

# Imaging Upper Extremity Injuries 2



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1

# Elbow Injuries



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## Fat Pad Signs

- Anterior vs Posterior
- Indicates joint effusion
  - Hemorrhage
  - Inflammation
  - Infection
  - Intra-articular fracture



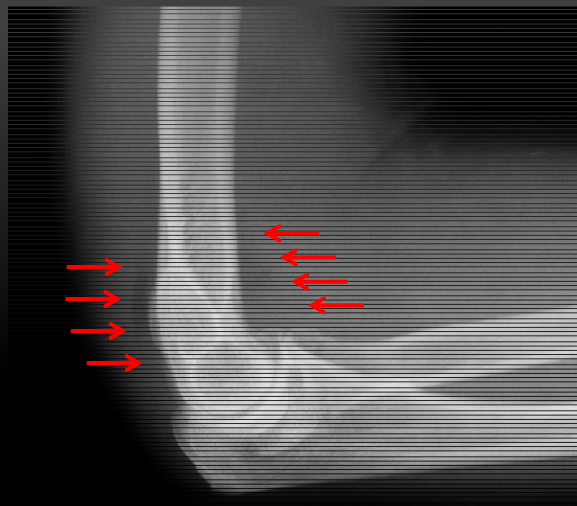
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3

## Fat Pad Signs

- Anterior fat pad distends first
  - Sail Sign
  - More sensitive of intra-capsular Fx
- Posterior fat pad distends with more significant intracapsular swelling
  - Fat Pad Sign
  - More specific of intra-capsular Fx



Source: Warshel Pathfile

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## Elbow Injuries

Adults		Children	
Radial head/neck	50%	Supracondylar	60%
Olecranon	20%	Lateral condyle	15%
Supracondylar	10%	Medial epicondyle	10%
Fracture/dislocation	15%		

5

## Supracondylar fracture

- M/C elbow fracture in children (60%)
- Transverse humeral fracture above condyles
- Distal fragment displaces posteriorly
- Anterior humeral line



6

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7

## Olecranon fracture

- 20% of adult elbow fractures
- Direct trauma
- Avulsion from triceps: hyperflexion injury
- Intra-articular fracture
- Often requires ORIF



8

## Radial Head / Neck Fracture

- M/C adult elbow fracture
- May be subtle / occult
- Indirect signs - displaced fat pads
- Vertical fracture through head
  - “chisel” fracture
- Cortical deformity
  - Impacted neck fracture
- Get the radial head view



9

## Osteochondral Fracture of Capitellum

- Osteochondral fracture vs osteochondritis dissecans
  - Acute fracture in adults vs repetitive trauma in children
- DDx: Panner disease
  - Avascular necrosis of the capitellum
    - Typically in children



10

## Little Leaguer Elbow

- Avulsion of the medial humeral epicondyle



Case courtesy of Dr Maulik S Patel, Radiopaedia.org, rID: 30167

11

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## Elbow dislocation

- Posterior dislocation is most common
  - Reduction is associated with fracture of the coronoid process
- Neurovascular injuries



Case courtesy of Dr David Cuete, Radiopaedia.org, rID: 26558

12

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## Epicondylitis / Epicondylosis

- Medial epicondylitis
  - Golfers elbow, little leaguers elbow
  - VALGUS forces
  - Resisted wrist FLEXION
  
- Lateral epicondylitis  
(7-20x more common than medial)
  - Tennis elbow
  - VARUS forces
  - Resisted wrist EXTENSION
  
- Imaging is of little value



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## Lateral Epicondylosis and Radial Collateral Ligament Tears

- “tennis elbow”
  
- Tears of the RCL and CET tears are often concomitant
  
- More common to see common extensor tendinosis
  
- DICOM 15



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## Biceps Distal Tendon Tear

- While lifting, tendon tears
  - Common during eccentric portion of lifting
- Pt may hear a pop, immediate onset pain, frequent heavy bruising in the antecubital fossa and up the arm
- DICOM 16



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## Forearm injuries

- Nightstick
- Monteggia
- Galeazzi
- Essex Lopresti
- Pediatric Incomplete Fractures
  - Torus
  - Greenstick



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## Nightstick fracture

- aka parry fracture
- Single fracture of ulna from a direct blow
- Always look for other injuries in ring structures



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## Monteggia Fracture / Dislocation

- Ulnar shaft fracture
- Dislocation of radial head



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Case courtesy of Assoc Prof Frank Gaillard, Radiopaedia.org, rID: 10435

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## Galeazzi Fracture / Dislocation

- aka Piedmont fracture
- Fracture of the distal radial shaft
- Dislocation of the distal radioulnar joint



Case courtesy of The Radswiki, Radiopaedia.org, rID: 12221

19



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## Essex Lopresti Fracture/Dislocation

- Fracture of the proximal radius
- Post-traumatic shortening of the radius
- Dislocation of the distal radio-ulnar joint



Case courtesy of Dr Liz Silverstone , Radiopaedia.org, rID: 92603

20



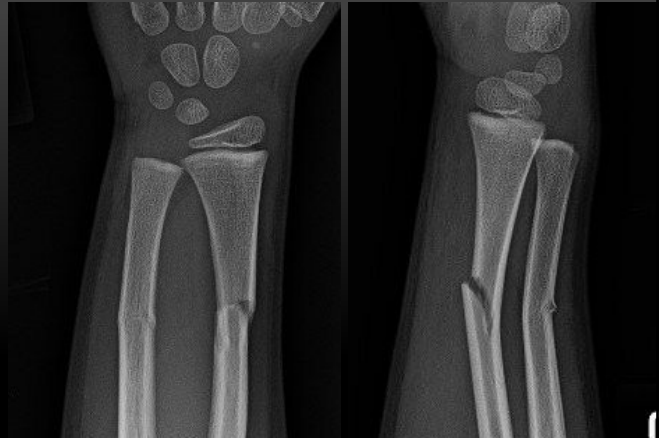
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## Pediatric Incomplete Fractures

- Pediatric bones are plastic, so there is as much deformation as fracture
- Torus: compressive forces
- Greenstick: angular forces



21

## Wrist injuries

### Fractures distal forearm

- Gymnast (Salter Harris 1)
- Colles
- Smith
- Barton
- Backfire
- Ulnar styloid process

### Fractures carpal bones

- Scaphoid
- Triquetrum
- Hook of hamate
- Pisiform

### Dislocations

- Lunate
- Scapholunate dissociation
- DISI
- VISI

22

## Gymnast Fracture

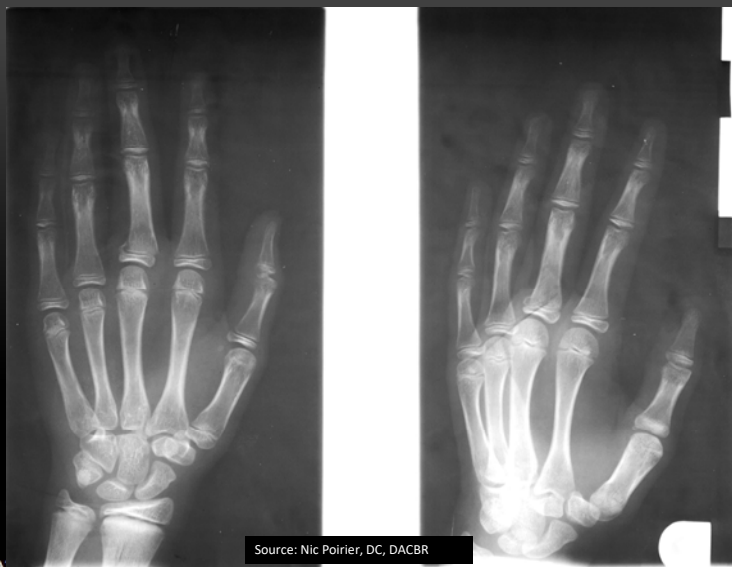
- FOOSH or intentional actions
- Salter Harris Type 1, distal radius
- Salter Harris Classification
  - 1: physeal
  - 2: metaphyseal
  - 3: epiphyseal
  - 4: meta and epi
  - 5: crush



Source: Nic Poirier, DC, DACBR

23

## Salter Harris Type 2



Source: Nic Poirier, DC, DACBR

24

24



25



26



27



28

## Colles' fracture

- FOOSH
- Distal radius fracture
- Dorsal angulation of fragment
- "Dinner fork" deformity
- Female > male
- Elderly - osteoporosis
- Common complications



29



30

## Smith fracture

- aka reverse Colles' fracture
- Fall on outstretched arm with flexed hand
- Anterior angulation of distal fragment



31

## Barton fracture

- FOOSH
- Fracture of posterior rim of distal radius
  - aka "rim" fracture
- Predisposes to posterior carpal dislocation
- Note pronator fat pad



32



## Radial Styloid Fracture

- aka Chauffeur fracture, backfire fracture, Hutchison fracture
- Fracture of radial styloid process



"SEK Tractor 2009 - Crank start Farmall" by jondresner is licensed under CC BY-NC-SA 2.0.

33

33

## Radial Styloid Fracture

- aka Chauffeur fracture, backfire fracture, Hutchison fracture
- Fracture of radial styloid process



Case courtesy of Dr Alexandra Stanislavsky, Radiopaedia.org, rID: 12360

34

34

## Ulnar styloid process fracture

- Uncommon isolated injury
- Avulsion of ulnar collateral ligament
- Usually combined with other injuries
- Concern for triangular fibrocartilage complex tear
- DICOM 17



35

## Triangular Fibrocartilage Complex Tears

- Ulnar sided wrist pain
- <50 traumatic tears
- >50 degenerative tears
- Increased frequency of tears with positive ulnar variance
- DICOM 18



36

## Scaphoid fracture

- FOOSH
- 15-40 years of age
- Most common carpal bone to fracture
- Most common occult fracture
- 3 major fracture locations
  - Waist 70%
  - Prox. pole 20%
  - Distal pole 10%



37

## Radiographic positioning

- PA wrist with ulnar deviation
- Complications
  - Avascular necrosis
    - 1-15%
  - Non-union
    - 25-30%
  - Carpal instability
  - Degeneration



38



39



40

## SNAC Wrist

- Scaphoid Nonunion Advanced Collapse



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## Triquetrum fracture

- aka Fischer fracture
- 2nd most common carpal to fracture
- Avulsion of dorsal surface
  - Hyperflexion
- Radiocarpal ligament
- Lateral radiograph
  - Pooping duck sign



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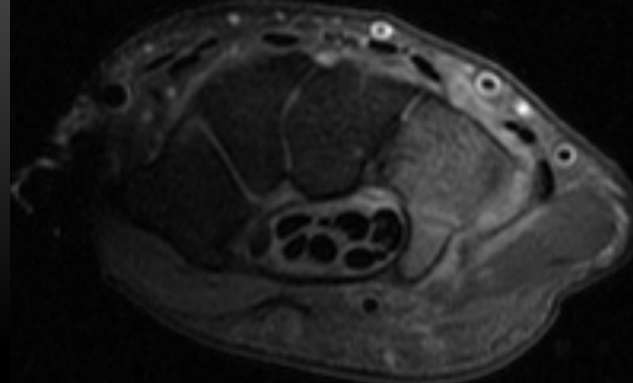
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## Hook of Hamate Fracture, Pisiform Fracture

- Golfing or racquet sports
- Stress fracture
- Carpal tunnel view



Source: Matt Skalski, DC, DACBR



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## Lunate dislocation

- Most common carpal dislocation
- Hyperextension injury
- Lunate is displaced anteriorly
- "Pie" sign on PA



Source: Matt Skalski, DC, DACBR

44



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45

## Scapholunate Dissociation

- aka rotatory subluxation of the scaphoid
- Rupture of the scapholunate ligament
  - Widening of the scapholunate joint > 2mm
    - "Terry Thomas" sign
  - Rotation of the scaphoid
    - "signet ring" sign



"Terry Thomas 72036" by Brechtbug is licensed under CC BY-NC-ND 2.0.



46



47



48



## VISI/DISI

- VISI/DISI
  - Volar/Dorsal Intercalary Segment Instability
- Shifting of the scaphoid/lunate/capitate complex secondary to ligamentous tear
- VISI = tear of the lunotriquetral ligament
- DISI = tear of scapholunate ligament

49

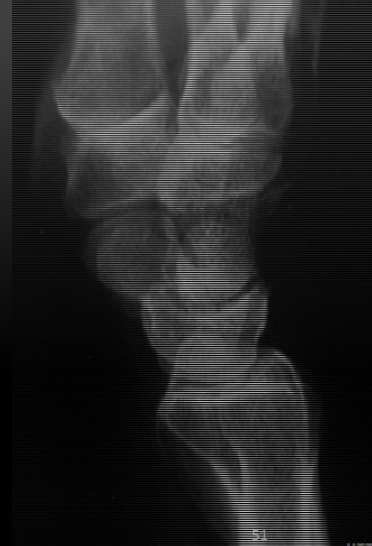
## VISI/DISI

- X-ray
  - The tilting of the lunate is readily visible
- MRI
  - Allows evaluation of the ligaments as well
- Both lead to wrist instability and possible progressive biomechanical failure

50

## Scapholunate Angle

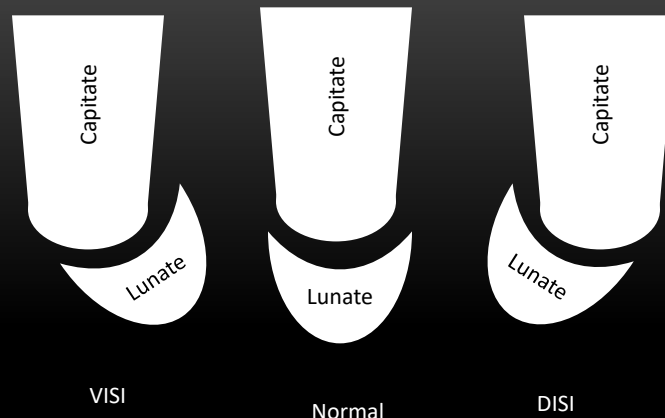
- DISI: scapholunate angle  $> 60$
- VISI: scapholunate angle  $< 30$



51

## Schematic

Palmar (Ventral) Side



Dorsal Side

52

## DISI

- **D**orsal **I**ntercalated **S**egmental **I**nstability
  - Dorsal angulation of lunate
- MC associated with scapholunate ligament injury
- Scapholunate angle  $> 60^\circ$
- DICOM 19



53

## VISI

- **V**olar **I**ntercalated **S**egmental **I**nstability
  - Volar angulation of lunate
- Associated with rupture of lunotriquetral ligament  $>$  scapholunate ligament
- Scapholunate angle  $< 30^\circ$



54

## Hand injuries

### Metacarpal fractures

- Bennett
- Rolando
- Boxer/Bar room

### Phalangeal fractures

- Gamekeepers'
- Dorsal plate Fx
- Volar plate Fx
- Mallet Finger
- Jersey Finger



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## Bennett Fracture, Rolando Fracture

- Fractures of the 1<sup>st</sup> metacarpal base
- Bennett: simple fracture
- Rolando: comminuted fracture



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## Distal Metacarpal Injuries

- Most common metacarpal fracture
  - » neck of 5<sup>th</sup>
- Boxer fracture
  - Fracture of distal 2<sup>nd</sup>/ 3<sup>rd</sup> metacarpal
- Bar room fracture
  - Fracture of distal 4<sup>th</sup>/5<sup>th</sup> metacarpal
- Fight Bite
  - Septic arthritis of the MCP



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## Gamekeeper Thumb

- aka Skier thumb
- Disruption of the ulnar collateral ligament vs. avulsion fracture at MCP joint of 1st digit
- Falling on ski pole
- Complication
  - Stener lesion



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## Volar Plate Fracture “Coaches Finger”

- Avulsion or impaction at the PIP in hyperextension



59

## Baseball Finger / Mallet Fracture

- Forceful flexion of DIP
- Avulsion fracture of dorsal corner of base of distal phalanx from extensor digitorum
- Loss of DIP extension



60

## Baseball Finger / Mallet Fracture

- Forceful flexion of DIP
- Avulsion fracture of dorsal corner of base of distal phalanx from extensor digitorum
- Loss of DIP extension



Case courtesy of Dr Hani Makky Al Salam, Radiopaedia.org, rID: 12227

61

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## Jersey Finger / Rugby Finger

- Forceful hyperextension of the DIP
- Avulsion of the flexor digitorum profundus
- Loss of DIP flexion



Case courtesy of Dr Francis Deng, Radiopaedia.org, rID: 71785

62

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## Ungual Tuft Fractures

- Crushing injuries of the tip of the finger
- Often has subungual hematoma and nailbed injury



63

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64