

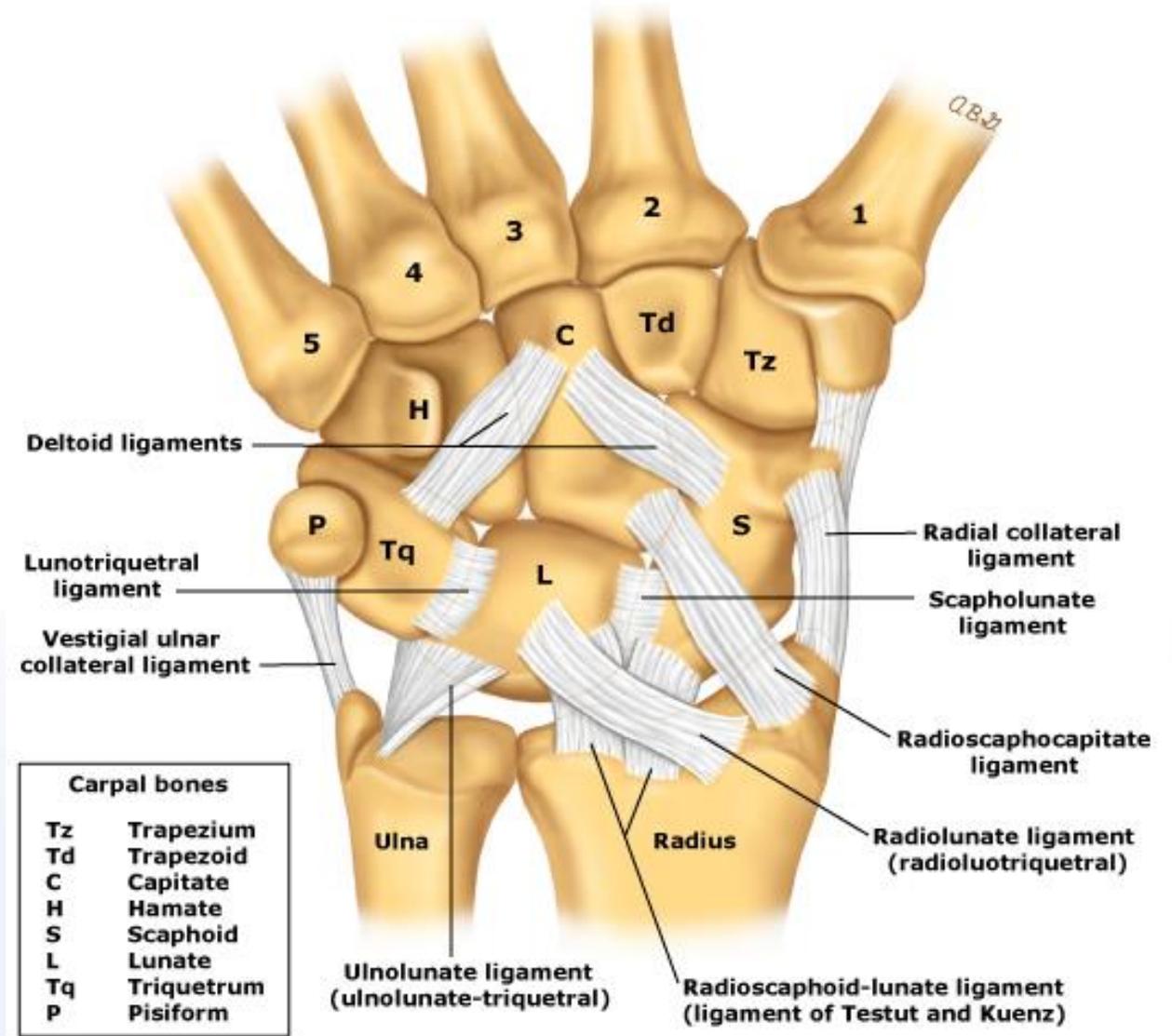
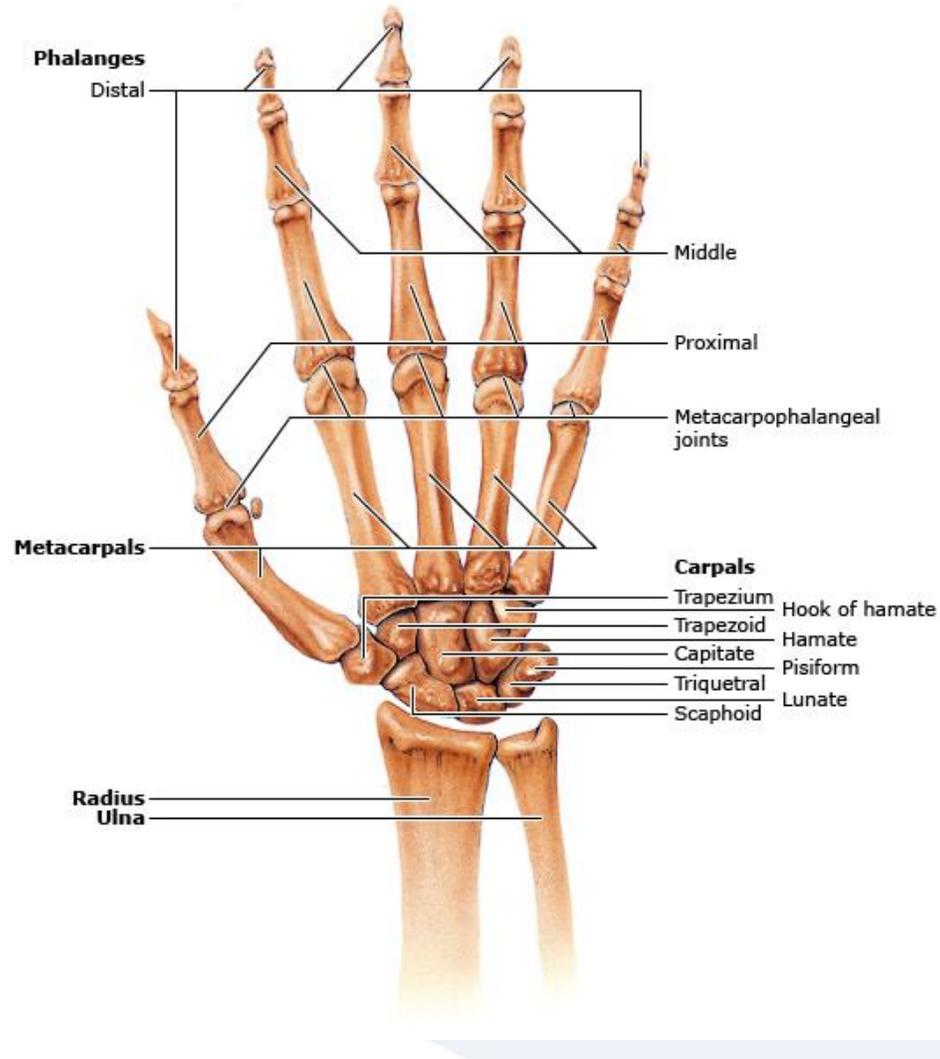
# Carpal Injuries and Management



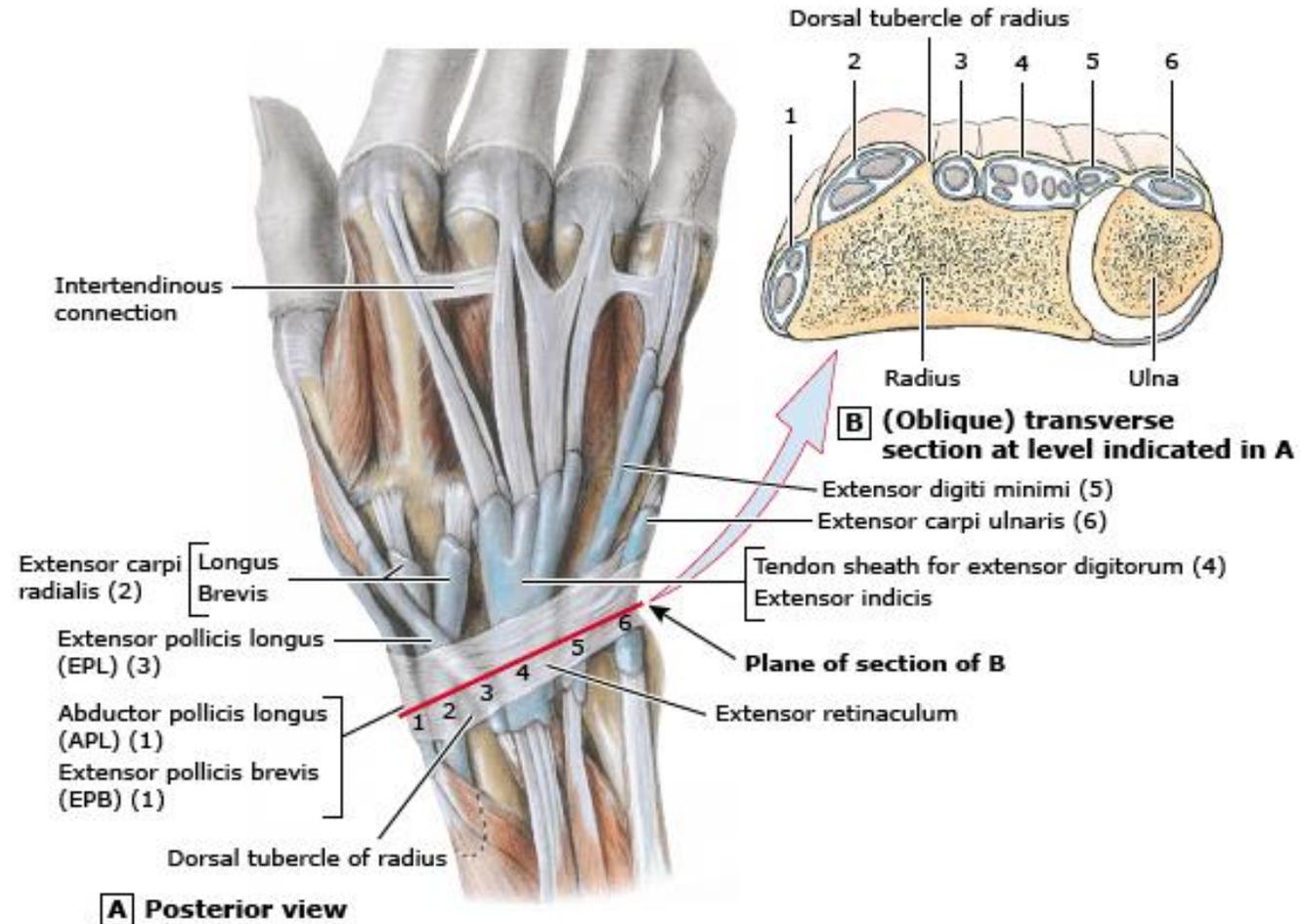
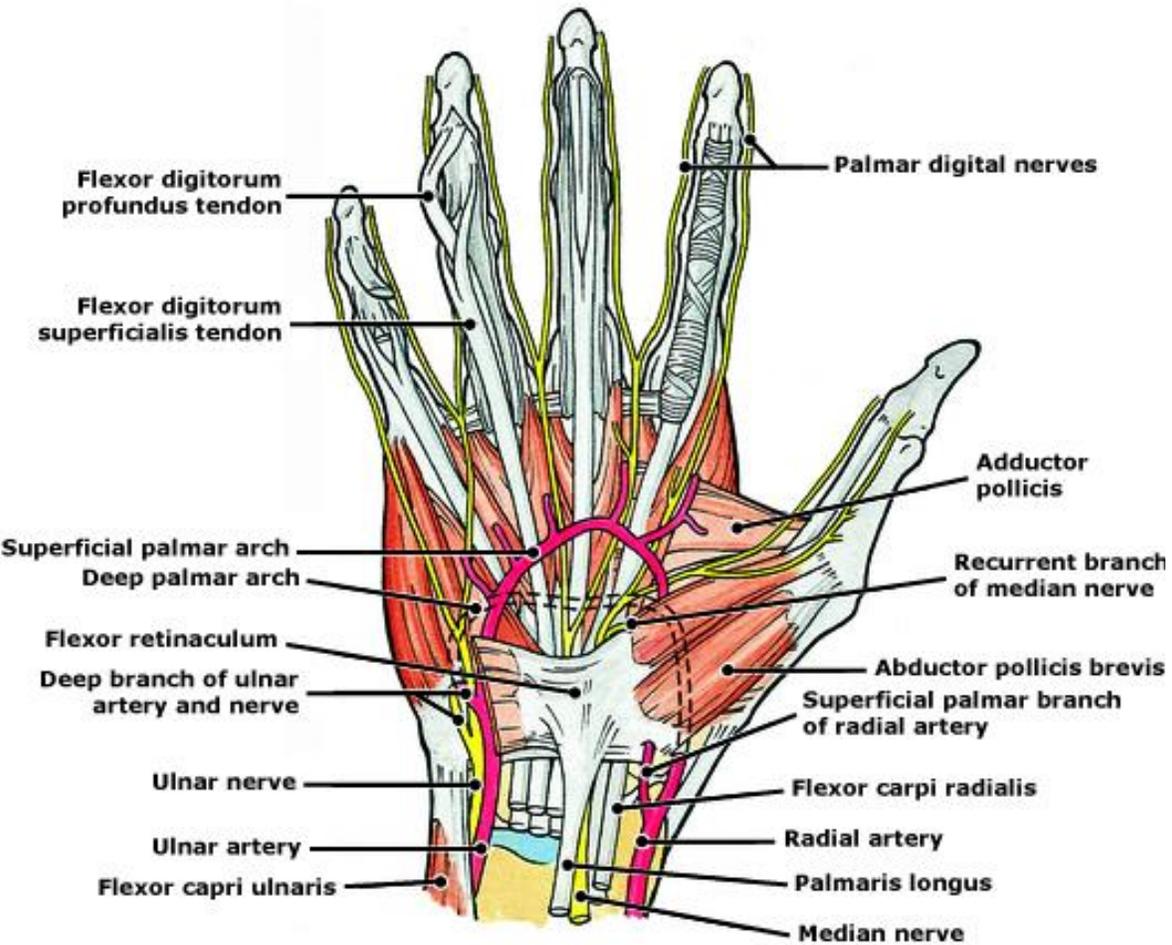
**Snehal C. Dalal, MD**  
**August 13, 2020**



# Wrist & Hand Anatomy



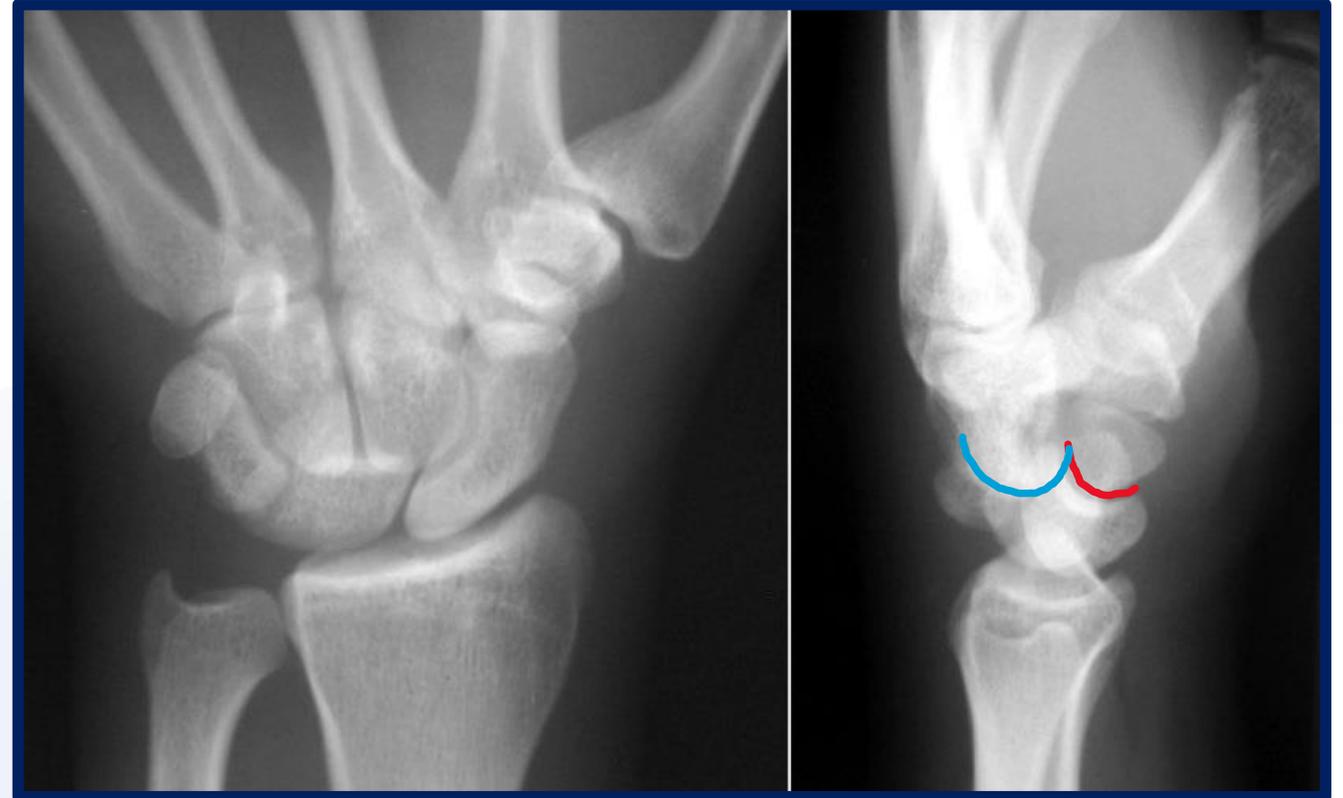
# Wrist & Hand Anatomy



# Perilunate Dislocation

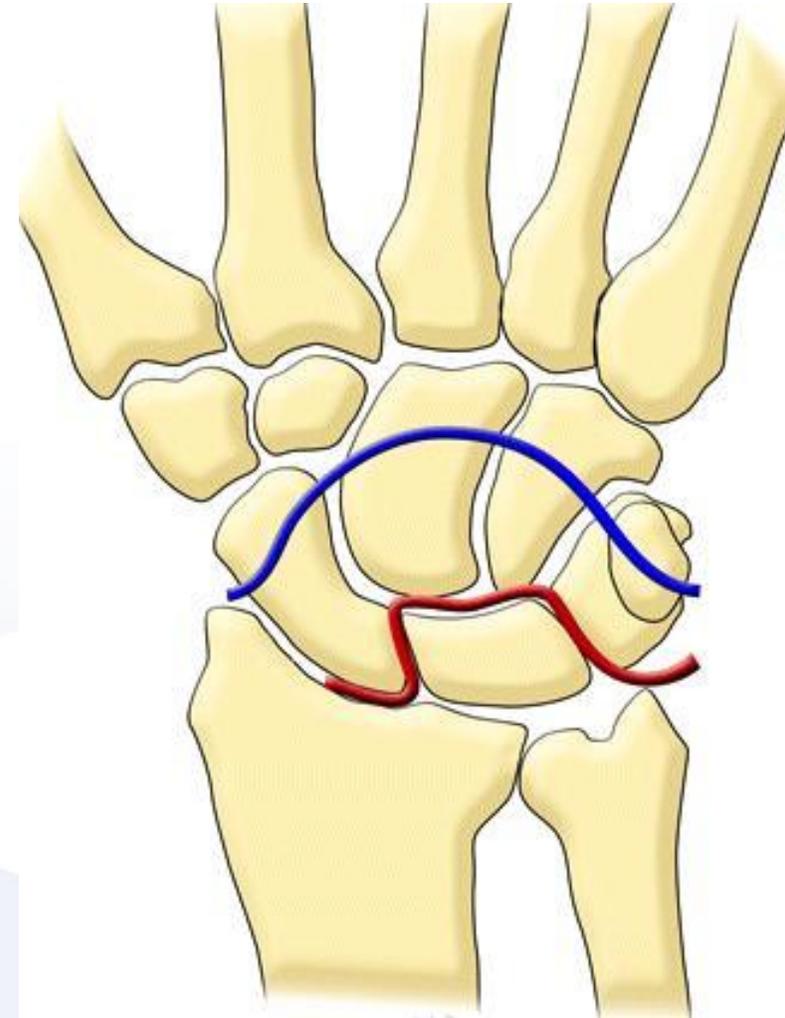
# Perilunate Dislocation

- ▶ High Energy injury with poor outcomes
- ▶ Commonly missed 25% of the time



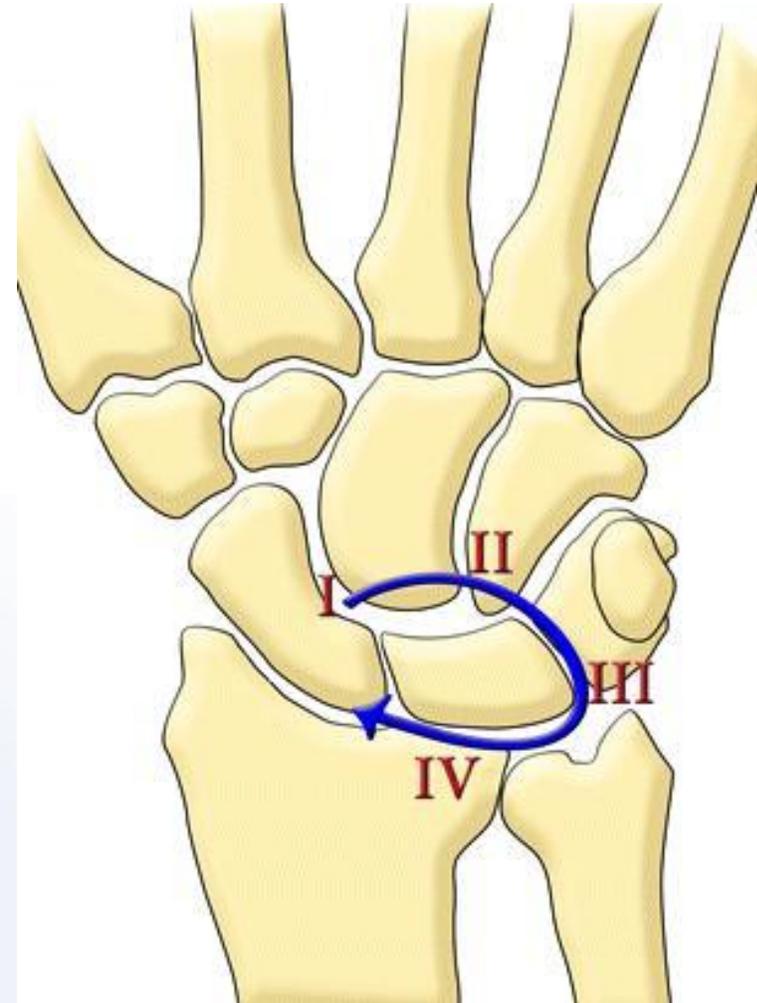
# Perilunate Dislocations

- ▶ 4 types
  - ▶ Trans-Scaphoid
  - ▶ Perilunate (lesser arc injury)
  - ▶ Trans-Radial Styloid
  - ▶ Trans-Scaphoid, Trans- Capitate
- ▶ Suspect ligament injury if radial styloid fracture seen



# Perilunate Dislocation

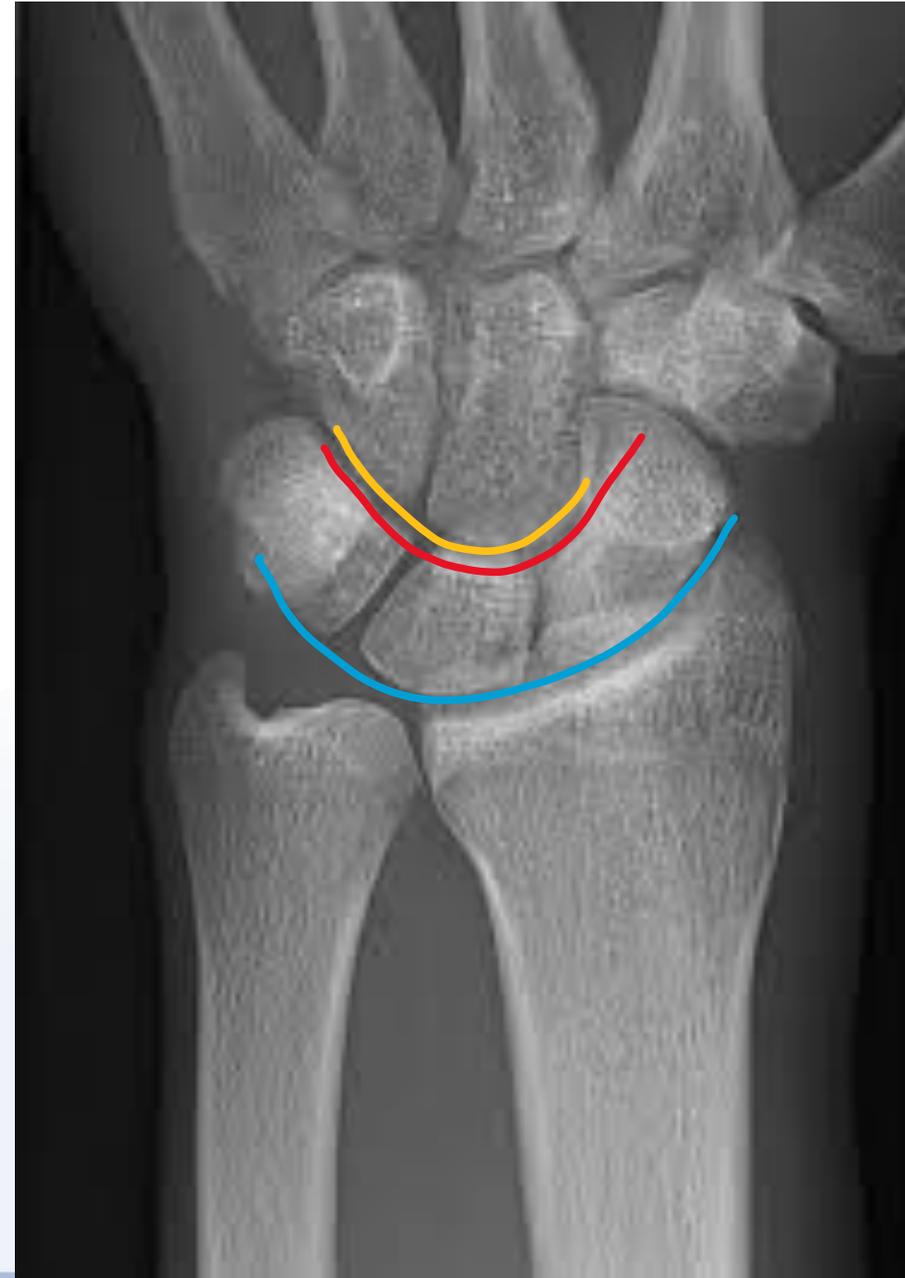
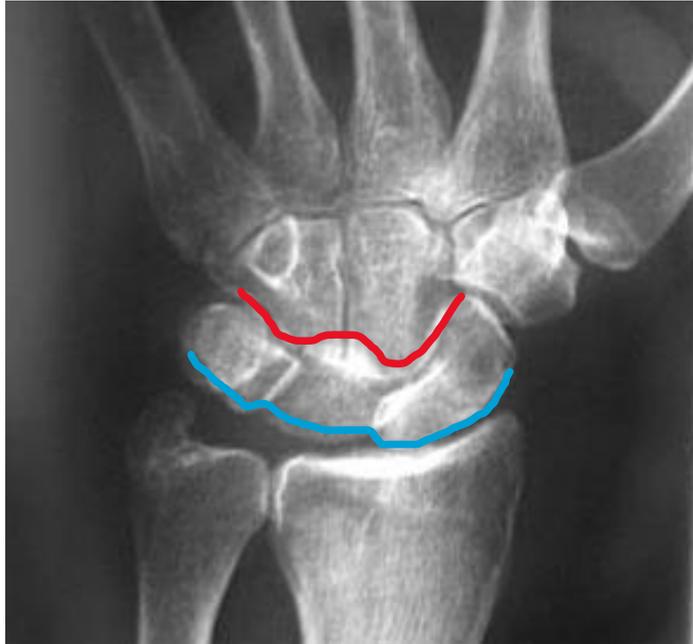
- ▶ Mechanism
    - ▶ Wrist Extension, Ulnar Deviation
    - ▶ Intercarpal Supination
1. Disruption of Scapholunate ligament
  2. Disruption of capitoulunate joint
  3. Disruption of lunotriquetral joint
  4. Failure of dorsal radiocarpal ligament
  5. Lunate dislocates in CARPAL TUNNEL



Mayfield Classification Level 1-4

# Radiographic Findings

- ▶ Loss of Gilula's arcs



# Radiographic Findings

- ▶ Piece of Pie Sign



- ▶ Spilled Tea Cup Sign



# Scapholunate rupture vs Trans-scaphoid fracture

- ▶ Emergent closed reduction required
- ▶ Avoid long term median neuropathy, occurs 25% of the time
- ▶ Definitive ligament repair and carpal tunnel release
  - ▶ 2 incision approach typical
  - ▶ Minimize volar approach to avoid carpal devascularization
  - ▶ Transient lunate ischemia 1-4 mos postop
- ▶ Delayed treatment:
  - ▶ PRC
  - ▶ Total wrist fusion/partial fusion



# Missed Trans-Scaphoid Perilunate Dislocation

- ▶ Don't get distracted by the obvious!



# Trans-Scaphoid Perilunate Dislocation

- ▶ Fixation

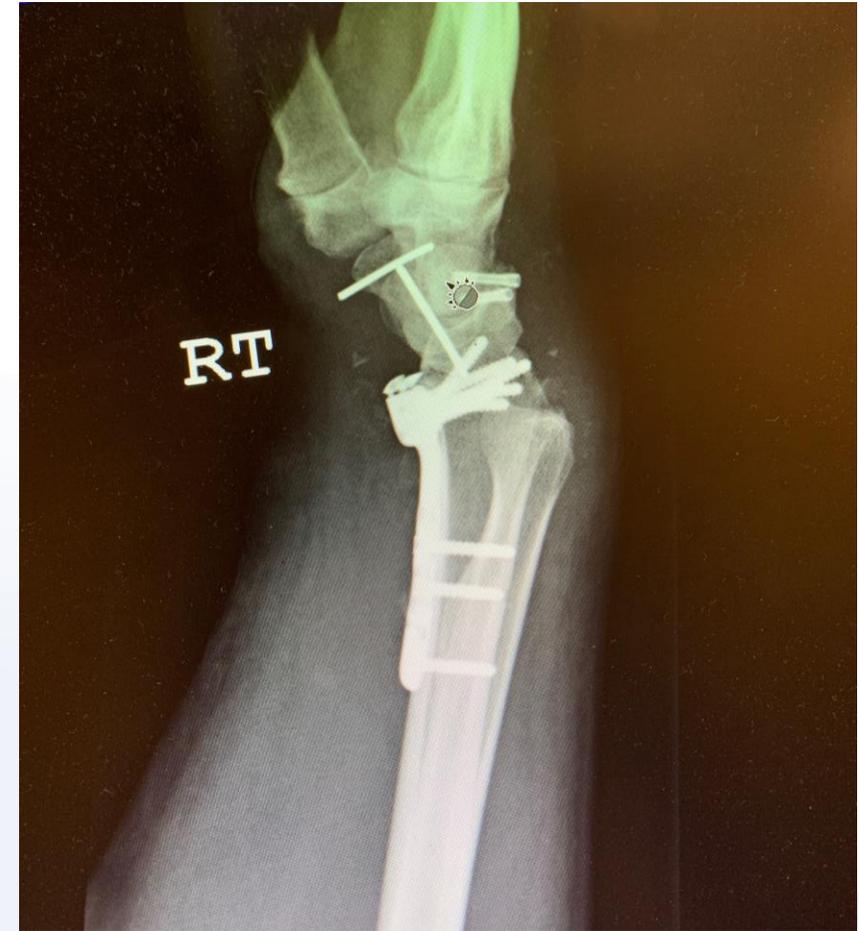
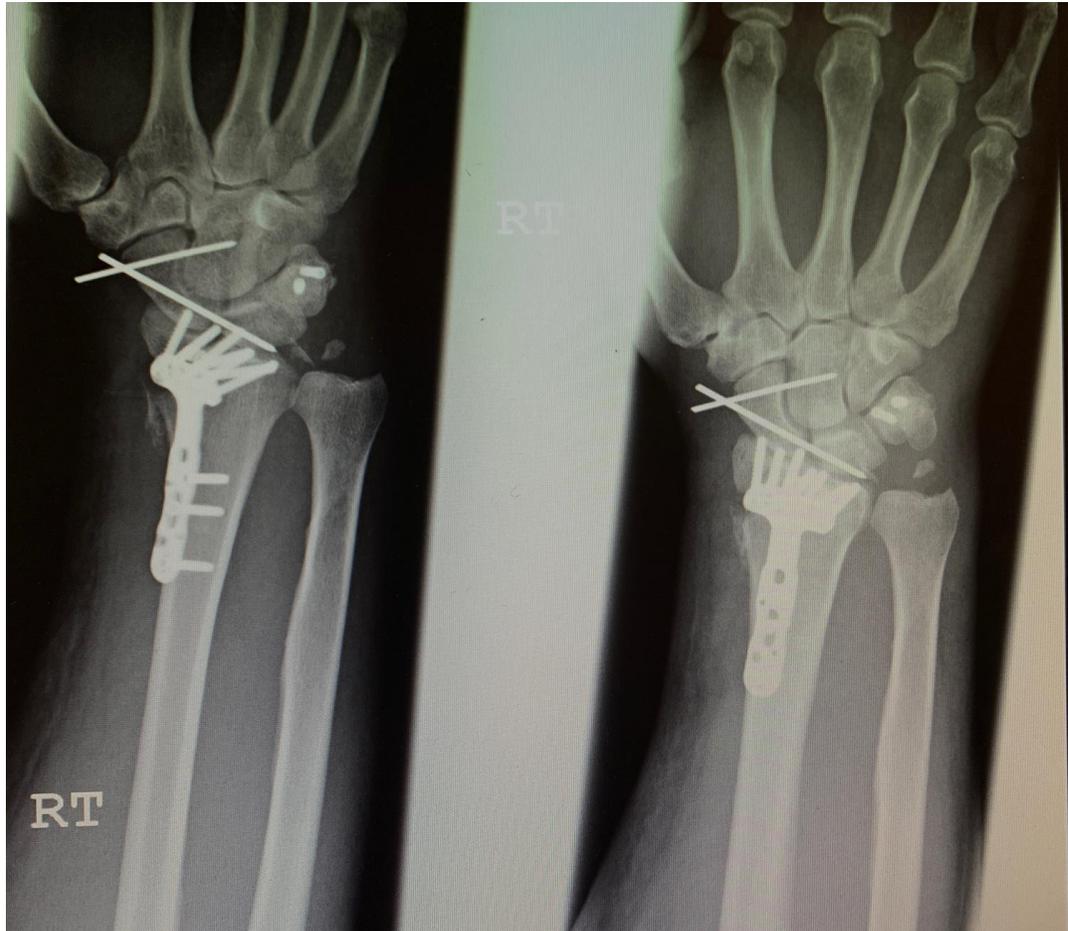




Smooth Intern

VR:

# Fixation of Mayfield 3: No lunate dislocation



# Scaphoid Fractures

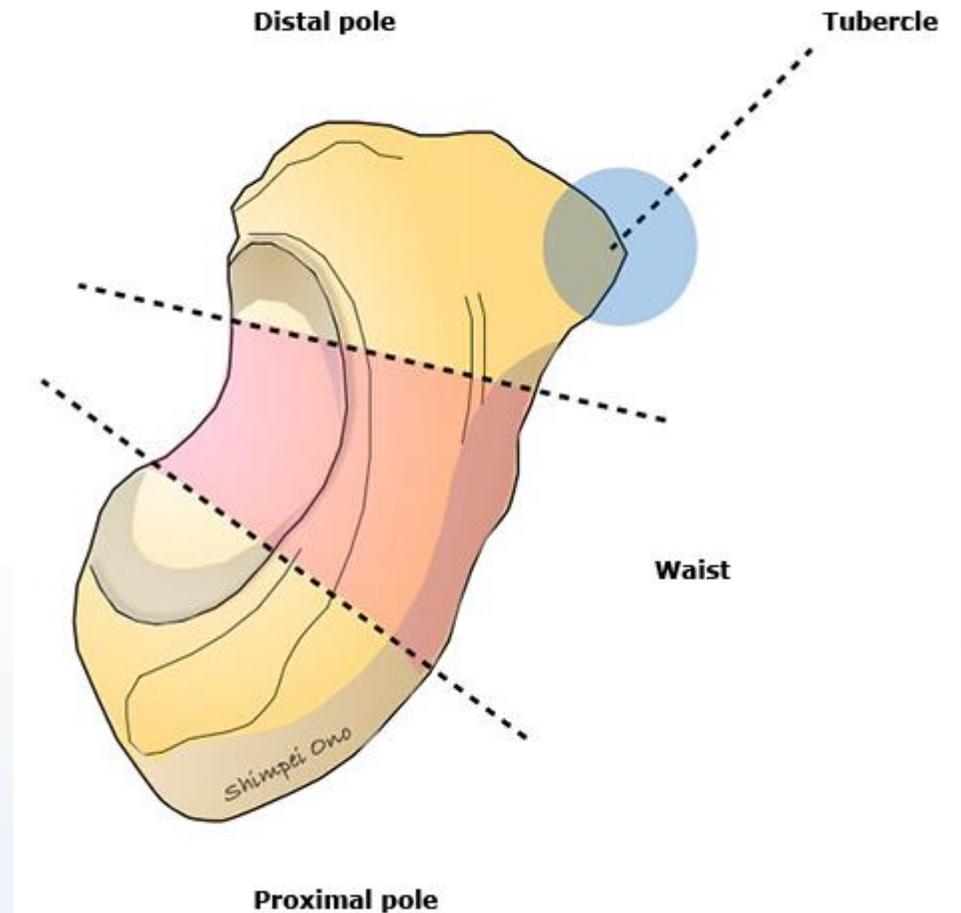
# Scaphoid Fracture

- ▶ One of the most common carpal fractures
- ▶ One of the HARDEST bones to heal in the body
  - ▶ Vascular supply disrupted
  - ▶ Avascular necrosis of proximal pole
- ▶ Non displaced fractures are only types treated nonoperatively – CONTROVERSIAL
- ▶ Refer all to an orthopaedic/hand surgeon



# Scaphoid Fracture

- ▶ Easily missed on x-ray
- ▶ Get ulnar deviated view
- ▶ High index of suspicion – snuffbox tenderness
- ▶ Radial pain despite “normal radiographs”

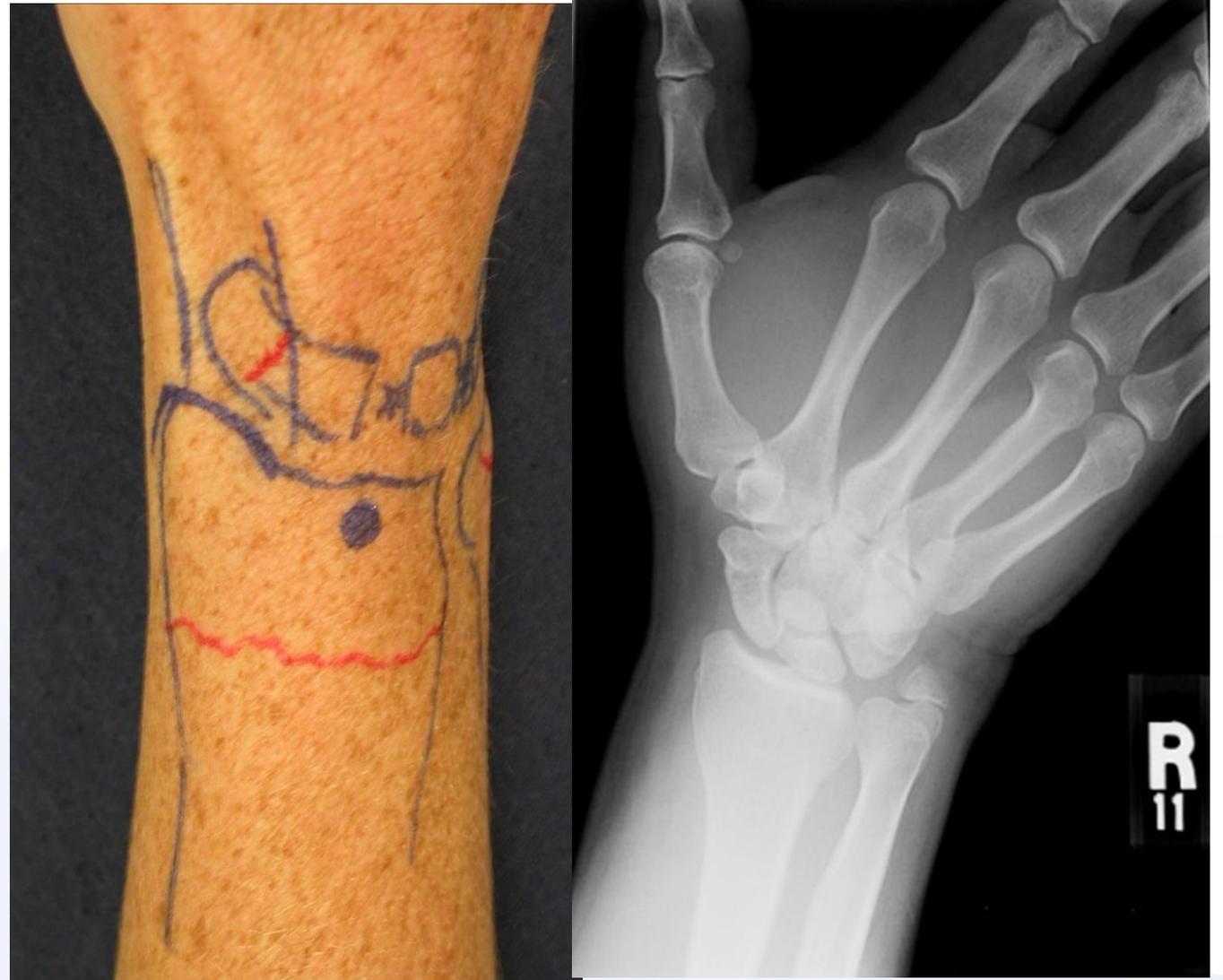


# Scaphoid Fracture Types

- ▶ Distal 10%
- ▶ Waist 65%
- ▶ Proximal 25%
  - ▶ Proximal 1/3: 33% AVN rate
  - ▶ Proximal 1/5: 100% AVN rate
- ▶ Mechanism
  - ▶ Axial load with hyper-dorsiflexed, pronated and ulnarly-deviated wrist

# Evaluation

- ▶ Snuffbox tenderness
- ▶ Volar scaphoid tubercle tenderness
- ▶ Scaphoid compression test thru thumb metacarpal



# Treatment

- ▶ Thumb spica cast
  - ▶ **Short arm** vs. long arm
  - ▶ 90% union if <1mm displacement
  - ▶ Distal or waist fractures
- ▶ Use of bone stimulator
  - ▶ PEMF
- ▶ Surgical fixation
  - ▶ Displaced or proximal pole



# Proximal Scaphoid fracture



# Scapholunate ligament Rupture

# Wrist Sprain

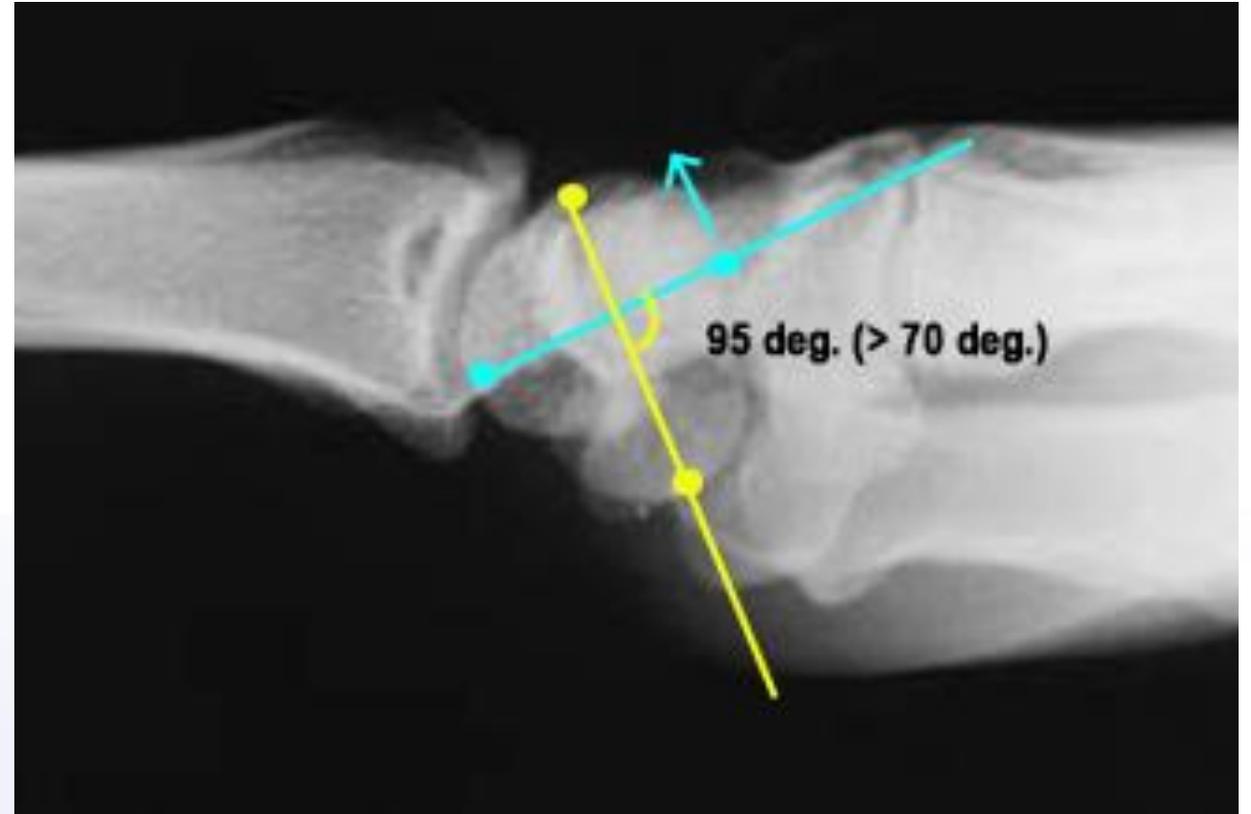
- **Diagnosis of exclusion**
- More severe injuries such as scaphoid fracture, distal radius fracture, or other carpal bone fractures must be ruled out with x-ray
- Associated with mild pain or stiffness and normal range of motion and negative x-rays
- If fracture is suspected but x-rays are negative at first visit, immobilize in splint or brace and return to clinic in 2 weeks for repeat x-rays
- Most sprains resolve in 2-4 weeks with conservative therapy (ice, immobilization, gentle passive stretching exercises)

# Scapholunate Ligament Rupture

- ▶ Most common and significant wrist ligament injury
  - ▶ Up to 30% of all carpal and intraarticular distal radius fractures
- ▶ Hyperextension of the wrist in ulnar deviation and carpal supination
- ▶ Wrist pain with limited motion, may mimick scaphoid or distal radius fx
- ▶ Degenerative in 50% of people over 80 y/o

# Evaluation

- ▶ Clenched fist PA wrist
  - ▶ Exaggerates the diastasis
- ▶ Contralateral view
- ▶ Lateral View
  - ▶ Scapholunate angle  $>70$  deg
- ▶ Arthroscopy is the gold standard in evaluation





What do these two have in common?



“Terry Thomas Sign”

# Scapholunate Ligament Rupture



# Scapholunate Ligament Rupture

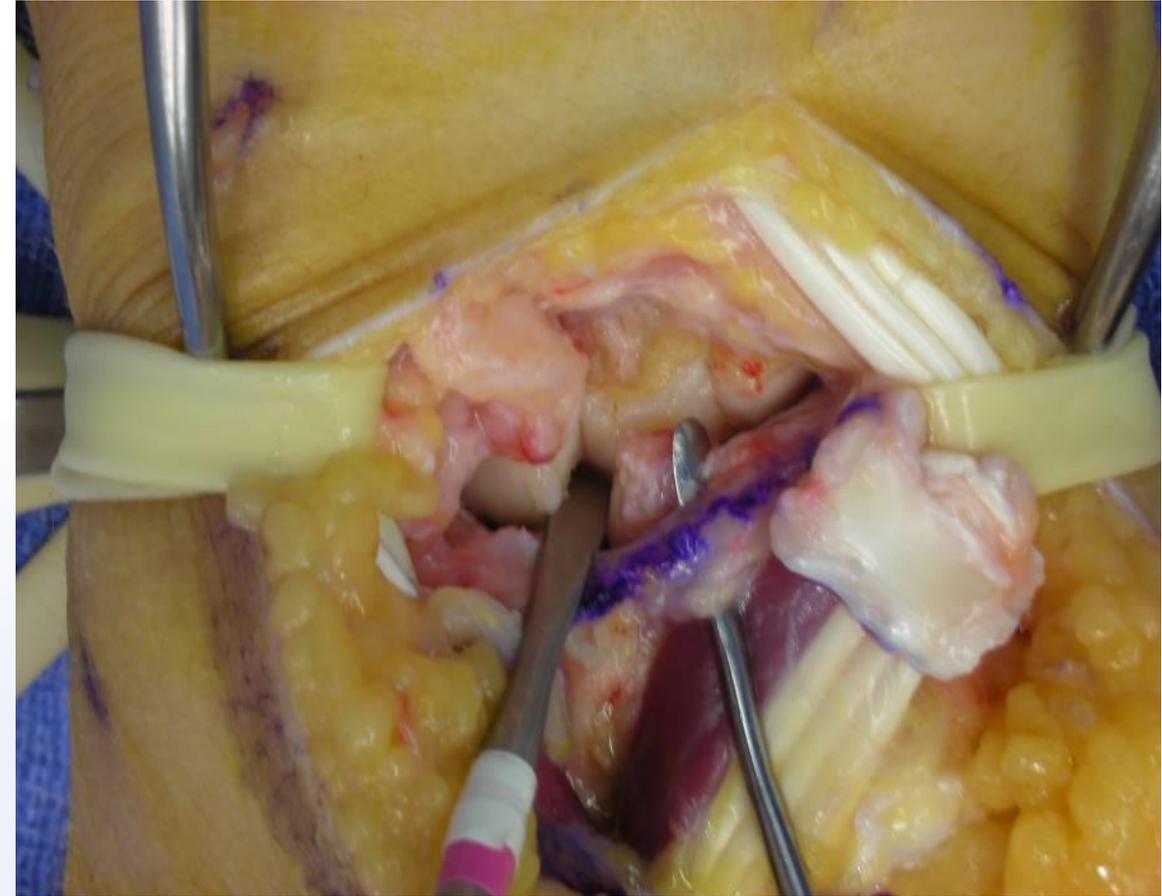
## Treatment

- ▣ Surgical problem
- ▣ Initially immobilize with a thumb spica splint
- ▣ Within 3 months:
  - ▣ Primary ligament repair
- ▣ After 3 months:
  - ▣ Ligament reconstruction or salvage procedure if arthritis has set in



# Treatment

- ▶ Immobilization
  - ▶ Partial tears
  - ▶ Degenerative Tears
- ▶ Scapholunate repair
  - ▶ <18 months with good carpal alignment
  - ▶ Adjunct with Blatt Capsulodesis
- ▶ Scapholunate reconstruction
  - ▶ >18 months or with DISI deformity
  - ▶ FCR tendon transfer
  - ▶ ECRB tenodesis
- ▶ Partial Fusion
  - ▶ STT fusion
  - ▶ Scapholunocapitate fusion



# Lunotriquetral Ligament Rupture

- ▶ Rupture of lunotriquetral ligament and dorsal radiocarpal ligament
- ▶ Scaphoid takes lunate into flexion
- ▶ Xray may be normal
- ▶ Exam
  - ▶ Lunotriquetral Shuck Test
  - ▶ Kleinman's Sheer Test
  - ▶ Lunotriquetal compression test
- ▶ VISI on xray
  - ▶ Scapholunate angle  $< 30$  deg. (normal 45 deg)



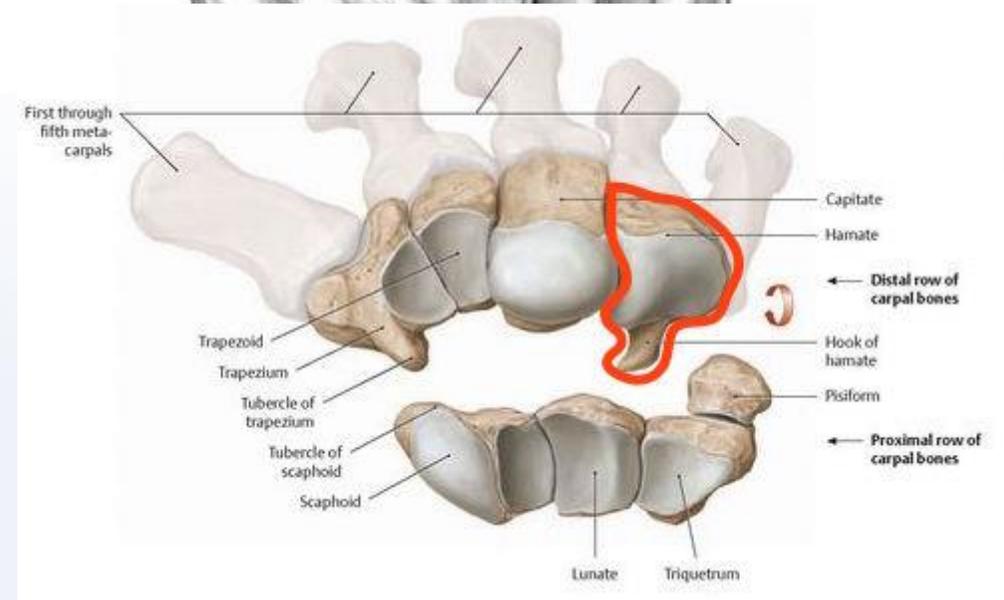
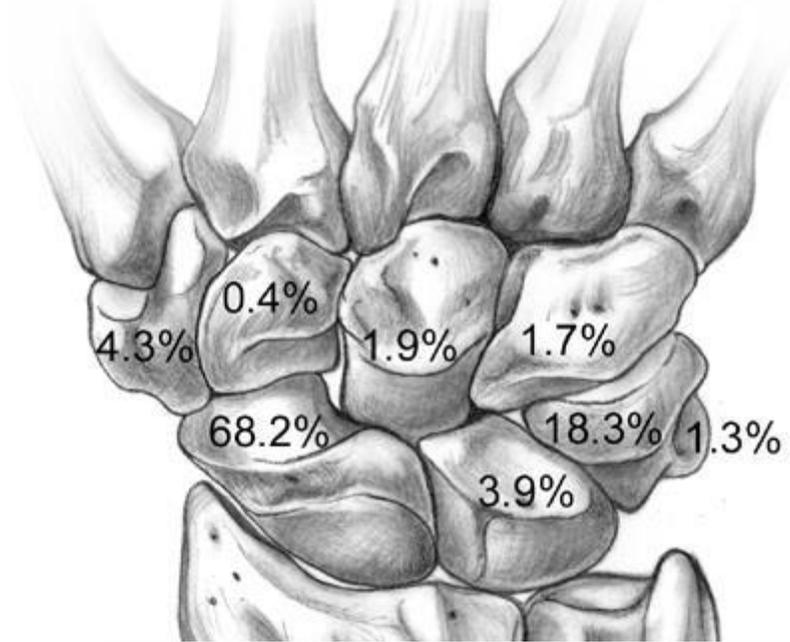
# Treatment

- ▶ Lunotriquetral Repair/ Reconstruction with dorsal capsulodesis and pinning
- ▶ LT fusion out of favor, high nonunion
- ▶ LT debridement with ulnar shortening osteotomy

# Hamate Fracture

# Hamate fracture

- ▶ Type I : hook
  - ▶ Most common
  - ▶ Direct blow to ulnar palm
    - ▶ Golf, falls, ulnar hammer
- ▶ Type II: body
  - ▶ II a : transverse
  - ▶ II b: coronal
    - ▶ Involves 4<sup>th</sup> and 5<sup>th</sup> metacarpal articulation
  - ▶ Usually from direct blow with clenched fist



- ▶ External Rotation Oblique
- ▶ Carpal Tunnel view



# Examples



# Missed!

- ▶ Don't be distracted by the obvious!!



# Triquetrum Fracture

- ▶ Second most common carpal fracture
- ▶ Impaction
  - ▶ Wrist dorsiflexion and ulnar deviation
- ▶ Avulsion
  - ▶ Wrist flexion and radial deviation
- ▶ Shearing
  - ▶ Hamate against triquetrum in forced extension
- ▶ Body (7%)
  - ▶ Associated with Perilunate dislocations, 25% of the time



# Important Ligaments

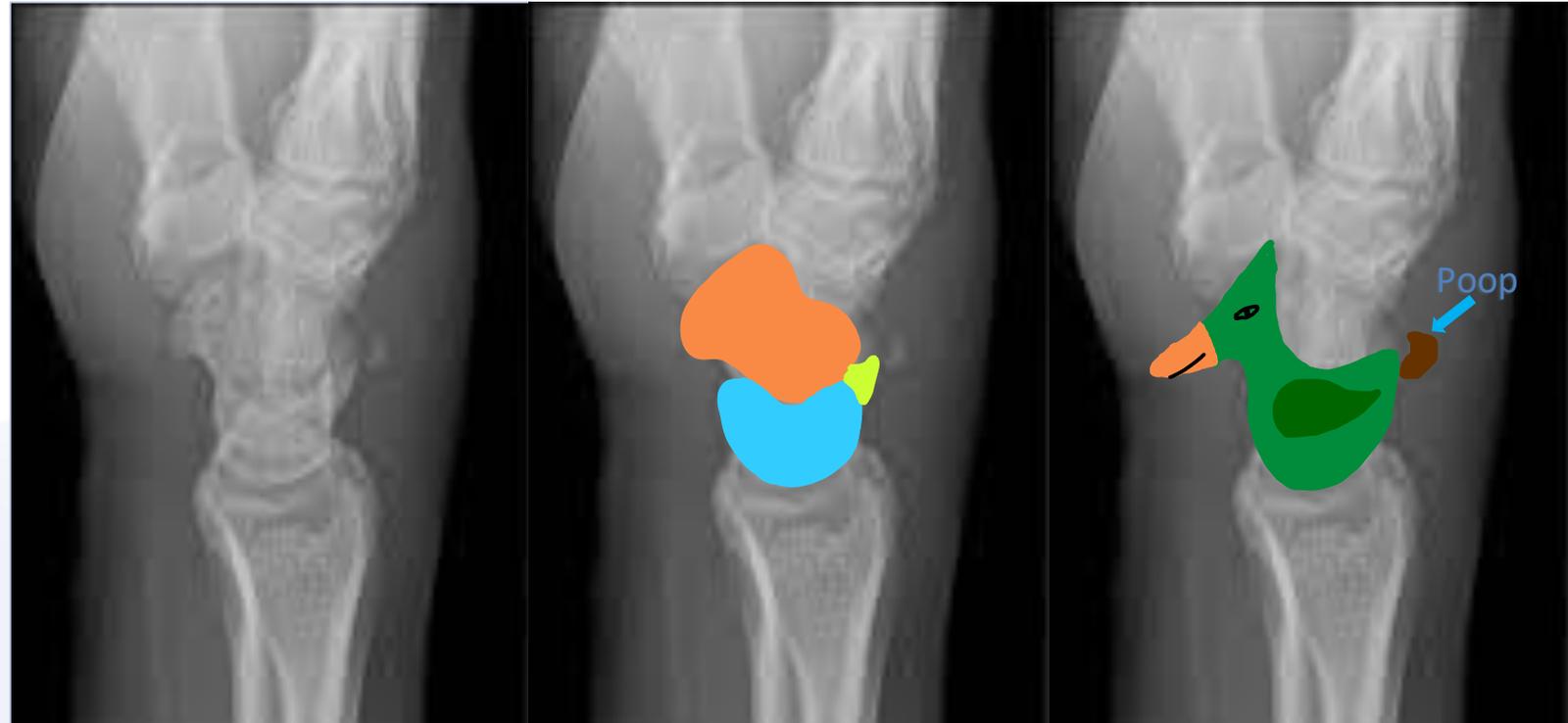
- ▶ Dorsal radiocarpal ligament (DRC)
  - ▶ DR to dorsal triquetrum
- ▶ Dorsal intercarpal ligament (DIC)
  - ▶ Dorsal triquetrum to dorsal scaphoid/ trapezoid/ trapezium

# Instability

- ▶ Ulnotriquetral ligaments insert
- ▶ Volar avulsion fractures can lead to instability
  - ▶ Volar LT ligament is the thickest
  - ▶ Obtain MRI for these

# Radiographic evaluation

- ▶ Lateral view:  
pooping duck sign
- ▶ Consider CT scan /  
MRI
- ▶ May lead to  
instability or  
pisotriquetral  
arthritis





# Thank you

*(and thank God for fall football)*



SEPT 3 <b>I</b> AT ILLINOIS THURSDAY	SEPT 12 <b>R</b> RUTGERS	SEPT 19 <b>P</b> AT PURDUE	SEPT 26 <b>Ψ</b> INDIANA
OCT 3 <b>BYE</b>	OCT 10 <b>N</b> NEBRASKA	OCT 17  AT MICHIGAN STATE	OCT 24 <b>M</b> MICHIGAN
OCT 31 <b>M</b> AT MARYLAND	NOV 7  AT PENN STATE	NOV 14 <b>BYE</b>	NOV 21  IOWA