Clinical Vignette

A 25 year old RHD amateur team cyclist suffered a fall from her bike while racing, landing on an outstretched right hand.
Background

- Mechanism = FOOSH
  - Higher velocity injuries from sports such as skiing and horseback riding tend to cause more complex fracture patterns
    - Also differences within sport based on experience level (ie, Snowboarders)

- Most common orthopedic injury
  - 17.5% of all adult fractures
  - More common in females (2-3:1)
  - Bimodal age distribution

- Presentation
  - Pain and swelling
  - Visible deformity if displaced
  - Motion limited by pain

- Multiple classification systems
Initial Evaluation

- Assess for neurovascular injury
  - Median nerve always compressed during FOOSH
- Obtain 3-view radiographs of wrist
  - AP
  - Lateral
  - Oblique
- CT
  - Further evaluation of intra-articular involvement
  - Surgical planning
Urgent Stabilization

- Closed Reduction
  - Requires adequate anesthesia
    - Local hematoma block

- Immobilization
  - Sugar Tong Splint
    - Prevents forearm rotation and wrist motion
      - Immobilizes wrist AND elbow
    - Not circumferential
Non-Operative Management

- 90% managed non-operatively
- Considered in following scenarios:
  - Non-displaced, extra-articular fracture
  - Stable, reduced fracture
  - Radiological Instability
    - Dorsal comminution
    - Dorsal angulation > 20 degrees
    - Articular radiocarpal fracture
    - Associated ulnar fracture
    - Radial shortening
- Clinical and radiographic evaluation 2-3 times over the first 3 weeks
Distal Radius Fx’s – NON OP

AAOS Nonoperative Guidelines

Table 1
Guidelines for Acceptable Reduction of Distal Radius Fractures*

1. Radial shortening <5 mm at the DRUJ compared with the contralateral side
2. Radial inclination on posteroanterior radiographs >15°
3. Sagittal tilt on the lateral projection between 15° dorsal tilt and 20° volar tilt
4. Intra-articular step-off or gap <2 mm of the radiocarpal joint
5. Articular incongruity <2 mm of the sigmoid notch of the distal radius

*These guidelines must be individualized to accommodate each patient’s functional activity levels and general medical status.
Treatment Options
57 yo female
Fracture reduced in ED after fall 3 weeks ago
Patient removed splint 1 week later, has been in Ace bandage since then
Volar PlatePost Op Xrays
Clinical Vignette

A senior, collegiate Rugby player is violently tackled during a pre-season match, quickly throwing his hand behind him an attempt to break his fall.
Background

Epidemiology/Anatomy

- Most commonly fractured carpal bone in athletic patients (>85%)
  - Common in sports involving high impact injuries to the wrist
- Mechanism = fall onto hyperextended wrist
- Poor blood supply → High risk of AVN

Presentation

- Vague overall
  - Variable levels of pain
  - Rarely any ecchymosis, hematoma, or gross deformity
- Provocative Testing
  - Anatomic snuffbox tenderness dorsally
  - Scaphoid tubercle tenderness volarly
Initial Evaluation

• Assess for neurovascular compromise

• Recommended X-Rays
  o Routine 3 View Series (PA, Lateral, & Oblique)
  o Scaphoid View
    • 30 degree extension, 20 degree ulnar deviation

• Fracture may NOT be visible on initial films (>25% of time)
  o MAINTAIN HIGH INDEX OF SUSPICION
Non-operative Management

- Reserved for non-displaced, stable fractures with no other bony/ligamentous injury
  - 25% treated operatively in athletic populations compared to only ~5% in the general population
- Herbert Classification
  - A1 = Scaphoid tubercle
  - A2 = Incomplete fracture of scaphoid waist
- Short arm, thumb spica cast or Colles cast without thumb immobilization
  - Return to sport in cast: Mean duration of 3 to 6 months
  - Return to sport after cast: Mean duration of 10 weeks
- 86% union rate, mean time to union of ~14 weeks
  - Regardless of return to sport in or out of case
Why is Fracture Location so Important in the Scaphoid?

- **Blood supply**
  - Primary vascular supply enters dorsal ridge and runs retrograde to the proximal scaphoid.
  - The more proximal the fracture, the more likely are healing complications.

- **Incidence of AVN with fracture location**
  - Proximal 5th AVN rate of 100%
  - Proximal 3rd AVN rate of 33%
Imaging

- X-rays
  - Initial films non-diagnostic in up to 25% of cases
- CT Scan – worst for occult fractures but good for evaluation of fracture fragments, collapse, progression of union/nonunion
- Bone Scan – rarely used (takes 72hrs to become useful)
- MRI – most accurate (within 24h and allows for assessment of vascularity.)

Hypointensity on T1
CT scan

Humpback deformity
Casting vs. Fixation


• 25 pts with acute nondisplaced fracture of the scaphoid waist
• Randomized to either:
  o cast immobilization (14)
  o fixation with a percutaneous cannulated screw (11)
• Fracture union
  o screw fixation group 7 weeks
  o cast immobilization group 12 weeks (p = 0.0003)
• Return to work
  o screw fixation 8 weeks
  o cast immobilization 15 weeks (p = 0.0001)
• no significant difference in ROM or grip strength at the 2 yr f/u
Indications for Surgery

• Unstable Scaphoid Fractures
  o Displacement of > 1 mm
  o Radiolunate angle > 15 degrees
  o Scapholunate angle of > 60 degrees
  o “Humpback” deformity
  o intra-scaphoid angle >10 degrees

• Nonunion
Scaphoid Nonunion: Diagnosis

• Non-union often an “incidental” finding after re-injury to wrist
  o Probable disruption of a previous stable, and therefore asymptomatic, scaphoid non-union
• Exam: tender, loss of motion, weakness
Non-union: How Does It Occur?

- Fractures at risk
  - Disrupted vascular patterns

Gelberman, J Hand Surg, 1980
CT SCAN AT 4 MON. POST TREATMENT
Scaphoid Non-union: Should It Be Treated?

• Natural history studies strongly suggest scaphoid fractures left untreated lead to carpal collapse patterns and almost 100% certainty of developing degenerative changes.
Scaphoid Non-union:

predictable pattern of arthrosis

TYPE I DJD:
N/U < 10 YR.

TYPE II DJD:
N/U ~ 15 YR.

TYPE III/IV DJD:
N/U > 25 YR.

MACK, et al., JBJS, 1984
Treatment Options -
Scaphoid Nonunion: Scaphoid preserving

- ORIF with cancellous bone graft
- ORIF with structural tricortical graft
- ORIF with vascularized graft
- Percutaneous fixation alone
Suspected scaphoid fracture

X-ray

Fracture

Displaced

ORIF

 Appeared nondisplaced

CT scan

Displaced

ORIF

Non-displaced

Cast or ORIF

No fracture seen

MRI

Abnormal signal +

Cast or ORIF

Normal

No scaphoid fracture

Clinical Vignette

A senior, collegiate Rugby player is violently tackled during a pre-season match, quickly throwing his hand behind him an attempt to break his fall.
Finger Fractures and Dislocations

Really need XRs to differentiate
Dorsal PIP Dislocations

• More common than volar
• Requires injury to the VOLAR PLATE and at least one collateral ligament
• If untreated leads to SWAN NECK DEFORMITY.
Dorsal PIP Dislocations - Classification

- **Simple** – middle phalanx in contact with condyles of P1
- **Complex** – base of P2 not in contact with condyle of P1
  - Bayonet appearance
  - Volar plate acts as block to reduction with longitudinal traction.
Dorsal PIP Dislocations - Treatment

• If reducible – nonop - buddy tape 3-6 weeks.
  - Complex – reduce with hyperextension and then a palmar force on base of P2
• If irreducible – OR for open reduction
PIP Fracture/dislocations

- Common Fracture
- Young patient population
- Treatment difficult
  - Significant stiffness
  - Redislocation
  - NEEDS TO BE MANAGED URGENTLY
Daly’s Slides (Surgical)
Dorsal PIP Fracture- Dislocation

- Hastings Classification – based on amount of P2 articular surface involved.
  - Volar lip fractures are the most common
  - Type I - <30% of P2 articular surface – stable
    - Dorsal Blocking Splint
  - Type II - 30-50% - tenuous
    - If reducible in flexion then dorsal blocking splint
  - Type III - >50% - unstable
    - ORIF
    - Hinged External Fixator
    - Hamate Autograft
    - Volar Plate Arthroplasty
Watch for “V” sign

Dorsal subluxation of joint

NO way to draw a V
Hinged Fixator

Custom fabricated in OR

Specifically designed for PIP joint
ORIF

- **Volar approach**
  - Open at A3 pulley
  - Retract flexor tendons
  - “shotgun” joint open
- Rigid fixation necessary to begin motion
- Small (1.0/1.3mm) screws make ORIF possible
Hemi-Hamate Arthroplasty

- Autogenous local osteochondral graft from dorsal 20-50% of ipsilateral hamate
Hamate as Autograft

- Sizeable osteochondral graft can be rigidly fixed
ORIF with hemi-hamate graft concentric reduction of joint
Dorsal PIP Fracture- Dislocation

- Articular surface reconstruction is desirable but more important is anatomic reduction of the gliding arc of the joint without subluxation.
Hand Fractures
Daly’s Slides (Surgical)
Surgical Indications

- Articular incongruity
- Rotational malalignment
- “significant” displacement or angulation
- Multiple unstable fractures
- Open fractures
Operative Techniques
K-Wire Fixation
Plates for ORIF
Metacarpal Shaft Fractures

• Most treated closed
• Jahss maneuver for reduction - ideal for neck fractures
  - Flexion of MP and PIP joint
  - Dorsal, axial load on head of P1
• Volar/dorsal splint; ulnar gutter or short arm cast across MP joints
Stability: central digits

Transverse inter-metacarpal ligaments
Metacarpal Shaft Fractures

• **Indications for Operative Rx:**
  - Mal-rotation
  - Multiple/displaced fractures
  - Significant shortening
  - Angulation in IF and MF
Summary

- Optimal management is key in allowing athletes to return to sport quickly and with the lowest risk for adverse events.
- Management principles for these injuries are largely comparable to those in the general population.
  - However, there are key examples where it does differ.
- Account for one of the longest return times to sport post-injury.
- Despite fractures comprising 10% of all sporting injuries, dedicated research into their management and outcomes is relatively limited.
References