Distal Radius Fractures
Tips and Tricks

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Full Disclosure

• Royalties
  – Acumed
  – Arthrex
  – Integra
  – Medartis

Fracture Stability

• LaFontaine
  • Initial dorsal angulation greater than 20 degrees
  • Dorsal metaphyseal comminution
  • Intraarticular involvement
  • Associated ulnar styloid
  • Age greater than 60

• Weber
  • Dorsal comminution volar to midaxial line

• Abbaszadegan
  • Axial shortening 4mm or more
Advantages of Arthroscopic Assisted Fixation

- Ideal view of joint surface
  - Minimal morbidity
  - Bright light
  - Magnified
- Loose bodies
- Associated soft tissue injuries

Greater Arc Injury
**Volar Approach**

**Advantages**

- More space available
- Flexor tendons located away from plate
- Concave surface of radius protects flexor tendons
- Blood supply less likely disrupted to fragments
- Volar cortex less comminuted
  - Key reduction
  - Release brachioradialis
- Volar scars better tolerated?

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**Plate Placement**

- Parallel to the radial shaft
  - Radial styloid screws will be ideal
- Bump of plate in line with sagittal ridge
- No gap between radius and plate
  - First screw non-locking
  - Flex wrist against plate
    - Assistant
    - Posterior towels to flex wrist

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**How NOT to do Volar Plate**

- Fracture not reduced
- Plate not in line with radial shaft
- Gap between plate and bone
Flexor Tendon Rupture

- Casaletto, JA, Brown DJ
  - J Hand Surg (Br) 34E: 471-474 2009
  - 353 pts, incidence 1.9% (7)
  - Average time to presentation 13.4 months
  - Not related to specific implant
    - Technical errors
      - Plate too distal – 4
      - Prominent screw heads – 1
      - Plate not seated radially - 1

Extensor Tendon Pathology

- Berglund LM and Messer TM
  - JAAOS: 17: 369-322. 2009
  - Stability of fixed angle volar plate
    - Depends on peg fixation in distal subchondral bone
    - Force transferred to intact radial shaft
  - Drill to far cortex
    - Do not penetrate
    - Uni-cortical screws
Extensor Tendon Rupture

• Beware screws that are too long
  – Extensor tendon injury
• Slope of Lister’s tubercle
  – X-ray deceiving
• Know which hole in plate is most at risk
  – Personal preference
  Pegs
  • Tip is not as sharp as a screw
  • Faster to insert

Dorsal Approach
Advantages

• Good view of fracture fragments
• Easy approach
  – Leave EPL out
• No neurovascular worries
• Easier to push fragments back and get volar tilt
  – Soft bone

Dorsal Approach
Disadvantages

– Small space available between skin and bone
– Dorsal surface occupied by tendons
– Radius convex
  • Forcing tendons to rub against plate
  • 25% - 33% plate removal
3 Months from Injury
Fell at Walmart

Dorsal Plate

Distal Radius Fracture
Fragment Specific Plates

- Volar Rim Fracture

Case

Conclusion

- Recognize unstable fracture patterns
  - Higher energy intra-articular fractures unstable
  - Do not let the fracture settle on you over period of weeks
- Use what is best in your hands
- Do not forget associated soft tissue injuries
  - Interosseous ligaments
  - DRUJ instability
Avoiding Complications in Distal Radius Fracture Management

VuMedi
May 28, 2014
Jorge Orbay MD

Disclosure:

• Skeletal Dynamics
Problems of Volar Plating

• Bone

Problems of Volar Plating

• Bone

• Tendon

Problems of Volar Plating

• Bone

• Tendon

• Nerve
Problems of Volar Plating
• Bone
• Tendon
• Nerve
• Rehabilitation

Subchondral Support Scaffold

2 mm
2 mm
Inadequate Subchondral Support

Inadequate Subchondral Support

[Images of medical scans and diagrams with labels PMF, RF, AMF]
Scaphoid Fossa

Lunate Fossa
Avoid tendon problems

Extensor Tendon Problems
Pronation
4th compartment
Supination
2nd compartment

Lister’s Tubercle

Subchondral Support Line
or
Subtract 2mm from DG measurement
Dorsal Horizon View: Detecting Screw Protrusion at the Distal Radius
Samuel James Joseph, MBBS, Jason N. Harvey, MBBS, FRACS
**Volar Locking Plate Implant Prominence and Flexor Tendon Rupture**

By Maximillian Soong, MD, Brandon E. Earp, MD, Gavin Bishop, MD, Albert Long, BS, and Philip Blau, MD

Investigation performed at the Department of Orthopaedic Surgery, Lahey Clinic, Burlington, and the Department of Orthopaedic Surgery, Brigham and Women’s Hospital, Boston, Massachusetts

“The Critical Line”

168 Radiuses treated with volar plating

<table>
<thead>
<tr>
<th>Grade 0</th>
<th>0 Ruptures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>1 Rupture</td>
</tr>
<tr>
<td>Grade 2</td>
<td>2 Ruptures</td>
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Acculock | DVR |
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</thead>
<tbody>
<tr>
<td>Grade 2</td>
<td>63%</td>
</tr>
<tr>
<td>Ruptures</td>
<td>4%</td>
</tr>
</tbody>
</table>
Tendon Impingement occurs in 3-D

Most Frequently Ruptured Flexors
Removing hematoma allows reduction

Extended FCR Approach

- Release FCR tendon sheath

Extended FCR Approach

- Release FCR tendon sheath
- Release the radial septum
Extended FCR Approach

- Release FCR tendon sheath
- Release the radial septum
- Pronate the proximal fragment
- Intrafocal Exposure
1. Reduce and Pin Lunate Fossa
2- Reduce and Pin the Scaphoid Fossa

Extension Interference Test
Thank You!

Steven L. Moran, MD
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Mayo Clinic, Rochester, MN

Disclosures

Dr. Moran is a consultant for Conventus.

ORIF of Distal Radius Fractures

• Gold Standard
• Allows for
  • Fracture reduction
  • Restoration of articular surface
  • Early rehabilitation

Volar Plate  Dorsal Plate
Disadvantages of ORIF

- Significant periosteal stripping
- Muscle injury
- Intra-articular hardware
- Extensor and flexor tendon rupture/irritation

Sonoma WRx (Rhee et al. THUES 2012)
Micronail (Rhee et al. THUES 2012)
Dorsal nail plate (Respoli et al. Acta Orthop Belg 2010)

Subchondral bone support provided only by locking or non-locking screws

New Technique

- Expandable Scaffold
- Fragment Screw
- Proximal Screws and Proximal Plate
Operative Technique

• Closed reduction (mini-open assist if needed)
• Provisional pin fixation (ulnar and radial cortices)
• Minimally invasive radial approach
Operative Technique

- Drill and ream to accept IM cage
- Deployment of the IM cage
- Proximal IM cage fixation (2 hole plate + 2 bicortical screws)

Operative Technique

- Percutaneous titanium screw fixation (headless or headed screws)
- Assess distal radioulnar joint → treat if necessary

Post-operative Rehabilitation

- 0 – 14 days: Sugar-tong splint
- 2 – 4 weeks: Short arm cast
- 4 – 12 weeks: Removal volar wrist splint → start wrist ROM
- > 3 months: Gradual return to full activities
Methods

Study Type:
• Retrospective case series (Level IV)
• All consecutive DRFx treated with the Conventus IM cage
• January 2013 to July 2013

Clinical outcome measures:
• Pain (VAS)
• Range of motion (ROM)
• DASH
• Complications

Radiographic outcome measures:
• Union (bridging trabecular bone on 3 of 4 cortices on orthogonal radiographs)
• Volar tilt
• Radial inclination
• Radial height
• Ulnar variance

Results

Total patients: 7 patients (6 females and 1 male)
Mean age: 62 years (range: 49 to 73 years)
Mean follow-up: 26 weeks (range: 14 to 29 weeks)
Dominant extremity injured: 3 of 7 patients

Fracture type:
• AO Type 23-C1 = 3
• AO Type 23-C2 = 4

Regional block:
• Supraclavicular = 5
• Axillary = 1
• General anesthesia = 1

Mean tourniquet time: 67 minutes (range: 47 to 83 mins)

Results: Clinical

Clinical:
• Pain at final follow-up: VAS 1/10 (0 to 5)

• Mean range of motion:
  • Flexion = 40° (20° to 55°)
  • Extension = 45° (35° to 60°)
  • Radial dev = 14° (10° to 15°)
  • Ulnar dev = 22° (5° to 30°)

• DASH: 13 (range 2-35)

• Complications:
  • Transient neuritis of the superficial branch of the radial nerve (n = 1)
  • Finger stiffness (resolved in 8 weeks)
68 y.o female
Results: Radiographic

Radiographic:
- Mean time to fracture union (x-ray): 7 weeks (6 to 10 weeks)
- No loss of reduction noted
  - Volar tilt = 10° (0° to 25°)
  - Radial inclination = 19° (6° to 25°)
  - Radial height = 10 mm (3 to 13 mm)
  - Ulnar variance = 1 mm (-2 to 5 mm)

Summary
- Select distal radius fractures (AO type 23-A1/A2, B1, and C1/C2) can be successfully stabilized with IM nitinol cage and percutaneous screw fixation.
- Nitinol IM cage can be useful to provide subchondral support in cases of metaphyseal bone loss or poor bone quality.
- Initial anatomic reduction is imperative prior to deployment of the IM cage.
- The superficial branch of the radial nerve must be protected from injury with minimally invasive approach.
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