Distal Radius Fractures: Complications & Limitations of the Volar Approach

Trauma 101
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Disclosures
• No disclosures

Distal Radius Fractures
• Volar plating complications
• Anatomic Considerations
• Volar plating limitations
Evolution of Distal Radius Fracture Treatment
(Chung Hand Clinics 2012)

- Casting - Cotton/Loder Position
  - loss of reduction
  - stiffness
  - median nerve compression
- Pins & Plaster
- External fixation Loss of reduction
  - stiffness
  - CRPS
  - Pin tract infections
- Dorsal plating
  - extensor tendon complications

Operative Treatment of DRFx
Volar Plating ~ 16 years

(Mellstrand-Navarro JBJS Br  2014)

Fixed Angle Volar Plates
Volar Locking Plate Complications

- Tendon related
  - Flexor Tendon rupture
  - Extensor tendon rupture
- Osseous Complications
- Nerve Injury
- CRPS

Volar Plate Prominence

Soong JBJS 2011

4% Flexor tendon rupture
3% flexor tendon “irritation”

Soong JBJS 2011
Fracture determines plate placement

1. EDUCATE THE PATIENT
2. CLOSE FOLLOW UP IF PLATE IS GRADE 1 OR 2
3. PLAN FOR PLATE REMOVAL

Extensor Tendon Complications

Shape of radius →
difficult to determine screw prominence

Anatomy Lister’s Tubercle

[ Clement JHS 2008]

Height (H3) : 4-10 mm
Extensor Tendon Rupture

Dorsal Tangential View

Pre Post

Intra-Op Clinical Findings
AVOIDING Extensor Tendon Complications

- Dorsal Tangential View [Babst JHS 2014]
- Supinated & pronated oblique views [Maschke Hand 2007]
- Know standard screw lengths
- Locked unicortical distal screws > 75% length [Calfee JHS 2012]
- Unicortical Drilling [Al-Rashad JBJS Br 2006]

Dorsal Tangential View [Babst JHS 2014]

Supinated & pronated oblique views [Maschke Hand 2007]
Osseous Complications
Avoiding intra-articular hardware

- Clinical Exam
- 20° tilt view
- PA of DRUJ
- Live fluoroscopy
- Arthroscopy
- Arthrotomy

Neurologic Complications

- Median nerve
- Retraction injury
  - Create mobile window
  - Blunt retractors
  - Release frequently
- PCB MN at risk with exposure
- 8-11% within FCR sheath [Hutchinson ASSH 2008]

Acute Carpal Tunnel Syndrome
[Dyer JHS 2008]

- Occurrence 5.4% of DRFx
- #1 risk: Fracture Translation
- Numbness from swelling/splint
- Pre-existing CTS
- Release – avoid CRPS
CRPS
It sees you more than you see it.
• 10-37% of DRFx
• Female, Older Age
• Intra-articular Fractures
• TYPE 2 – Associated with CTS
  – CTR if symptomatic
• Vitamin C – No benefit [Evaniew JOT 2015]

Anatomic Considerations

• Anatomic Reduction and rigid fixation
  – lateral & intermediate columns
• Medial column stabilized as necessary
• Allows for early mobilization

Fracture Pattern → Determines Fixation

LIMITATIONS TO STANDARD VOLAR PLATING
“You can’t throw out the baby with the bathwater”

Understand:
• Dorsal Plating
• Distal Volar plates
• Fragment-Specific fixation
• Dorsal bridge Plating
• External fixation
“Critical” Fragments

(Wolfe - Oper Tech Sports Med 2010)

Radiographic Evaluation

(Medhoff - Hand Clinics 2005)

What cannot be fixed with a standard volar plate?

- Volar ulnar corner fragment
- Dorsal ulnar corner fragment
- Unstable radial styloid fragment
- Dorsal Shear Fracture (Barton’s)
- Articular shear fracture
Anatomy ➔ Volar Ulnar Corner

Short Radio-lunate Ligament
ATTACHES TO VOLAR ULNAR CORNER
Carpus follows this fragment

Volar Ulnar Corner
Harness, Jupiter, Orbay et al. JBJS 2004

Volar Ulnar Corner Fragment
Volar Ulnar Corner

Dorsal Ulnar Fragment

Dorsal Shear Fracture
Extraarticular

BEWARE: Flexor Tendons & Median Nerve
Unstable Radial Styloid

Evaluate for associated injuries.

Marginal Articular Fractures

Marginal Articular Fracture
+ metadiaphyseal extension
+ polytrauma

Marginal Articular Fractures

Dorsal Bridge Plate

- Internal External Fixator
- Comminution + metadiaphyseal extension
- High Energy Polytrauma
- Early Weight Bearing
- Elderly [Ruch JHS 2012]
DBP → Outcomes at 1 year

[Hanef JHS 2015]

Use of External Fixator

External Fixator
1 wk s/p injury – ORIF radius and ulna

Use external fixator for provisional reduction tool

Summary ORIF DRFx

1. Preop C-arm images
2. Know your implant system
3. Plate placement = determined by fracture
4. Have an ex-fix/DBP available
5. Nobody looks good taking out hardware??

What about the medial column?

Medial column stabilized as necessary
1. Do nothing
2. Immobilization
3. ORIF
4. TFCC repair
DRUJ Stability: Restore Coronal Translation

(Wolf JHS 2015)

Evaluate DRUJ Intraop

DRUJ Stability: Ulnar Styloid Fracture

OCID Prospective ORIF Distal Radius Study Group - JBJS 2009
Kim - JBJS 2010

- Unrepaired fracture base of the ulnar styloid
- No difference in function or outcome AFTER treatment of DRFX with plate/screw fixation
- Including initial displacement > 2 mm.
DRUJ Stability:
Ulnar Styloid Fracture

- Is DRUJ unstable in all positions of forearm rotation?
- Is large ulnar styloid base fracture present?
- ORIF of ulnar styloid
- Immobilize in position of stability (usually supination)
- TFCC repair (open or arthroscopic)
- vs DRUJ Pinning

Chung Hand Clin 2012

DRUJ Instability ➔
Ulnar Styloid Fracture + Torn DIOM

IN SUMMARY
- FRACTURE PATTERN DETERMINES PLATE PLACEMENT
- REMOVE HARDWARE IF NECESSARY
- CAREFUL INTRAOPERATIVE FLUOROSCOPY
Thank You
Fracture pattern → determines approach
VOLAR

Fracture pattern → determines approach
DORSAL
Marginal Articular Fractures