Distal Radius Fractures

Lee W Hash, MD
Affinity Orthopedics and Sports Medicine
The Problem of Distal Radius Fractures

• Common injury: >450,000/yr. in USA
• High potential for functional impairment and frequent complications
Introduction

• Distal radius fractures occur through the distal metaphysis of the radius
• May involve articular surface
• Frequently involving the ulnar styloid
• Most often result from a fall on the outstretched hand.
  – forced extension of the carpus,
  – impact loading of the distal radius.
• Associated injuries may accompany distal radius fractures.
Introduction

• Classified by:
  – presence or absence of intra-articular involvement,
  – degree of comminution,
  – dorsal vs. volar displacement,
  – involvement of the distal radioulnar joint.
Diagnosis: History and Physical Findings

- History of fall on outstretched hand or trauma
- A visible deformity of the wrist is usually noted, with the hand most commonly displaced in the dorsal direction.
- Movement of the hand and wrist are painful.
- Adequate and accurate assessment of the neurovascular status of the hand is imperative, before any treatment is carried out.
Diagnosis: Diagnostic Tests and Examination

- General physical exam of the patient, including an evaluation of the injured joint, and a joint above and below.
- Radiographs of the injured wrist.
- Radiographs of other areas, if symptoms warrant.
- CT scan of the distal radius in selected instances.
Treatment Goals

• Preserve hand and wrist function

• Realign normal osseous anatomy

• Promote bony healing

• Avoid complications

• Allow early finger and elbow ROM
Osseous Anatomy

- Distal radius – 80% of axial load
  - Scaphoid fossa
  - Lunate fossa
  - Sigmoid notch – DRUJ
- Distal ulna
Anatomy

- **scaphoid and lunate fossa**
  - Ridge normally exists between these two
- **sigmoid notch**: second important articular surface
- **triangular fibrocartilage complex (TFCC)**: distal edge of radius to base of ulnar styloid
Radiology

- Radial inclination = 22°
- Radial length = 12mm
  - ulnar neutral
- Palmar tilt = 11-14°
- Scapho-lunate angle = 47° +/- 15°
Inclination = 23 degrees

Normal x = 11-12 mm
range 8-18 mm
PALMAR TILT

Normal = 11-12°
Palmar (+) tilt
Range 0-28°
Scapholunate angle measured between lines 2 and 3

(normal 47 ± 15 degrees)

1: Line connecting dorsal and volar tip of lunate
2: Line perpendicular to lunate
3: Line along axis of scaphoid
Computed Tomography
Indications

- Intra-articular fx's with multiple fragments
- Centrally impacted fragments
- DRUJ incongruity

- 19 consecutive fx, CT had better sensitivity for intraarticular frag
- management change in 5 pts

Classification of Distal Radius Fractures

- Ideal system should describe:
  - Type of injury
  - Severity
  - Evaluation
  - Treatment
  - Prognosis
Common Classifications

• Gartland/Werley
• Frykman
• Weber (AO/ASIF)
• Melone
• Column theory
• Fernandez (mechanism)
Assessment of X-rays

• Assess involvement of dorsal or volar rim
  – Is comminution mainly volar or dorsal?
  – Is one of four cortices intact?

• Look for “die-punch” lesions of the scaphoid or lunate fossa.

• Assess amount of shortening

• Look for DRUJ involvement
Dorsal angulation and comminution
Volar subluxation of carpus with fracture fragment
Treatment Choice

• Depends on assessment of fracture stability

• Indicators of instability are:
  – Shortening
  – Comminution
  – Reversal of normal volar angulation
  – Articular involvement
Options for Treatment

- **Casting**
  - Long arm vs short arm
  - Sugar-tong splint
- **External Fixation**
  - Joint-spanning
  - Non bridging
- **Percutaneous pinning**
- **Internal Fixation**
  - Dorsal plating
  - Volar plating
  - Combined dorsal/volar plating
  - focal (fracture specific) plating
Indications for Closed Treatment

- Low-energy fracture
- Low-demand patient
- Medical co-morbidities
- Minimal displacement - acceptable alignment
- *Match treatment to demands of the patient*
Closed Treatment of Distal Radial Fractures

• Depends on obtaining and then maintaining an acceptable reduction.
• Immobilization:
  – long arm (cast or sugar-tong for high demand)
  – short arm adequate for elderly patients
• Frequent follow-up necessary in order to diagnose redisplacement.
Technique of Closed Reduction

- **Anesthesia**
  - Hematoma block
  - Intravenous sedation
  - Bier block
- **Traction:** finger traps and weights
- **Reduction Maneuver (dorsally angulated fracture):**
  - Hyperextension of the distal fragment,
  - Maintain weighted traction and reduce the distal to the proximal fragment with pressure applied to the distal radius.
- **Apply well-molded “sugar-tong” splint or cast, with wrist in neutral to slight flexion.**
- **Avoid Extreme Positions!**
Acceptable Reduction Criteria

- dorsal angulation < 10 degrees
- > 15 degrees of inclination
- Articular step-off < 2mm
- < 5 mm shortening compared to opposite wrist.
- DRUJ congruent
After-treatment

• Watch for median nerve symptoms
  – parasthesias common but should diminish over few hours
  – If persist release pressure on cast, take wrist out of flexion
  – Acute carpal tunnel: symptoms progress; CTR required

• Follow-up x-rays needed in 1-2 weeks to evaluate reduction.

• Change to short-arm cast after 2-3 weeks, continue until fracture healing.
Management of Redisplacement

- Repeat reduction and casting – high rate of failure
- Repeat reduction and percutaneous pinning
- External Fixation
- ORIF
Indications for Surgical Treatment

- High-energy injury
- Open injury
- Secondary loss of reduction
- Articular comminution, step-off, or gap
- Metaphyseal comminution or bone loss
- Loss of volar buttress with displacement
- DRUJ incongruity
Percutaneous Pinning-Methods

• variety described
• most common radial styloid pinning + dorsal-ulnar corner of radius pinning
• supplemental immobilization with cast, splint
• in conjunction with external fixation (Augmented external fixation)
Percutaneous Pins
Percutaneous Pins
Percutaneous Pinning

• 2 radial styloid pins - Mah and Atkinson, J Hand Surg 1992
  – excellent anatomic 82%
  – good-excellent functional results 100%

• radial styloid with dorsal - prospective study, 30 pts (Clancey JBJS 1984)
  – excellent anatomic results in 90%
Percutaneous Pinning-Kapandji

• intrafocal pinning through fracture site
• buttress against displacement
• good results in literature
  - Greatting & Bishop, OCNA 1993
After Pin Removal
Internal Fixation of Distal Radius Fractures

• Useful for elevation of depressed articular fragments
• required if articular fragments can not be adequately reduced with percutaneous methods
• Dorsal and/or volar approaches both used.
Selection of Approach

- Based on location of comminution.
- Dorsal approach for dorsally angulated fractures.
- Volar approach for volar rim fractures
- Radial styloid approach for buttressing of styloid
- Combined approaches needed for high-energy fractures with significant axial impaction.
WHICH APPROACH?

DORSAL

1-2\textsuperscript{nd} DC
VOLAR

Classical Henry approach  Extended carpal tunnel approach
Distal Radius-volar barton

- 64 yo M, MVA, contralateral tibial shaft Fx
Volar Plating for Dorsal Fractures

- less tendon irritation than dorsal

- Indirect reduction  - better tolerated than Ex fix
Fixed angle locked screws
50 yo Female
Volar Locking Plate
81 yo Female
Fragment Specific System
Radial and Ulnar Columns

- Pin plates
- 90-90 plating technique
Focal Plating

Radial Styloid Fragment
Dorsal ulnar fragment

70 – 90 degrees apart
Advanced Techniques
Arthroscopic-Assisted

• reduce articular incongruities
• also diagnose associated soft tissue lesions
• minimally invasive
Arthroscopic-Assisted

Culp and Osterman, OCNA 26(4) 1995
Malunion of Distal Radius Fractures

- Changes load-bearing patterns on the distal radius and load sharing between the radius and ulna.

- Can lead to arthrosis.
GRIP STRENGTH VS SHORTENING

90 pts prospectively followed over 3yr.

Grip Strength vs Opposite Hand

Conclusions

• Identify the fracture
• R/O need for immediate tx
• Immobilization- well padded splint
• Ice and elevation to control edema
• Ortho referral
Conclusions

• Treatment goals – restore function
  – Patient specific
  Nonoperative and operative treatment
  Recovery takes months