

WRIST MRI

LIGAMENT (thin slice coronal GRE): low to intermediate signal on GRE; consider abnormal if high signal (equal to fluid) or discontinuity/thinning/elongation or increased intercarpal space

INTRINSIC (intercarpal):

- SCAPHOLUNATE (dorsal=dark "band", middle=intermediate "triangular", volar=intermediate "trapezoidal" which actually attaches directly to bone; dorsal and volar more important)
- LUNOTRIQUETRAL (smaller; intermediate signal; assoc with TFCC tears)

EXTRINSIC (radiocarpal)—are intracapsular but extrasynovial; importance unclear!!

- VOLAR (more imp; stronger and thicker; obliquely oriented and striated; both originate from radial styloid; superior RSC=radioscaphocapitate which crosses waist of scaphoid, inferior-lateral and larger RLT= radiolunotriquetral)
- DORSAL (obliquely oriented from radius to all the bones of prox carpal row; also seen on sag view)

TFCC (SIMILAR TO MENISCUS): best seen on coronal (except for RUL, use sag)

-TFC (biconcave/bowtie disc; attaches to high-signal cartilage of lateral radius; attaches to fovea of ulnar head and to ulnar styloid near UCL; thickness inversely proportional to degree of ulnar variance meaning thinner in pos var and thinner in neg var; assessment like knee meniscus—intrasubs degen=esp central portion with intermediate signal/thinning/ perforation vs traumatic partial/full thickness tear=prox/distal/radial/central/ulnar aspect vs detached; traumatic tear sequence of worsening severity: tear of TFC→discontinuity of ECU sleeve→tear ulnar attachment→instability of DRUJ→tear lunotriquetral lig; normally striated ulnar aspect in young patients; tears at vascularized ulnar aspect hard to see and may heal spont; synovitis or synovial proliferation along ulnar prestyloid recess mimic ulnar sided TFC tear; TFC may get torn & trapped in DRUJ)

-RadioUlnar Lig (associated band-like, not biconcave, striated volar/dorsal lig btwn sigmoid notch of radius and ulnar styloid; blends in with TFC; attached to bone, not radial cartilage; imp for DRUJ stability)

-ULNAR COLLATERAL LIG (from ulnar styloid to triquetrum; represents thickening of wrist joint capsule; RCL=radial collateral lig is the counterpart on the other side of wrist from radius to scaphoid)

-ECU TENDON SHEATH Extensor Carpi Ulnaris (located dorsal groove of ulna; best seen on axial; sheath not seen unless tenosynovitis; may sublux/dislocate out of groove medially w/ sheath disruption; may have magic angle near ulnar styloid)

-MENISCAL HOMOLOGUE (triangular thickening of ulnar aspect of capsule; may be absent; attaches to triquetrum or base of 5th MC; prestyloid recess=located inferior to meniscal homologue, around tip of ulnar styloid normally contains fluid)

-Ulnolunate and Ulnotriquetral ligaments (vertically /obliquely anchor TFC)

-Fluid in DRUJ or fluid in pisotriquetral recess is normal (along volar aspect)

BONE/CARTILAGE:

-DISTAL RADIUS: sigmoid notch (DRUJ), scaphoid fossa (scaphoid), lunate fossa (lunate), lister tubercle (dorsal)

-REPETITIVE STRESS INJURY (BM edema distal radius at subphyseal involving metaphysis in gymnast; hamate in bicyclist; lunate in martial arts which may be precursor to AVN)

-SCAPHOLUNATE DISSOC (SLAC=prox migration of capitate)

-SCAPHOID FX (rotatory subluxation=scaphoid tilts volar)

-VISI (lunotriquetral disruption; lunate tips volar; SL<30deg) / DISI (scapholunate dissociation; lunate tips dorsal; SL>60deg)

-TYPE II LUNATE (hamate)

-DRUJ (small fluid prox OK; sigmoid notch of radius; look for ulnar subluxation)

-ULNAR NEG (KEINBOCK—lunate AVN may be partial hence, not definite)

-ULNAR POS (ABUTMENT SYN—lunate/ulna cartilage degen, lunate subchondral edema/cyst, TFC tear)

-OS STYLOIDEUM ("carpal boss", 2nd/3rd MC base dorsal; bursitis, synovial cyst)

-AVN (T1/T2 dark classic; T1 dark but T2 bright is non-specific—possible ischemia vs BM edema vs healing, T1 bright and T2 intermediate is normal; fat signal indicates viability)

-RA (erosions, proliferative enhancing synovitis, "pannus", tenosynovitis, bursitis, ST nodule aka rheumatoid nodule, numerous rice bodies)

-INTRAOSSEOUS LESION (ddx: bone cyst, geode, intraosseous ganglion, erosion)

TENDON: best seen on axial

-Small fluid in tendon sheath may be normal if non-circumferential

-TENOSYNOVITIS= circumferential fluid within sleeve vs synovial proliferation, fusiform swelling/enlargement of tendon over longer length with abnormal signal within tendon aka edema

-INTERSTITIAL TEAR of tendon=difficult to tell from tenosynovitis but are sharply marginated signal within tendon

-TENDINOPATHY=intermediate signal within tendon

-6 EXTENSOR COMPARTMENTS (located dorsally; extensor retinaculum w/ fascial septations separating compartments; II and III separated by Lister's tubercle; ECU in 6th compartment along ulnar groove may have magic angle artifact; ECU may be subluxed/dislocated; small fluid in tendon sheath OK unless completely surrounds the tendon)
-9 FLEXORS TENDONS (pass thru carpal tunnel)—don't need to know their names!!
-DEQUERVAIN'S (entrapment/tenosynovitis of 1st compartment along radial styloid; varied appearance on MRI—not always high T2 signal; acute=may be tendon fusiform thickened/internal signal/surrounding signal/loss of adj fat; chronic=low to intermediate T2 signal with fibrous adhesions in sleeve can be painful; idiopathic vs pregnancy vs manual labor; tx=steroid vs surgical decompression)
-DISTAL INTERSECTION syndrome (tenosynovitis of 2nd and 3rd compartments distal to Lister's tubercle where the tendon sheaths are connected by foramen)

FINGERS:

-Trigger finger (repetitive trauma of A1 pulley near MCP jt; flexor stenosing tenosynovitis; sensation of finger catching; steroid inj helps)
-Flexor tendon tear (Flexor Dig Profundus FDP vs Flexor Dig Superficialis FDS; identify site of tear and degree of prox retraction; tendon rupture is rare)
-Flexor pulley system injury (fibro-osseous canal; 5 annular pulleys + 3 cruciform pulleys; numbered from prox to distal; A1 thru A5 with odd number at joint while even number along phalanx; most commonly injured A2→then A3→then A4; in rock climber usually tear A2 and A4 with “bowstringing” on sag →correlate on axial to see what part of pulley is injured=radial vs ulnar aspect or apex)
-Extensor tendon tear (EDC has central and medial/lateral slips; sagittal bands stabilizes it at MCP and retinacular lig stabilizes it at middle phalanx; retinacular lig may be torn on one side with subluxation of tendon)
-MCP collateral lig injury (usually at base of thumb=gamekeeper's see below; UCL vs RCL; +/-avulsion fragment)
-Volar plate (injured during hyper-extension)

NERVE: best seen on axial

-MEDIAN NERVE IN CT (flexor retinaculum is 2.5-3.5mm thick and bows slightly out towards palm; intermediate signal oval median nerve on the radial and volar aspect; normally very little fat in CT except dorsal aspect; evaluate median nerve at DRUJ prior to CT→at pisiform in prox CT→at hook of hamate in distal CT where MN most constricted, may be flat, and closely opposed to flexor tendons; size of MN is maintained or slightly decreases distally; narrowest portion of carpal tunnel is distally at level of palmar-oriented prominence of capitate ~10mm AP width)
-CARPAL TUNNEL SYNDROME (4 findings=focal or segmental swelling/enlargement by 50% aka pseudoneuroma at level of pisiform + focal flattening/angulation of MN at level of hamate + increased MN T2 signal + increased palmar bowing of flexor retinaculum ratio >15% at level of hamate)—other etiologies=tenosynovitis of flexor tendons, ganglion cyst
-Failed CTS surgery (residual intact retinaculum, perineuronal fibrotic scarring, MN neuroma)
-Fibrolipomatous hamartoma of MN (stippled nerve fascicles surrounded by fat, may be assoc with macrodystrophia lipomatosa)
-ULNAR NERVE IN GUYON'S CANAL (ulnar aspect; contains nerve/artery/vein only; nerve is medial to ulnar artery; floor of tunnel=flexor retinaculum and hypothenar muscles; roof of tunnel=volar carpal lig, palmaris brevis muscle; in canal, ulnar nerve divides into superficial sensory and deep motor branches; etiologies include ganglia, hook hamate fx, pisiform-hamate coalition)—r/o ulnar artery aneurysm

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-Carpal tunnel syndrome (4 findings=focal or segmental swelling/enlargement by 50% aka pseudoneuroma at level of pisiform + focal flattening/angulation of MN at level of hamate + increased MN T2 signal + increased palmar bowing of flexor retinaculum ratio >15% at level of hamate)—other etiologies=tenosynovitis of flexor tendons, ganglion cyst
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OTHERS:

-EFFUSION (fluid within DRUJ can be normal)

-INTRAOSSEOUS GANGLION (RADIAL ASPECT OF LUNATE)—may enhance esp if not contiguous with joint

-GANGLION CYST (dorsal scapholunate; volar pisotriquetral; may originate w/in scapholunate lig & erode into radial aspect of lunate; multiseptate T1 dark and T2 bright; may be T1 bright due to high protein content; Gad to exclude myxoid tumor)—r/o ulnar artery aneurysm

-SYNOVIAL CYST (arising from pisotriquetral jt—synovial recess vs cyst if >1cm; cyst may be symp; like bakers cyst)

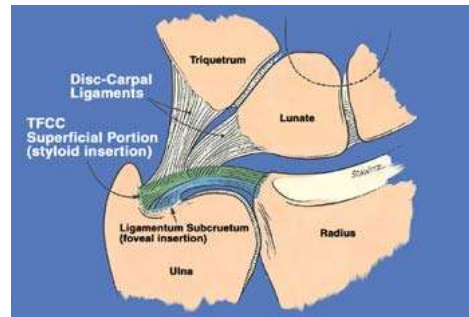
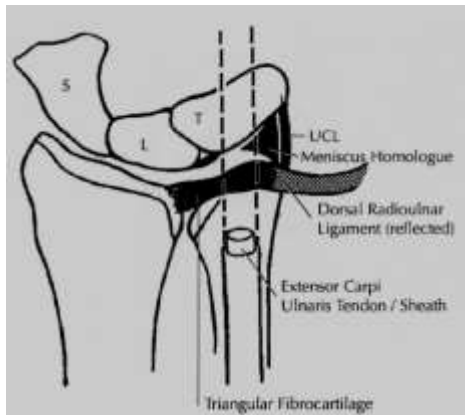
-EROSIONS (ULNAR STYLOID AND MCPs)—look for enhancement and assoc synovitis; confirm on plain film

-GCT TENDON SHEATH (VOLAR FLEXOR TENDON; T1/T2 DARK; scallops bone surface; may have heterogenous enhancement; ddx=gouty tophus, amyloid deposit)

-MASSES=schwannoma, neurofibroms, fibromatosis (palmar), glomus tumor (distal phalanx)

-Gamekeeper's thumb (vertically oriented ulnar collateral lig UCL at MCP; adductor aponeurosis is thin band also vertically oriented but normally located superficial to UCL; Stener lesion=torn intermediate signal UCL retracted prox and displaced superficial to aponeurosis, "yo-yo on a string"; look for avulsion frag, BM edema, chondral injury, and adductor pollicis muscle edema)

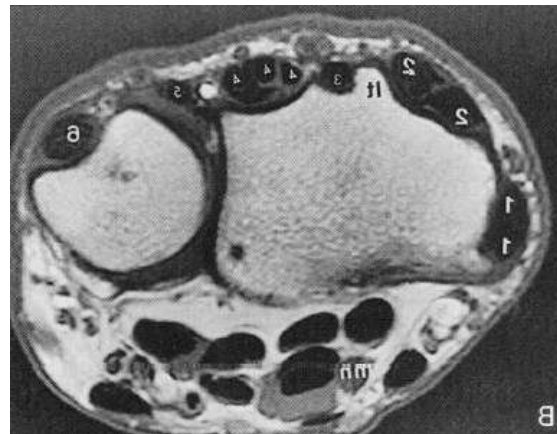
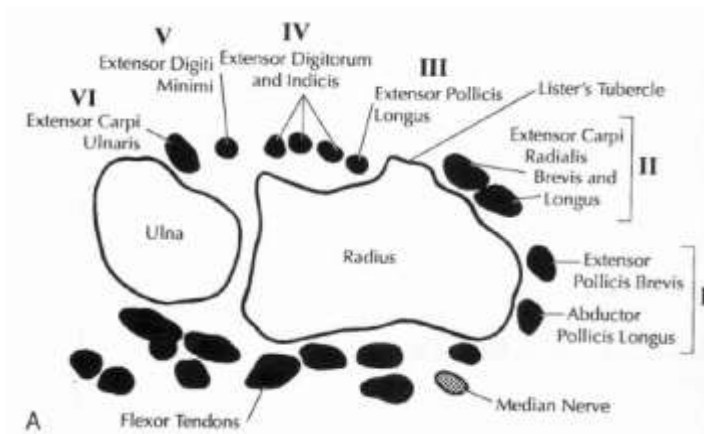
VESSELS: -Hypothenar hammer syn (repetitive trauma to heel of palm → spasm/thrombosis/aneurysm ulnar a. → digital ischemia)

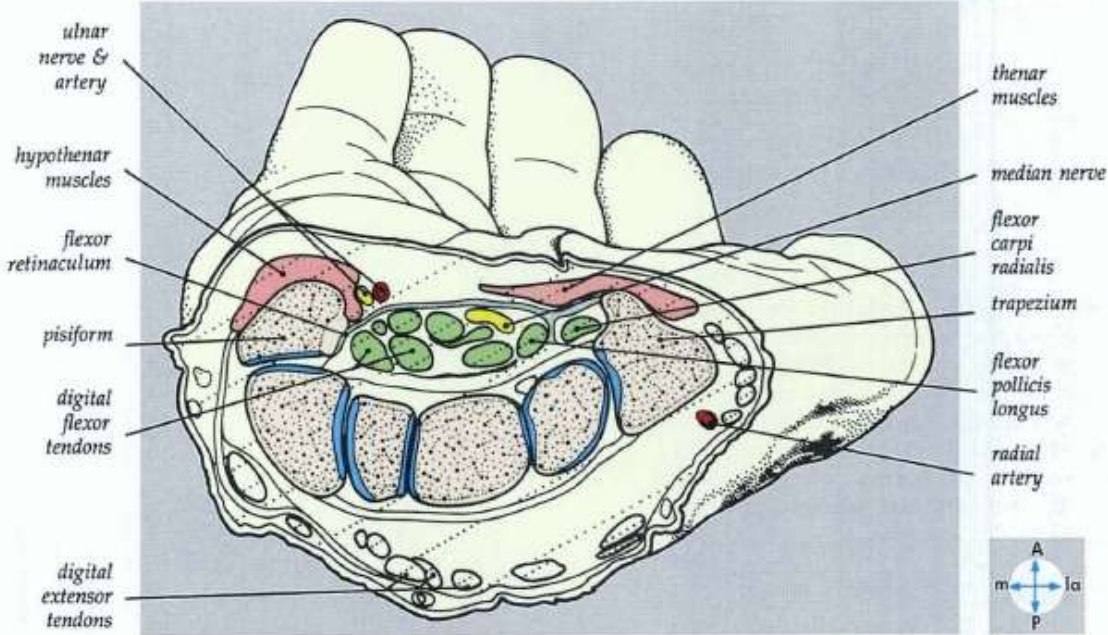
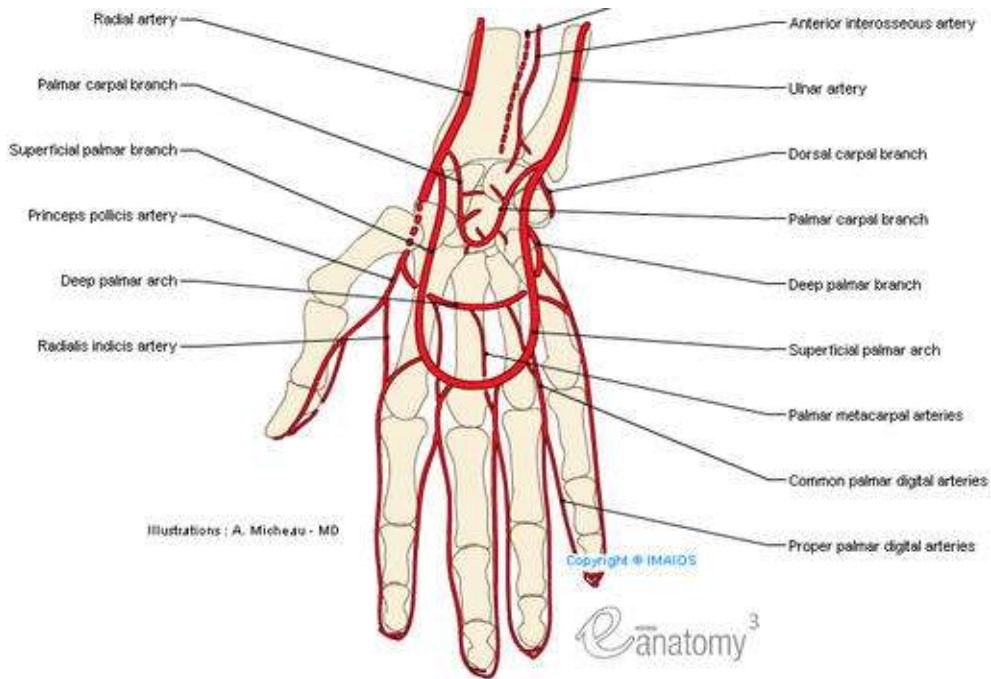


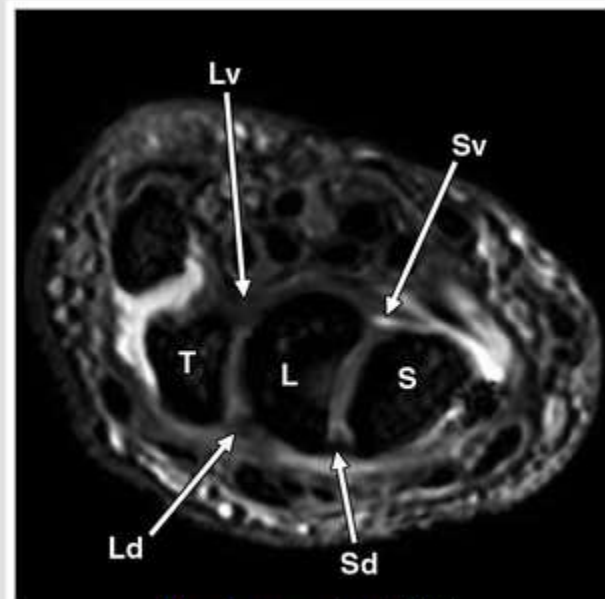
- *Class IA:* Perforation or traumatic tear of the TFC disc proper (Fig. 10.123)
- *Class IB:* Ulnar avulsion of the TFC complex with or without associated ulnar styloid fracture (Fig. 10.124)
- *Class IC:* Distal avulsions of the TFC complex through its lunate attachment (the ulnolunate ligament) or its triquetrum attachment (the ulotriquetral ligament) (Fig. 10.125)
- *Class ID:* Radial avulsions at the level of the distal sigmoid notch with or without associated sigmoid notch fracture (Fig. 10.126)

Class II degenerative lesions demonstrate the spectrum of ulnocarpal (ulnolunate) abutment syndrome findings and are also subdivided into several classes:

- *Class IIA:* TFC complex wear (Fig. 10.127)
- *Class IIB:* TFC complex wear with associated lunate and/or ulnar chondromalacia (Fig. 10.128)
- *Class IIC:* TFC complex perforation in association with lunate or ulnar chondromalacia (Fig. 10.129)
- *Class IID:* TFC complex perforation, lunate or ulnar chondromalacia, and lunotriquetral ligament perforation (Fig. 10.130)
- *Class IIE:* Class IID injuries with the additional finding of ulnocarpal arthritis (Fig. 10.131)



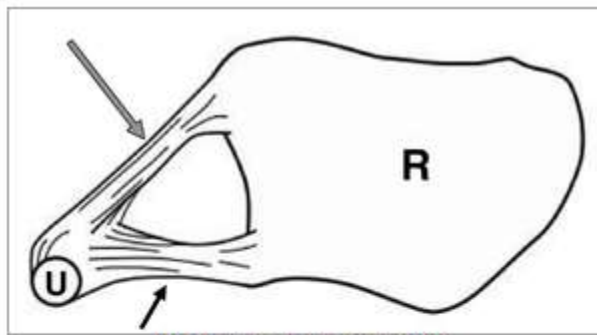




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Fig. 1B —21-year-old man with normal MRI appearance of scapholunate ligament.

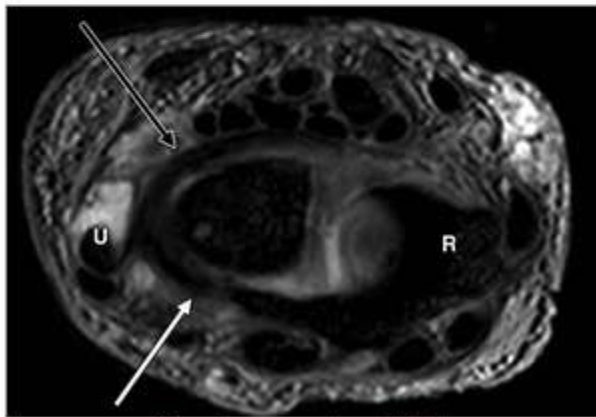
B, Normal scapholunate ligament (Sd = dorsal band of scapholunate ligament, Sv = volar band) and lunotriquetral ligament (Ld = dorsal band of lunotriquetral ligament, Lv = volar band) are seen on axial 3D gradient-recalled echo sequence from MR arthrogram of wrist.



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Fig. 6A —Normal appearance of volar and dorsal radioulnar ligaments.

A, Drawing depicts normal appearance of volar (*gray arrow*) and dorsal (*black arrow*) radioulnar ligaments. R = radius, U = ulna. (Drawing by Richardson ML)

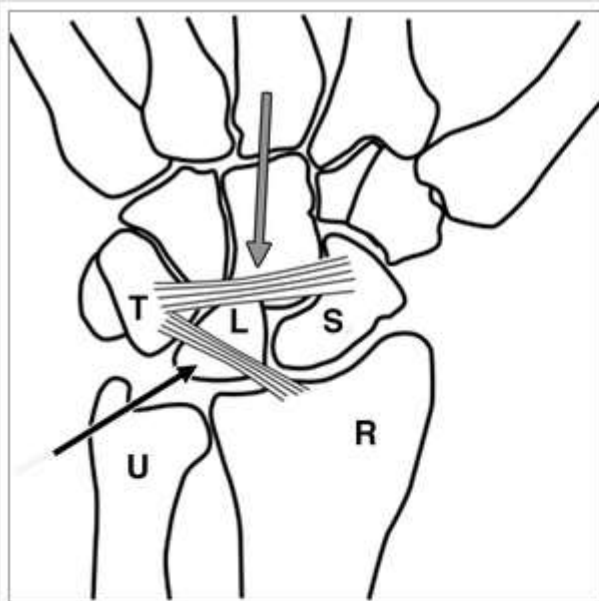


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Fig. 6B —Normal appearance of volar and dorsal radioulnar ligaments.

B, 73-year-old woman with normal volar radioulnar ligament (*black arrow*) and dorsal radioulnar ligament (*white arrow*) seen on axial 3D gradient-recalled echo MR arthrogram.





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Fig. 7A —Normal appearance of dorsal radiotriquetral ligament and dorsal intercarpal ligament.

A, Drawing depicts normal anatomy of dorsal intercarpal ligament (*gray arrow*) and dorsal radiotriquetral ligament (*black arrow*). Dorsal intercarpal ligament extends from dorsal tubercle of triquetrum (T) to dorsal groove of scaphoid (S). Dorsal radiotriquetral ligament extends from dorsal radial styloid to dorsal tubercle of triquetrum. L = lunate, R = radius, U = ulna. (Drawing by Richardson ML)



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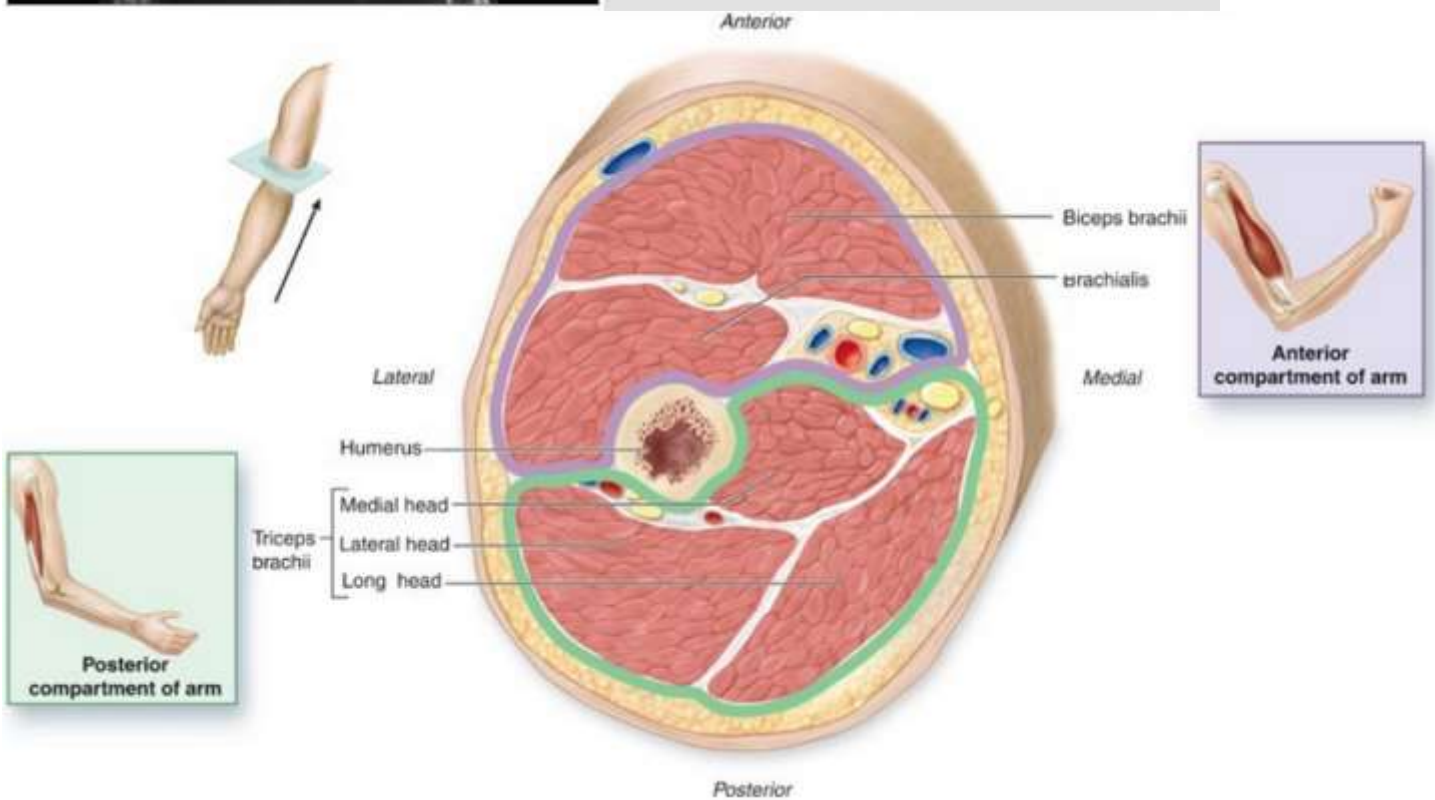
Fig. 7B —Normal appearance of dorsal radiotriquetral ligament and dorsal intercarpal ligament.

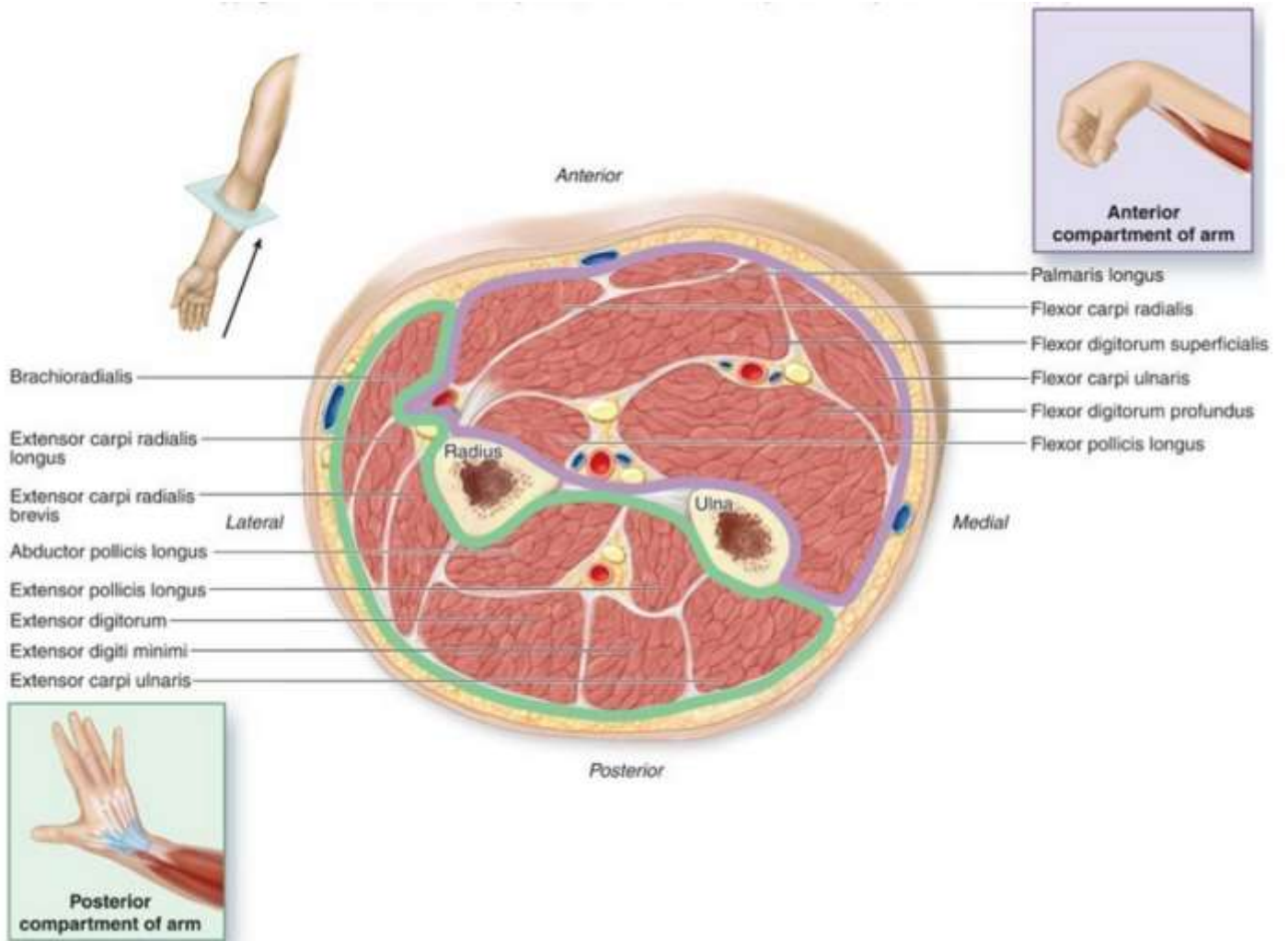
B, 51-year-old man with normal dorsal radiotriquetral ligament (*black arrows*, sites of attachment on dorsal radial styloid and dorsal tubercle of triquetrum) and dorsal intercarpal ligament (*white arrows*, attachment sites on scaphoid and triquetrum) on coronal T1-weighted MR arthrogram.

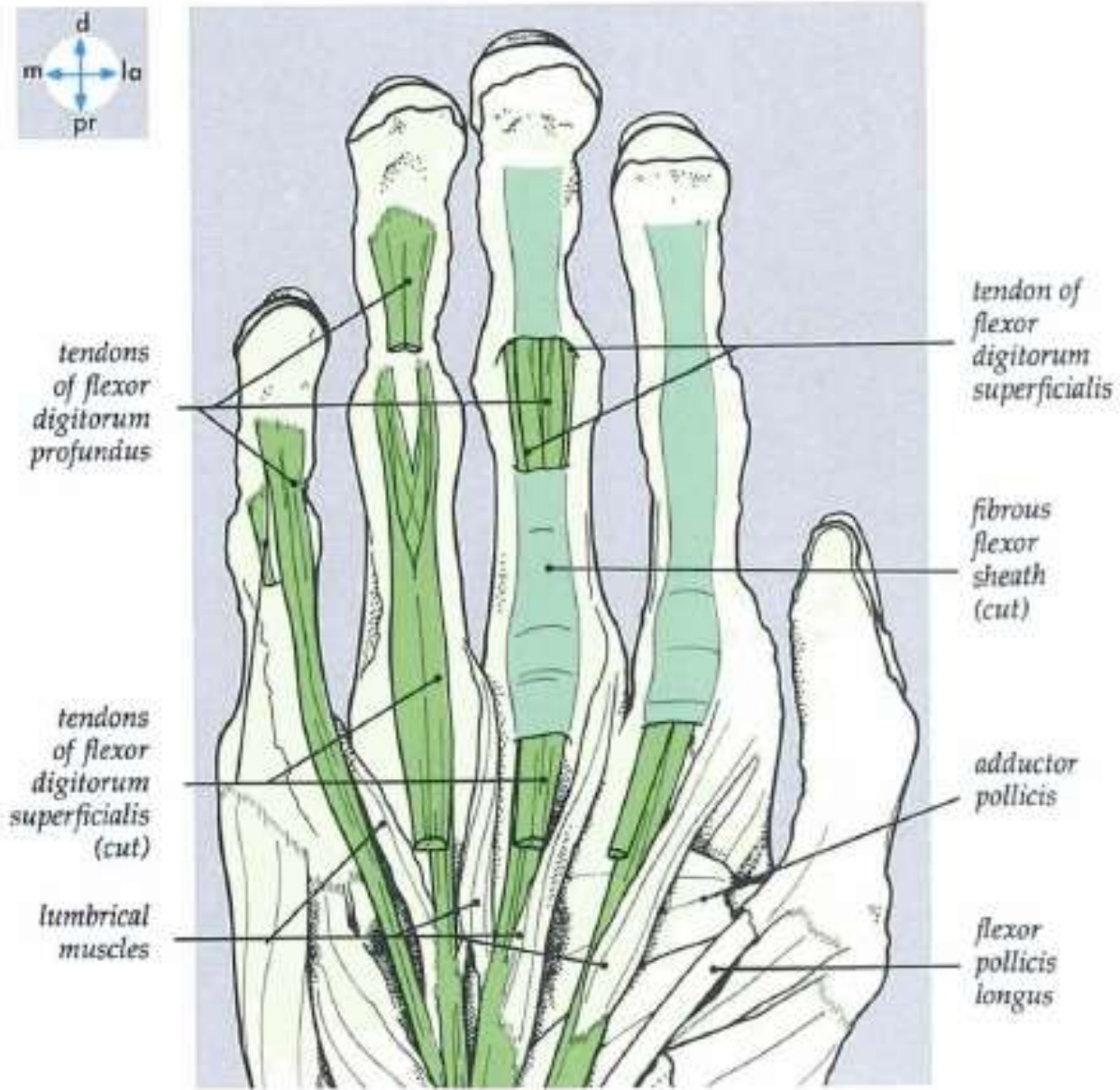
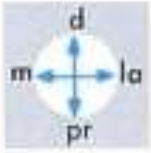


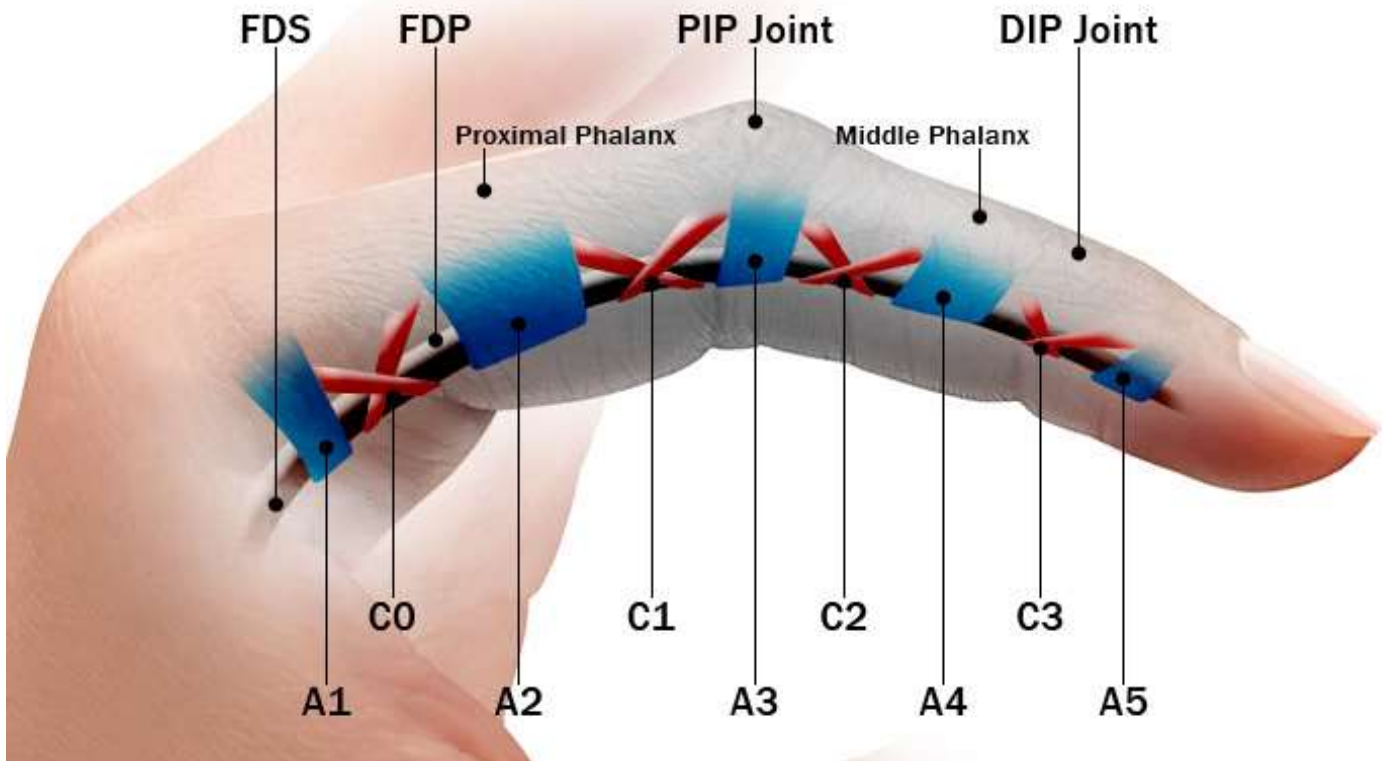
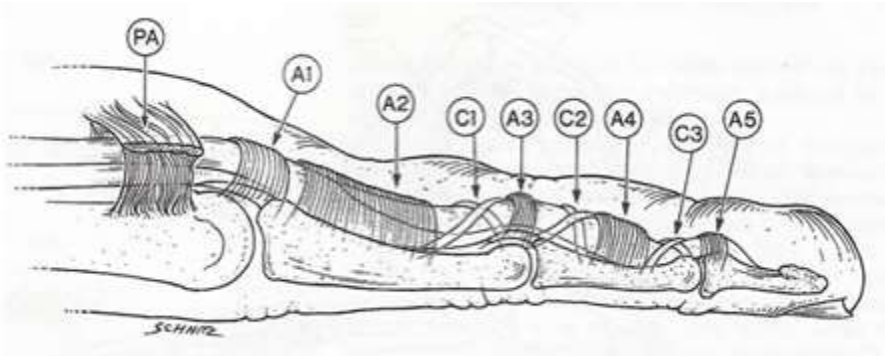
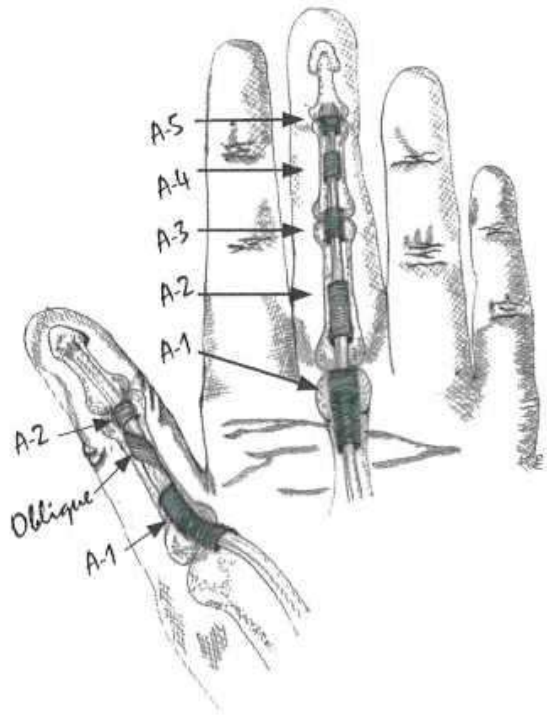
Fig. 4C —Normal appearance of volar radioscaphocapitate and volar radiolunate ligaments.

C, 51-year-old man with normal volar radioscaphocapitate ligament (*black arrow*) and volar radiolunate ligament (*white arrow*) seen on coronal T1-weighted MR arthrogram from volar aspect of wrist. Fluid within radiocarpal joint from arthrogram is seen intervening between volar radioscaphocapitate ligament and volar radiolunate ligament, allowing delineation between two.



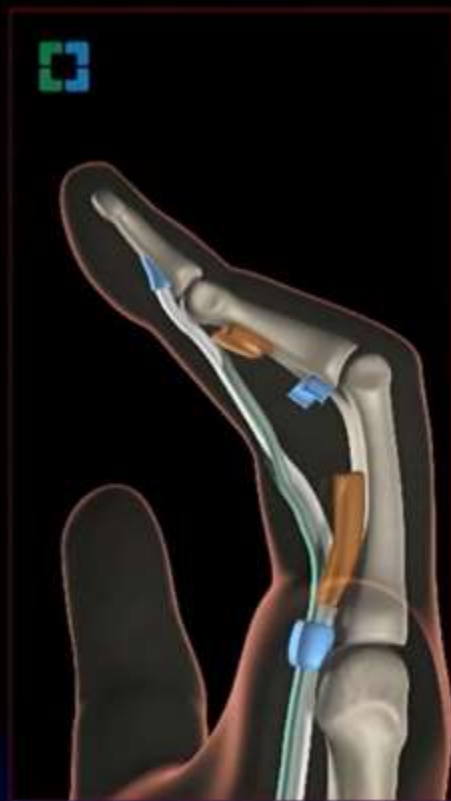






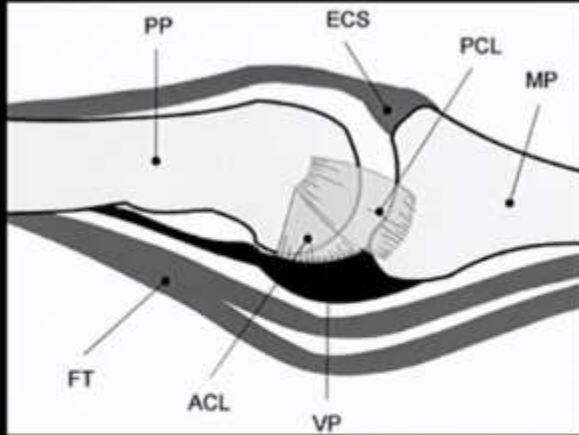
Finger Pulley Function

- A2 & A4 Pulleys
 - A 2 and A 4 most important to aid in flexion at PIP and DIP joints
 - Severity of injury increases with the number of annular pulleys involved after the A 2 injury

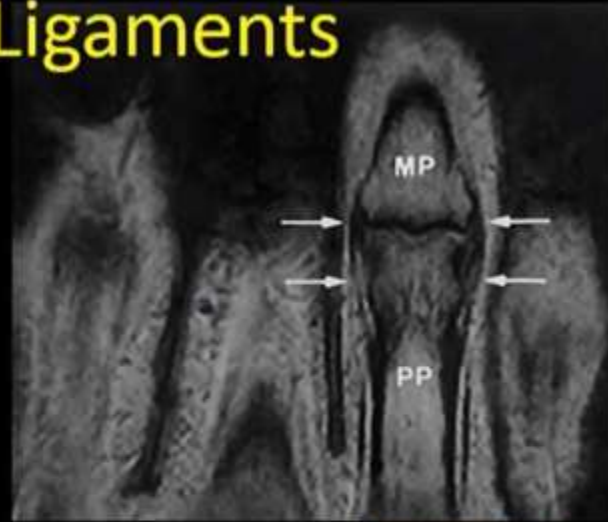


Video demonstrates bowstring sign of the flexor tendon after pulley ligament rupture. *Degree of finger flexion is **limited** with pulley tear.

Collateral Ligaments



RadioGraphics 2002

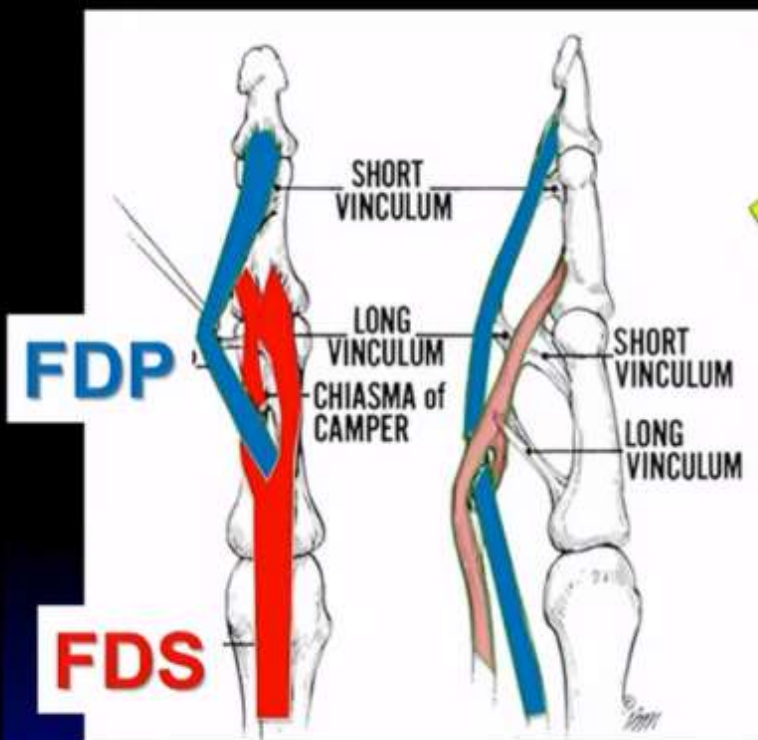


RadioGraphics 2002

- Static Stabilizers
 - Proper CL
 - Accessory CL

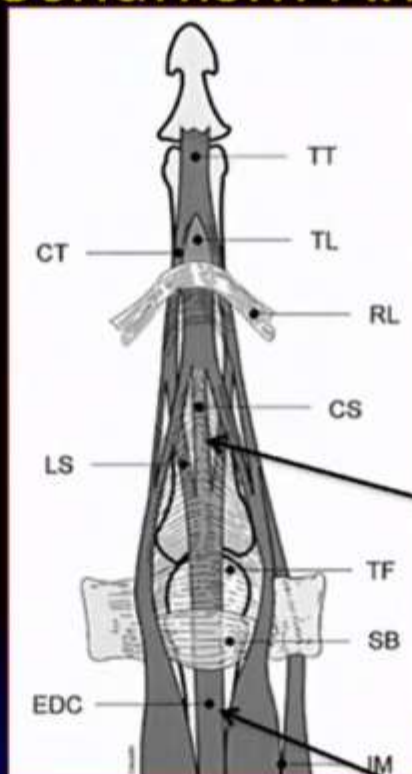
- Dynamic Stabilizers
 - Extensor Mechanism
 - Flexor Tendons
 - Retinacular Ligaments

Tendons



Extensor Mechanism Anatomy

- EDC at metacarpal
- Splits at proximal phalanx



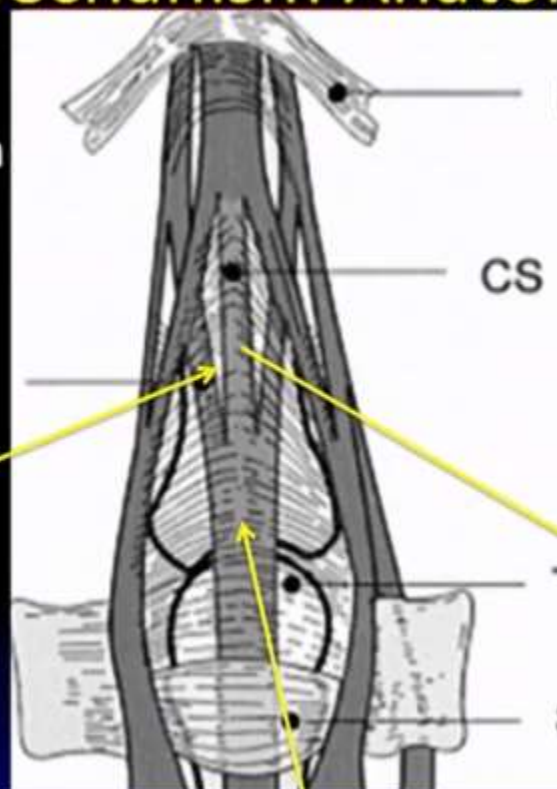
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Extensor Digitorum Communis

Extensor Mechanism Anatomy

- Central Slip inserts on dorsal base middle phalanx.
- Lateral Slips traverse PIP

Lateral Slip



Central Slip

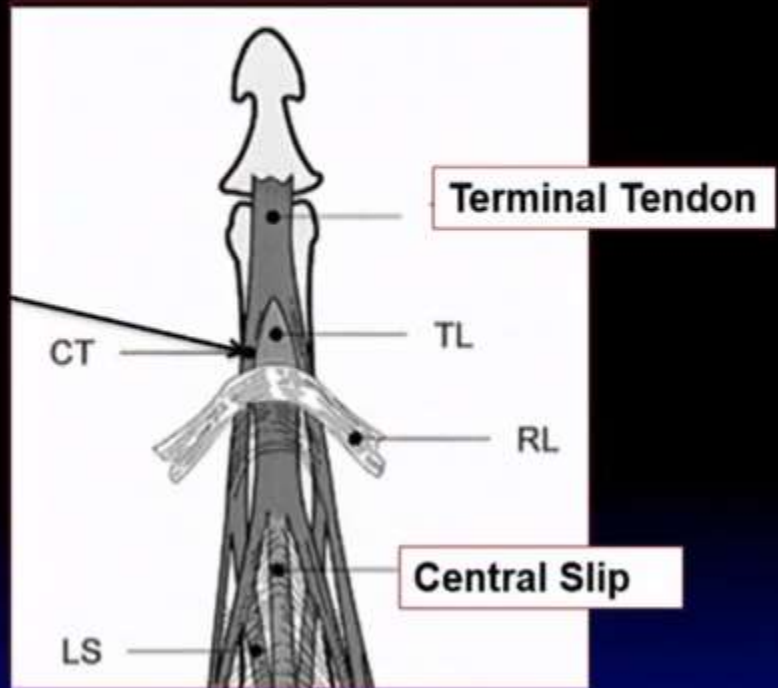
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Extensor Digitorum Communis

Extensor Mechanism Anatomy

- Fuse into terminal tendon proximal to DIP

Med/Lat
Conjoined
Tendon



Types of soft tissue tumors in hands

Tissue	Benign	Malignant
Cyst	Ganglion cyst	
Adipocytic	Lipoma	Liposarcoma
Fibrohistocytic	Giant cell tumor	Pleomorphic fibrosaroma
Fibroblastic	Fibroma of TS	Malignant fibrous histocytoma
Vascular	Hemangioma	Hemangioendothelioma
Neurogenic	PNST, Neurofibroma	Malignant PNST
Skeletal and smooth muscle	Rhabdomyoma, Leiomyoma	Rhabdomyosarcoma, Leiomyosarcoma
Chondro-osseous	Soft tissue chondroma	Extra-osseous chondrosarcoma
Pericytic	Glomus tumor	Malignant glomus tumor
Unclassified	Fibrolipomatous hamartoma Lobular capillary hemangioma	Synovial sarcoma