

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Wrist extrinsic ligaments MRI

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Ligaments

Wrist ligaments

- Intrinsic carpal ligaments -- connect carpal bones to one another.
- Extrinsic ligaments -- connect forearm bones to wrist bones.

Extrinsic ligaments

Volar & Dorsal ligaments

- The extrinsic carpal ligaments are well seen on GE coronal images.
- They are seen in cross section on sagittal images (best seen on oblique sagittal as they run obliquely).
- They course between carpal bones and radius on the volar and dorsal sides of the wrist.
- The volar ligaments are stronger and thicker than the dorsal.
- They represent thickenings of joint capsule and are intracapsular extrasynovial.

Volar ligaments

- Radio-scapho-capitate & radio-luno-triquetral ligaments.

Dorsal ligaments

- They run obliquely between distal radius and to carpal bones of in the proximal carpal row (radio-scaphoid, radio-lunate, and radio-triquetral ligaments).

On MRI

- Seen as striated fascicular structures with alternating bands of low and medium signal on coronal images.



Extrinsic ligaments

A, Coronal GE, portions of the two major volar carpal extrinsic ligaments are shown coursing obliquely as striated low signal structures. (rlt) radio-luno-triquetral ligaments; (rsc) radio-scapho-capitate.

B, Sagittal T1, volar and dorsal extrinsic ligaments are seen as round, low signal structures (*arrowheads*) in cross section.

Volar ligaments

The radio-scapho-capitate ligament:

- Arises from volar surface of radius styloid process.
- Courses obliquely across waist of scaphoid without attaching to it.
- Inserts on the center of capitate.

The radio-luno-triquetral ligament: (the largest ligament of the wrist)

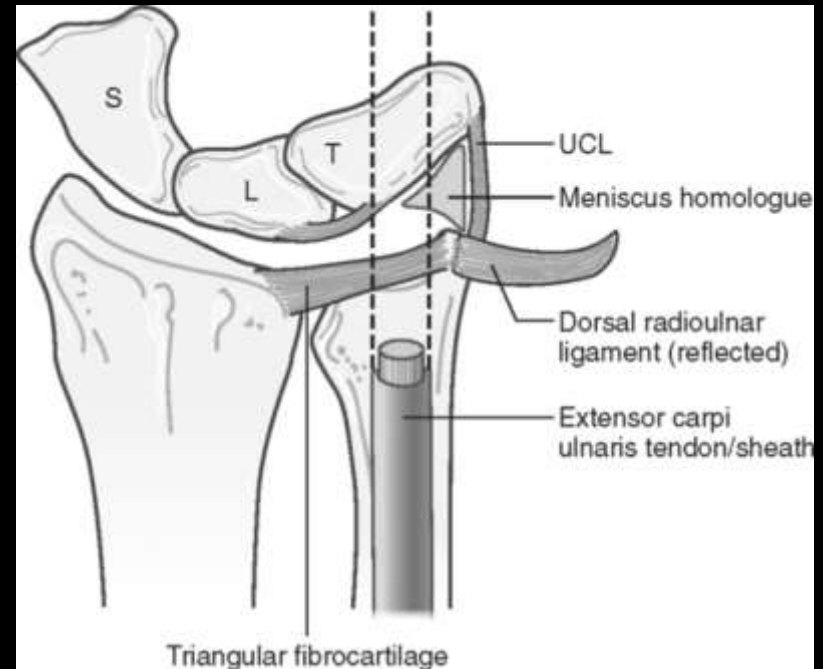
- Arises adjacent to (on ulnar side of) radio-scapho-capitate ligament on the radial styloid.
- Runs obliquely to attach to the volar surfaces of the lunate and triquetrum.

Triangular Fibrocartilage Complex

TFC Complex

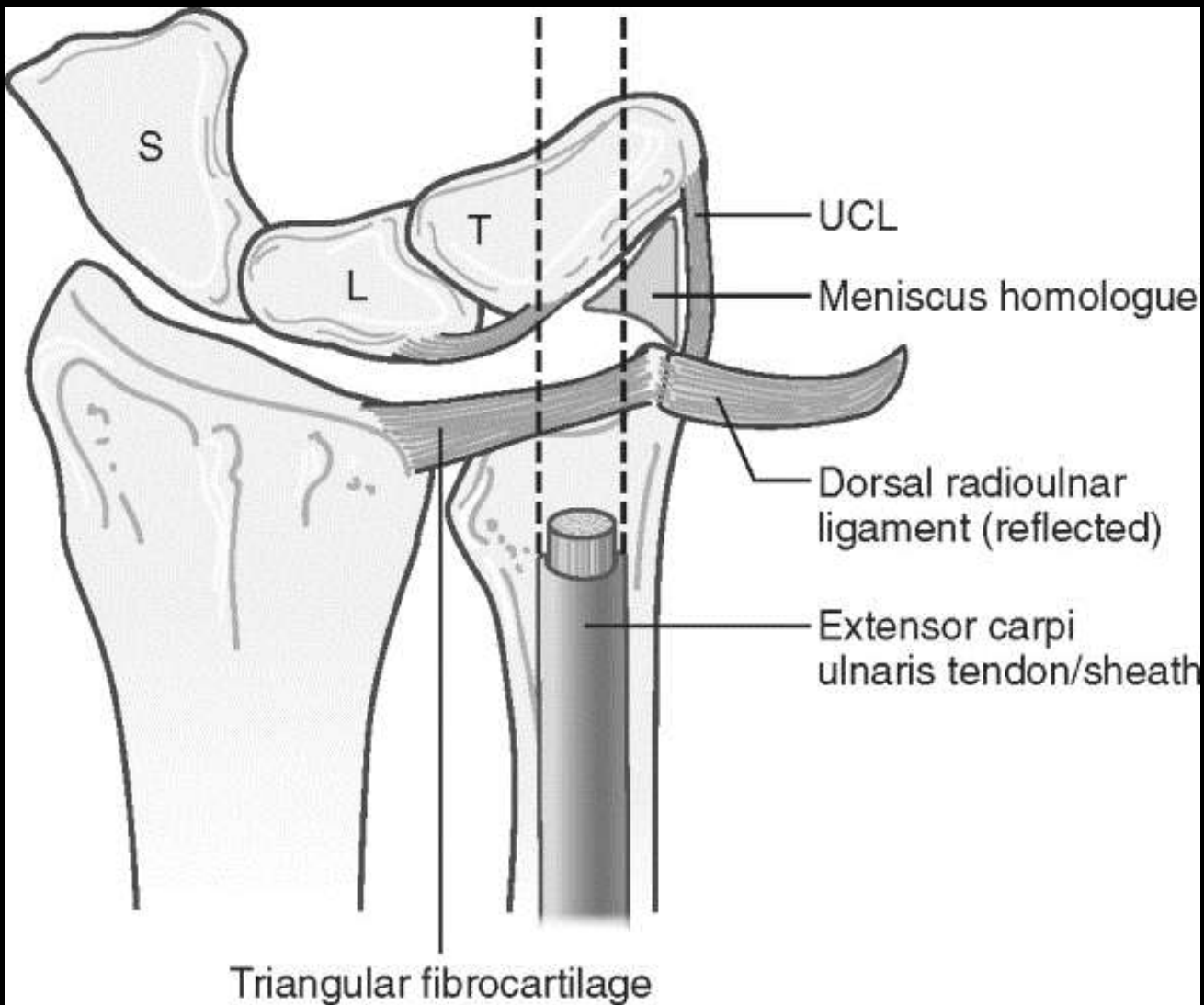
Components (several soft tissue structures on the ulnar side of the wrist)

- TFC.
- Radio-ulnar ligaments (volar & dorsal)
- Ulnar collateral ligament
- Extensor carpi ulnaris tendon sheath
- Meniscus homologue.



Function

- The 1ry stabilizer of distal radio-ulnar joint (stabilizes ulnar side of wrist).



TFC complex

Anatomic components of the TFC from a dorsal perspective. L, lunate; S, scaphoid; T, triquetrum; UCL, ulnar collateral ligament.



Prestyloid recess



TFC complex

Inserts into ulnar styloid process by fascicles that are directed to styloid tip & base.

UCL extends from styloid to triquetrum, hamata and 5th metacarpal bone.

Meniscus homologue = the thickened fibers of UCL distal to TFCC.



Meniscus homologue

A fibrous tissue fold interposed between ulnar styloid and triquetrum.

Abnormalities of TFC complex

• TFC

- Partial / full-thickness tears, detachment, degeneration.
- High signal through surface on T2 = tear.

• Radio-ulnar ligaments

- High signal through these structures = tear.
- Tear leads to instability of distal radioulnar joint.

• Extensor carpi ulnaris sheath

- Tenosynovitis commonly affects this tendon
- High signal surrounding tendon on axial T2.
- Disruption of the sheath leads to medial subluxation of extensor carpi ulnaris from its groove in ulna.

1-Triangular Fibrocartilage

Normal TFC

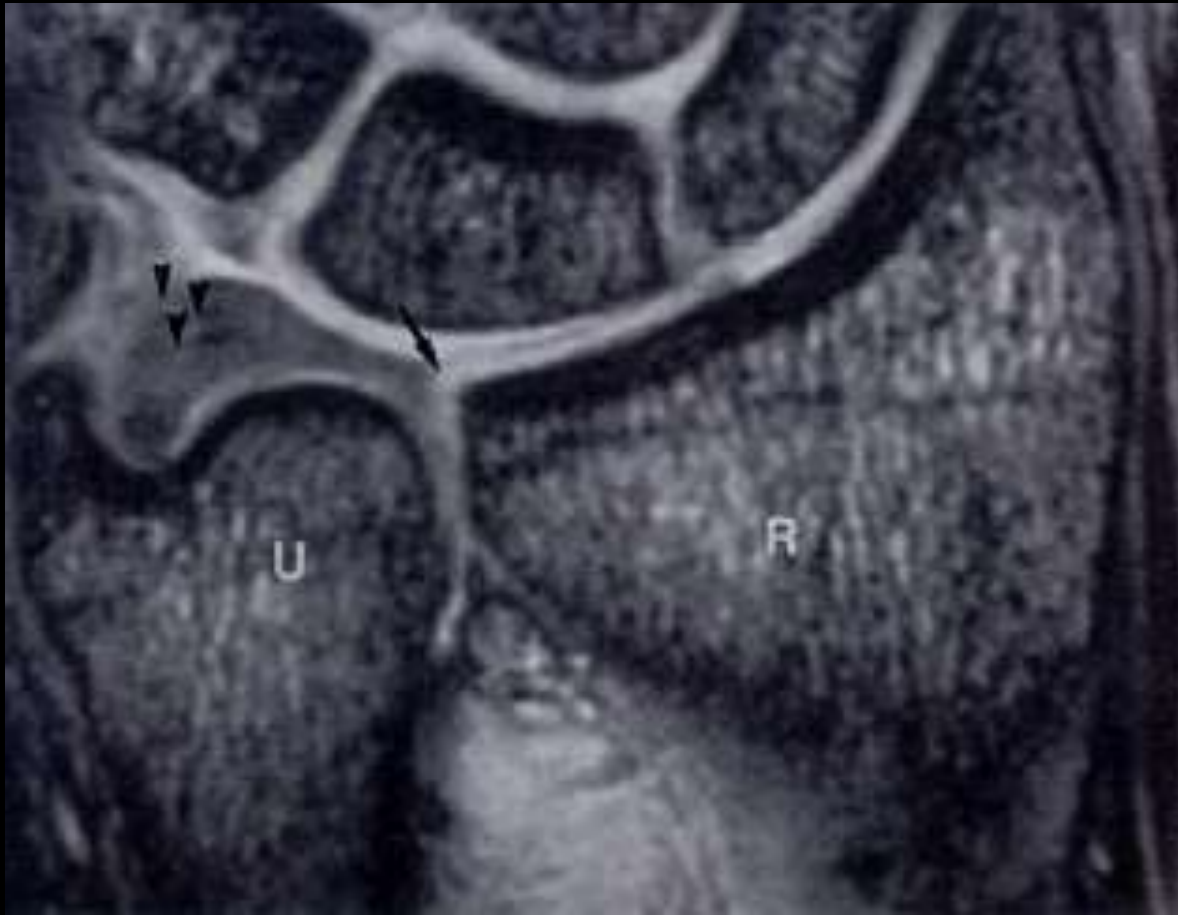
- It is fibro-cartilaginous biconcave disk.
- Asymmetric bow-tie shape (as TMJ disk).
- Lie on the ulno-carpal space.
- Arises from medial surface of the radius.
- Inserts into the base of the styloid process by 2 thin bands.
- The central portion is thin (common site of tear).
- At its radial attachment, there is hyaline cartilage interposed between the TFC and the radius (that must not be confused with a detached or torn TFC).
- TFC attaches directly to the cartilage (the articular surface of distal radioulnar joint).
- The thickness of TFC is inversely proportional to the degree of ulnar variance
 - TFC is thinner in pts with +ve ulnar variance.
 - TFC is thicker in pts with -ve ulnar variance.

TFC on MRI

- Best seen on coronal images
- Diffuse low signal regardless of pulse sequence.
- May show medium signal in its substance 2ry to myxoid degeneration.



- Biconcave disc (coronal)
- Homogenous low signal
- Discoid shape (sagittal)

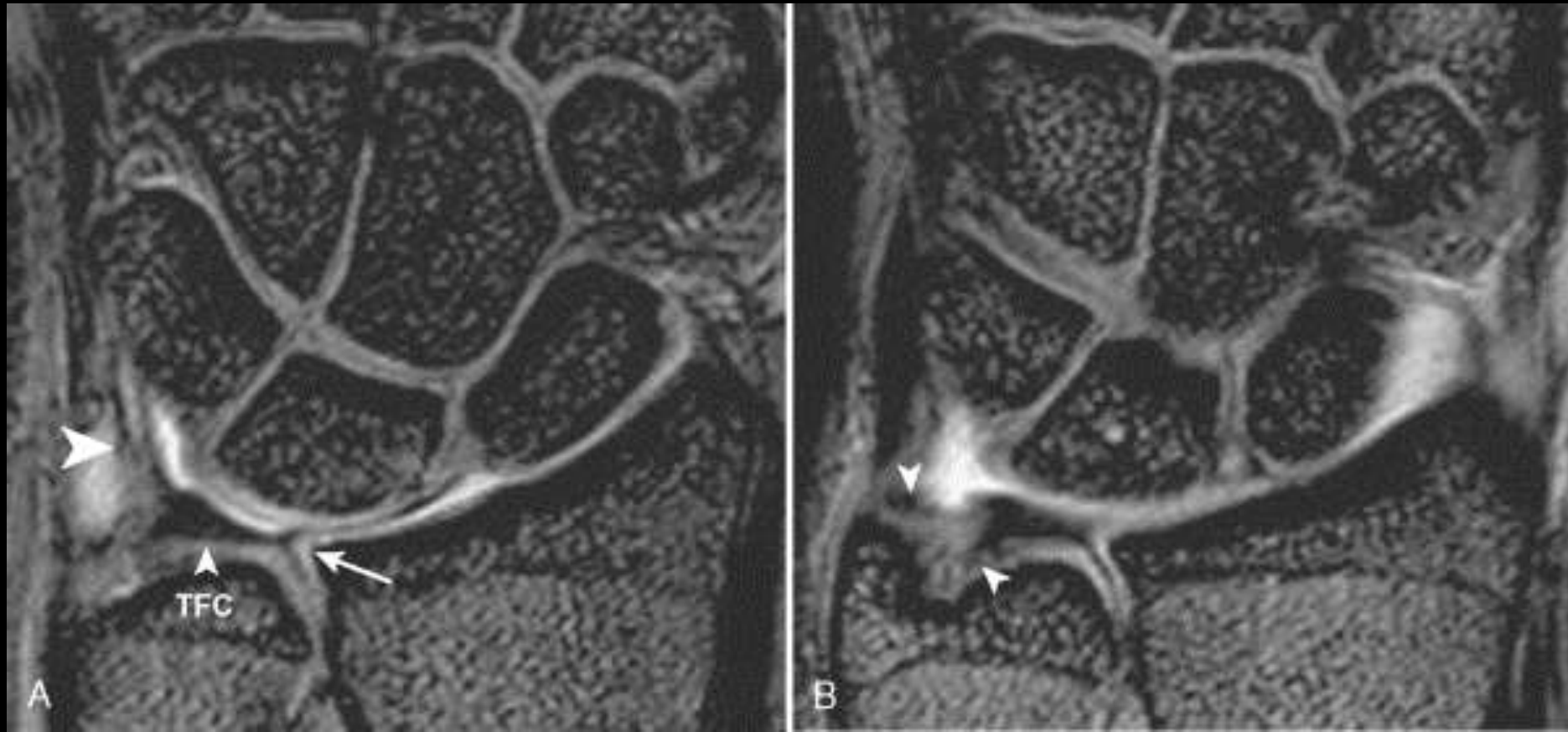


Normal radial and ulnar attachments of the TFC (Coronal GE)

TFC attaches to radial cartilage and not to cortex (arrow).

The ulnar aspect of the TFC near its attachment to the ulnar fovea has a striated appearance (arrowheads).

The foci of intermediate signal at TFC attachment sites should not be mistaken for tears.



Normal TFC (Coronal GE)

A, The TFC (*small arrowhead*) is a biconcave structure attaching to the medium signal radius cartilage (*white arrow*). Ulnar collateral ligament also seen (*large arrowhead*).

B, The ulnar attachment of TFC consists of 2 thin bands of tissue (*arrowheads*).

Abnormal TFC

Tear / detachment.

On MRI

- As on Knee, high signal in TFC substance = no significance.
- High signal extending through the proximal / distal surface = tear.
- TFC tears are partial / full thickness.
- Partial tears are ++ at the proximal articular surface (facing distal radio-ulnar J).
- Fluid in distal radio-ulnar joint was previously believed to be a 2ry sign of a TFC tear, but a small amount of fluid may be normally present in this joint.
- Traumatic tear of TFC often associated with injury of adjacent extensor carpi ulnaris tendon sheath and luno-triquetral ligament.
- Tears in the central and radial portions are best shown.
- Tears near ulnar attachment are less accurately diagnosed (as synovitis / synovial proliferation in prestyloid recess may mimic a tear).

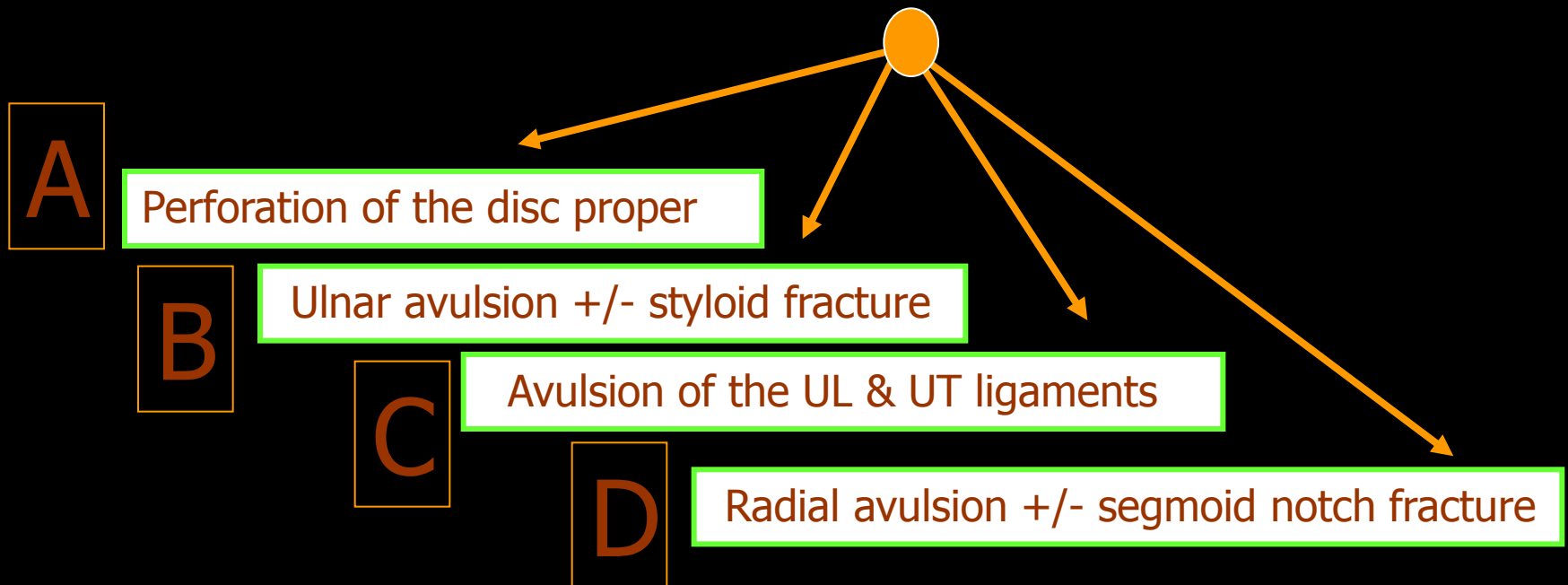
Pitfalls in TFC MRI

- Minimal fluid in distal radio-ulnar joint may be normally present.
- Tears near ulnar attachment are less accurately diagnosed (as synovitis / synovial proliferation in prestyloid recess may mimic a tear).
- TFC substance may show medium signal 2ry to myxoid degeneration.

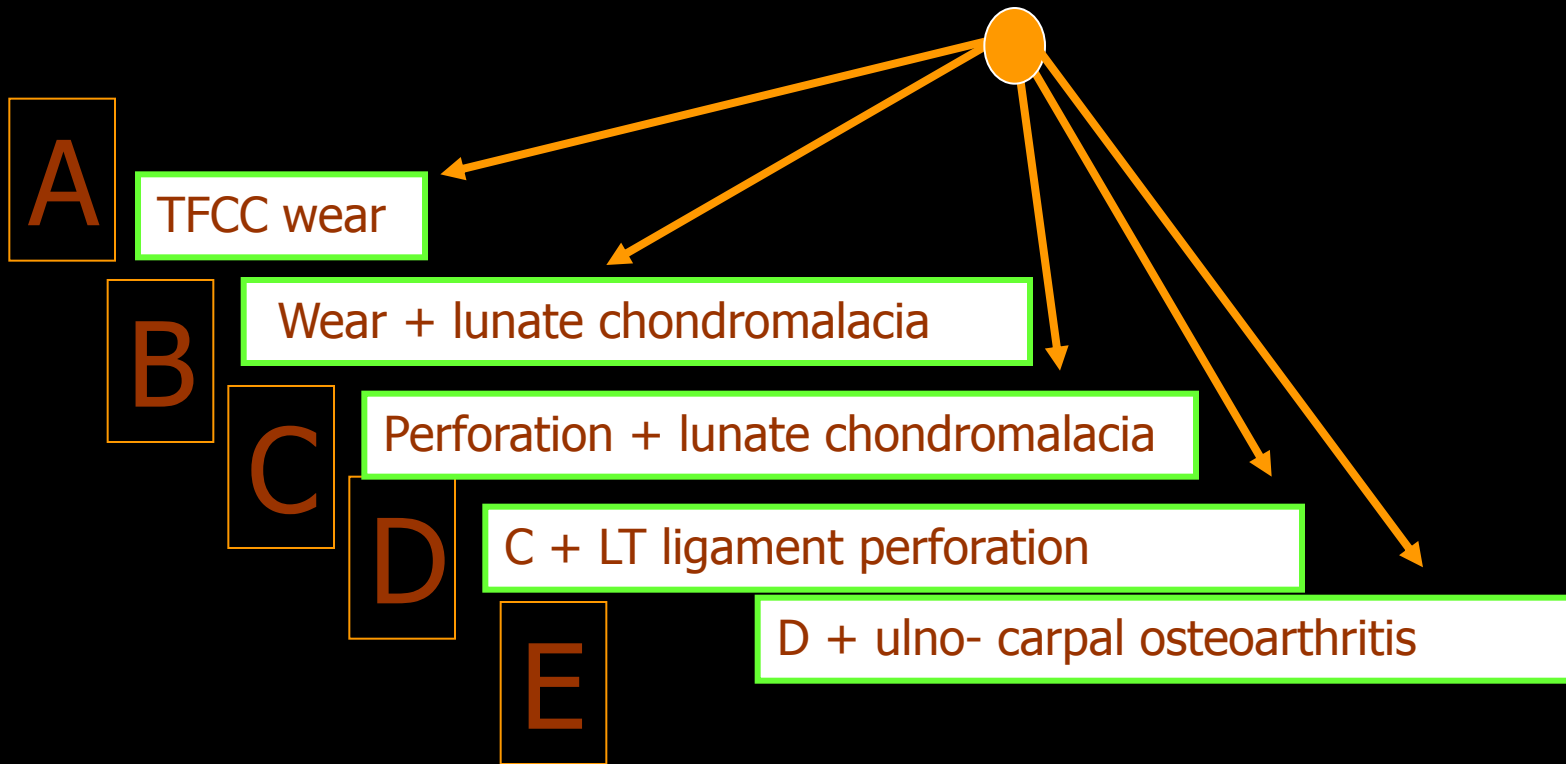
TFCC Injury

- Traumatic tear = Type I injury.
- Degenerative tear = Type II injury.

Traumatic tear (Type I)



Degenerative tear (Type II)





Degenerative tear (MR Arthrogram)

Degenerative tear of the radial aspect of TFC.



TFC perforation (MR Arthrogram)

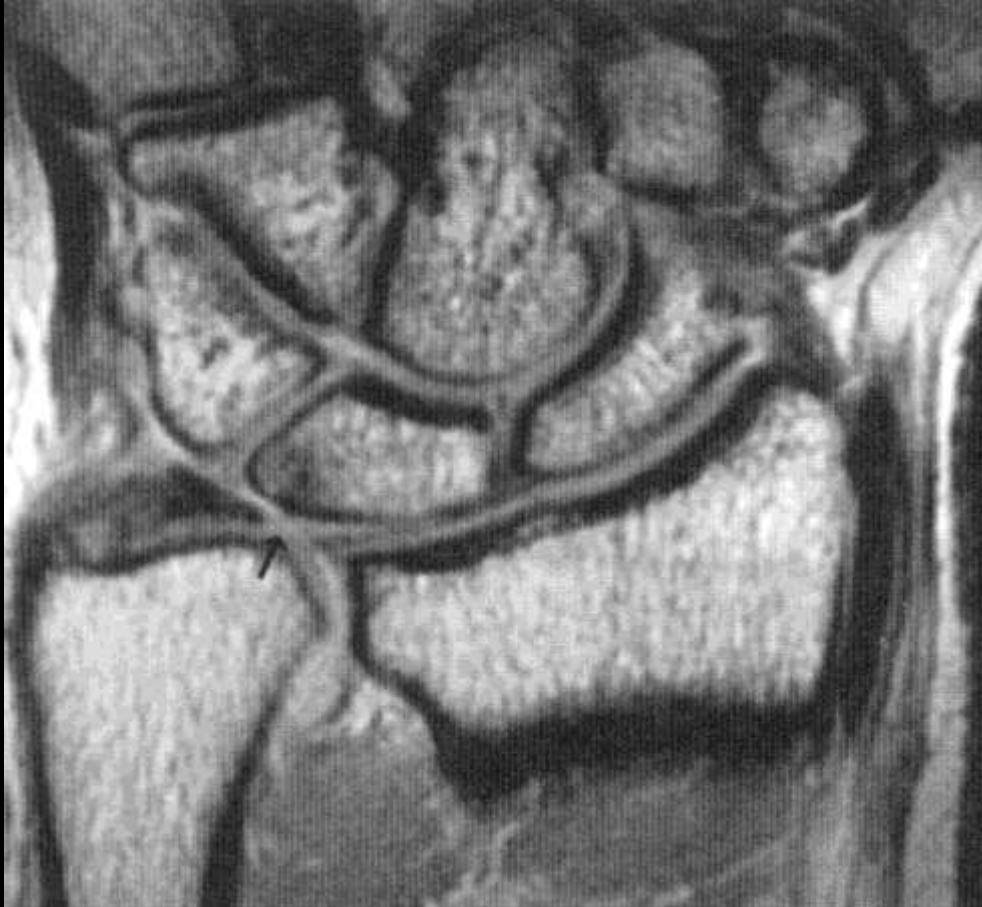
Slit like perforation near the radial attachment with contrast leak into DRUJ.



TFC avulsion (MR Arthrogram)

Avulsion of ulnar attachment with contrast leak.

Torn SL ligament with absent LT ligament.



Associated findings

Synovitis or radio-carpal joint effusion.

Chondromalacia of lunate and triquetrum.



TFC injury

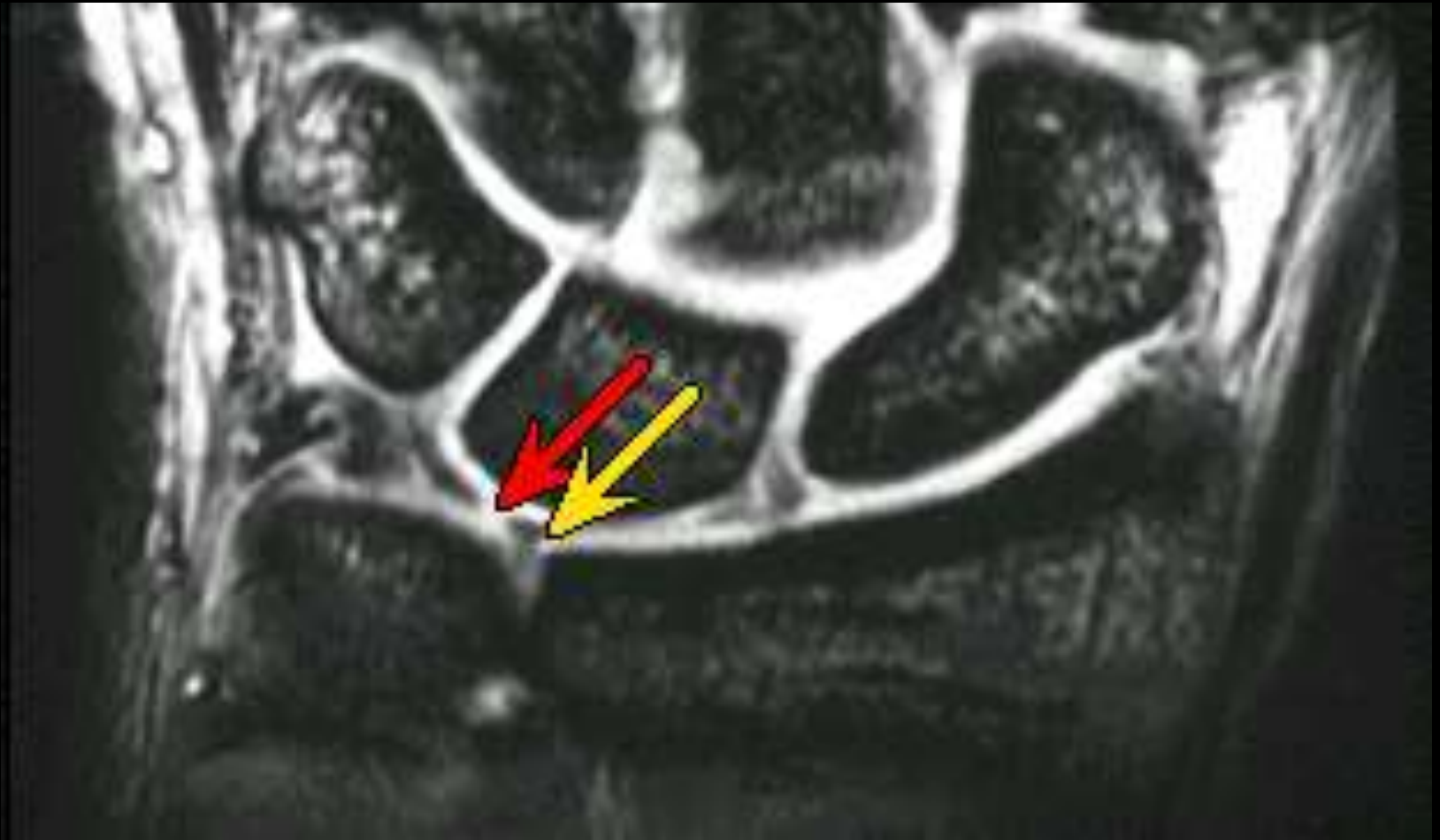


TFC injury

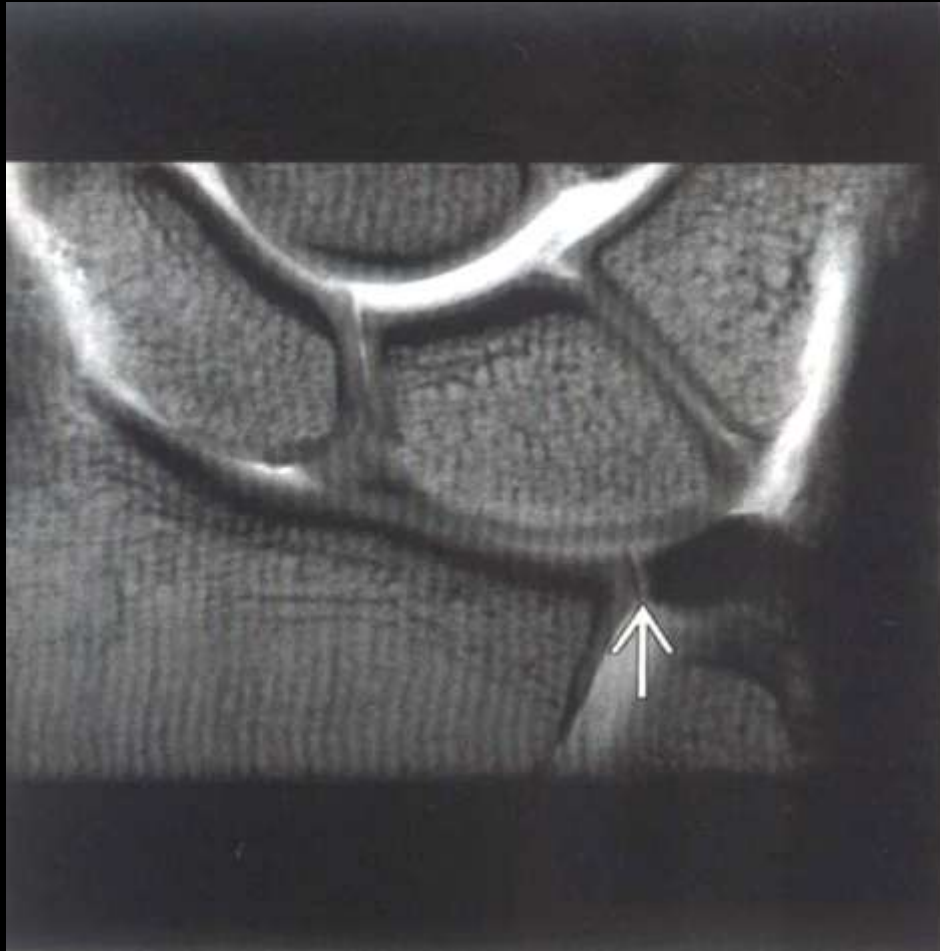


1-Avulsion of radial attachment with contrast leak.

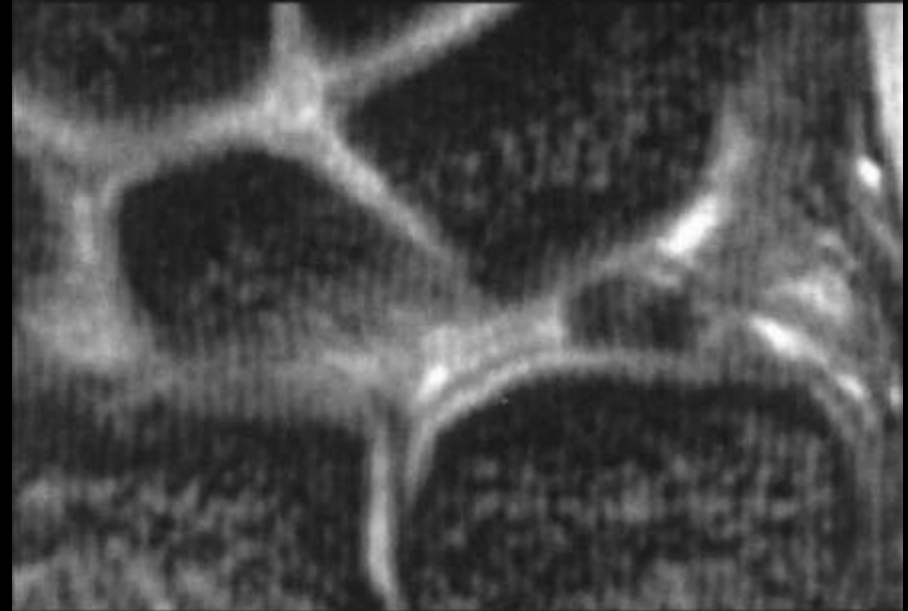
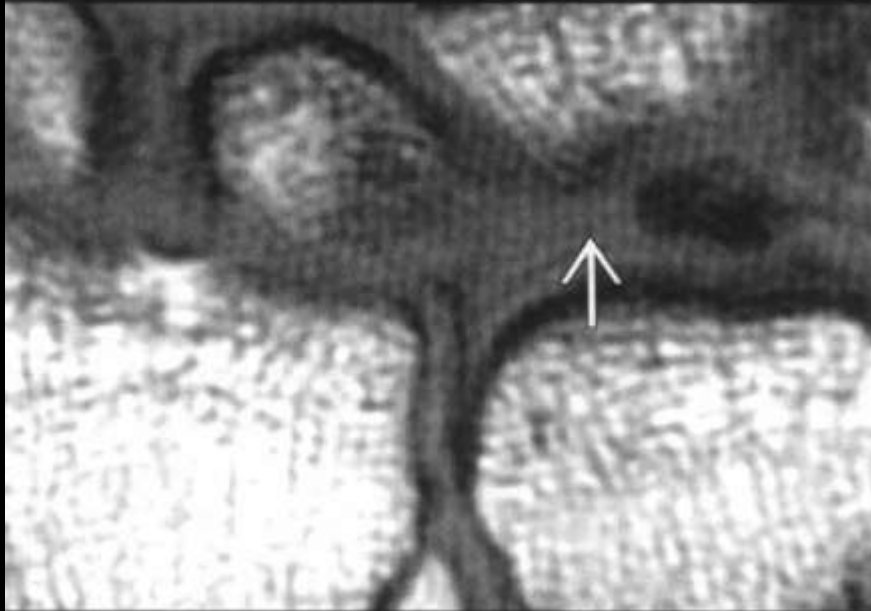
1-Central perforation with lunate chondromalacia. Intact LT ligament.



TFC injury



Focal TFC tear at radial aspect



GE T1 & T2 show TFC tear at radial aspect



TFC tears (Coronal GE)

Gap in the radial aspect of TFC (*arrowhead*) from a tear.



TFC tears (Coronal GE)

Perforation at the radial attachment of TFC is evident as a high signal line (*arrowhead*) traversing TFC. Note BM edema in lunate as a result of ulno-lunate impaction.



TFC tears (Coronal GE)

High signal irregularity (*arrowhead*) on the distal surface of TFC due to a partial tear.



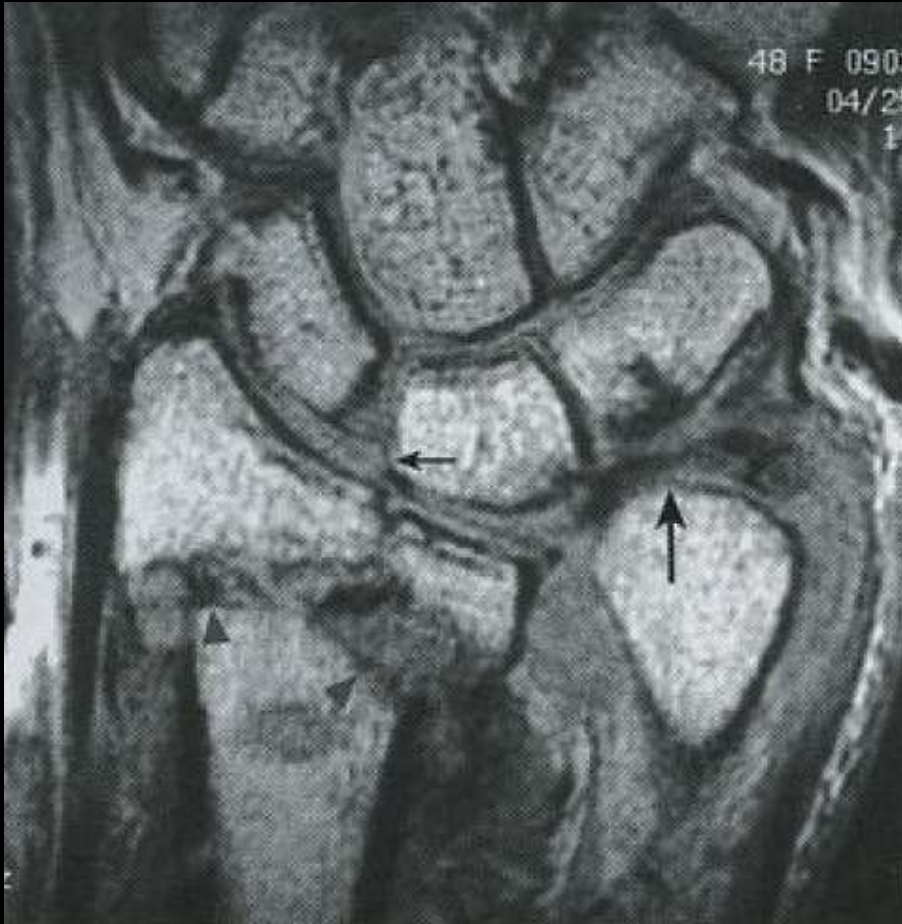
TFC Tear (Coronal GE T2)

Focal increased signal (arrow) seen in central part of TFC. Similar increased signal also seen at ulnar attachment of TFC due to inflammatory oedema.



TFC detachment (Coronal FS T2)

The ulnar attachment of TFC is detached with discontinuity and a gap (*arrow*) through the two thin bands that attach it to the ulnar styloid process.



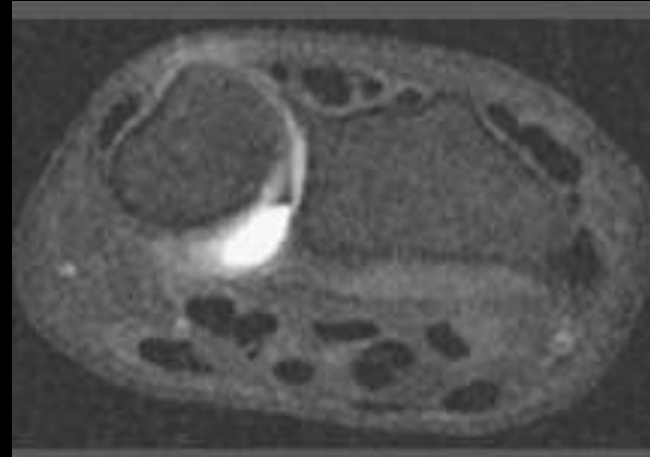
TFCC Tear (Coronal PD & Coronal GE T2)

Extensive increased signal (long arrow) seen in TFCC due to a complex post traumatic tear. Wide scapho-lunate distance with complete scapho-lunate ligament (short arrow) is also seen. Fluid seen in distal radius fracture (arrowheads) indicating non union. +ve ulnar variance is also seen.



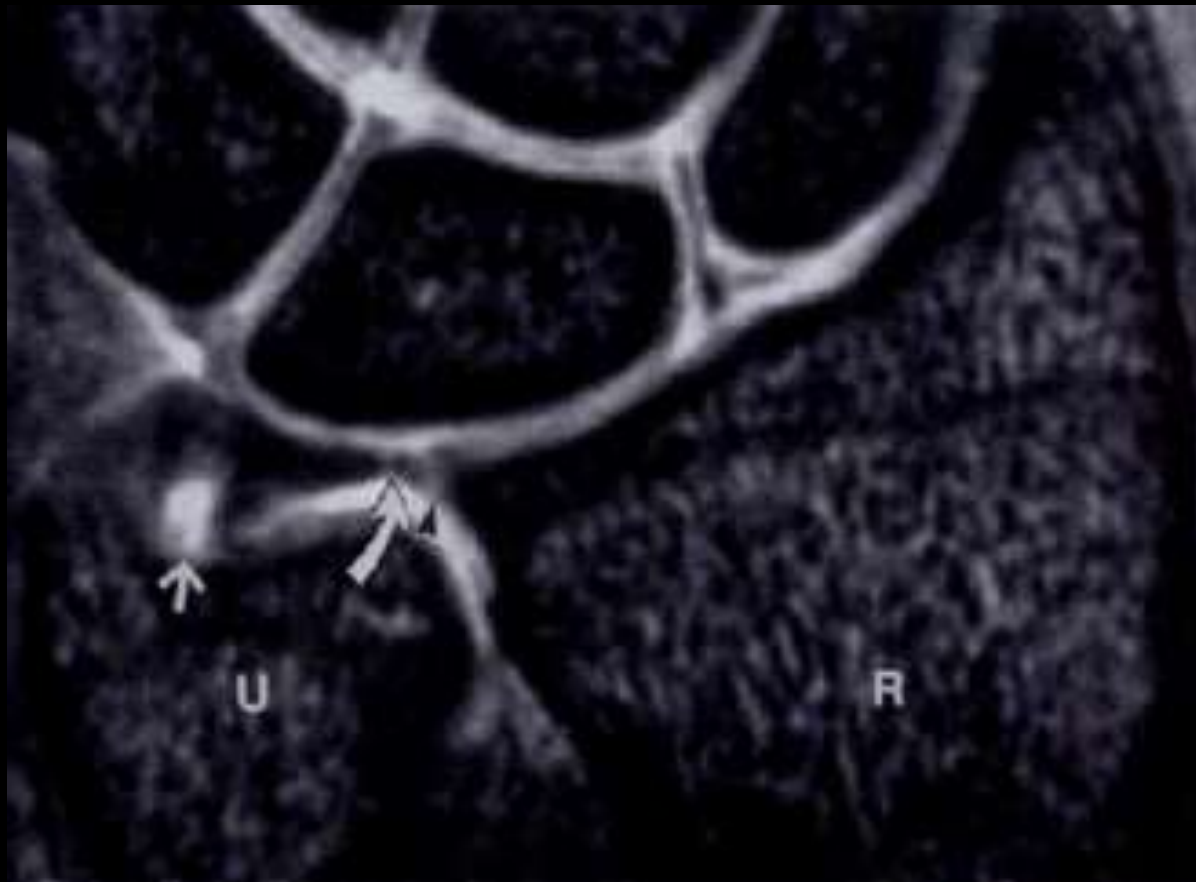
TFCC tear (Coronal FS T1 Arthrogram)

Contrast extending from the radio-carpal joint into distal radio-ulnar recess indicating perforation of TFCC.



TFCC tear (Ap athrogram, axial T1, coronal FS T2. coronal T2)

Fluid in radio-carpal joint and distal radio-ulnar recess indicating tear of TFCC.



True TFC tears at the radial aspect and ulnar attachment site (Coronal GRE)

A slit like radial-sided tear of TFC (curved arrow) just ulnar to the medium signal hyaline cartilage of the radial attachment of the TFC (arrowhead).

Fluid signal at the ulnar fovea (which differs from the normal striated medium signal) indicates a TFC avulsion at its ulnar attachment site (straight arrow).

2-Radio-ulnar ligaments

Normal radio-ulnar ligaments

- Volar & dorsal radio-ulnar ligaments.
- They are broad striated bands.
- Arise from volar and dorsal cortex of the sigmoid notch of distal radius.
- Pass on the volar and dorsal surfaces of TFC and blend with it.
- Attach to ulnar styloid process medially & to distal radius laterally.
- Low signal on all pulse sequences.
- Best seen on coronal images.

Ddt from the TFC proper:

- Have a flat superior and inferior margins (not biconcave).
- Attach directly to bone (not radius cartilage).



Normal radioulnar ligament (Coronal FS T2)

The volar radioulnar ligament is seen as a low signal structure (*arrowheads*) attaching to the bones of the radius and ulna, with straight proximal and distal margins.

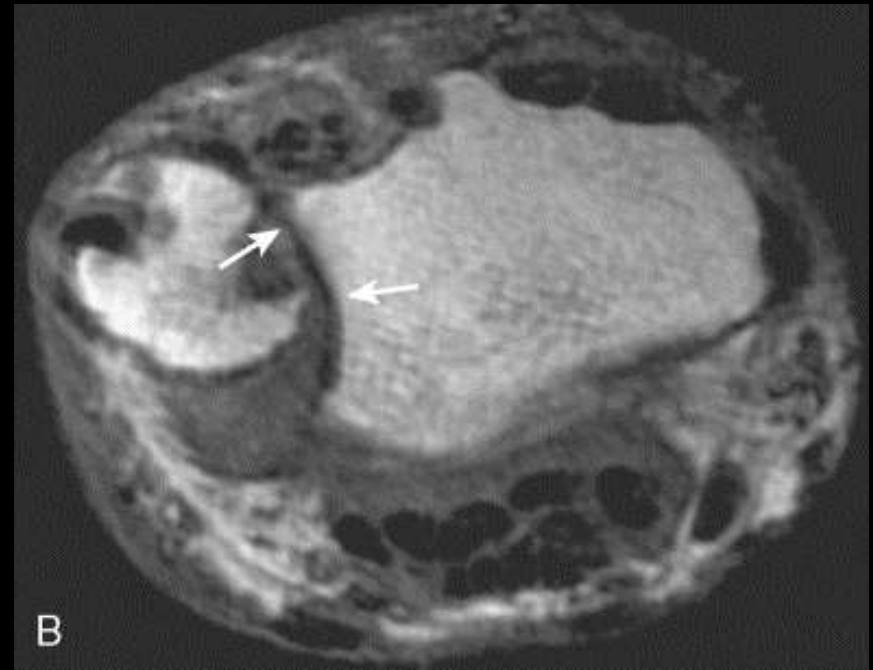
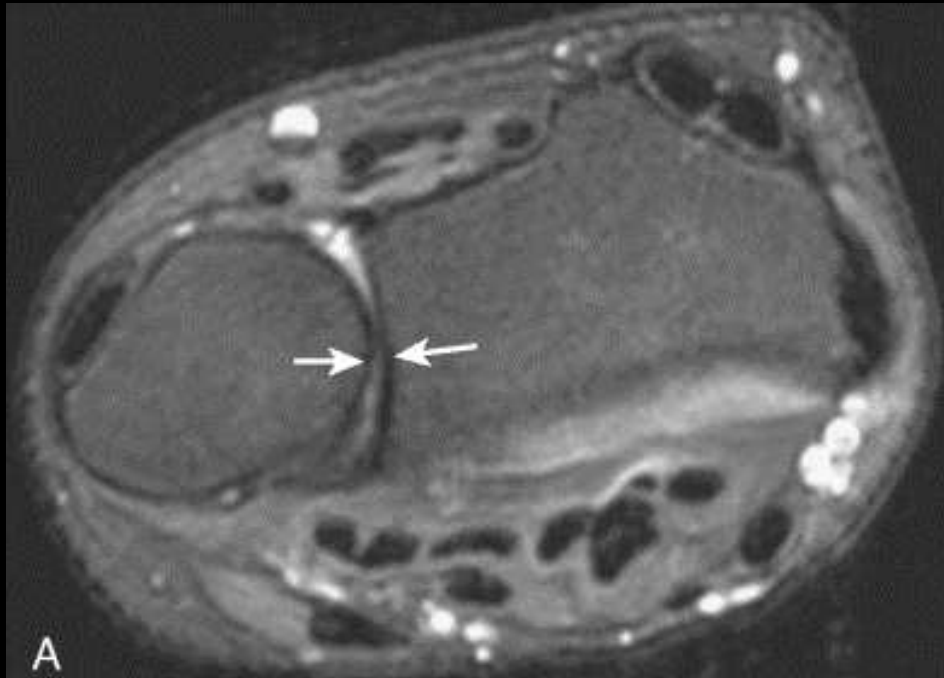
These all are features ddt it from the adjacent TFC proper. The dorsal radioulnar ligament has an identical appearance to the volar ligament.

Abnormal Radio-ulnar ligament

- Disruption of volar / dorsal radioulnar ligaments is associated with instability of the distal radioulnar joint.
- Disrupted ligaments, subluxation or dislocation of distal radio-ulnar joint can be shown easily on axial MRI.

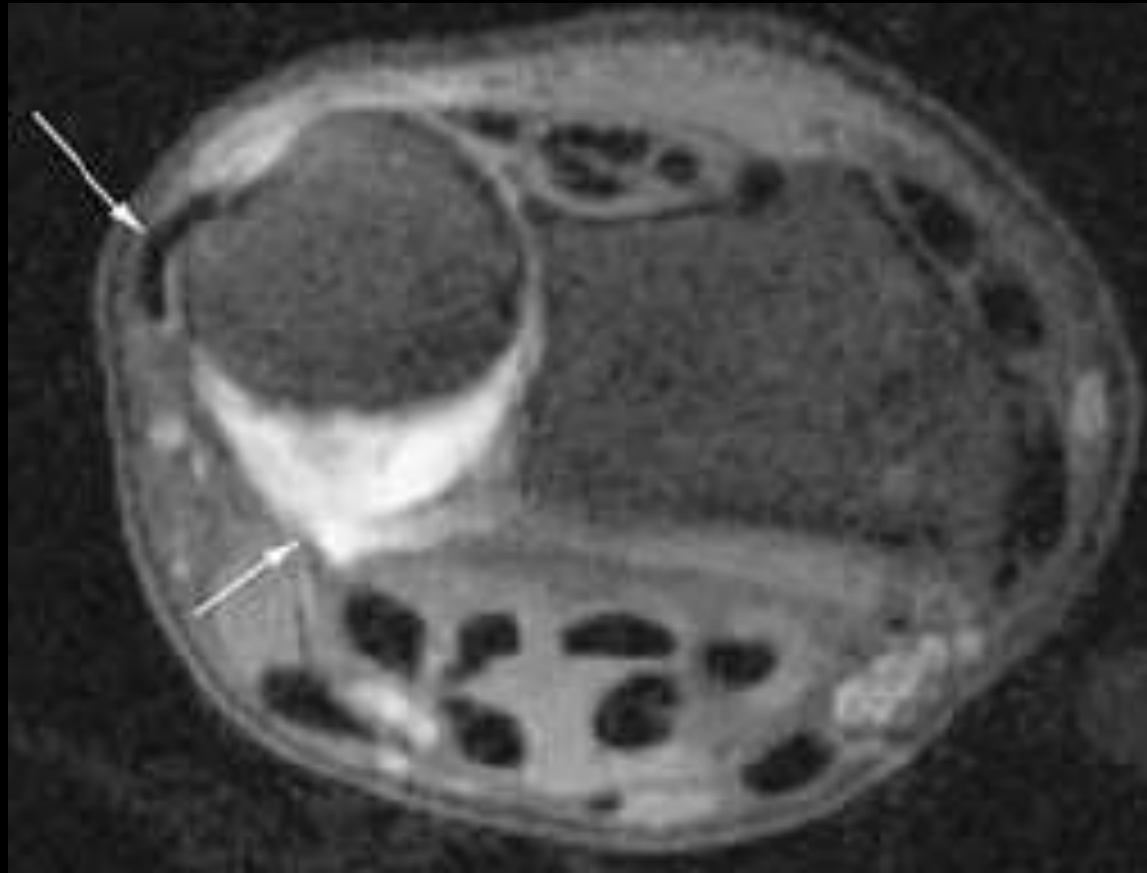
Signs of distal radio-ulnar joint instability

- Ulna does not articulating properly with the sigmoid notch of distal radius.
- Ulna is displaced in a dorsal / volar direction from the notch.



Distal radioulnar joint: normal and abnormal

A, Axial FS, the normal concentric relationship of the radius and ulna is shown (*arrows*) in the distal radioulnar joint of a patient with intact radioulnar ligaments. **B**, Axial T1 (different pt), disruption of the dorsal radioulnar ligament with dorsal subluxation of the ulna relative to the radius (*arrows*).



Volar radio-ulnar ligament tear (Axial FS T1)

Dorsal subluxation of the ulna 2ry to tear of the volar radio-ulnar ligament (arrows) as well as subluxation of the ECU ligament out of its groove in the dorsum of the ulna (arrow).

3-Ulnar collateral ligament (wrist)

The ulnar collateral ligament of the wrist

- It is an additional support structure.
- May be seen on coronal MRI.
- It represents a thickening of the wrist joint capsule.
- Extends from ulnar styloid process to triquetrum.

Radial collateral ligament

- Is present on lateral side of wrist.
- Extends from the radial styloid process to scaphoid.

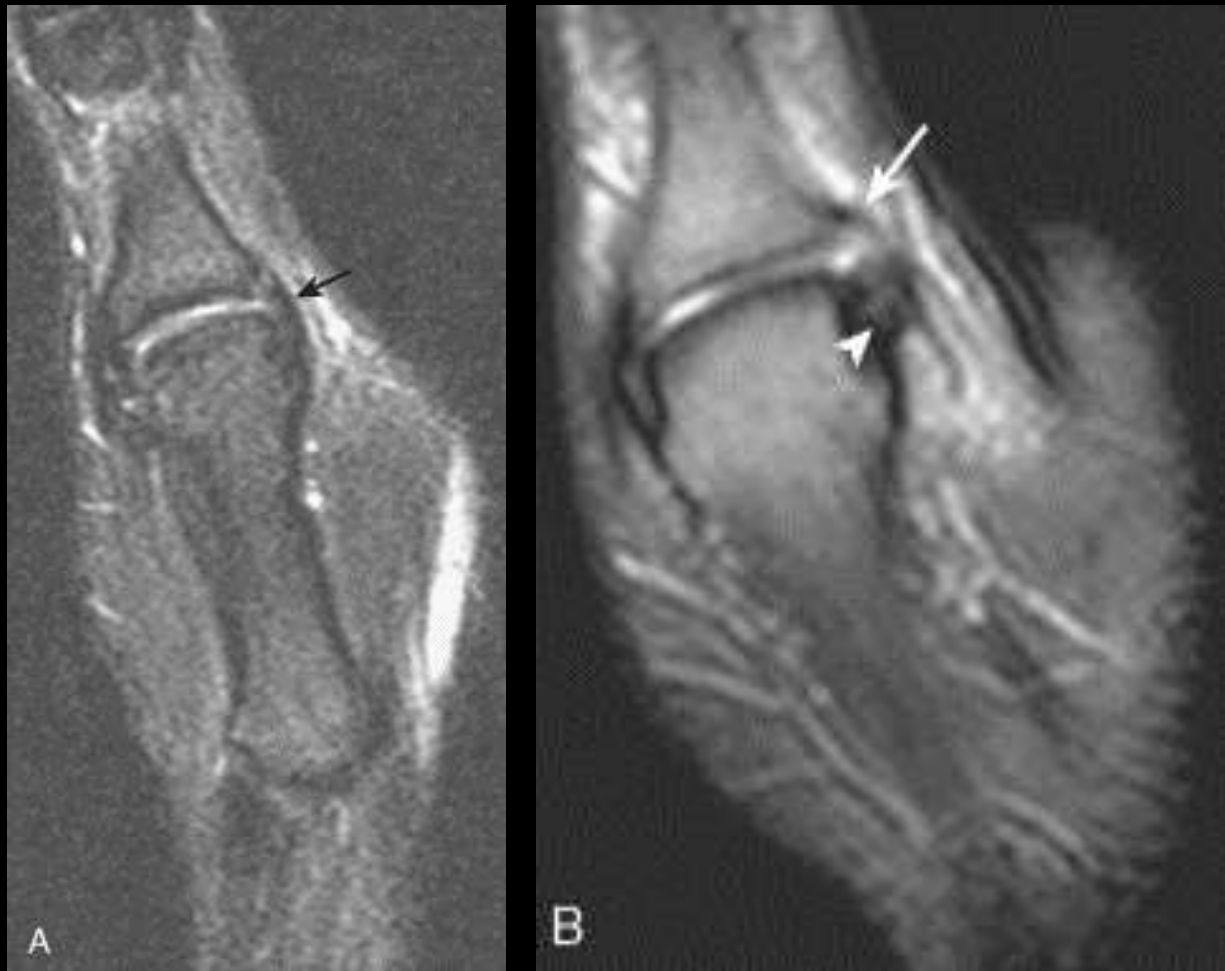
**Ulnar Collateral Ligament
(Thumb)**

Normal ulnar collateral ligament of the thumb

- It is a taut structure that stabilizes the ulnar aspect of 1st MCP joint.
- Attaches to
 - The base of proximal phalanx of the thumb.
 - Distal end of 1st MC.

On MRI

- Seen as a low signal band that spans the 1st MCP joint.
- Lies deep to a similar vertically oriented low signal band (adductor aponeurosis).
- Well seen on coronal plane only.



Ulnar collateral ligament of the thumb: normal and abnormal (Coronal FS T2)

A, Normal ulnar collateral ligament (*arrow*) is spanning the 1st MCP joint as a continuous, low signal band.

B, Ulnar collateral ligament (*arrowhead*) is avulsed from its attachment to the base of proximal phalanx of the thumb (gamekeeper's or skier's thumb), but remains deep to the adductor aponeurosis (*arrow*).



Ulnar collateral ligament of the thumb: normal and abnormal (Coronal FS T2)

A, Normal ulnar collateral ligament (*arrow*) is spanning the 1st MCP joint as a continuous, low signal band.

C, Stener lesion, the ulnar collateral ligament (*arrowhead*) is detached from the base of proximal phalanx, thickened, intermediate signal, and retracted proximally so that it gives the “yoyo on a string” appearance. The string of the yoyo is the adductor aponeurosis (*arrow*).

Gamekeeper's Thumb

It is an abduction injury to the 1st MCP joint.

It may lead to

- Avulsion fracture at the site of attachment of UCL (to the base of proximal phalanx of the thumb).
- /UCL injury without osseous abnormality.
- /Stener lesions.

MRI of a UCL tear

- Ligament is avulsed from the base of the thumb.
- Ligament discontinuity with hage & edema around the torn ends.
- The ligament remains deep to the linear adductor aponeurosis.
(GE images are excellent for showing the ligament well).

Stener lesions

- When the torn UCL is retracted proximally and displaced superficial to the adductor aponeurosis.

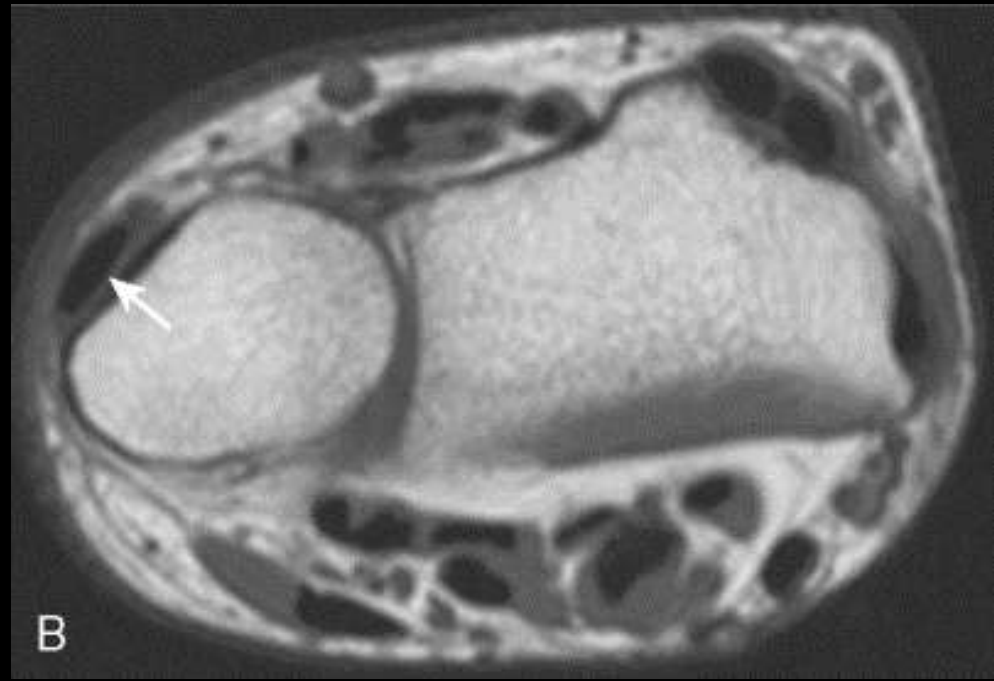
On MRI

- Described as a yoyo on a string.
 - The yoyo = the balled-up and retracted UCL.
 - The string = the adductor aponeurosis.

4-Extensor Carpi Ulnaris tendon sheath

Normal extensor carpi ulnaris

- The ECU tendon & its sheath can be seen on coronal MRI but is best seen on axial plane.
- The tendon sheath is not evident on MRI unless there is fluid in it.
- The tendon lies in the groove on the dorsum of the ulna in neutral & pronation positions of the wrist.
- Subluxation can be seen if imaged in supination.



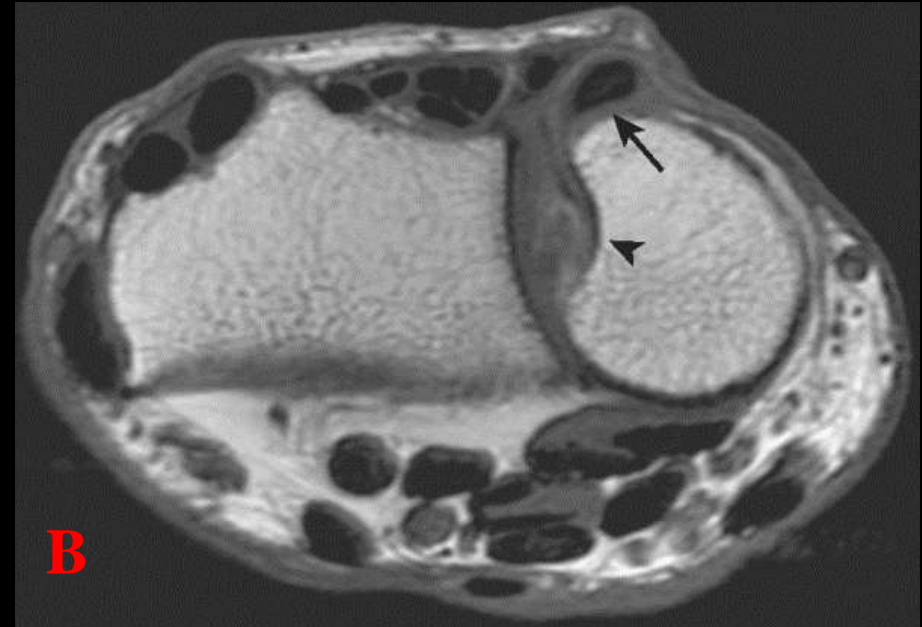
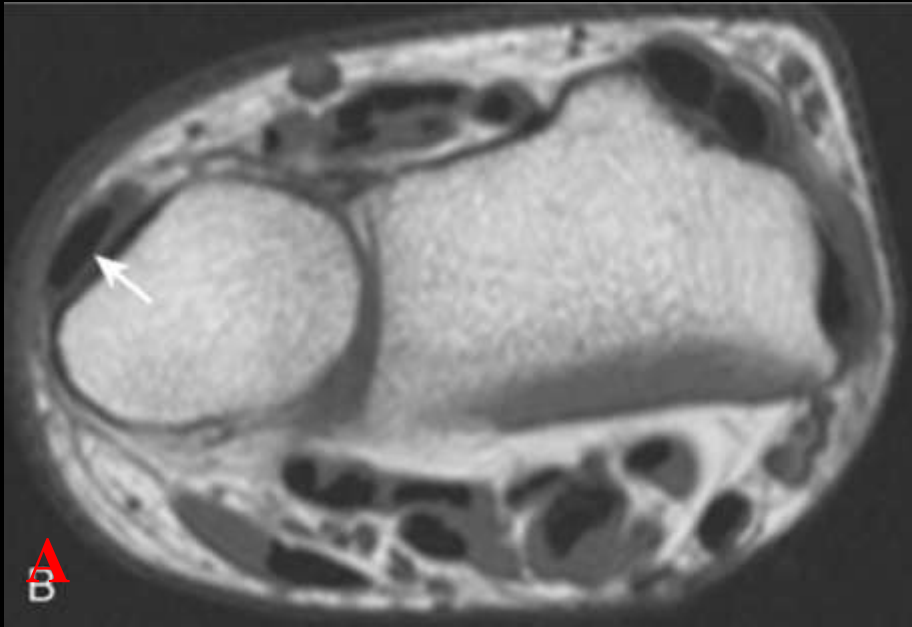
Normal extensor carpi ulnaris tendon

A, Coronal FS T2, the extensor carpi ulnaris tendon is seen on the ulnar and dorsal side of the wrist (*arrowheads*).

B, Axial T1, the normal position of the extensor carpi ulnaris is evident in the groove on the dorsum of the ulna (*arrow*).

Abnormal ECU sheath

- Traumatic disruption of ECU tendon sheath can result in subluxation / dislocation of the tendon at the level of the distal ulna in a medial direction.
- Associated tenosynovitis is common.
- Subluxation & tenosynovitis are best shown on axial images.



Dislocated ECU tendon (Axial T1W)

A, Normal position of ECU tendon in the groove on the dorsum of the ulna (*arrow*).

B-The ECU tendon (*arrow*) is dislocated in a medial direction (*arrowhead*) indicating disruption of the tendon sheath..

5-Meniscus homologue

Meniscus homologue

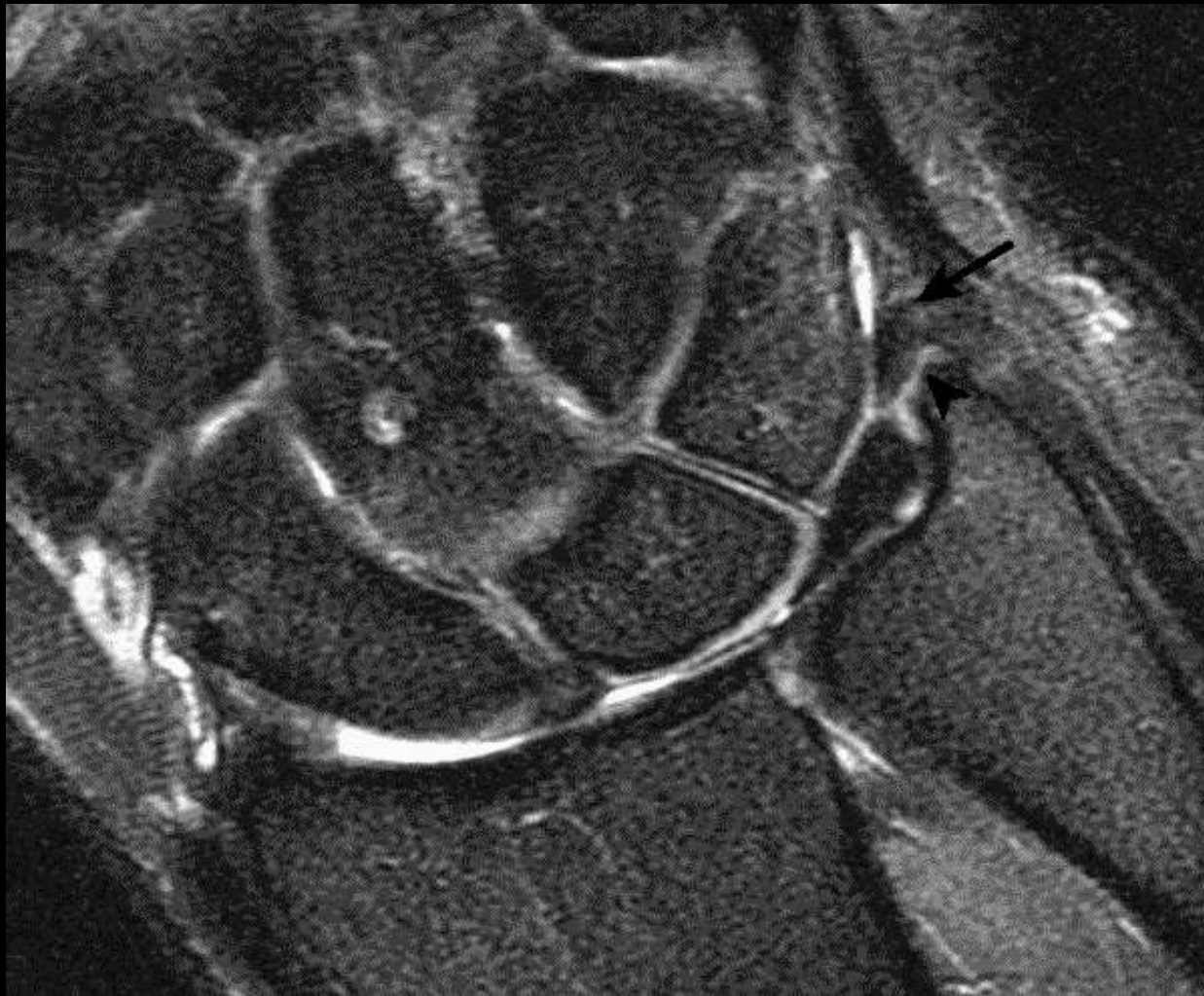
- It is a thickening of the ulnar side of joint capsule.
- It lies just distal to the prestyloid recess.
- Attaches to triquetrum.

Coronal MRI

- Low signal triangle-shaped structure.

The prestyloid recess (normally contains fluid)

- Triangle-shaped space bordered by:
 - Meniscus homologue distally.
 - TFCC attachment to ulnar styloid process proximally.
 - The central TFC disk radially.



Meniscus homologue and prestyloid recess (Coronal FS T2)

The meniscus homologue is a triangular low signal structure (*arrow*) on the ulnar side of the wrist. It is the distal boundary of the prestyloid recess (*arrowhead*), which is a space also bounded by the TFC fibrocartilage proximally and radially.

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