



2024 MUSCULOSKELETAL GALAXY MEETING

ENLIGHTENING ELBOW ENIGMAS. HIGH YIELD  
TOPICS ABOUT THE ELBOW

**Adam Mirarchi, MD**

Associate Professor

Department of Orthopaedics and Rehabilitation

Oregon Health and Science University

# DISCLOSURE

- Paid consultant for Acumed

\*All of the relevant financial relationships listed for these individuals have been mitigated

Musculoskeletal



# SUPER MARIO SPEED RUN!!!

- Scapholunate Ligament Injury and Perilunate/Lunate Dislocation
- Wrist Osteoarthritis
- Thumb CMC Arthritis
- TFCC Tears
- DeQuervains Tenosynovitis
- Distal Biceps rupture
- Medial/ Lateral Epicondylitis
- Elbow- UCL Tear
- Cubital Tunnel



# SCAPHOLUNATE LIGAMENT INJURY / PERILUNATE DISLOCATION

Scapholunate/perilunate/lunate dislocation

Start with anatomy/xrays

# STANDARD STATIC RADIOGRAPHS

Minimum accepted views necessary

3 projections

- Posteroanterior (PA)
- Lateral
- Oblique



# POSTEROANTERIOR (PA) FRONTAL VIEW

- Taken when the elbow is flexed & abducted, palm flat
- Intercarpal articulations – seen as uniform spaces of 1-2 mm
  - Scapholunate space may be a little wider
- A correctly positioned PA view will show the extensor carpi ulnaris groove radial to the midportion of the ulnar styloid.
- Joint between trapezium and trapezoid is not well visualized
  - Better visualized in the oblique view



# LATERAL VIEW

- View must be obtained with the forearm in neutral position without pronation or supination
- Easy way to determine the correctness of positioning on the lateral
  - Overlap of scaphoid and pisiform
  - Pisiform's anterior margin should project half way between the anterior margin of the scaphoid and the lunate
- This view is critical for the evaluation of carpal alignment, evaluation of the alignment of the DRUJ, and for assessment of the palmar tilt of the distal radius



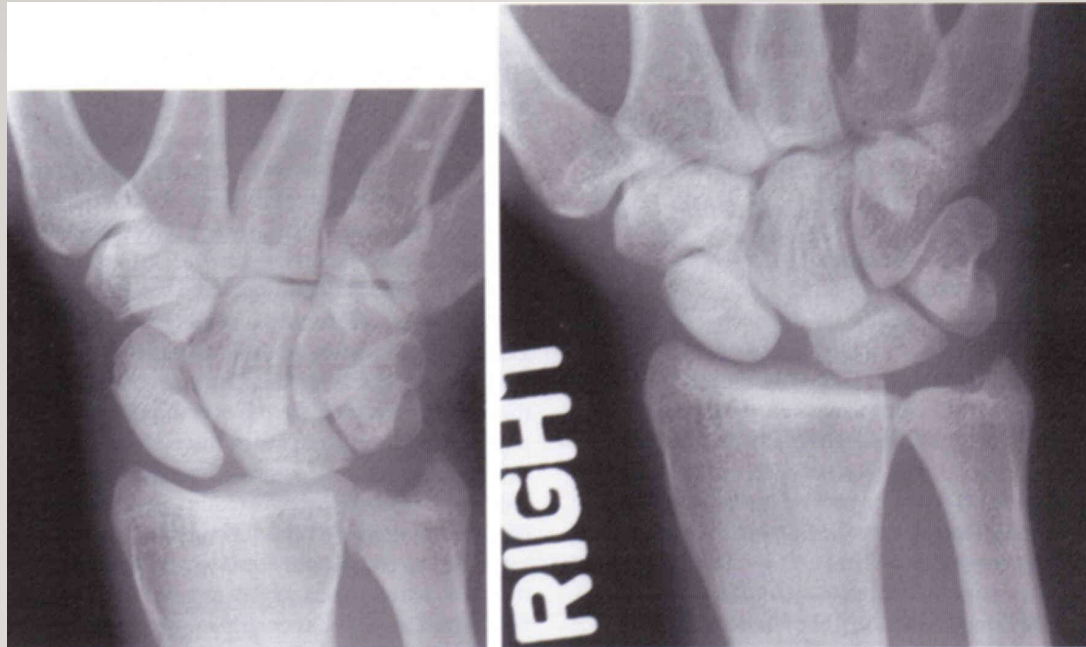


# THE THREE ARCS

- Evaluation of the three parallel arcs in PA view
- Contour of the proximal and distal surfaces of the first carpal row describes two arches
  - Should be parallel to each other in normal alignment of the wrist
- Proximal surface of the capitate and hamate represent the third arch
  - Should be concentric with the first two
- Interruption of the arcs represents an abnormality: fracture of carpals, dislocation of the lunate, or complex injuries – transscaphoid perilunate dislocations



# MOTION VIEWS (INSTABILITY SERIES)



- The wrist is positioned in the extremes of its physiologic motion
- PA views in maximal ulnar and radial deviation and clenched fist PA and AP views
- Collectively known as instability series
- When abnormal joint openings are demonstrated, ligamentous tear or dynamic instability can be seen
- Stress on carpal bones during a clenched fist reveals gap
- Gap > 3mm abnormal = SL tear

# MRI – SCAPHOLUNATE TEAR



# SCAPHOLUNATE TEAR - TREATMENT

Acute without displacement – non op  
brace/cast 4-6 weeks, reassess for ongoing pain  
at that point. Consider arthroscopic  
debridement

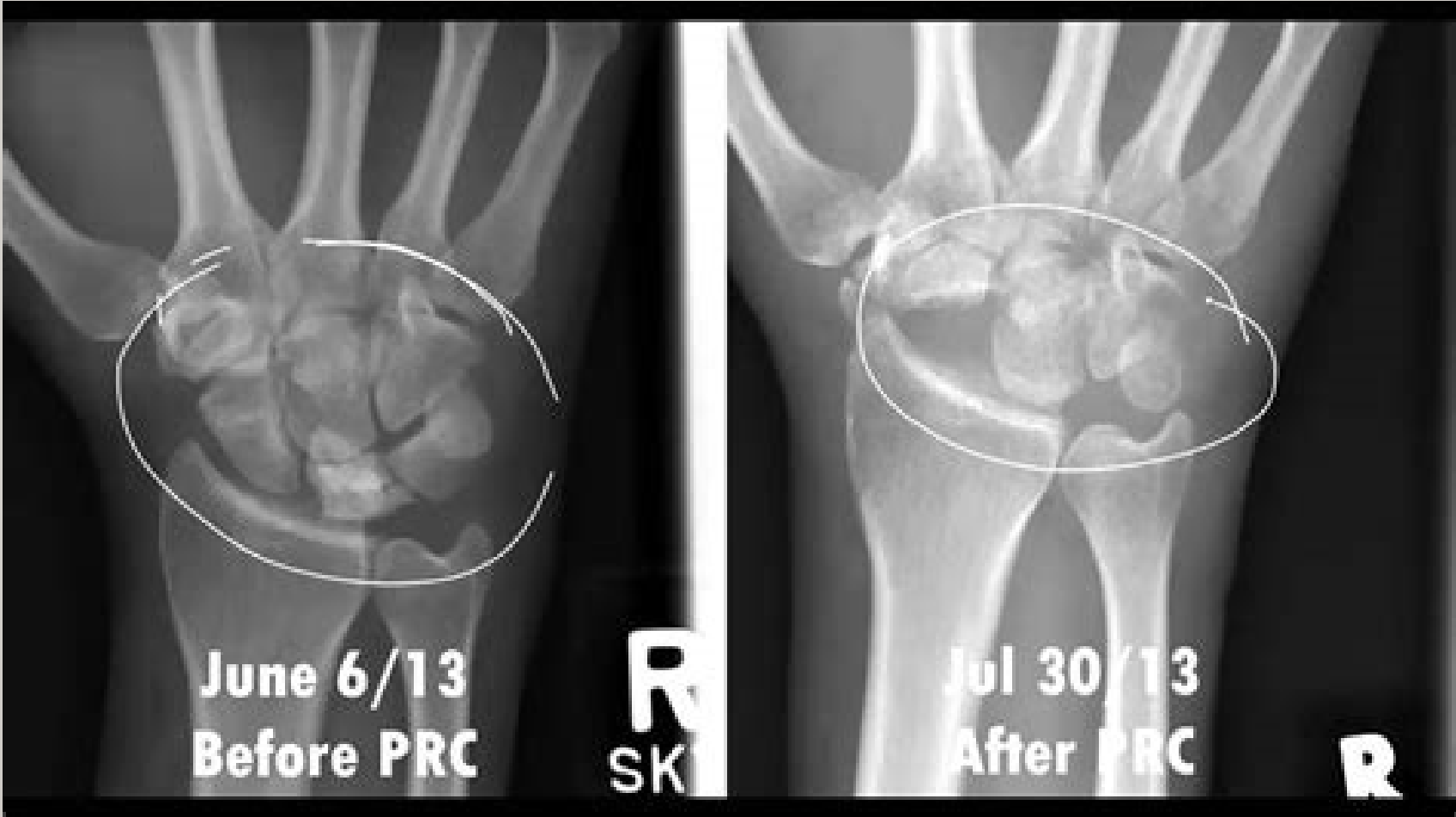
Acute and displaced. – primary repair, pinning,  
ligament reconstruction (variety of ways)

Chronic without arthritis –  
repair/reconstruction as above

Chronic with arthritis – PRC/Four corner  
fusion/total wrist fusion depending on extent of  
arthritis.

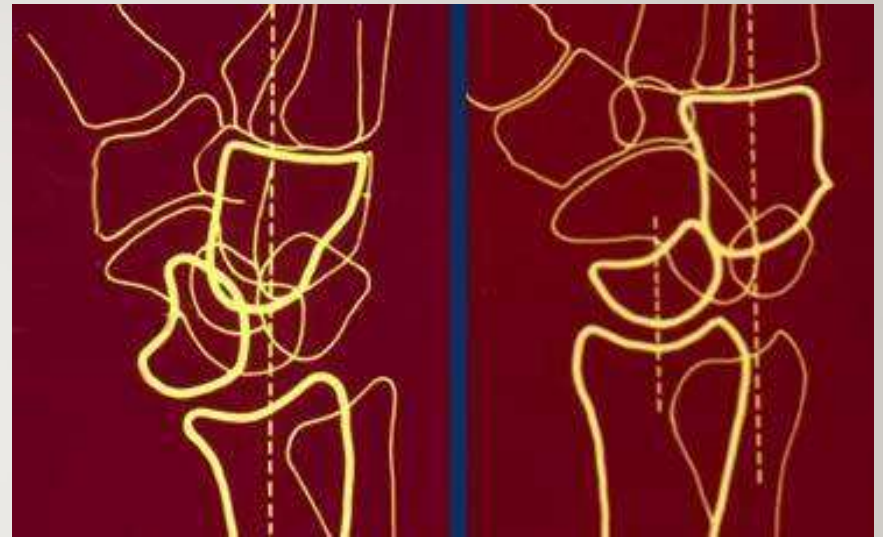


# SCAPHOLUNATE TEAR - TREATMENT



# LUNATE VS PERILUNATE DISLOCATION

- The key to differentiation between both is what is centered over the radius.
- If the capitate is centered over the radius and the lunate is tilted out, it is a lunate dislocation.
- If however the lunate centers over the distal radius and the capitate is dorsal, we are dealing with a perilunate dislocation.



LEFT: Lunate dislocation: capitate is centered over the radius and lunate is tilted out.

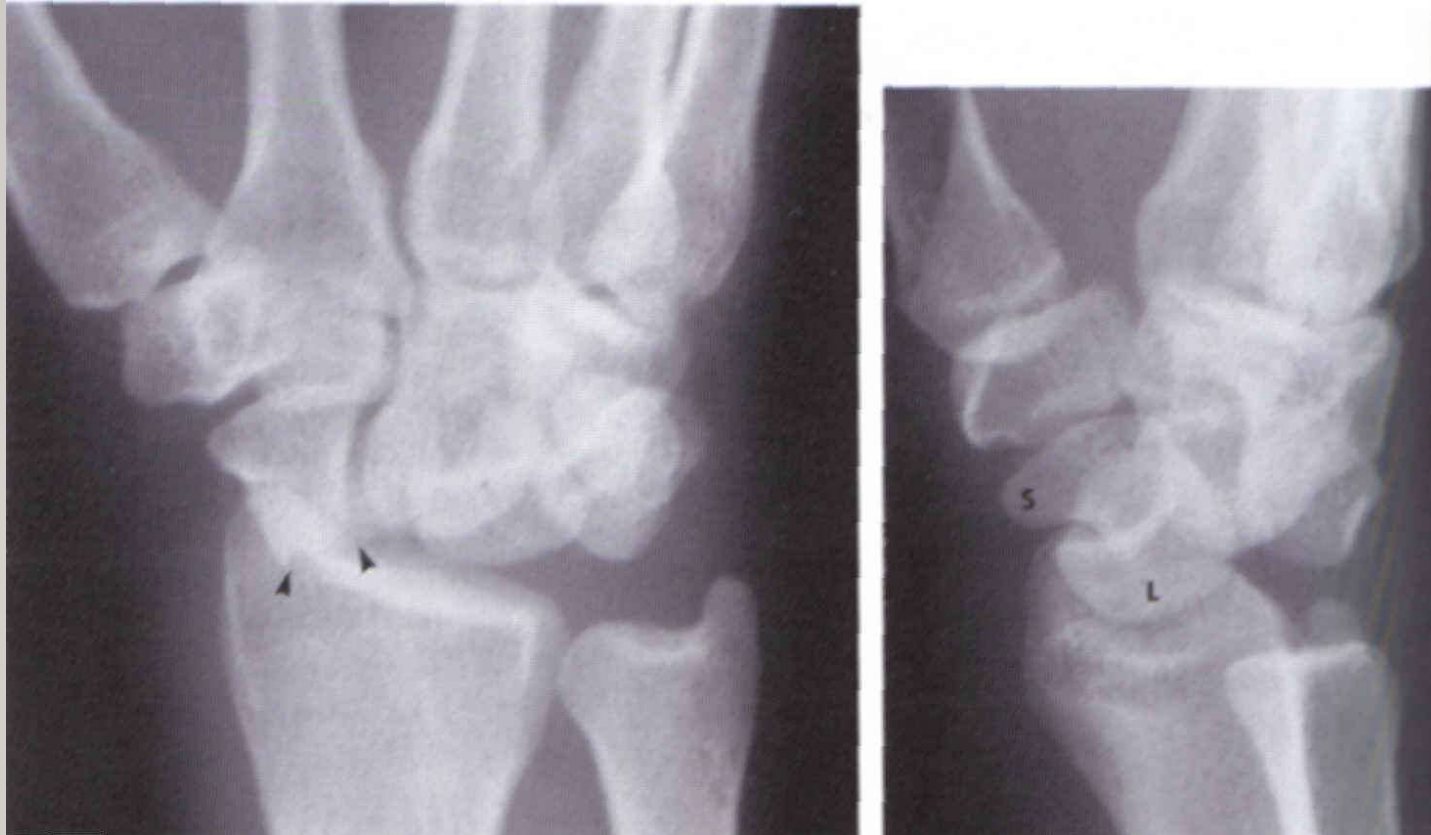
RIGHT: Perilunate dislocation: lunate is centered over the radius and capitate is tilted out dorsally.

# ANTERIOR LUNATE DISLOCATION



- PA - lunate is dislocated and no longer articulates with adjacent bones
- Lateral – lunate is dislocated and rotated 90 degrees

# TRANSCAPHOID POSTERIOR PERILUNATE DISLOCATION



- PA – scaphoid is fractured at the waist, midcarpal joint space is not seen
- Lateral – distal carpal row is dislocated posteriorly



# PERILUNATE/LUNATE DISLOCATION -TREATMENT

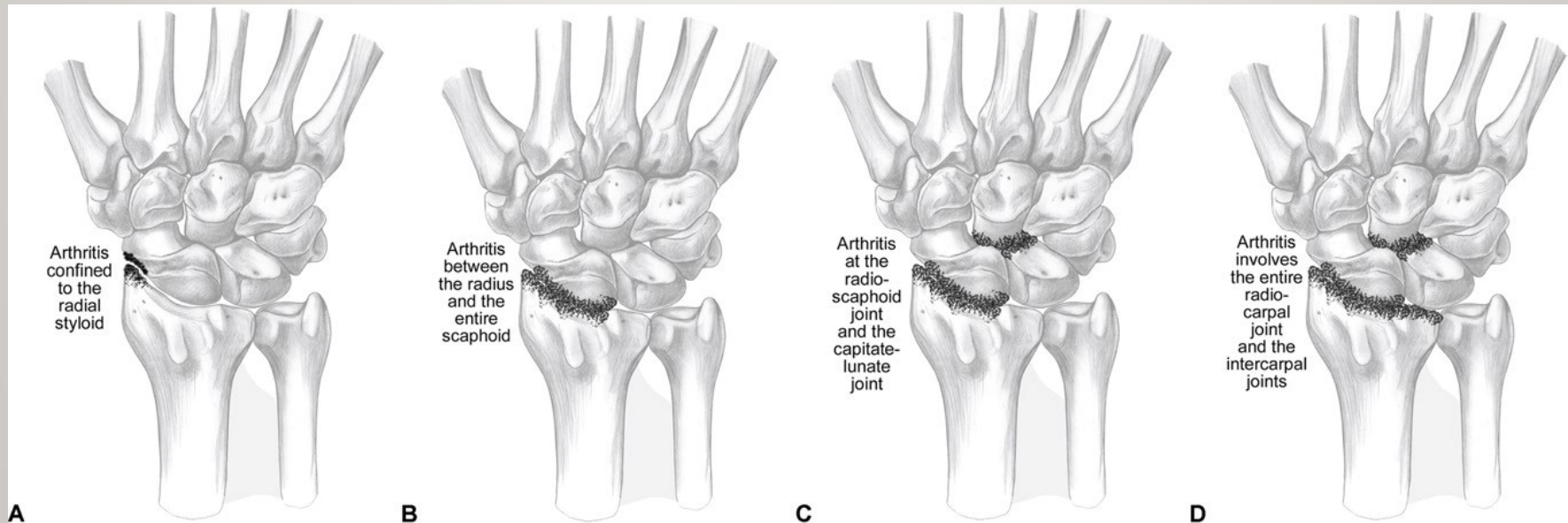
- Acute – immediate reduction attempt in ER
- If successful – delayed repair/reconstruction of ligaments in OR
  - Always do carpal tunnel release
- If unsuccessful reduction – delayed repair still OK if no acute carpal tunnel signs/symptoms
- If acute/progressive carpal tunnel symptoms then emergency release in OR with open reduction
- May delay reconstruction or do it at that point
- Outcomes are variable
  - Long return to work time 6 months
  - Loss of motion 50% or more
  - Pain, decrease grip strength
  - Early arthritis



# WRIST ARTHRITIS

- Mechanism

- Degenerative
- Primary OA / Idiopathic
- Posttraumatic – SLAC, SNAC, dislocation
- Inflammatory
- Congenital may be secondary to Madelung's deformity
- Secondary to Kienbock's or Preiser's disease

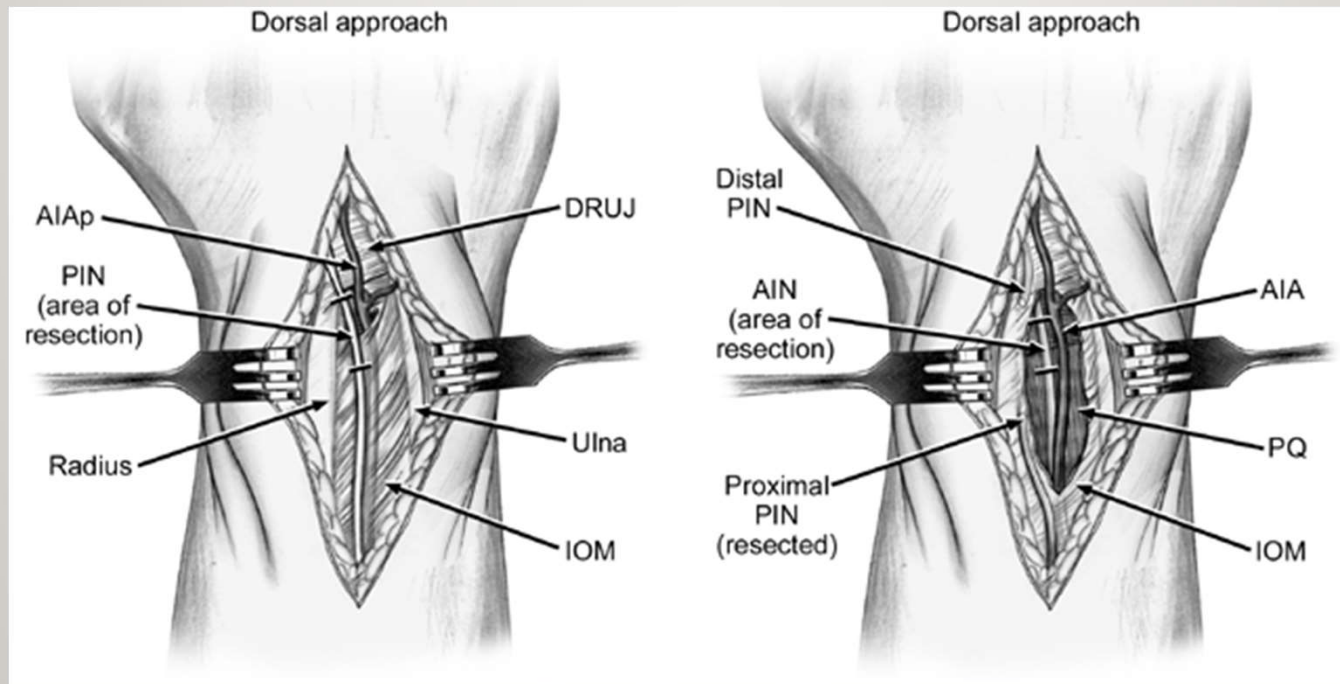


# WRIST ARTHRITIS - TREATMENT

- **Nonsurgical - The regular stuff**
  - Activity mods
  - Splinting/therapy
  - Steroid injection
  - Local / topical agents: Arthritis Pain Gel, Lidocaine patch

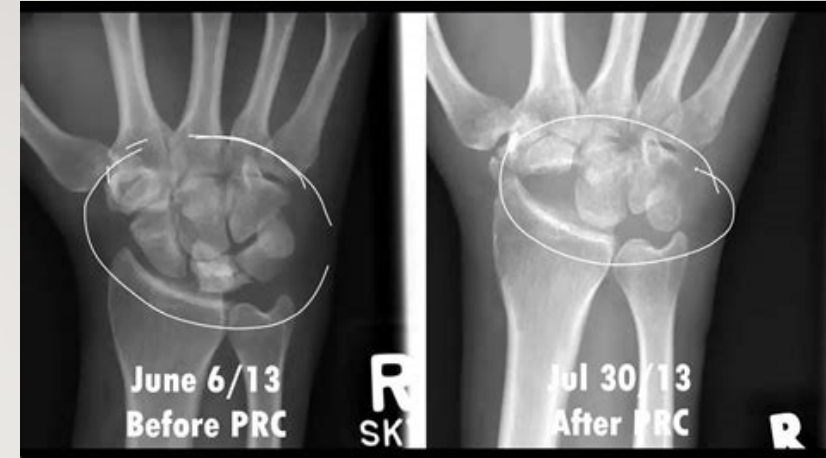
# WRIST ARTHRITIS – SURGICAL TREATMENT

- Partial Wrist denervation
  - Less invasive, no bone loss. 60-70% chance of success
  - Easy to do, quick recovery transect anterior interosseous and posterior interosseous nerves
  - May not be effective and require additional surgery



# WRIST ARTHRITIS - TREATMENT

- Proximal Row Carpectomy, 4 corner fusion – salvage operations
  - Trade off of continued ROM, decreased pain, usually does not eliminate all pain
  - May wear out and require additional surgery
- Total wrist fusion
  - Trade off loss of wrist flex/ext and rad/uln dev but highest chance of decreased pain
  - Not likely to ever wear out, but loss of ROM is permanent

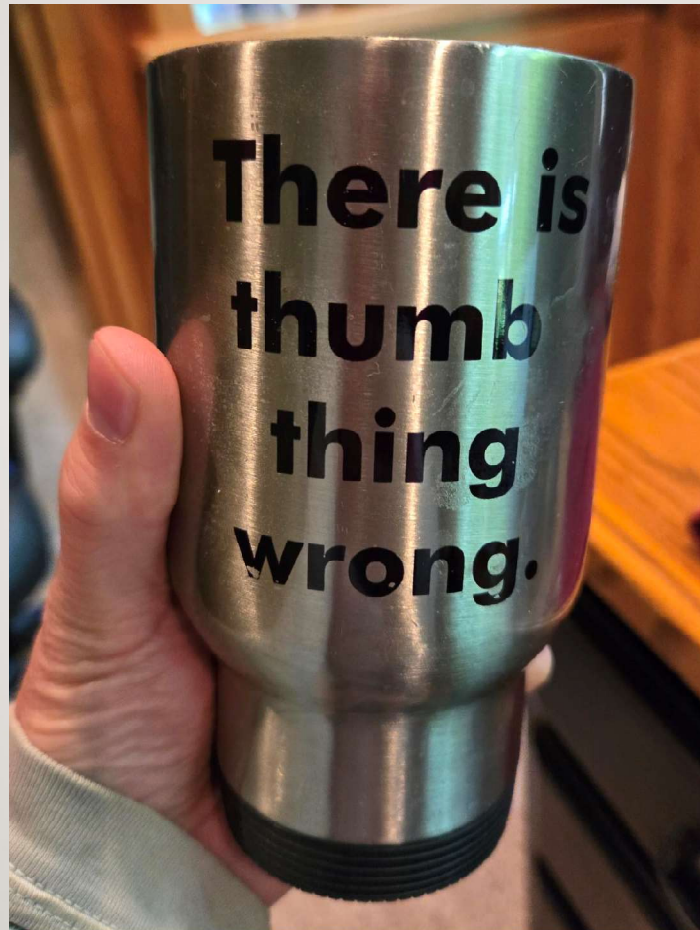


# WRIST ARTHRITIS - TREATMENT

- Typical time to fusion is 6-8 weeks. Return to full activity approx. 3 months
- Generally plate is permanent
- Occasionally have to remove



# THUMB CMC ARTHRITIS



# THUMB CMC ARTHRITIS

- Most common is OA in females, 45 – 65 y.o.
- 1 in 4 women, vs 1 in 12 men





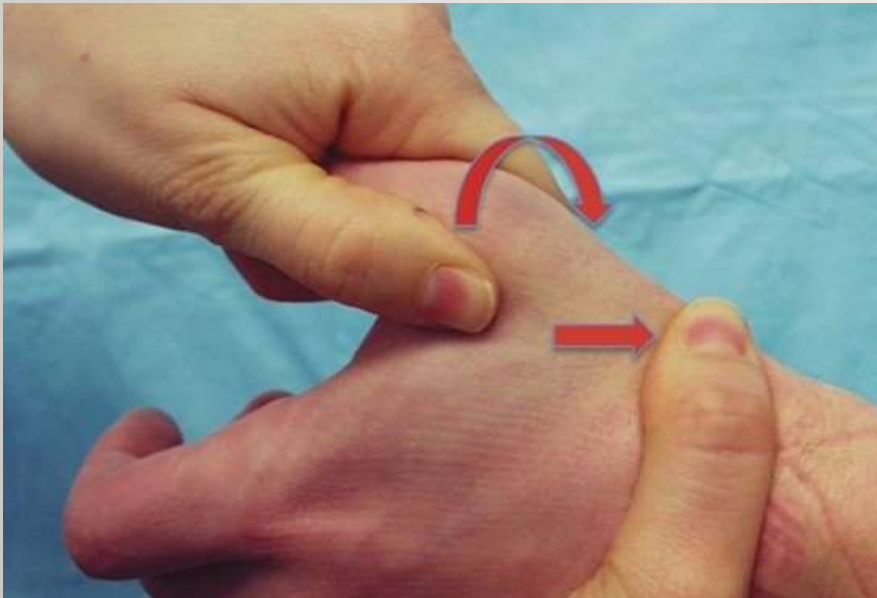
# THUMB CMC ARTHRITIS

- Patient develops pain and loss of pinch strength as CMC becomes adducted, MCP hyperextends
- Interferes with activities of daily living
  - Everyday tasks like opening jars, buttoning pants
  - Cooking, holding pots/pans becomes very challenging
- Interferes with recreation
  - Kayaking, hiking, golf, fishing



# THUMB CMC ARTHRITIS

- Physical exam
  - Shoulder sign
  - Grind test
  - Stress test – instability
  - Thenar atrophy



# THUMB CMC ARTHRITIS

**Table 1**

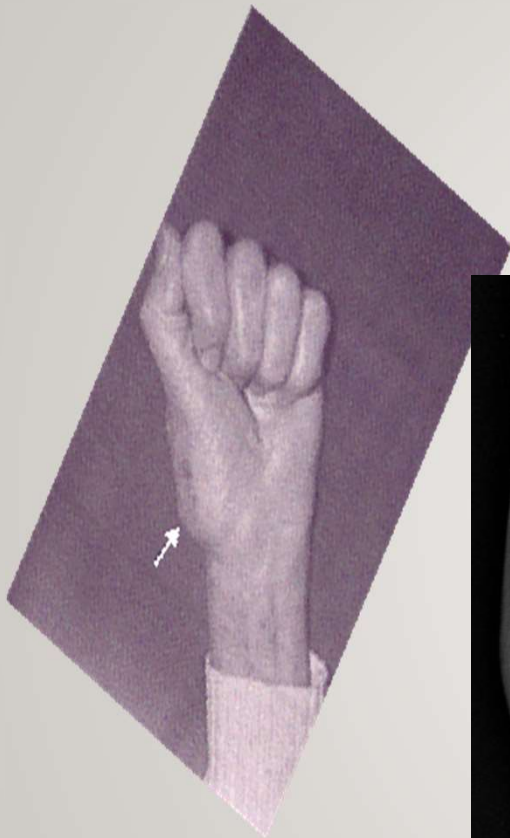
The four stages of the Eaton-Littler classification

<b>Stage</b>	<b>Description</b>
I	Subtle carpometacarpal joint space widening
II	Slight carpometacarpal joint space narrowing, sclerosis, and cystic changes with osteophytes or loose bodies < 2 mm
III	Advanced carpometacarpal joint space narrowing, sclerosis, and cystic changes with osteophytes or loose bodies > 2 mm
IV*	Arthritic changes in the carpometacarpal joint as in Stage III with scaphotrapezial arthritis

[Open in a separate window](#)

\*Stage IV as modified by Eaton and Glickel [[10](#)].

# THUMB CMC ARTHRITIS



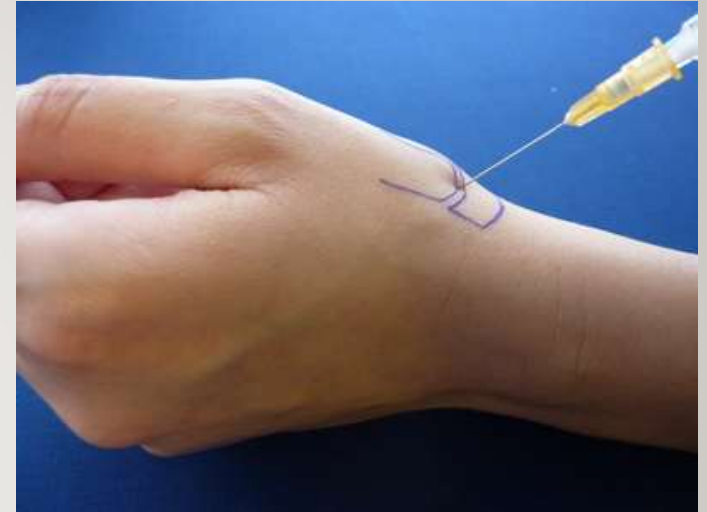
# THUMB CMC ARTHRITIS

- Splinting
  - Pain relief
  - Improves joint stability
  - Wear during heavy or painful activity
  - Interfere with some hand activities
- Anti-Inflammatories - NSAIDs
  - Ibuprofen/Advil/Aleve/Motrin
  - All similarly effective
- Voltaren gel, lidocaine patch
  - Useful adjuncts



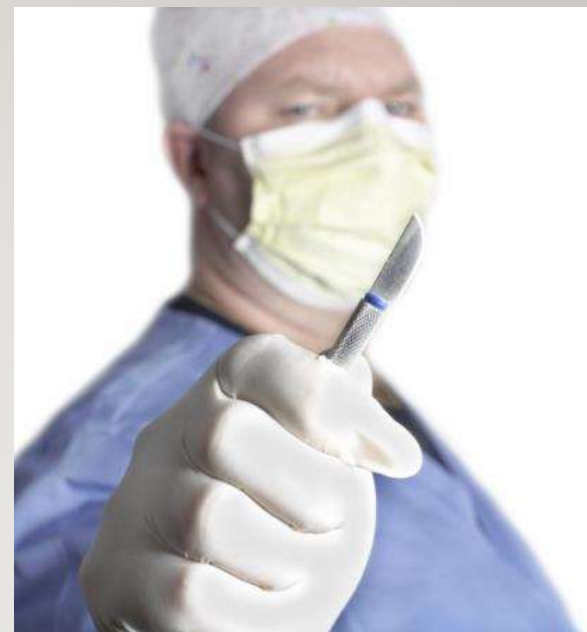
# THUMB CMC ARTHRITIS

- Steroid injections
- Technically challenging injection
  - +/- ultrasound
  - Corticosteroid of choice
    - 20mg-40mg of Depomedrol
- Hard to pin down the effectiveness in the literature
  - Most studies confirm short medium term benefit up to several months
  - Little to no long term benefit especially in more severe disease
  - Local reactions: skin atrophy or hypopigmentation, acute corticosteroid-microcrystalline joint flare, hemarthrosis
  - Systemic effects: facial flush, hyperglycemia, HTN,

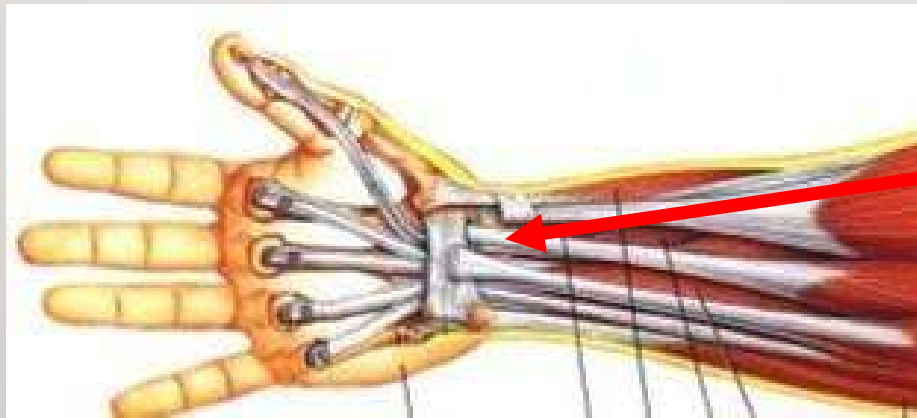
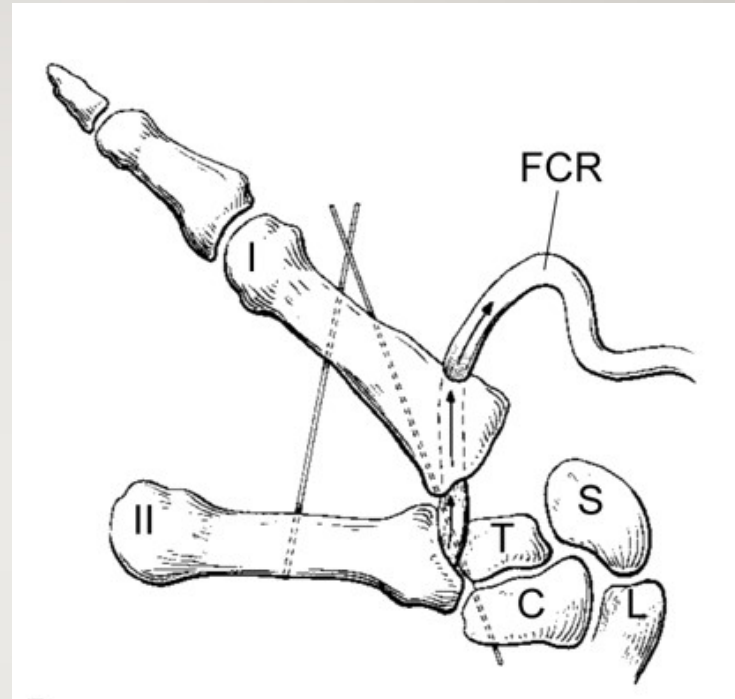
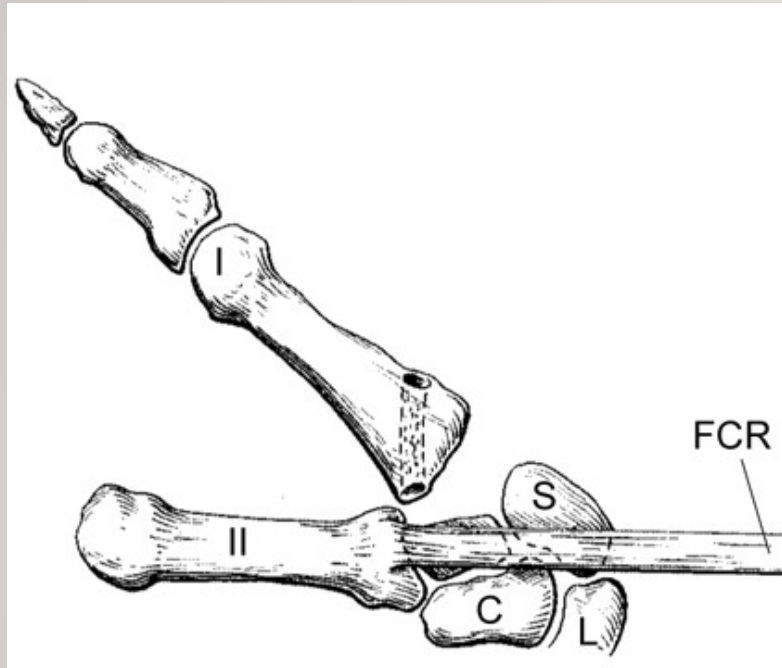


# THUMB CMC ARTHRITIS

- Failed nonoperative treatments
- Many techniques described using soft tissue and/or prosthetic implants
- Generally not any better than traditional
- Trapeziectomy with Ligament reconstruction & tendon interposition (LRTI) described over 30 years ago with good long term results
- Trapeziectomy alone – statistically the only thing that seems to matter
- CMC joint denervation – new kid on the block



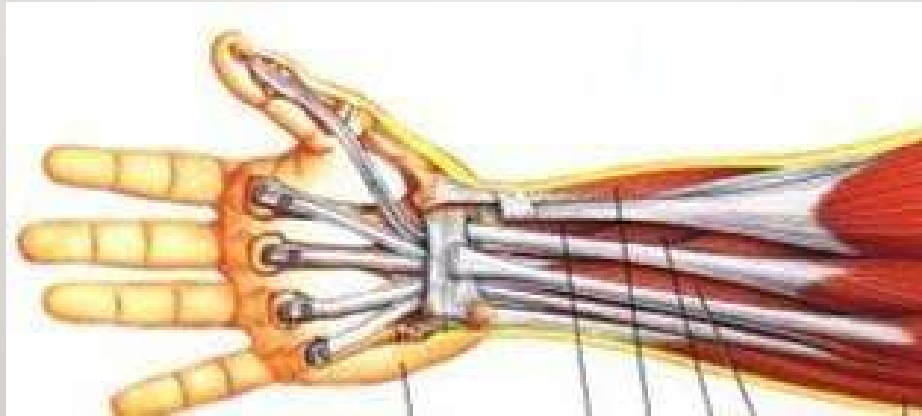
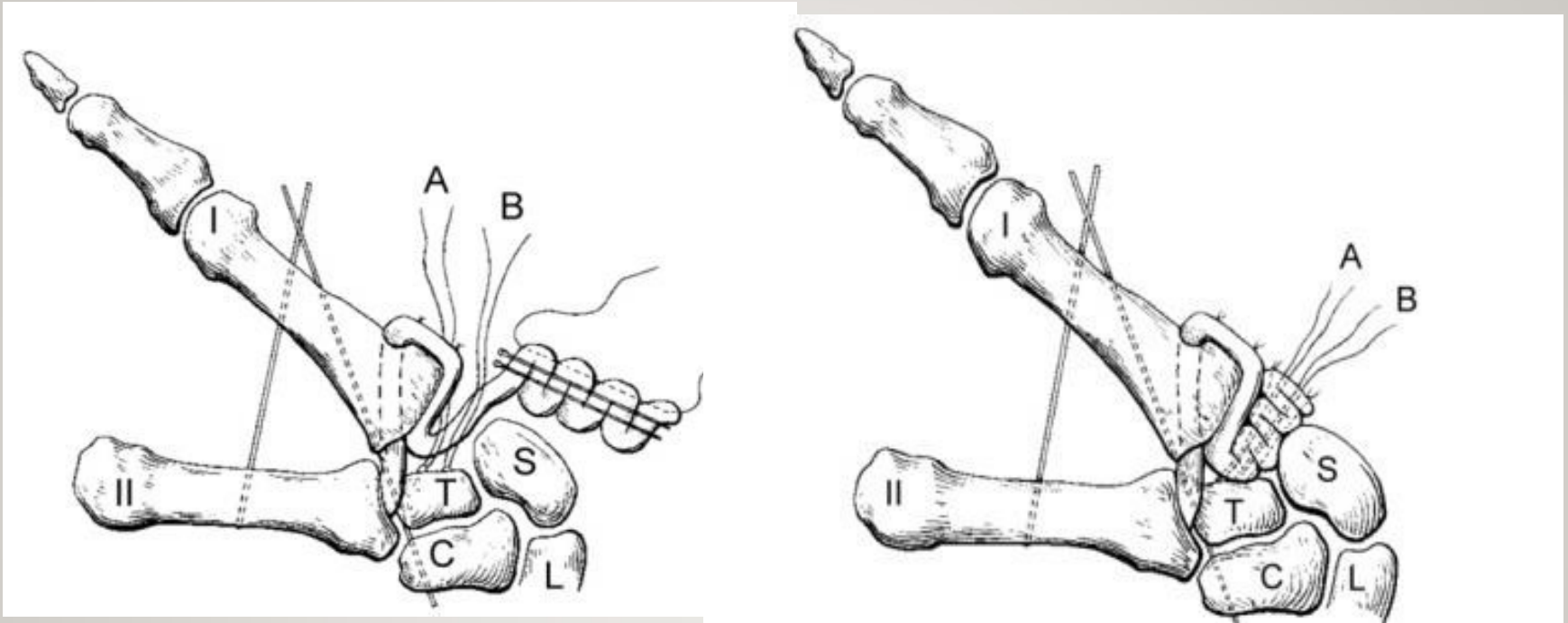
# THUMB CMC ARTHRITIS



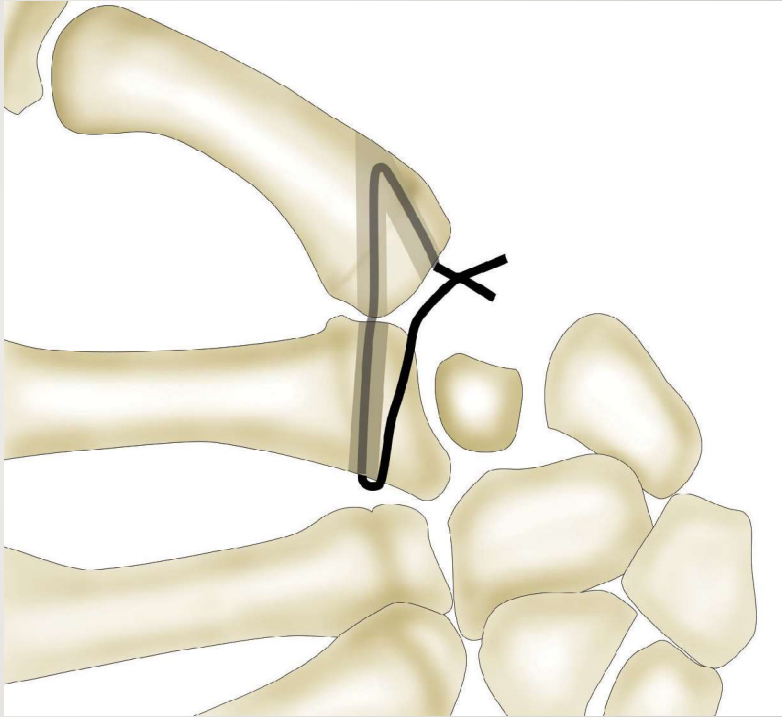
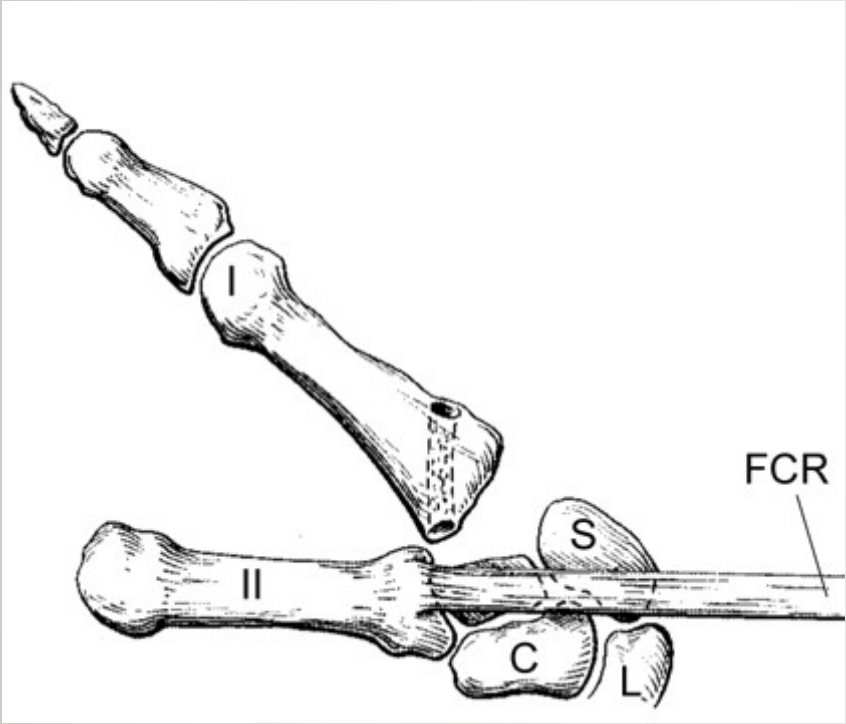
Flexor Carpi Radialis



# THUMB CMC ARTHRITIS



# THUMB CMC ARTHRITIS



# THUMB CMC ARTHRITIS

- Splint placed in OR
- Remains for 2 weeks
- Out of splint and into removable thumb brace x 2 weeks
- Start OT and wean from brace at 4 weeks
- Some cast for 6 weeks still



# THUMB CMC ARTHRITIS

- Hand based thumb splint
- Up to 4 months at night
- Wean out of splint during activity as motion improves
- ROM
  - Thumb opposition
  - Wrist flexion/extension
  - Wrist ulnar/radial deviation



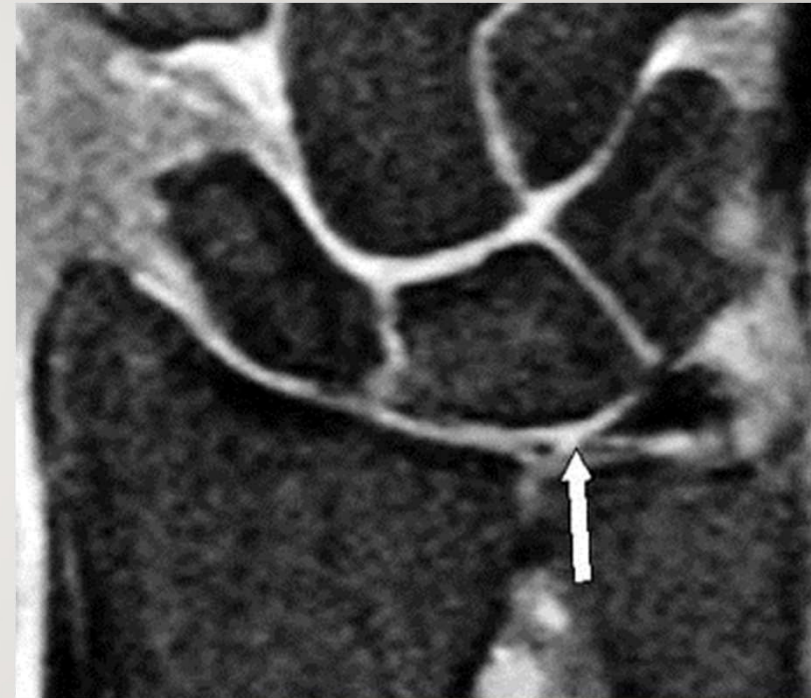
# THUMB CMC ARTHRITIS

- High satisfaction > 95% pain relief
- Grip strength, tip pinch, lateral pinch
  - 70% of normal published values
- Range of motion 95% of normal
- Most people return to full activities around 3 months
- Improvements can be seen for up to 6 years from surgery



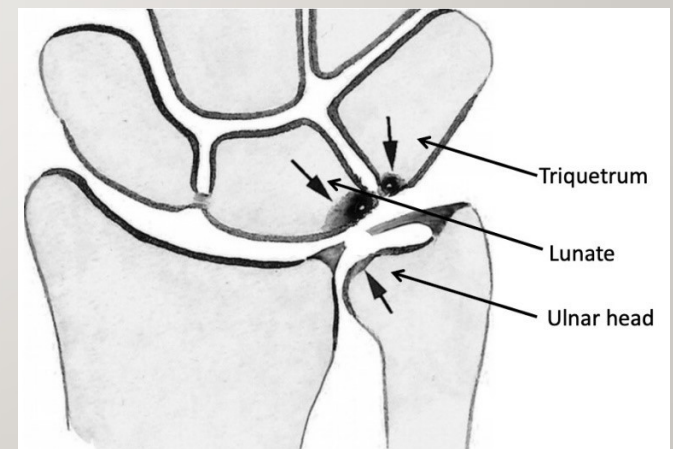
# TRIANGULAR FIBROCARILAGINOUS COMPLEX

- TFCC Common cause of ulnar sided wrist pain
- Acts as a cushion between the carpus and the ulnar head ~ knee meniscus
- Usually after trauma, twisting/pulling motion
- Can also be degenerative
- Typically presents as increased pain with power grasp, pulling/twisting maneuvers
- Occasional swelling



# TRIANGULAR FIBROCARILAGINOUS COMPLEX

- Diagnosis is usually made by history
- Fovea sign
  - Pressure on TFCC just anterior to ECU
  - Tenderness in the soft spot between the ulnar styloid and FCU, between the volar surface of the ulnar head and the pisiform
  - 95% sensitivity and 87% specificity for foveal disruptions of TFCC or ulnotriquetral ligament injuries
- Ulnocarpal grind
  - Handshake with ulnar deviation, forward pressure and twist on hand



# TRIANGULAR FIBROCARILAGINOUS COMPLEX

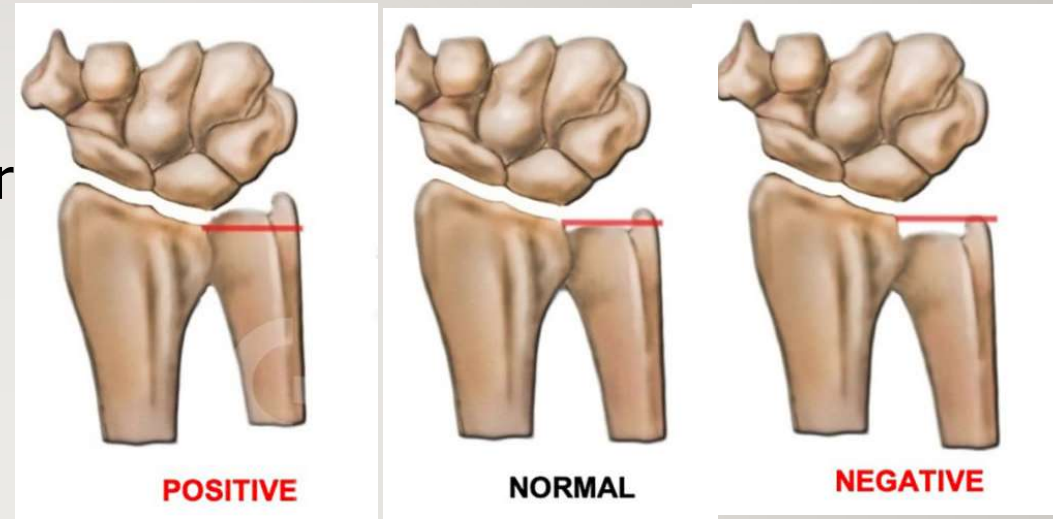
- Piano key test
  - Stabilize the distal radius
  - Push the ulna anterior/posterior
  - Should be minimal movement and be nonpainful
  - Excessive motion anterior/posterior indicated distal radio-ulnar joint instability
  - Result of injury DRUJ ligament and TFCC tears





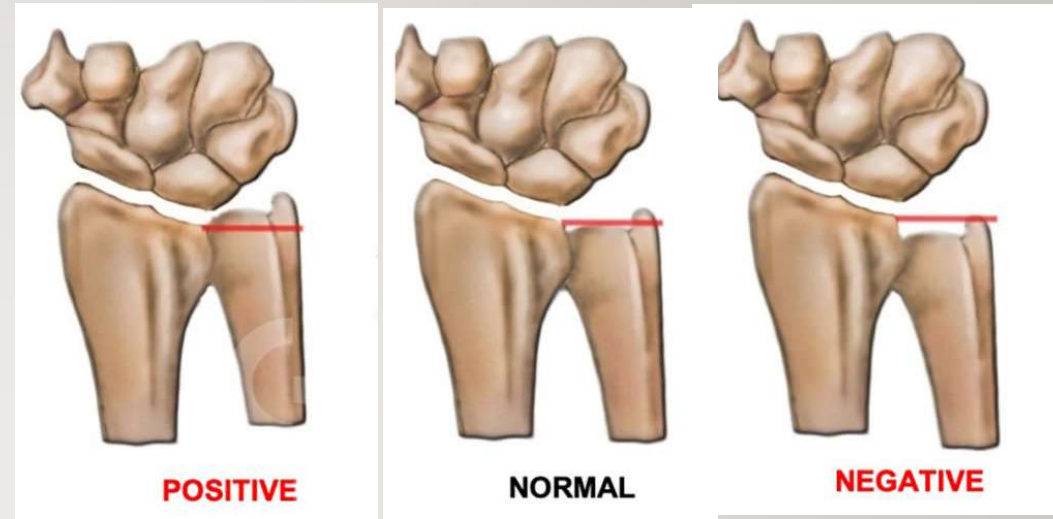
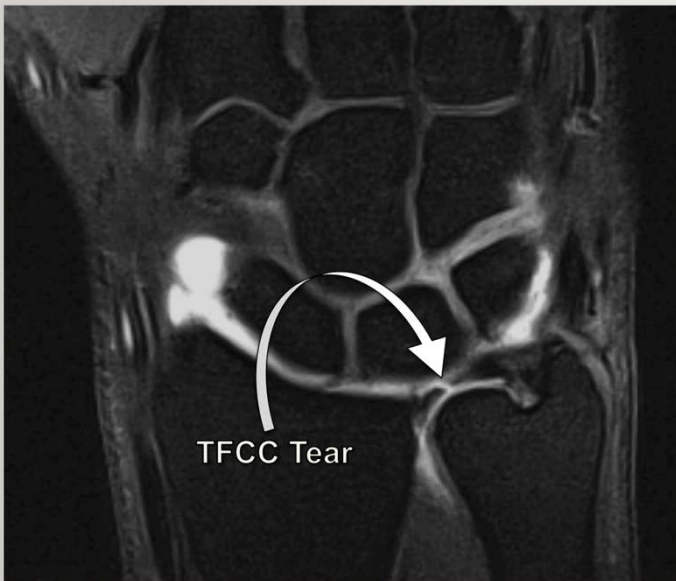
# TRIANGULAR FIBROCARILAGINOUS COMPLEX

- Imaging
  - Plain films can show arthritis or ulnar positive head
  - MRI – without contrast 74-100% sensitivity
- Treatment
  - Conservative
  - Steroid injection
  - Operative
    - Arthroscopy TFCC repair/debridement
    - Wafer procedure
    - Ulna shortening



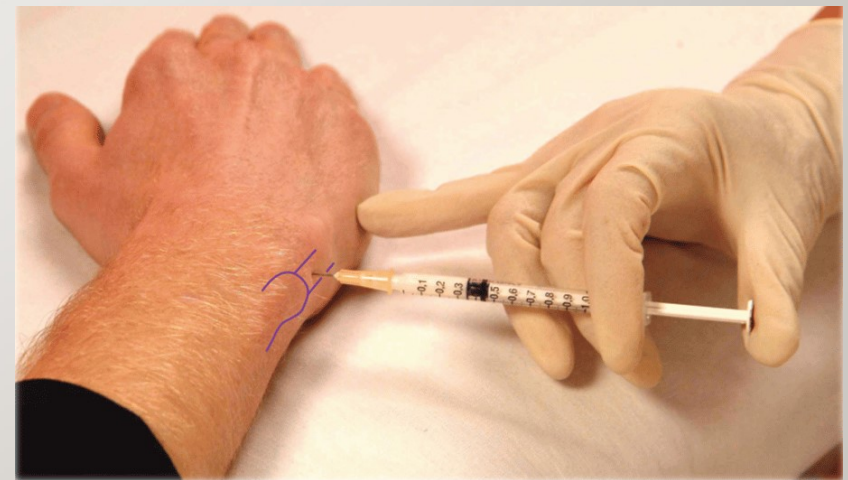
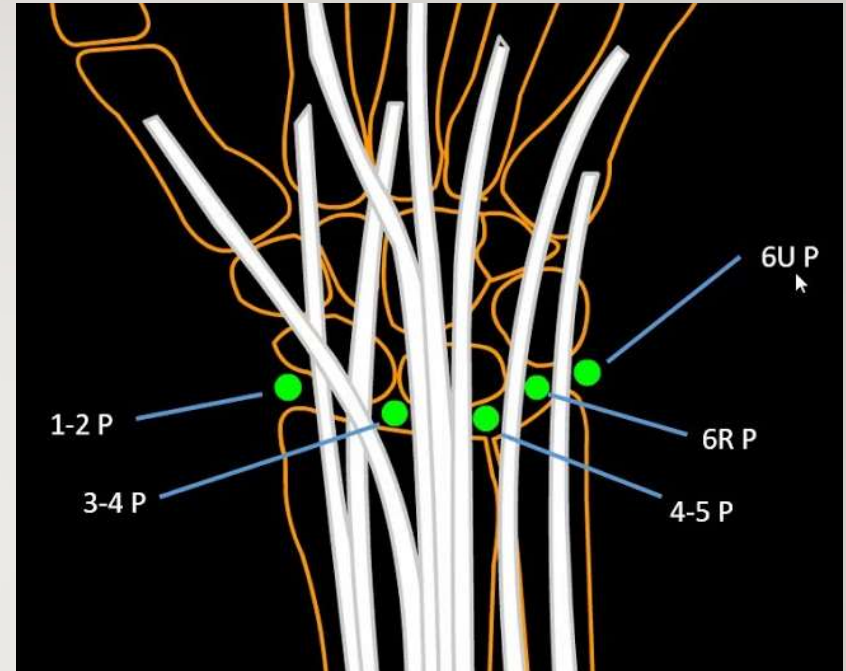
# TRIANGULAR FIBROCARILAGINOUS COMPLEX

- Imaging
  - Plain films can show arthritis or ulnar positive head
  - MRI – without contrast 74-100% sensitivity

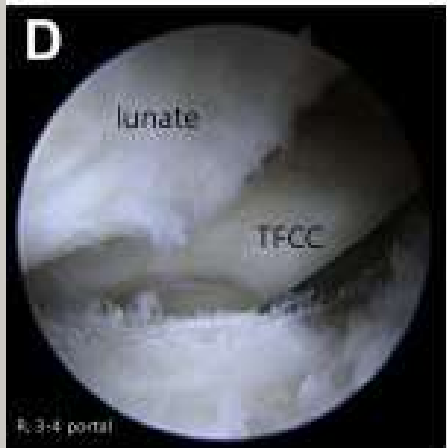
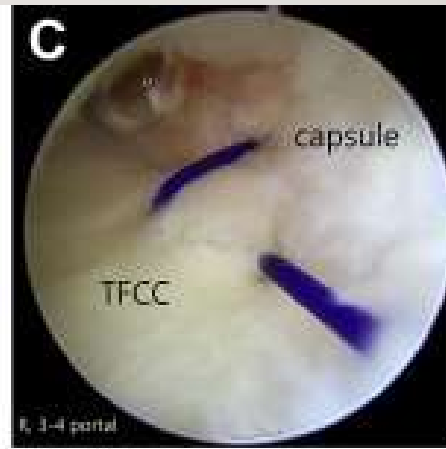
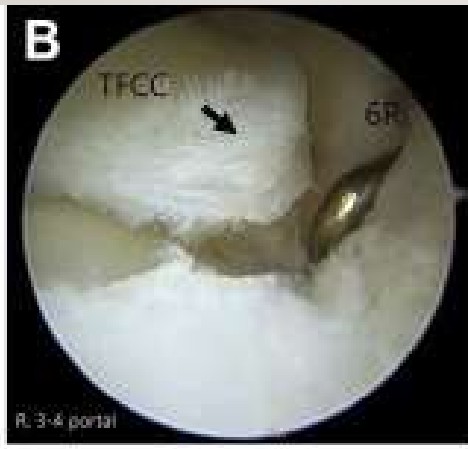
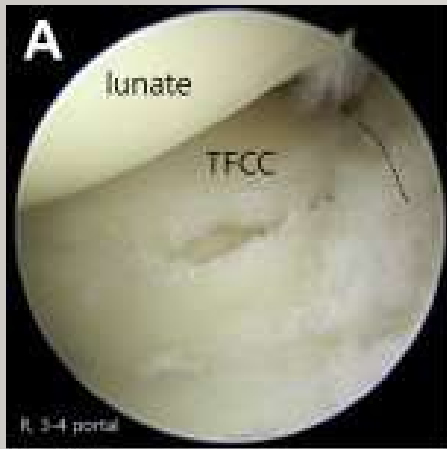


# TRIANGULAR FIBROCARILAGINOUS COMPLEX

- Treatment
  - Conservative
  - Steroid injection
  - Operative
    - Arthroscopy TFCC repair/debridement. ~ 80% for pain relief
    - Wafer procedure
    - Ulna shortening
    - Darrach (ulnar head removal)



# TRIANGULAR FIBROCARILAGINOUS COMPLEX



# DEQUERVAIN DISEASE



# DEQUERVAIN DISEASE

- First described by Fritz deQuervain 1895
  - Some Swiss dude
- Stenosing tenosynovitis of the first dorsal compartment
- Seen in an profession or activity that involves
  - Ulnar deviation
  - Repetitive thumb use



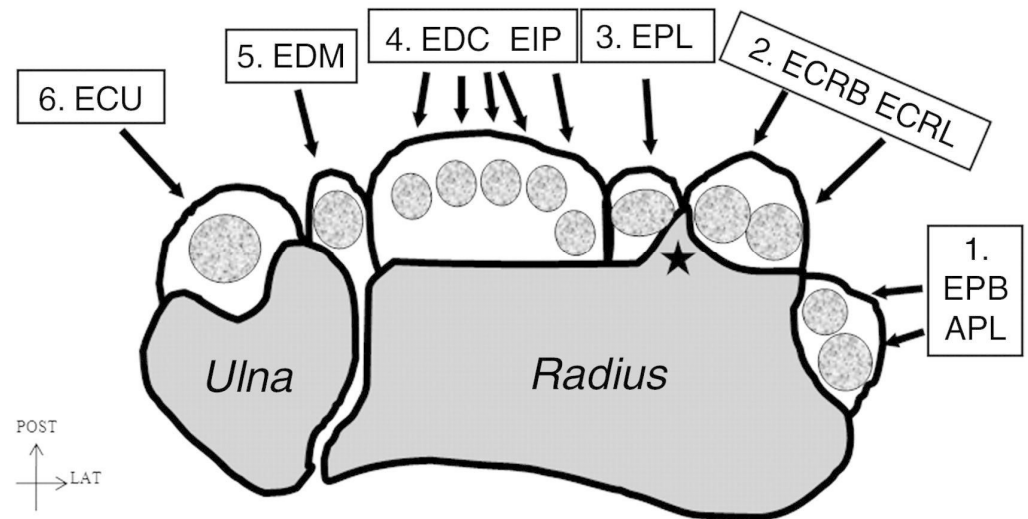
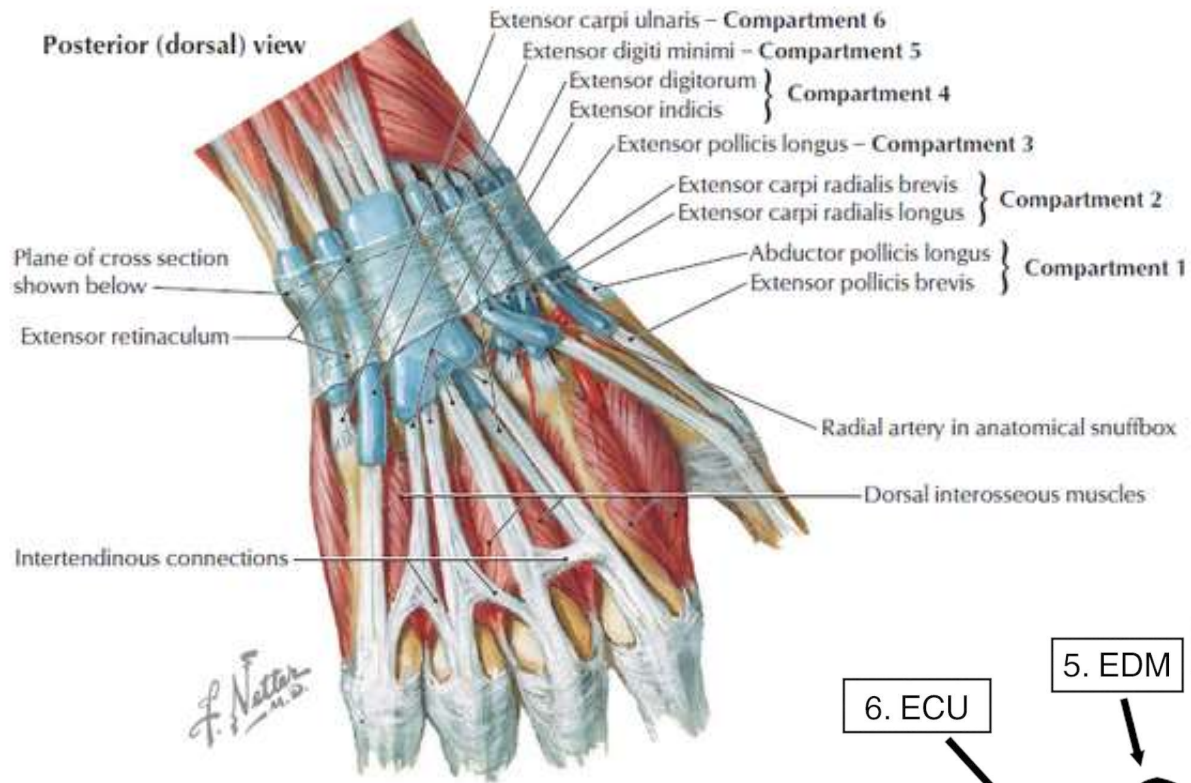
Fritz De QUERVAIN  
1868–1940

# DEQUERVAIN DISEASE

- Often called Mommy Thumb, Gamer's thumb, Texter's thumb
- Position of lifting up an infant is ergonomically bad for the thumbs



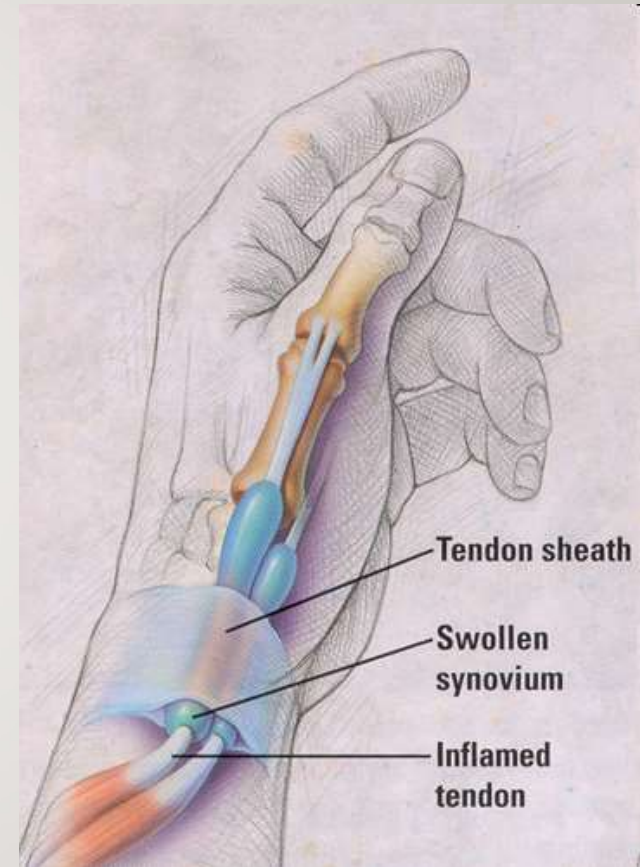
# DEQUERVAIN DISEASE





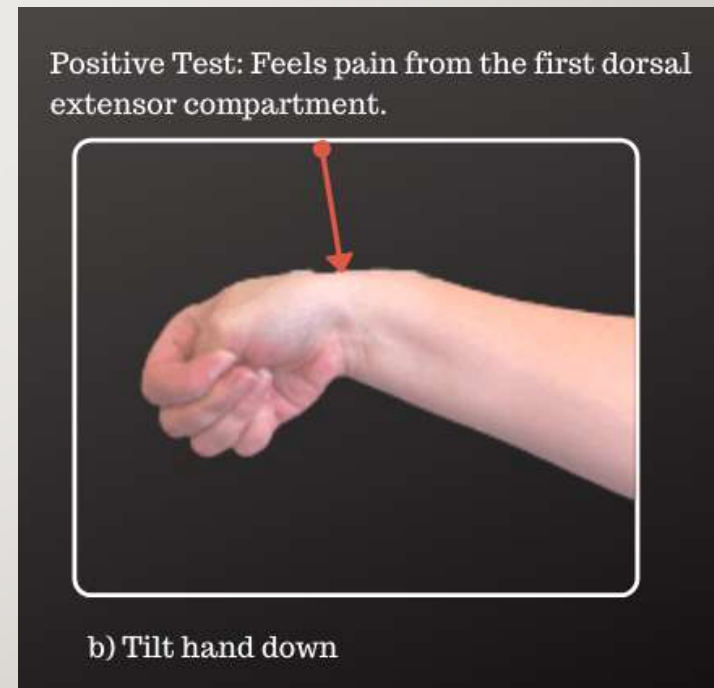
# DEQUERVAIN DISEASE

- Abductor pollicis longus, extensor pollicis brevis
- Ride in a groove on radial side of wrist
- Swelling tenderness over the site
- Crepitus or triggering can be noted
- Palpable fibrous thickening
- Occasional ganglion



# DEQUERVAIN DISEASE

- Finkelstein's test/Eichoff's test
- H. Finkelstein, JBJS, 1930
  - American surgeon
- Thumb placed in the palm and held with the fingers
- Ulnar deviation causes intense pain over the radial styloid which disappears if the thumb is released.



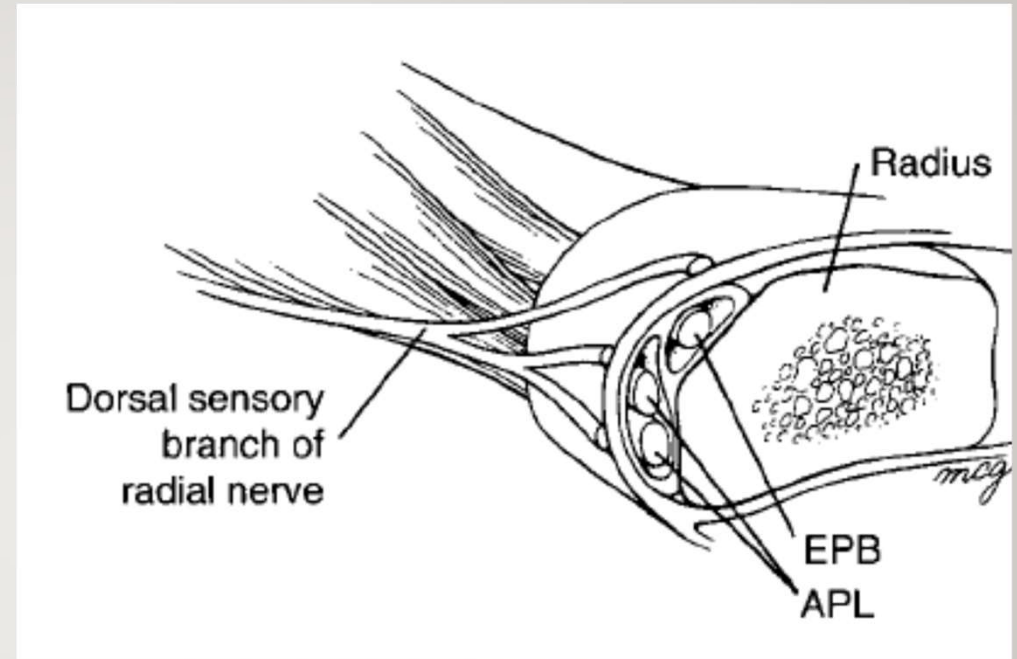
# DEQUERVAIN DISEASE

- Nonoperative treatment
  - Thumb spica splint
  - Tendon gliding exercises with hand therapy
  - NSAIDS
- Corticosteroid injection
  - Effective cure rates 62-100%
- Lack of improvement after 6-8 weeks
  - Surgical release



# DEQUERVAIN' DISEASE

- APL and EPB are within separate compartments
  - 30% - but higher in symptomatic people
- APL has multiple slips
  - 56-81% of the time
- Surgical treatment is curative
  - Return to full use 6 -12 weeks

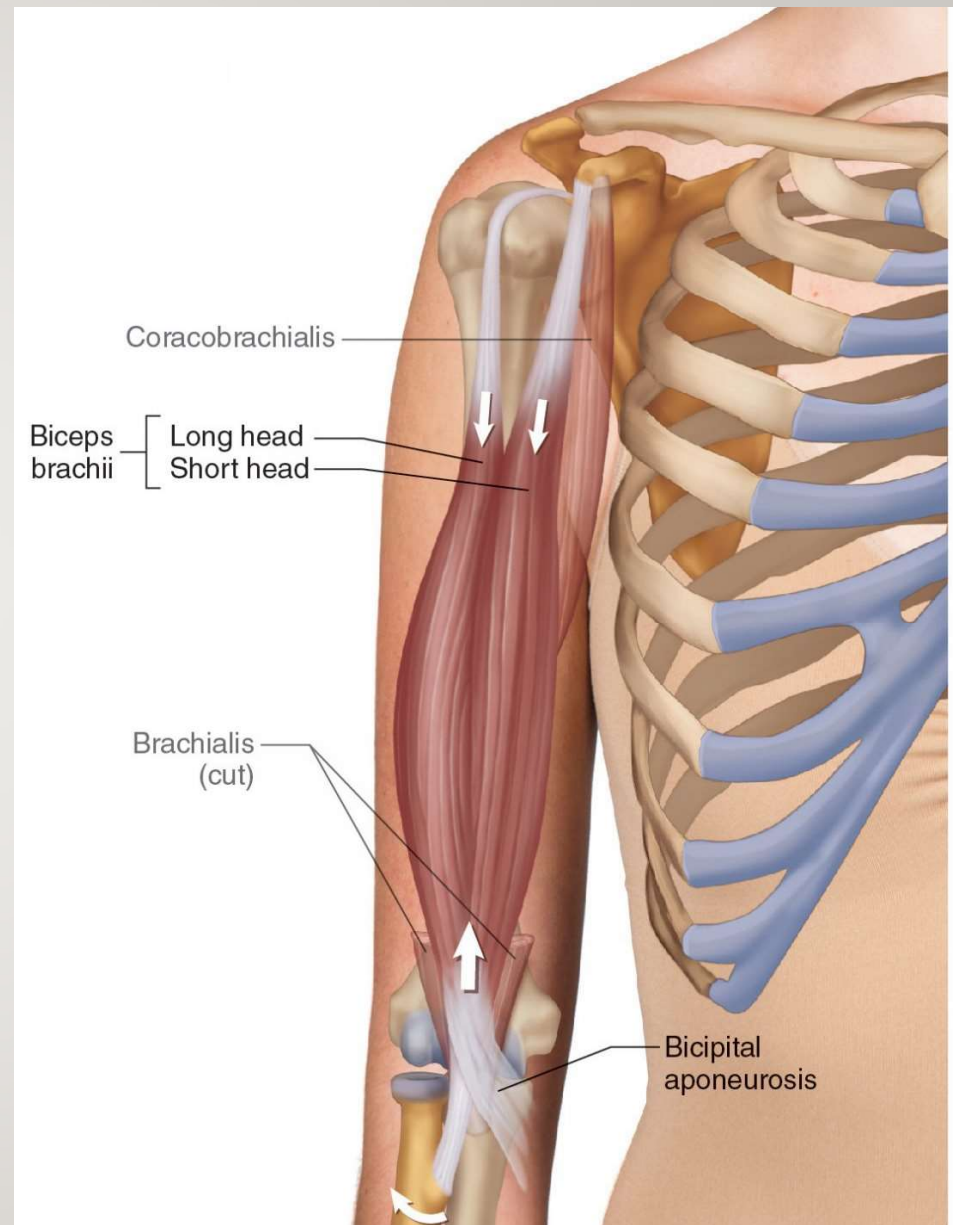
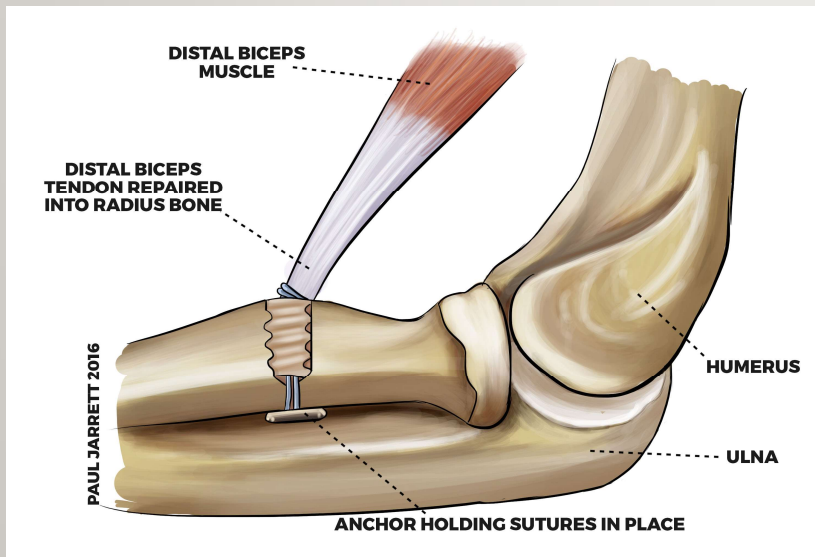


# DISTAL BICEPS RUPTURE



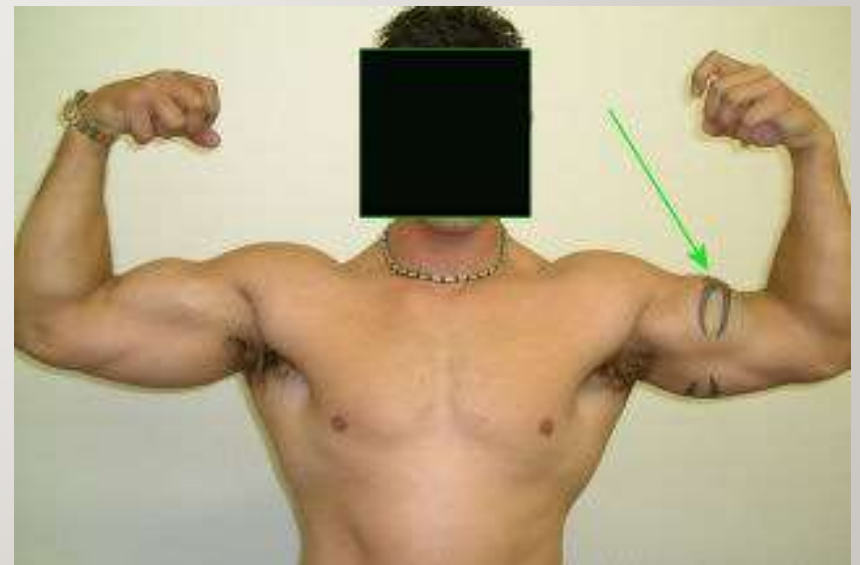
# DISTAL BICEPS RUPTURE

- Biceps muscle is responsible for flexing the forearm and supinating the forearm
- Two heads
  - Long head from intraarticular superior labrum
  - Short head from the corocoid process
- Inserts onto the biceps tuberosity of the radius



# DISTAL BICEPS RUPTURE

- Patients present with bruising or swelling in the antecubital fossa
- Felt a pop
- Often is a defect where the tendon used to insert
- Patients note weakness in elbow flexion and forearm supination
- May have pain and cramping of the biceps muscle

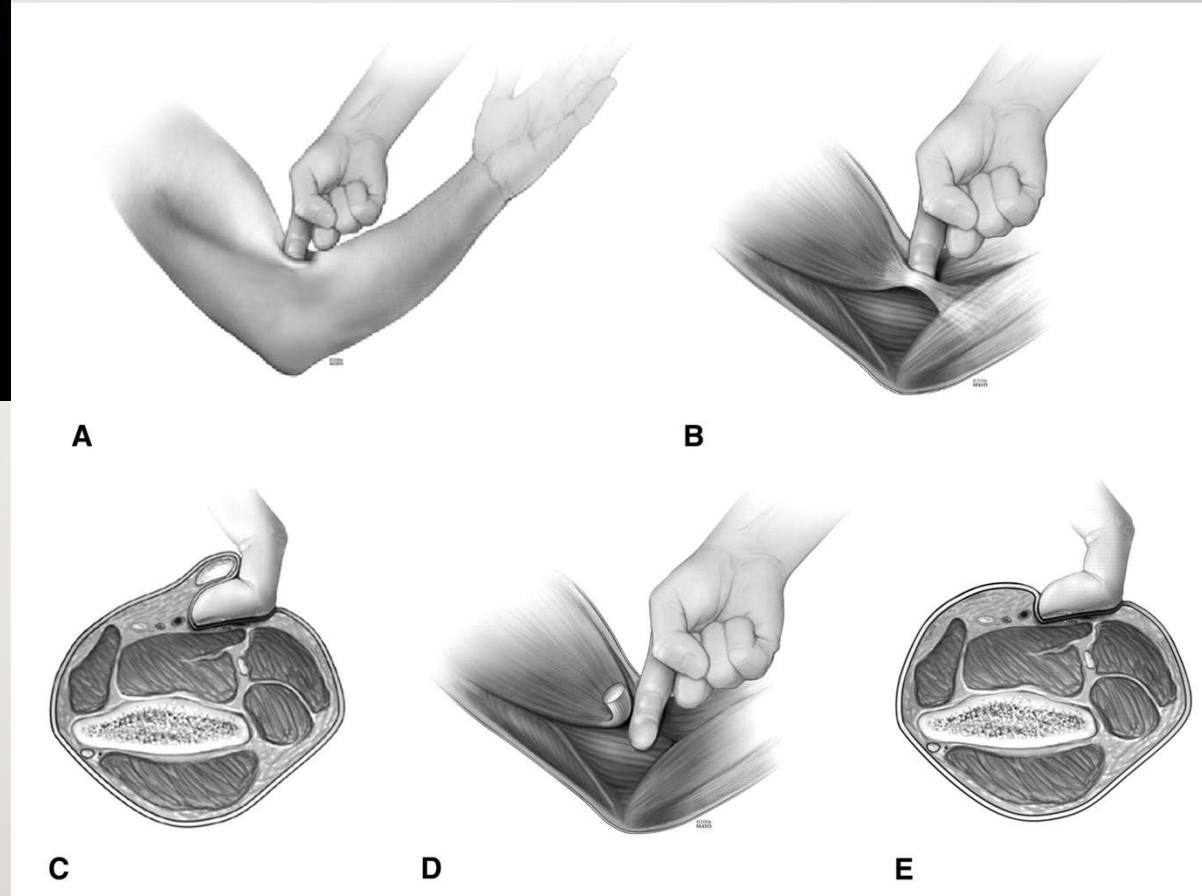


# DISTAL BICEPS RUPTURE

## Clinical Evaluation of Distal Biceps Tendon Rupture

### Hook Test

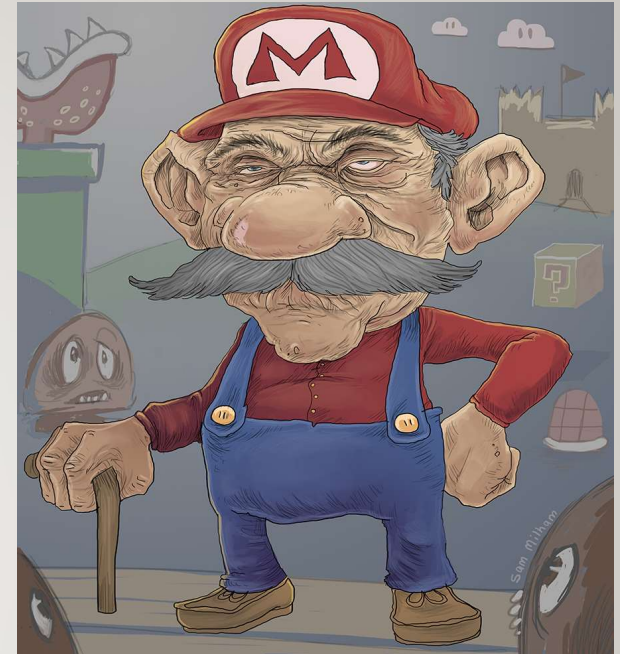
If the distal biceps tendon can be hooked from the lateral side of the elbow, then the biceps tendon is intact.



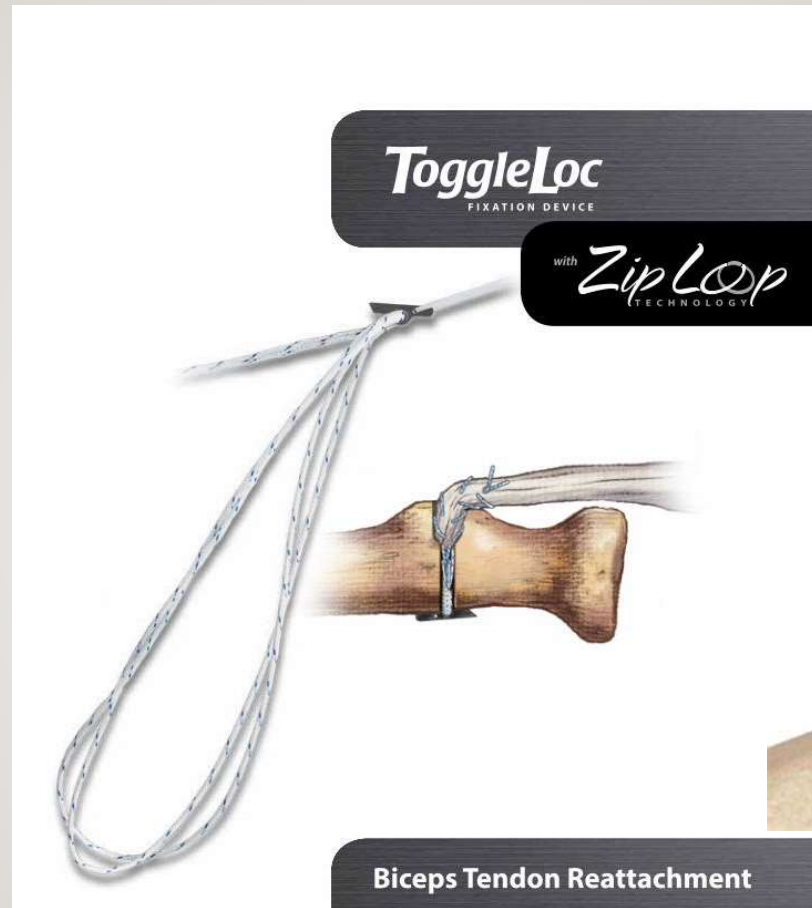
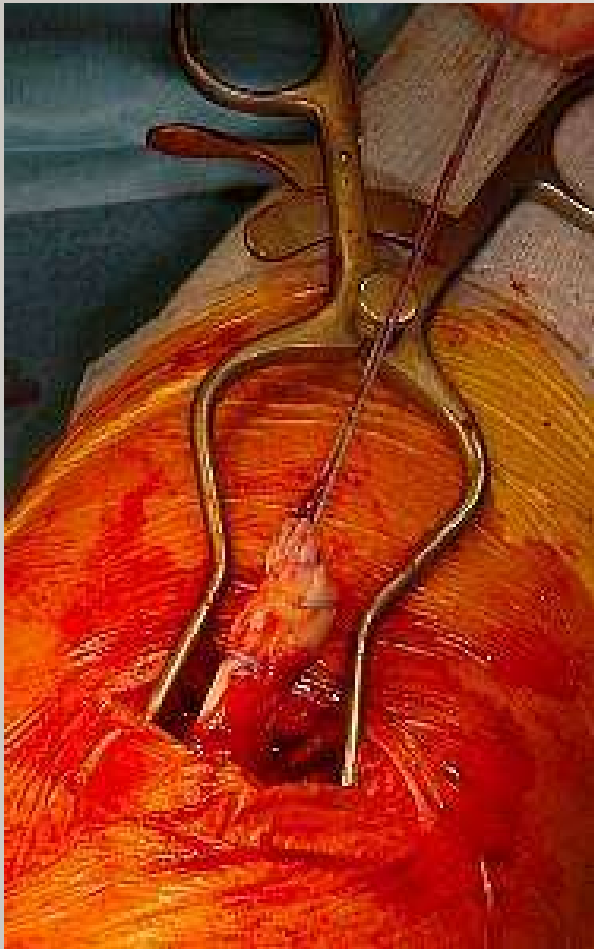


# DISTAL BICEPS RUPTURE

- Can be treated non-operatively – reserved for low demand, older
- Patient should expect 30% decrease in overall flexion strength and 40% decrease in supination strength
- Often can have continued cramping in the biceps muscle
- Surgical treatment – ideal within the first 2 weeks – primary repair
  - Tendon can shrink and lose elasticity
  - Delayed surgery – often requires allograft



# DISTAL BICEPS RUPTURE



# SURGERY

- One vs two incision technique
  - One incision less incidence of heterotopic ossification
  - Two incision technique – arguably more anatomic fixation
- Splint x 2 weeks
- Rehab - hinged brace weeks 2-6
  - Progressive extension 60, 40 20, 0 over 4 weeks
- Begin strengthening weeks 6-12
- Return to full ROM and VWB at 12 weeks
- May be delayed to 3 months if allograft is used
- High risk for injury to lateral antebrachial cutaneous nerve
  - N/T anterior lateral forearm
  - Usually transient

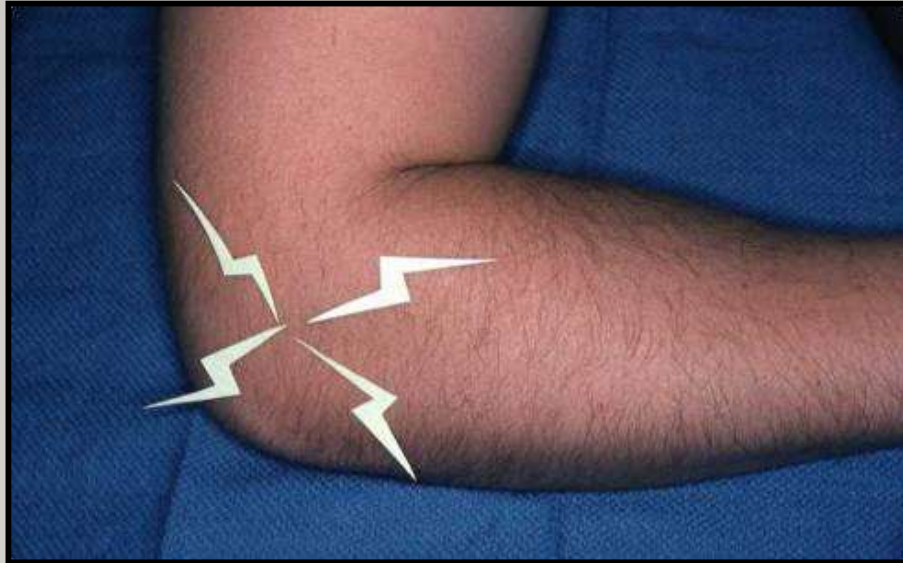




# TENNIS/GOLFER'S ELBOW

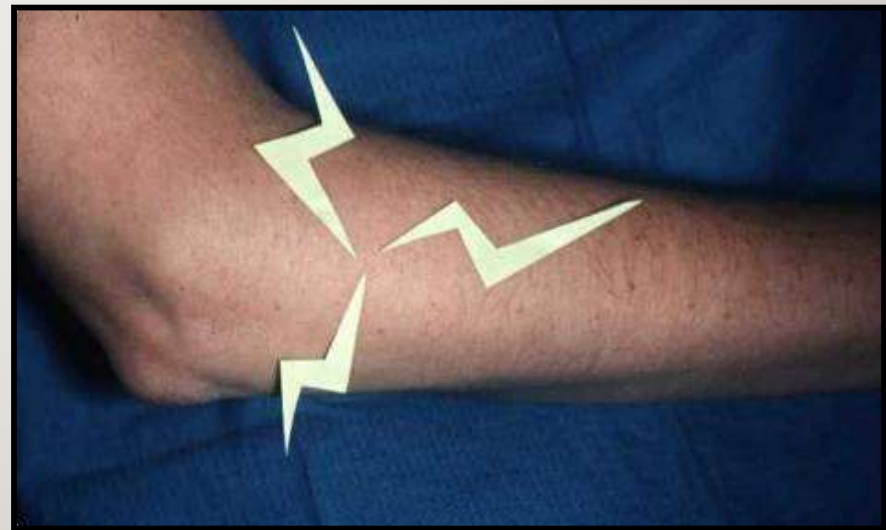
- Medial / lateral epicondylitis or tendinitis
- Stems from forceful repetitive elbow motion
- Not inflammation, therefore not “-itis”
- “Tendinosis” or “Tendinopathy” preferred but meaningless
- Mechanical overload → microtears  
→ mucinoid degeneration → partial tendon failure
- Tissue shows characteristics of degeneration of dense fibrous common extensor origin





Pain centered  
at  
lateral epicondyle:  
tennis elbow

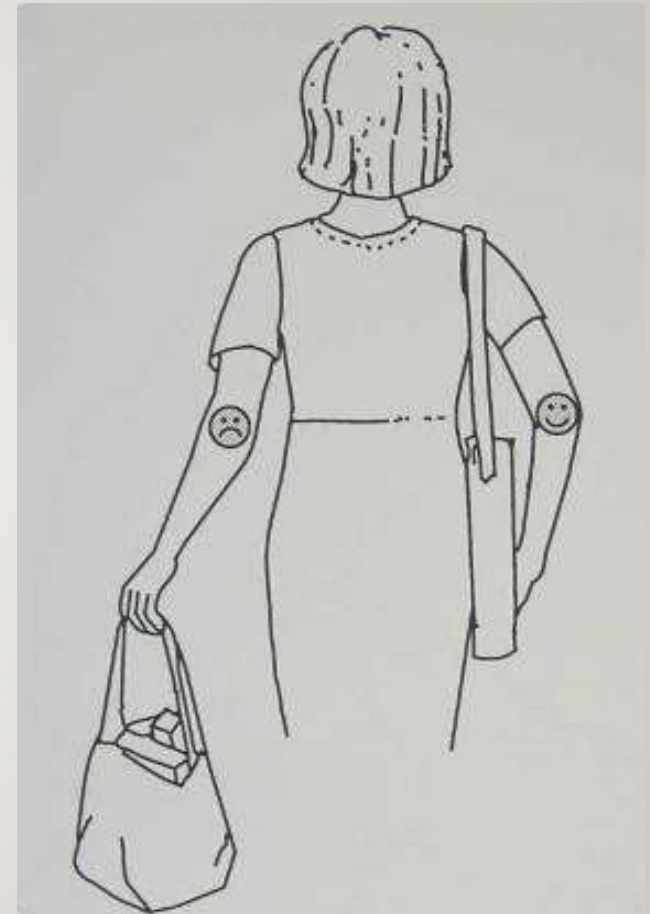
Pain distal  
to  
lateral epicondyle:  
radial tunnel  
syndrome





# TENNIS ELBOW TREATMENT

- Self limited disease – can last 12 to 18 months
- Avoid inciting activity
- Counter force / tennis elbow strap
- Heat, gentle stretching
- NSAIDs
- Steroids – decrease short term pain, prolong disease
- Surgical release - very rare





## MEDIAL EPICONDYLITIS: GOLFER'S ELBOW

- Much less common than lateral epicondylitis
- Avoid inciting activity
- Tennis elbow strap +/-
- Cortisone +/-
- Surgical release very rare
- Ulnar nerve nearby

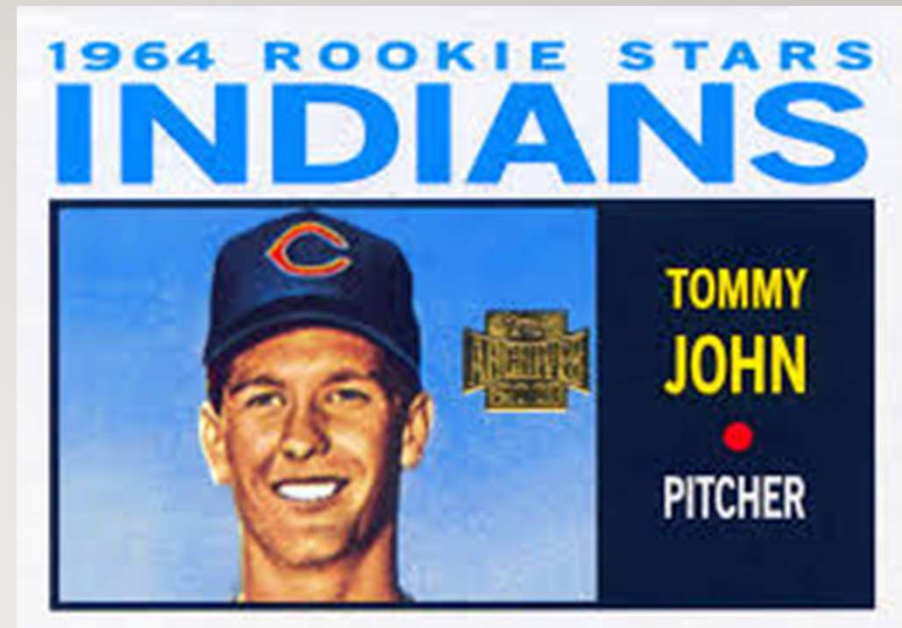


# TRIVIA!

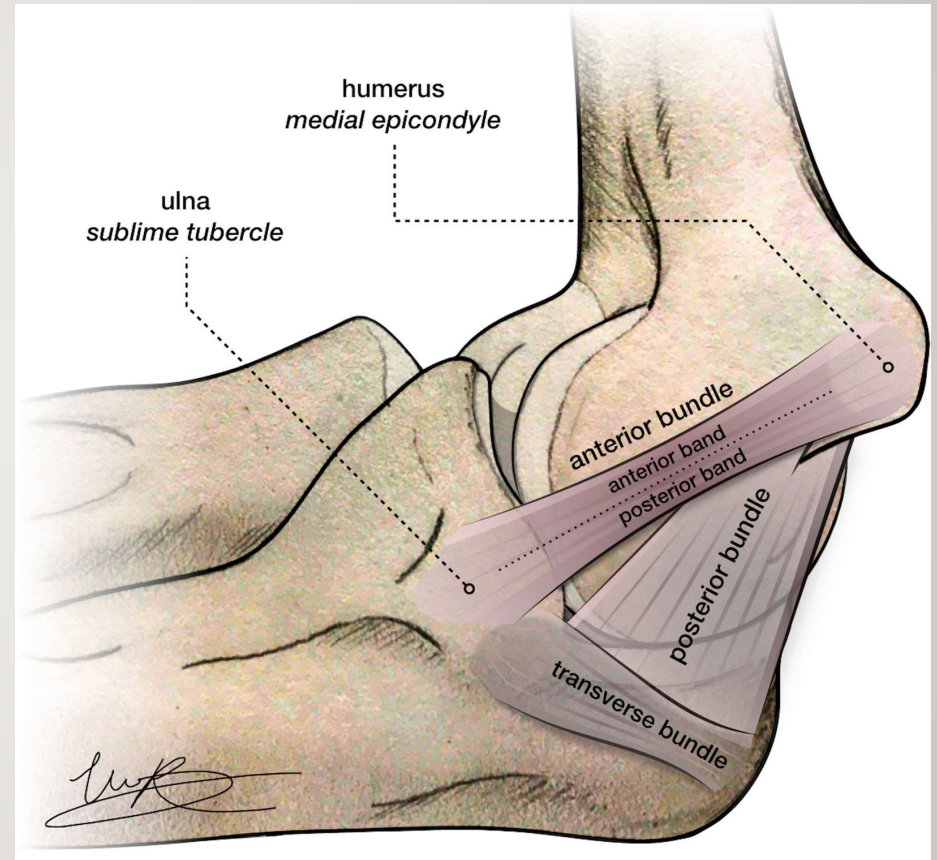
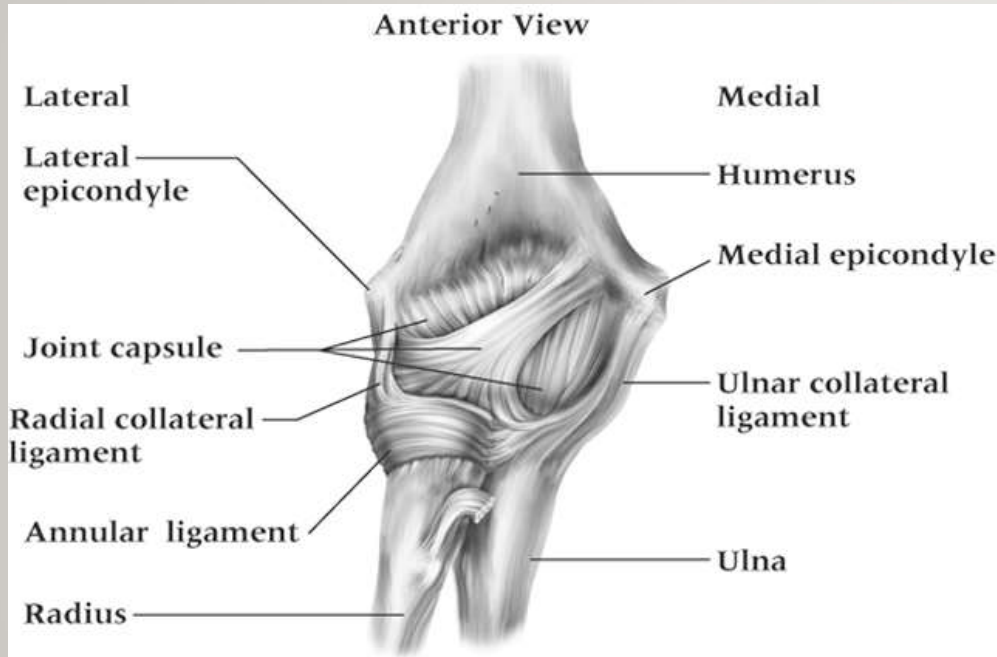


# TOMMY JOHN

- Medial ulnar collateral ligament injury
  - Reconstructed by Frank Jobe in 1974
  - 7<sup>th</sup> most victories among left handed pitchers
  - Before his surgery, John had won 124 games. He won 164 games after surgery, retiring in 1989 at age 46.
- 
- In our actual patients:
    - Overhead athletes acute injury or acute on chronic
    - Traumatic
    - Loss of velocity and pain



# MEDIAL COLLATERAL LIGAMENT



# MEDIAL COLLATERAL LIGAMENT

- Valgus stress
  - 30 deg extension, externally rotate humerus apply valgus force
  - 50% sensitive
- Milking maneuver
  - Flex to 90, grasp thumb and milk into valgus
- Moving Valus Stress test
  - Milking maneuver going from flex to extension and back between 70-120 deg
  - 100% sensitive, 75% specific



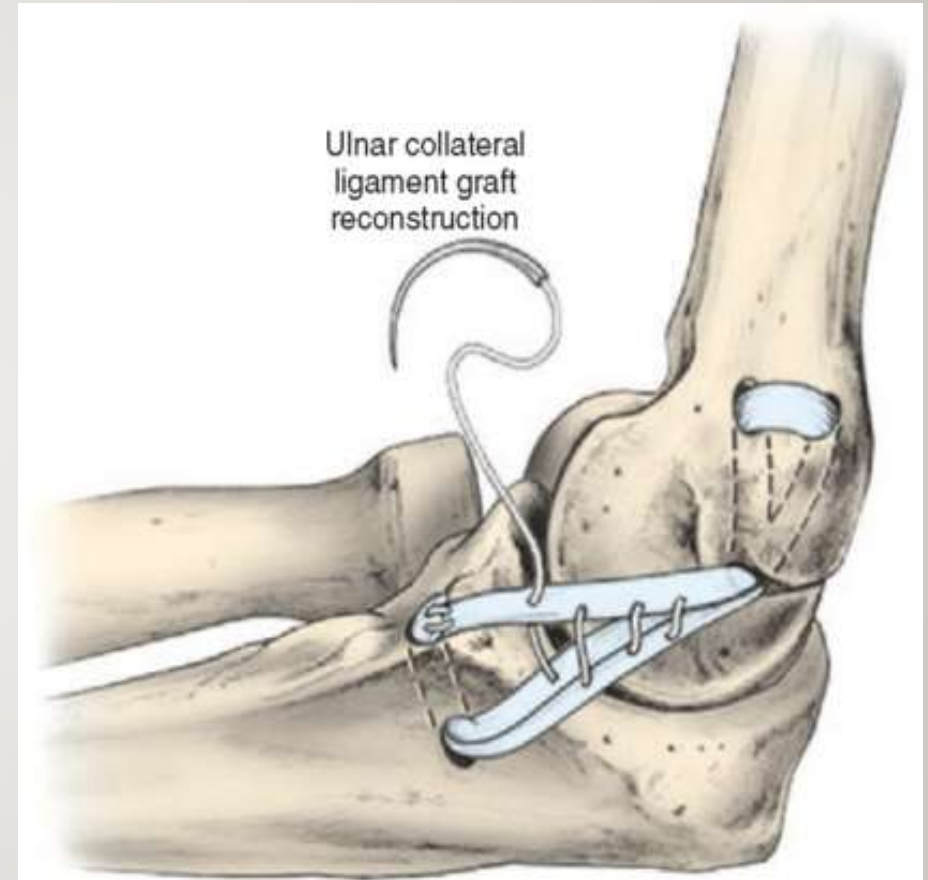
# MEDIAL COLLATERAL LIGAMENT

- Xray
  - Elbow series AP, lateral, oblique
  - Stress view
- MRI test of choice
  - Non need for contrast or arthrogram



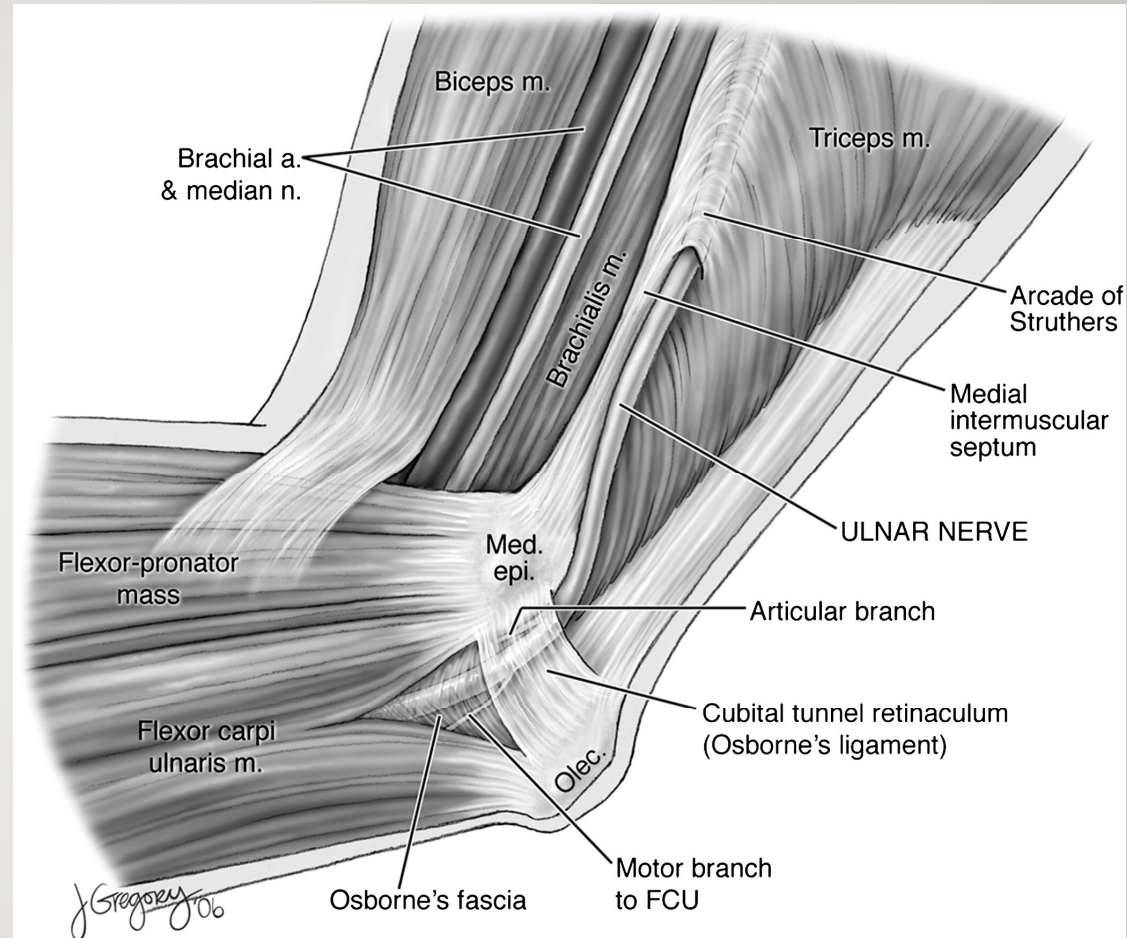
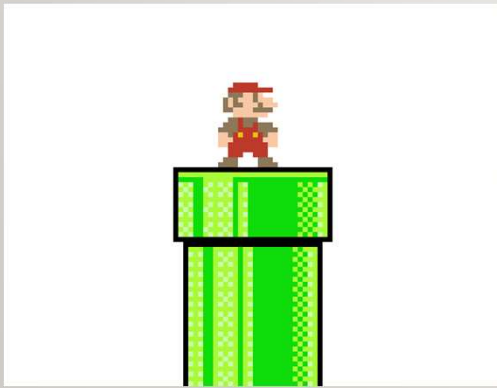
# MEDIAL COLLATERAL LIGAMENT

- Nonoperative
  - First line in most cases
  - 6 weeks rest
  - Begin strengthening program at 6 wks
  - 42% return to pre injury sport
- Operative
  - Tommy John Surgery
  - 90% Return to pre injury level ? bias
  - 12-15 months for pitchers, catchers
  - 6 months for fielders
  - 95% of original strength



# CUBITAL TUNNEL SYNDROME

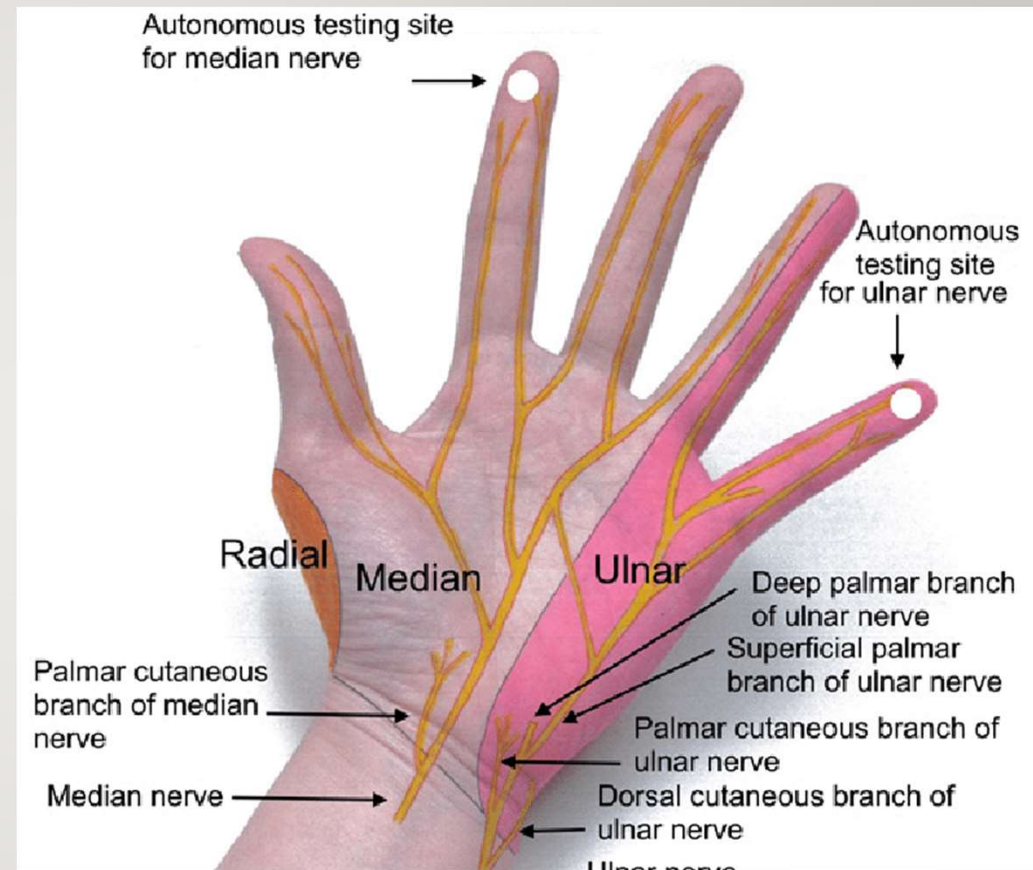
- Compression of the ulnar nerve at several points around the elbow
- Second most common UE compressive neuropathy
- Incidence: 25 per 100000 person years
  - USA: 75000 cases annually
  - World-wide: 1.5 million cases





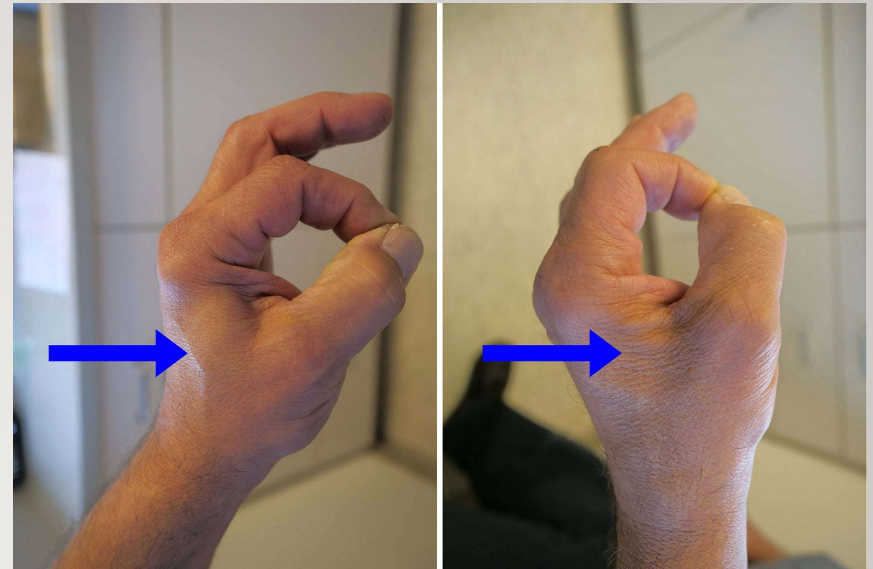
# CUBITAL TUNNEL SYNDROME

- History and clinical exam
  - Ulnar sided of hand N/T
  - Tinel's at elbow
  - Palpation of nerve subluxation at elbow
  - Ulnar nerve stretch test: elbow at 90, supination of forearm, extension of wrist



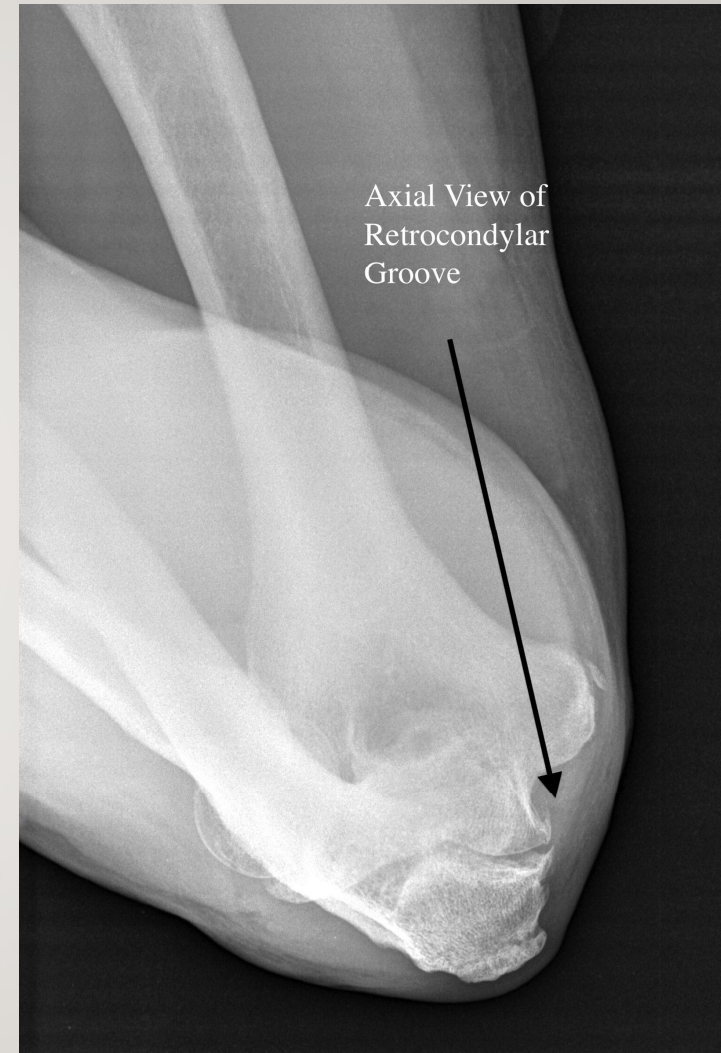
# CUBITAL TUNNEL SYNDROME

- History and clinical exam
  - Abductor weakness - Froment's sign
    - Compensatory flexion of FPL
  - Wartenberg's Sign:
  - Ulnar abduction of 5<sup>th</sup> digit due to due to intrinsic weakness and unopposed abduction by extensor digiti minimi (because of it's slightly ulnar insertion)
  - Ulnar nerve stretch test: elbow at 90, supination of forearm, extension of wrist



# CUBITAL TUNNEL SYNDROME

- EMG/NCS - When clinical exam is equivocal, work comp
  - Slowing across entrapment point
- Diagnostic Ultrasound:
  - Sensitivity 64-80%
  - Specificity 60-91%
- Suspect possible other cause:
  - polyneuropathy, motor neuron disease, etc.
- Xray: AP/Lateral, Cubital tunnel views
- R/O cervical origin, brachial plexus origin (TOS), Pancoast tumor
- Consider: c-spine films, spine consultation, CXR



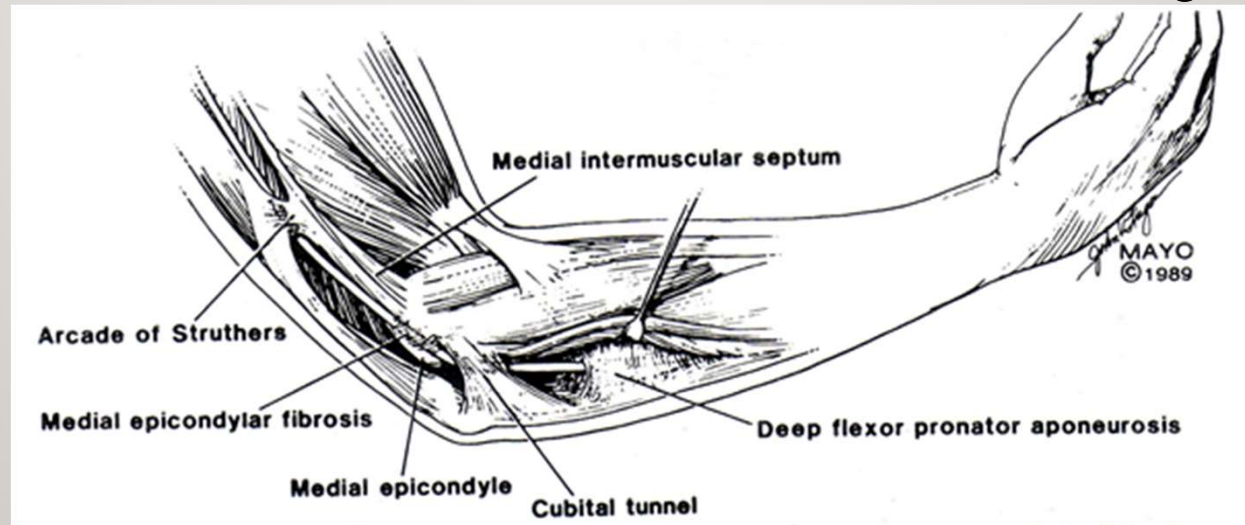
# CUBITAL TUNNEL SYNDROME

- Nonoperative
- NSAIDs: minimally helpful
- Extension splinting: 30-45° of flexion
  - May include wrist to rest FCU
- Activity modification
- Steroid injection: few advocates
- If no resolution or progressive sx's, consider operative treatment

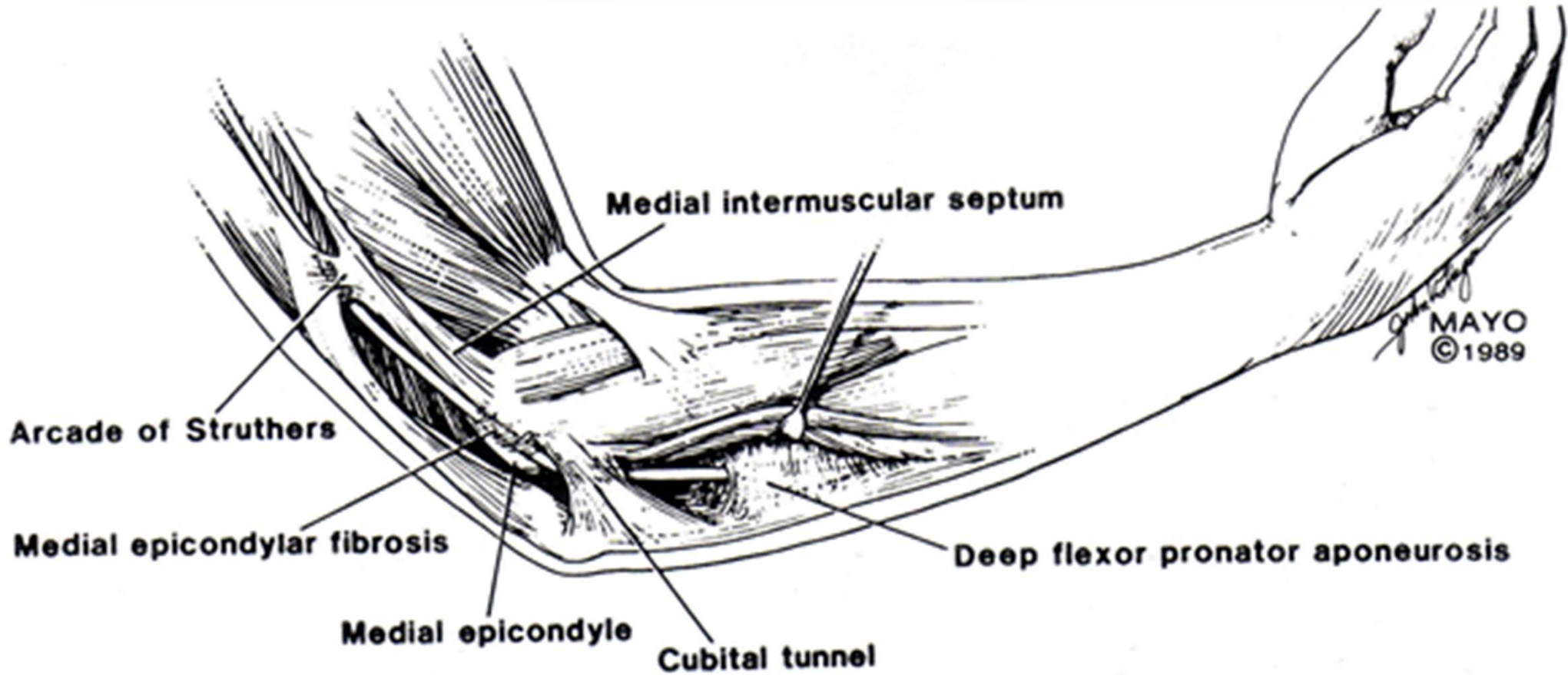


# CUBITAL TUNNEL SYNDROME

- Sites of Entrapment: 4 common sites
- Medial intermuscular septum, Arcade of Struthers
- Retroepicondylar groove
- Humeroulnar arcade (most common)
- Deep flexor pronator aponeurosis
- 30-50% of cases have no identifiable anatomic cause at time of surgery

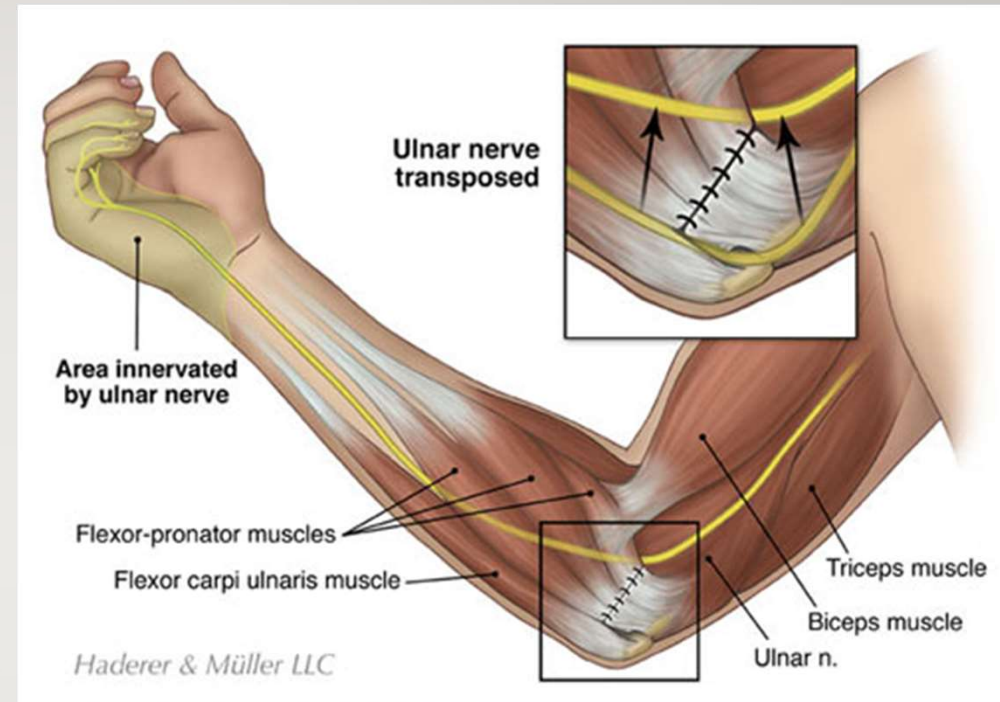


# CUBITAL TUNNEL SYNDROME



# CUBITAL TUNNEL SYNDROME

- Operative
  - Simple Decompression
  - Anterior Transposition
    - Submuscular or subcutaneous
  - Medial epicondylectomy - historic
- Outcomes
  - Intrinsic atrophy correlates with poor postop prognosis
  - Overall surgical success ~70% (34-87%)
    - Similar results in situ decompression vs transposition
  - Conservative treatment successful in 11-62%



MARIO  
393450

🍄 ×04

WORLD  
8-4

TIME  
224

THANK YOU MARIO!  
YOUR QUEST IS OVER.

