

Distal Radius Fractures: Complications & Limitations of the Volar Approach

Trauma 101
Friday April 29, 2016
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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



[Orbay - Tech Hand Upper Ext Surg 2001]

Fixed Angle Volar Plates

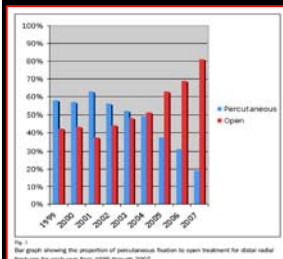
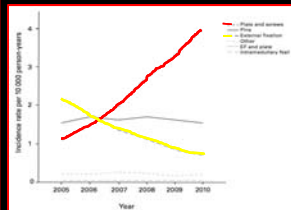


Fig. 1 Bar graph showing the proportion of percutaneous fixation to open treatment for distal radius fractures for each year from 1998 through 2007.

[Koval JBJS 2008]



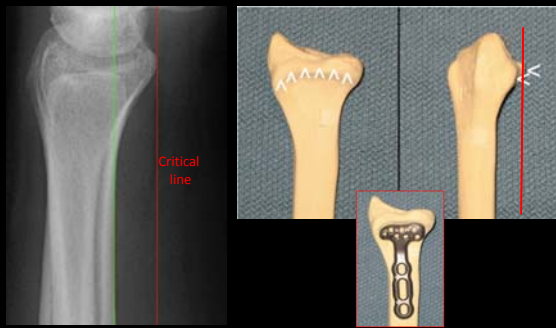
[Mellstrand-Navarro JBJS Br 2014]

Volar Locking Plate Complications

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

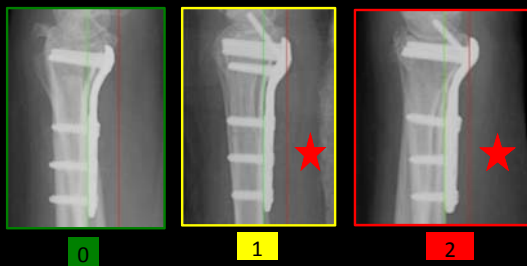
Volar Plate Prominence

Soong JBS 2011



Volar Plate Prominence

4% Flexor tendon rupture
3% flexor tendon "irritation"
Soong JBS 2011

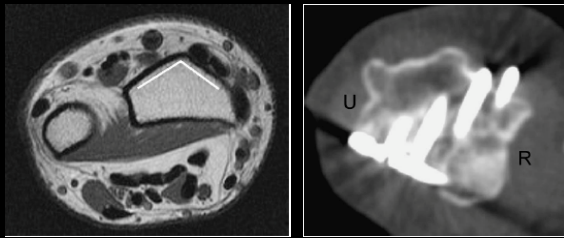


Fracture determines plate placement

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

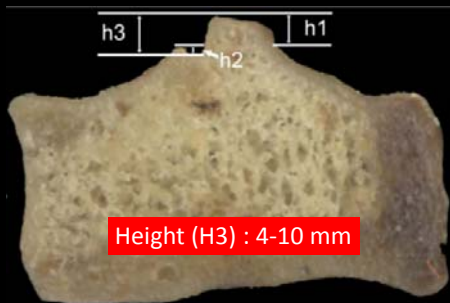


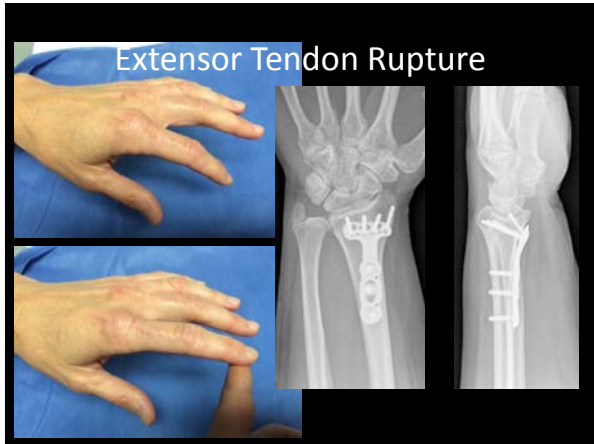
Extensor Tendon Complications

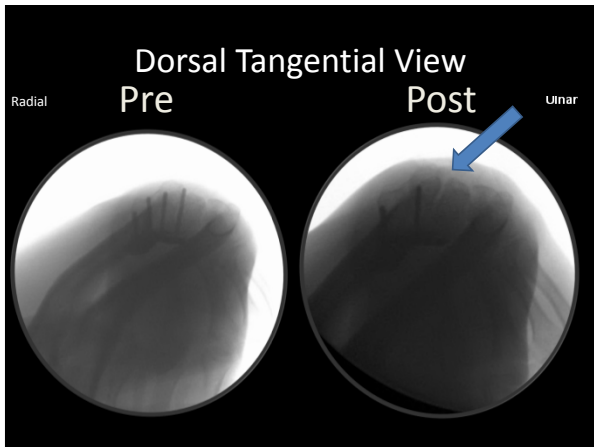


Shape of radius →
difficult to determine screw prominence

Anatomy Lister's Tubercle *[Clement JHS 2008]*





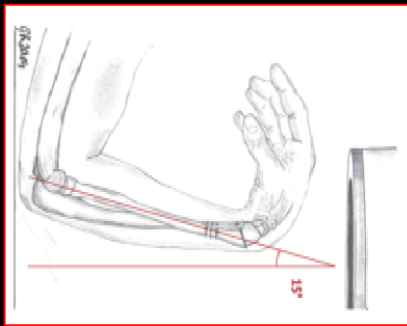




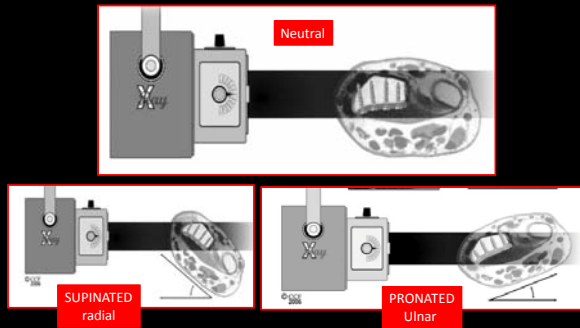
AVOIDING Extensor Tendon Complications

- Dorsal Tangential View [Babst JHS 2014]
- Supinated & pronated oblique views [Maschke Hand 2007]
- Know standard screw lengths
- Locked unicortical distal screws $\geq 75\%$ length [Calfree 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
- PCBMN 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

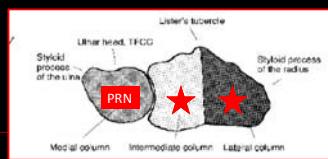
It sees you more than you see it.

- 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"

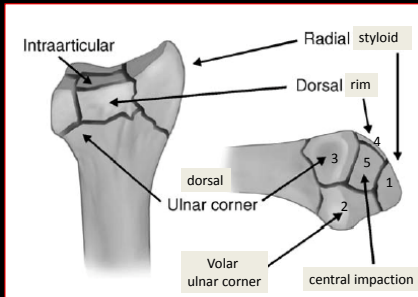


Understand:
Dorsal Plating
Distal Volar plates
Fragment Specific fixation
Dorsal bridge Plating
External fixation



“Critical” Fragments

[Wolfe - Oper Tech Sports Med 2010]



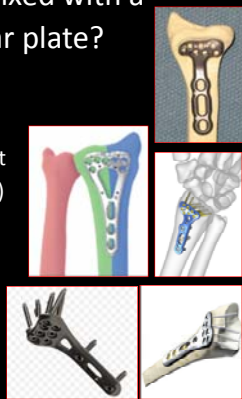
Radiographic Evaluation

[Medhoff - Hand Clinics 2005]

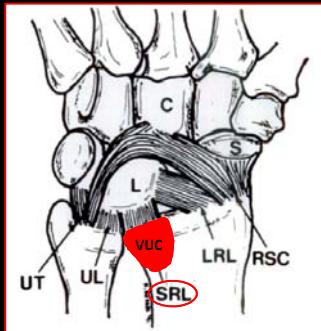


What cannot be fixed with a standard volar plate?

- Volar ulnar corner fragment*
- Dorsal ulnar corner fragment
- Unstable radial styloid fragment
- Dorsal Shear Fracture (Barton's)
- Articular shear fracture



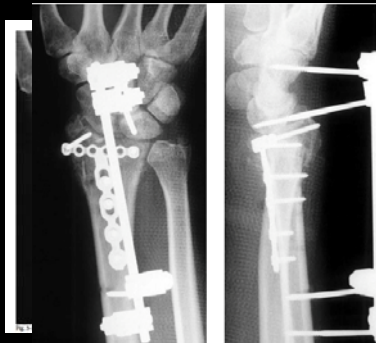
Anatomy → Volar Ulnar Corner



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

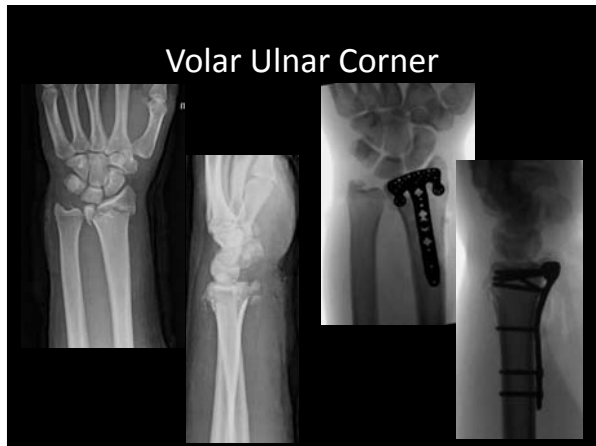
Volar Ulnar Corner

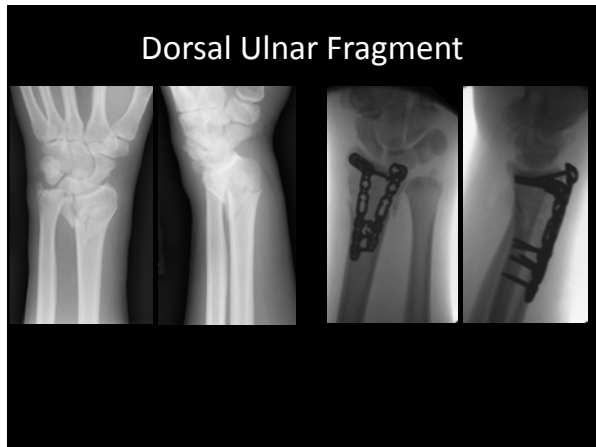
[Harness, Jupiter, Orbay et al - JBJS 2004]

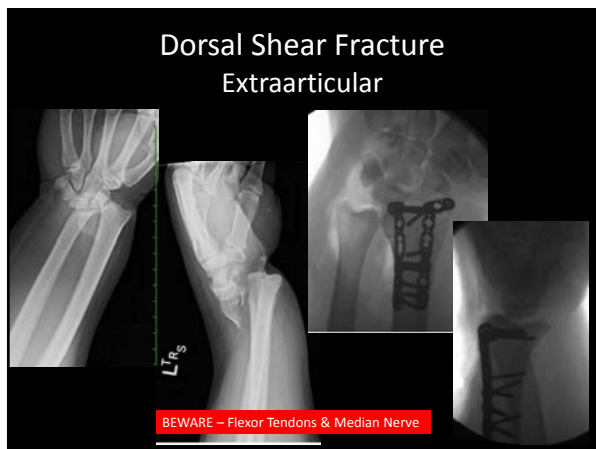


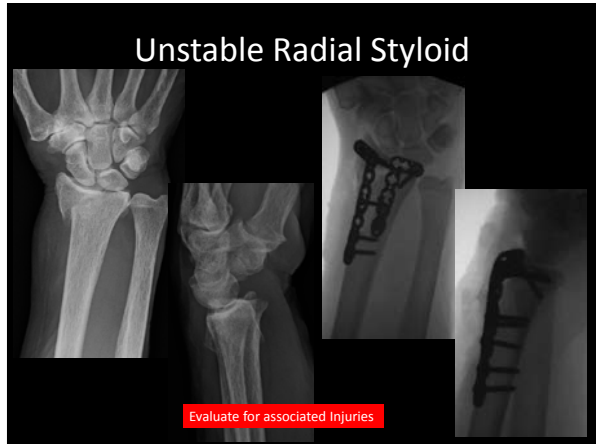
Volar Ulnar Corner Fragment

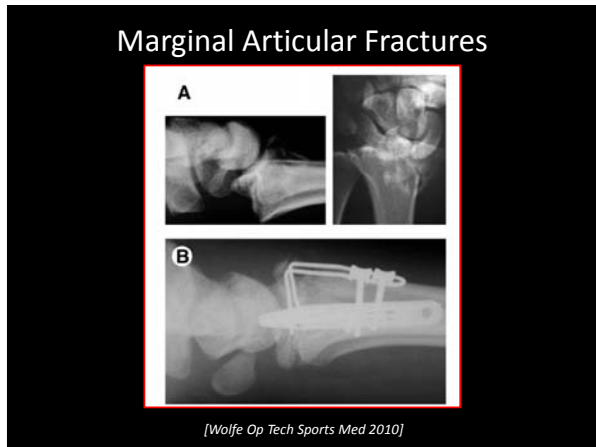




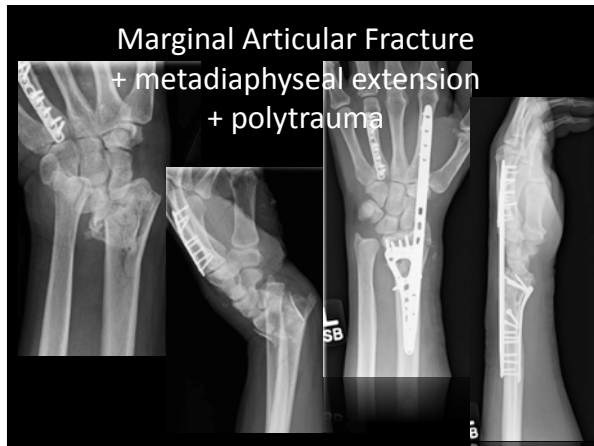


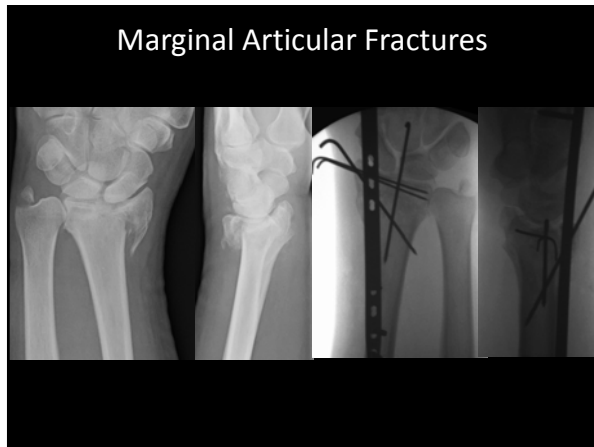








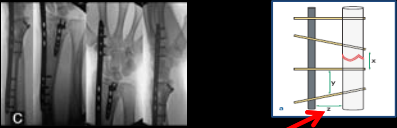




Dorsal Bridge Plate

[Burke & Singer 1998, Hanel JBJS 2005, CORR 2006]

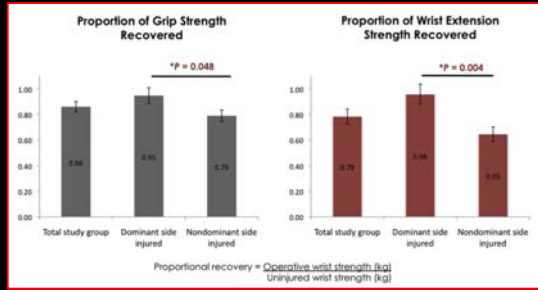
- Internal External Fixator
- Comminution + metadiaphyseal extension
- High Energy Polytrauma
- Early Weight Bearing
- Elderly [Ruch JHS 2012]



Zero bone-to-bar distance

DBP → Outcomes at 1 year

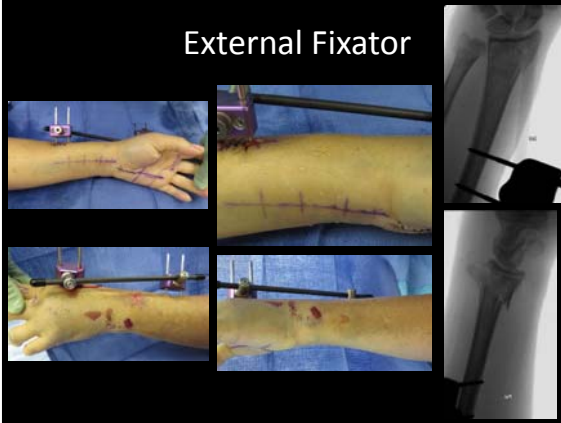
[Hanel JHS 2015]



Use of External Fixator



External Fixator



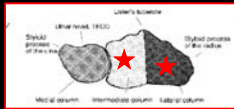
1 wk s/p injury – ORIF radius and ulna



Use external fixator for provisional reduction tool

Summary ORIF DRFx

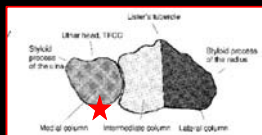
1. Preop C-arm images
2. Know your implant system
3. Plate placement = determined by fracture
4. Have an ex-fix/DBP available
5. Nobody looks good taking out hardware??



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

< 2 cm coronal shift

[Wolfe JHS 2015]

Evaluate DRUJ Intraop

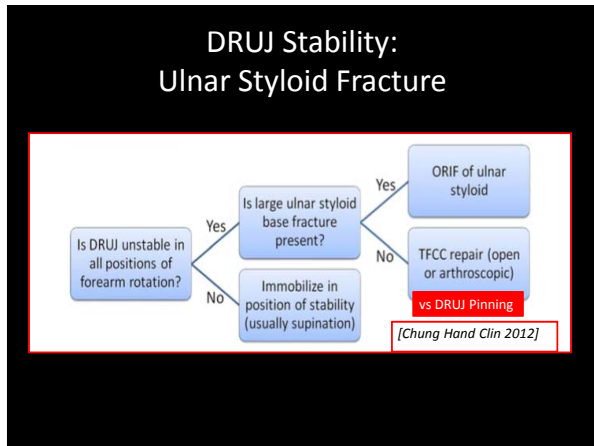
1. Line up volar and dorsal lip
a. Screw placement
b. Coronal Shift

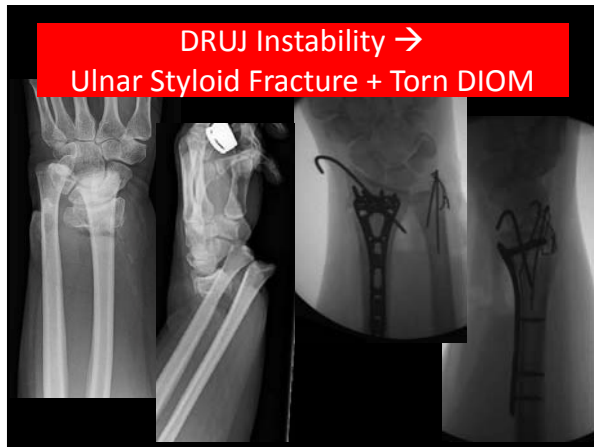
DRUJ Stability: Ulnar Styloid Fracture

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.

INTRAOP 5 MO POST-OP





- ### IN SUMMARY
- FRACTURE PATTERN DETERMINES PLATE PLACEMENT
 - REMOVE HARDWARE IF NECESSARY
 - CAREFUL INTRAOPERATIVE FLUOROSCOPY



Thank You



