



EM CASES SUMMARY

Episode 189 Wrist Injuries Part 1

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General principles in assessing wrist injuries

- Consider **age-related prevalence** when constructing an orthopedic differential diagnosis. Pediatric patients and older adults have weaker long bones than young adults; they are more likely to sustain a distal radius fracture after a FOOSH than a carpal bone injury. Carpal bone injuries occur almost exclusively in young adults.
- Knowing the **surface anatomy** of the wrist bones is essential to accurately diagnose commonly missed wrist injuries
- **Volar injuries** (eg Smith's, volar Barton's) occur with a force to the back of the hand, are generally more unstable compared to dorsal injuries (eg Colles) requiring more urgent orthopedics involvement for consideration of surgery as well as above elbow splint
- **DRUJ** has been called the "forgotten joint of the wrist" and requires careful consideration in all wrist injuries, an

awareness of the pronation/supination mechanism of injury, specific physical exam maneuvers and immobilization with an above elbow splint

Wrist physical examination for commonly missed and mismanaged wrist injuries: Know the surface anatomy

It is important to complete a thorough wrist exam *before* ordering/interpreting the x-ray to help narrow your differential diagnosis and guide the x-ray request.

Active range of motion (ROM) followed by ROM against resistance should precede palpation. Supination/pronation testing is crucial to raise one's suspicion for a DRUJ injury, which are commonly missed in the ED.

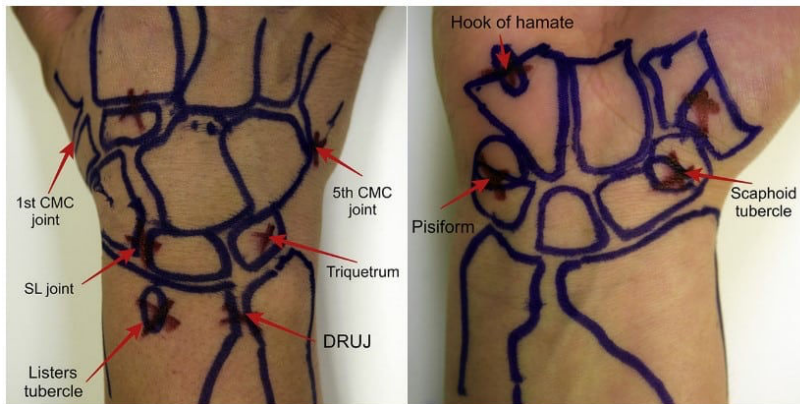
The point of maximal tenderness should be elucidated after palpating the surrounding tissues. The following key points of surface anatomy should be palpated routinely:

Surface anatomy on *dorsal*/wrist: 4 key divot points to palpate besides the distal radius (see image below)

1. **Scapholunate (SL) space/joint** – the divot just distal to Lister's tubercle
2. **Triquetrium** – the divot just distal to the ulnar styloid
3. **Scaphoid snuffbox** – important to palpate the snuffbox with the wrist in *ulnar deviation* and compare to contralateral side (as older patients can have snuffbox tenderness from chronic arthritis)
4. **DRUJ** – the divot between the distal radius and ulnar styloid

Surface anatomy on volar (palmar) wrist: 3 key bump points to palpate (see image below)

1. **Scaphoid tubercle** – the bump just proximal to the base of the thenar eminence; start with the wrist in ulnar deviation and slowly moving the wrist into radial deviation which brings out the scaphoid
2. **Pisiform** – the only volar carpal bone just proximal to the base of the hypothenar eminence
3. **Hook of hamate** – 2cm proximal and 1 cm radial to the pisiform with deep palpation



Dorsal and volar surface anatomy of key anatomical structures of the wrist. SL=Scapholunate. Source: <https://rehand.net/en/home/>

***Pitfall:** A common pitfall is to skip testing pronation and supination range of motion of the wrist. For testing range of motion of the wrist it is important to include supination and pronation, as limitations of these may signify a subtle DRUJ injury.*

Wrist x-ray interpretation: learn to recognize normal wrist x-ray alignment first

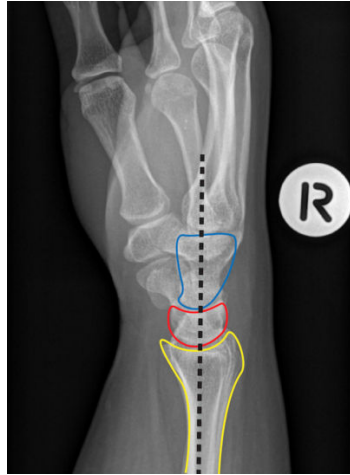
Standard views of the wrist include AP, lateral and oblique. The primary orthopedic view is the lateral view and the view that often reveals subtle missed wrist injuries.



Normal AP view of the wrist. Source: Don't Forget the Bubbles

Two key AP wrist x-ray key normal alignment patterns:

1. **Distal radius-ulna space** on the AP is normally no more than 2mm wide; >2mm should raise suspicion for a DRUJ dislocation
2. **Gilula's 3 arcs** – on AP x-ray of the wrist proximal aspect of proximal carpals, distal aspect of proximal carpals, proximal aspect of distal carpals all normally form smooth arcs with equal spaces between the carpal bones; a disruption of the smooth arc or size of space between carpal bones could signify a carpal bone injury (see image above)



Normal lateral x-ray wrist showing normal alignment of radius, lunate and capitate as well as normal overlap of distal radius and ulna. Source: EM Curious <https://www.emcurious.com/blog-1/2015/7/8/1ftadghymctqd2flw27ao4zwl1m6tb>

Two key lateral wrist x-ray normal alignment patterns:

1. **Radius-capitate-lunate alignment** which, if not present, may indicate a scapholunate injury (see image above)
2. **Radius-ulna overlap** which, if not present, may indicate a DRUJ injury (see image above)

Two key shapes of wrist bones to scrutinize on wrist x-ray:

1. Scaphoid on AP view is normally the shape of a boat (see image above)
2. Lunate on lateral view appears like a half moon while on the AP view appears roughly square-shaped (see image above)

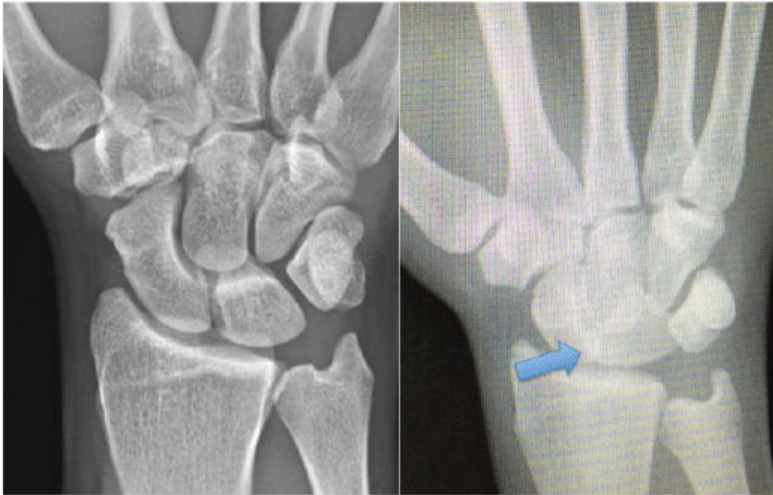
Key wrist x-ray signs signifying subluxation/dislocation of lunate

Signet ring sign of scaphoid is rounded appearance of cortex of the scaphoid tubercle on a AP wrist x-ray due to subluxation as a result of flexion of the scaphoid (see image below)



Signet ring sign (rounding of the scaphoid tubercle cortex) indicating subluxation
Source: Orthobullets <https://www.orthobullets.com/hand/6041/scapholunate-ligament-injury-and-disi>

Pizza sign or Piece of Pie Sign is the triangular appearance of the lunate on the AP view suggesting a lunate dislocation



Normal PA of wrist compared to lunate dislocation. With disruption of Gilula's arc, the lunate appears triangular (arrow points to lunate), producing the "piece-of-pie" sign.

Source: Core EM <https://coreem.net/core/lunate-dislocation/>

Empty teacup sign is seen on the lateral wrist x-ray as a malalignment of the lunate and capitate such that the capitate no longer sits in the concavity of the lunate signifying a perilunate dislocation (see image below)



Empty tea cup sign perilunate dislocation lateral wrist x-ray Source: Case courtesy of Ian Bickle, Radiopaedia.org, rID: 46714

DRUJ Injuries: The forgotten joint of the wrist

- A missed DRUJ injury may lead to chronic wrist supination deficit and pain which can be prevented with surgery in some cases, so early diagnosis in the ED is important.
- There is a spectrum of injuries from minor sprain to subluxation to dislocation.
- A mechanism of forced supination/pronation (power tools, fall while carrying a heavy load in relative pronation, MVC with tight grip of steering wheel in supination/pronation), should raise suspicion for a DRUJ injury as well as any FOOSH
- DRUJ injuries can be picked up on physical exam with:

- Pain on active and passive supination/pronation ROM against resistance
- Point tenderness over the DRUJ
- The **DRUJ shuck test (or ballottement test)** involves grasping the ulnar styloid while stabilizing the distal radius to assess for increased movement compared to the contralateral wrist, an often overlooked physical exam maneuver that should be considered in all wrist injured patients.
- The **piano key sign** is present when the ulnar styloid is easily ballotable, appears to be more protuberant compared the contralateral wrist (signifying a complete DRUJ dislocation), and rebounds to a dislocated position with volar depression of the ulnar styloid.
- DRUJ injuries, while often occult to x-ray, can sometimes be seen on the PA as a widening of >2mm of the DRUJ or as loss of overlap of the distal radius and ulna on the lateral.
- DRUJ injuries can occur in isolation or in association with any fracture of the radius, most commonly distal radius, but also Galeazzi fracture pattern (dorsally angulated distal 1/3 radius fracture + DRUJ dislocation) and radial neck fracture.
- All displaced distal radius fractures are associated with some degree of DRUJ injury and it is therefore prudent to scrutinize the post-reduction x-ray for radius-ulna alignment and arrange earlier orthopedic followup for those patients in whom a displaced DRUJ injury is suspected.

***Pearl:** DRUJ injury can be associated with any radius fracture, so it is prudent to examine the DRUJ and scrutinize it on the x-ray in all patients suspected of a radius fracture.*

***Pearl:** shuck/ballot the ulnar styloid to assess for increased ROM compared to the contralateral wrist found in DRUJ injuries*

Management of DRUJ injuries in the ED

The goal of managing a DRUJ injury is to immobilize the DRUJ and *block pronation* by immobilizing the wrist in supination. This can be achieved using a deep radial gutter splint followed by an *above elbow* back slab.

***Pitfall:** a common pitfall is immobilizing a DRUJ injury (whether isolated or associated with a wrist/forearm fracture) with a short below elbow splint. DRUJ injuries should be splinted in an above elbow splint with the forearm supinated to prevent pronation of the wrist.*

Galeazzi injury is a distal 1/3 radial shaft fracture with a concomitant DRUJ injury (see image below) and generally requires ORIF



Galeazzi injury: distal 1/3 radius fracture + DRUJ injury. Source: <https://www.orthobullets.com/trauma/1029/galeazzi-fractures>

Distal radius fractures – principles for picking up and managing volar injuries

- Volar distal radius injuries such as Smith's or volar Barton fractures are usually caused by a *fall on the back of the hand* (as apposed to a typical FOOSH as with dorsal distal radius injuries), may appear as a *reverse dinner fork deformity* on physical exam, and are generally more unstable, requiring early orthopedic involvement, compared to the more common dorsal distal radius injuries
- When scrutinizing wrist x-rays, start with lateral view with the forearm in the *horizontal plane* (landscape view) with the *thumb pointing down*; this will improve pick up rates of volar distal radius fractures
- Distal radius fractures associated with a significant DRUJ injury as well as all volar fractures (eg Smith's) should generally be immobilized in an *above elbow splint*
- **Reduction and immobilization of wrist fractures** should be in the opposite direction of the mechanism of injury so that a volar fracture (eg Smith's) should be immobilized with the wrist in extension/radial deviation, while a dorsal fracture (eg Colles) should be immobilized with the wrist in flexion/ulnar deviation
- **Molding of splints** for distal radius fractures should only be done with dorsal fractures (eg Colles) but not with volar fractures (eg Smiths) because the median nerve may be compromised

Barton fractures appear minor on x-ray but are often unstable and may require urgent surgery

A **dorsal Barton fracture** is a fracture of the dorsal lip of the distal radius that extends into the joint, but does not involve the volar aspect. It needs to be distinguished from a Colles fracture as the management is more often surgical. There is usually an associated subluxation or dislocation of the radiocarpal joint.



Source: Radiopaedia

A **volar Barton fracture** (sometimes referred to as a reverse Barton) involves only the volar lip of the distal radius, is an unstable fracture and requires ORIF.



Volar Barton's fracture. Source: <https://www.wheelessonline.com/trauma-fractures/volar-bartons-fractures/>

Triangular fibrocartilage (TFC) injury

Distal radius fractures, particularly displaced ones, may be associated with a TFC injury such as a tear which typically causes chronic pain on the ulnar aspect of the wrist after the distal radius fracture has healed. The TFC can be thought of as “the meniscus of the wrist”.



Arrow showing TFC space on AP wrist x-ray.

Source: <https://pathologies.lexmedicus.com.au/collection/triangular-fibrocartilage-complex-injury>