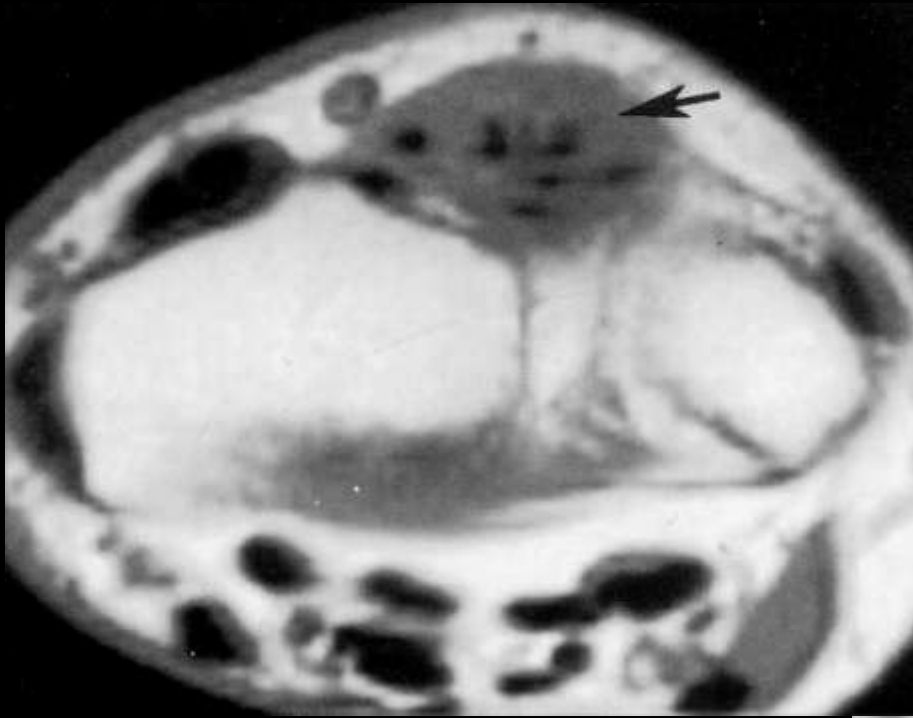
**Tenosynovitis**



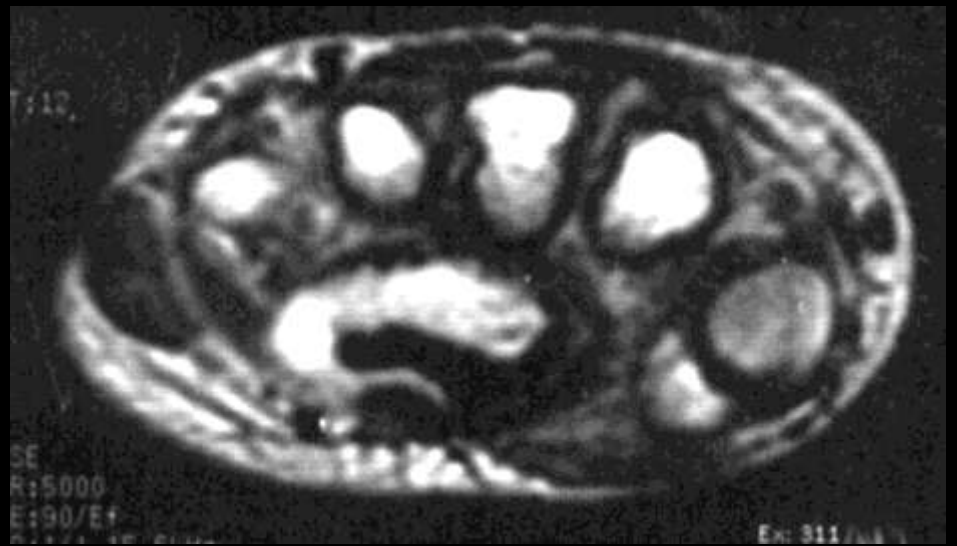
**Tenosynovitis of all flexor tendons**

**FDS, FDP, FPL**

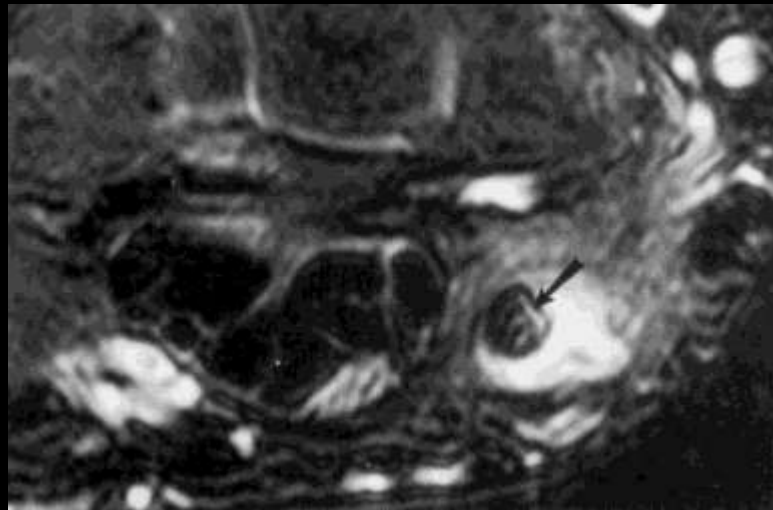
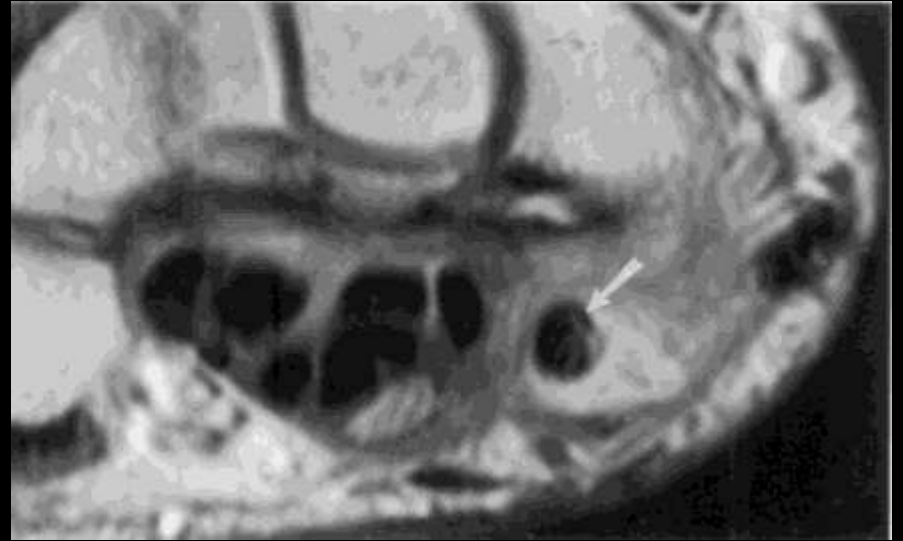
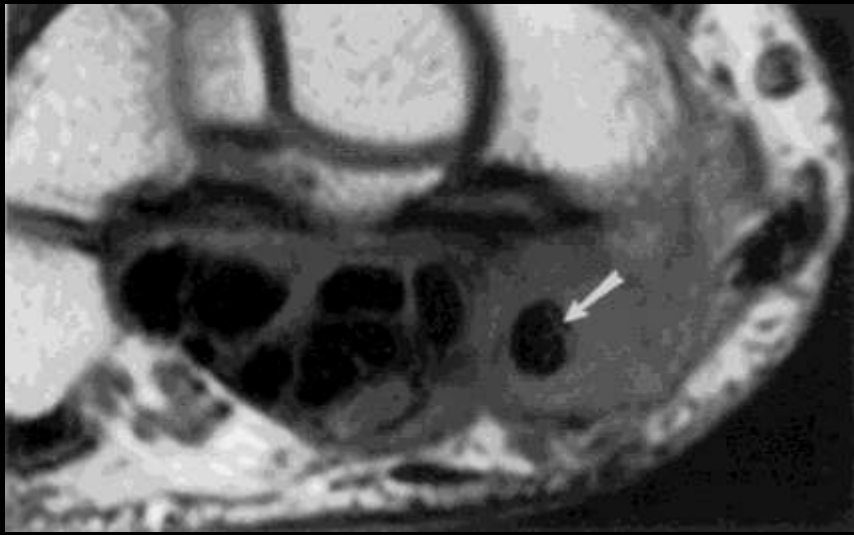




**Extensor tenosynovitis**



**Hypertrophic synovitis**



**Partial tear of flexor carpi radialis**

A photograph of a sunset over a mountain range. The sky is filled with soft, pink and orange clouds, with a bright yellow sun partially obscured by a cloud. The mountains in the foreground are dark and silhouetted against the bright sky. The text "Thank You" is overlaid in the center in a white, serif font with a drop shadow.

**Thank You**