Scaphoid Fractures

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- 23 year-old man with rollerblading injury
- Fell backwards, breaking fall with outstretched hands
- Presents with radial-sided left wrist pain, snuffbox tenderness
Clinical differential diagnosis

- Scaphoid Fracture
- Scapholunate Instability
- Lunate Dislocation or Fracture
- Rupture of Flexor Carpi Radialis Tendon
- Radial Styloid Fracture
- Trapezium Fracture
- Extensor Carpi Radialis Longus Avulsion
- Extensor Carpi Radialis Brevis Avulsion
- Osteochondral Fracture of Distal Radius
- DeQuervain’s Tenosynovitis
- Basilar Joint (CMC) Arthrosis
Menu of tests available to image traumatic wrist injuries

- Routine plain films
- Specialty plain film series (e.g., scaphoid view)
- CT
- MRI
- Bone Scan
- Ultrasound
Our patient’s plain films, left wrist

Film findings:

Subtle linear lucency across the waist of the scaphoid suggesting scaphoid fracture

Courtesy of BIDMC files
Our patient’s scaphoid views

Film findings:

? Subtle scaphoid fracture
A closer look at the AP view...

Film findings:

Highly suggestive of an acute scaphoid fracture
Our patient’s wrist CT

Film findings:

Lucent line through scaphoid confirms acute fracture
Our patient was treated with internal fixation
For our discussion

We will first review the typical history, anatomy, and physical findings associated with scaphoid fractures
History

- History of wrist dorsiflexion injury
- 95% males
- Average age 25 years
- Sporting injuries, motorcycle accidents
- Previous trauma?: second injury may be trivial but may convert asymptomatic fracture to a symptomatic fracture
Dorsal landmarks

- A, Radial styloid
- B, Extensor pollicis brevis tendon
- C, Anatomic snuffbox
- D, Extensor pollicis longus tendon
- E, Lister’s tubercle
- F, Dorsal wrist depression
- G, Ulnar styloid

Ritchie, JV, Munter, DW. Emer Med Clin N Amer, 1999 Nov; 17(4): 823-42, vi
Bone anatomy

- D, Scaphoid
- Proximal row: scaphoid (D), lunate (F), triquetrum (G), pisiform (H)
- Distal row: trapezium (B), trapezoid (K), capitate (I), hamate (J)
The scaphoid has a precarious blood supply

- 67% have arterial foramina throughout length
- 13% supplied predominantly by distal 1/3
- 20% supplied by middle 1/3
- 1/3 of fractures in proximal third at risk for avascular necrosis
Physical examination

- Tenderness on palpation of anatomic snuffbox
- Minimal or gross swelling
- Pain with dorsiflexion, radial deviation
- Pain with longitudinal compression/tension on thumb metacarpal
- Palpable deformity distal to radial styloid
- Check for compartment syndrome
Scaphoid fractures can be subtle and therefore the imaging algorithm may include some of the following:

- Plain films
- Bone scan
- Ultrasound
- CT
- MRI
Plain film evaluation

AP  Lateral  Pronated oblique  Scaphoid view

Scaphoid view

- Ulnar deviation
- Distracts scaphoid, enhances visualization of fracture

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Bone scan

- Increased tracer uptake in region of scaphoid may suggest occult fracture


Rockwood & Green's Fractures in Adults, 4th ed., 1996
Ultrasound

- Top: normal scaphoid (small arrows), flexor carpi radialis tendon (curved arrow)
- Bottom: scaphoid waist fracture (arrows), compared to normal scaphoid

Computed tomography

- Focuses on plane of scaphoid
- Assessment of displacement, angulation

Fracture?
MRI (cont)

- Coronal STIR MR confirming marrow edema and scaphoid injury

www.scar.rad.washington.edu/radcourse/wrist.html
Types of scaphoid fracture

- 65% Waist
- 15% Proximal pole
- 10% Distal body
- 8% Tuberosity
- 2% Distal articular surface

Rockwood & Green’s Fractures in Adults, 4th ed., 1996
Classification

Simple Anatomic Classification

- I: Proximal third
- II: Middle third
- III: Distal third

Herbert Classification

- A: Acute, stable
  - A1: Tubercle
  - A2: Nondisplaced crack in waist
- B: Acute, unstable
  - B1: Oblique, distal 1/3
  - B2: Displaced or mobile, waist
  - B3: Proximal pole
  - B4: Fracture-dislocation
  - B5: Comminuted
- C: Delayed Union
- D: Established Nonunion
  - D1: Fibrous
  - D2: Sclerotic
Unstable fracture

- Greater than 1 mm stepoff
- Lunocapitate angulation > 15 degrees (lateral)
- Scapholunate angulation > 70 degrees (lateral)

Complications

- Nonunion
- Avascular necrosis
- Scapholunate advanced collapse (SLAC)
Nonunion
Avascular necrosis

Sclerotic on plain film

Low signal on MRI
Scapholunate advanced collapse (SLAC)
Treatment

- **Undisplaced, stable**
  - Splint, short/long arm thumb spica cast (6-12 weeks)

- **Displaced, unstable**
  - Longitudinal traction along thumb, compression of carpus, then splint and cast
  - Surgery
    - Closed reduction, percutaneous pinning
    - Open reduction, internal fixation

- **Nonunion**
  - Excision of fragments
  - Styloidectomy
  - Radial graft
  - Proximal row carpectomy
  - Partial/total arthrodesis of wrist
Surgery

- Displaced scaphoid fracture treated by ORIF, Herbert screw fixation, radial bone grafting for comminution

Four corner fusion
A history and examination typical for scaphoid fractures may result from other injuries
Distal radius fracture

- Coronal fast spin echo MR
- Distal radius fracture in patient with snuffbox tenderness, negative AP film

www.scar.rad.washington.edu/radcourse/wrist.html
Ddx for clinical presentation of scaphoid fracture:

- Transscaphoid perilunar dislocation
- Trapezium fracture
- Bennett fracture
- Radial head fracture
- Distal radius fracture
- Lunate dislocation

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www.aafp.org/afp/980301ap/shearman.html
References

References

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