Distal Radius Fractures, Do They All Need to be Fixed?

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Elderly patients fastest growing population segment & more active lifestyles Mandates increased attention to their fracture care & outcomes

20% of all fractures seen in the ED
Knowelden 1964 women >35, 32% fxs are DR
25% peds fxs are DR
18% elderly fxs are DR
2001 > 640,000 DRFs in USA
2017, any surgical construct @ $2,000.00
Data from our level 1 trauma center
If all fixed = > billions of dollars
Evidence to support surgical treatment?
Literature search DRFs
Google scholar
104,000 citations
Pubmed
6,000+ articles
DISTAL RADIUS FRACTURES
WHAT CAN GO WRONG?

Distal Radius Fractures, Do They All Need to be Fixed?

Why discuss?
- To improve outcomes
- Increased scrutiny
- Insurance companies, and

Distal Radius Fractures, Do They All Need to be Fixed?
Why debate? Are we seeing problems?
- Implant problems?
- Surgical technique issues
- Cost?
- Patient morbidities?
- Lack of evidence based medicine?

DISTAL RADIUS FRACTURES
WHAT CAN GO WRONG?

17 YEAR OLD MALE I HOPE TO NEVER SEE THIS COMPLICATION AGAIN
17 year old male, 6 week post-op visit.

Management?

Allen test
Ulnar flow intact
Aneurysm excised
DISTAL RADIUS FRACTURES
WHAT ELSE CAN GO WRONG?

FIXATOR PIN IN METACARPAL TOO BIG (3MM, WIDTH OF METACARPAL 7MM) NEXT TIME 2MM PIN

BRIDGE PLATING – DISTAL RADIUS FRACTURES

- History (Augusta, Georgia, USA)
- Indications
- Surgical Technique

1st bridge plate patient? Barbaro the Kentucky Derby horse

- An internal fixator technique for stabilizing comminuted Colles fractures
- 35 clinical cases. The Colles Fracture Plate (Biomet, Inc., Warsaw, Indiana)
- Relatively short plate
- Radius to 2nd metacarpal
- Great dorsal buttress

BECTON, ET AL…SEPT.1998
- Don’t over distract
  - Clinical check: fingers reach palm
  - Flouro: check radio-carpal joint space

**At time of removal**
1. Release adhesions
2. Tenolysis
3. Wrist MUA

**HARDWARE REMOVAL**

- Hardware removal
  - @2-3 months
  - Mobilize tendons: release adhesions
  - Manipulation under anesthesia
DISTAL RADIUS FRACTURES
WHAT ELSE CAN GO WRONG?
INFECTIONS WITH CRPP

DISTAL RADIUS FRACTURES
WHAT CAN GO WRONG?
ALL PINS NOW CUT BELOW THE SKIN

DISTAL RADIUS FRACTURES
WHAT CAN GO WRONG?
1) Volar tilt: neutral
2) Radial height: 10-13mm
3) Radial inclination: <25 degrees

• Ulnar impaction?

Correcting ulnar impaction

Distal Radius Fractures, Do They All Need to Be Fixed?

- Treatment goals (classic teaching)
  - Normal ulnar variance (0.7-1.5mm)
  - Radial height (10-13mm)
  - Radial inclination (<25 degrees)
- Anatomical considerations
- Surgical options: Pros/cons

IS IT REALLY NECESSARY TO RESTORE RADIAL ANATOMIC PARAMETERS AFTER DISTAL RADIUS FRACTURES?

Chart review of 51 pts, all volar plating
- >66% achieved anatomic restoration
- Those who did not had lower grip scores higher DASH scores and least 3 years ulnar variance and volar tilt
- Ulnar variance and volar tilt were the most important radiographic parameters to be restored to obtain good functional outcome in distal radius fracture.
- Small variations in radial length and inclination
does not affect the final outcome at minimum 3 years follow-up.

IMPLANT PROBLEMS?
- Mechanical Failure of the Distal Radius Volar Locking Plate
  - Tun-Lin Foo, Aaron WT Gan, Tamara Soh, Winston YC Chew
  - J of Orthopaedic Surgery December, 2013
  - Retro review 274 pts
  - 9 failures between 2 & 12 weeks (2.4%)
  - Screw pullout = 5, plate bend =2 locking screw break =1, variable screw loosening = 1
  - 1 revised, 2 hardware removal

79 YO FEMALE PASSING THROUGH ATL AIRPORT

Tendon issues?
- Delayed Rupture of the Flexor Pollicis Longus Tendon After Inappropriate Placement of the plate on the Volar Surface of the Distal Radius

JAMES A. NUNLEY, MD, PETER R. ROWAN, MD, DURHAM, NC
THE JOURNAL OF HAND SURGERY 1999

Extensor tendon issues
- The incidence of tendon rupture in
- nonoperative management of distal radius fractures has been reported to be as high as 3%, with extensor pollicis longus
- Mechanical and vascular insults to the tendon have been the 2 most accepted etiologies.
- Tendon rupture after volar plate fixation has been as high as 12%.
- The flexor tendon most commonly involved is the flexor pollicis longus (FPL).
- reports of flexor digitorum profundus, extensor digitorum communis, and EPL ruptures after volar plate fixation.
- Suspected causes of tendon rupture include improper plate position, prominent screw placement, plate design, steroid use, loss of reduction or fracture collapse, and inadvertent retention of drill guides.
They identified 6 cases of tendon rupture in 1,359 patients (0.4%) treated nonoperatively for distal radius fractures. Tendon rupture occurred at an average of 9 weeks after initial injury (range, 3–16 wk) and involved the EPL in all 6 cases. Extensor indicis proprius to EPL transfer was performed in all 6 cases. The average age was 63 years (range, 55–76 y) and all were women. All 6 fractures were extra-articular.

They identified 8 patients with 11 tendon ruptures in 999 patients treated with volar plate fixation (0.8%). The average age was 64 years (range, 50–82 y), and 7 were women. The average time to tendon rupture was 20 months (range, 4–56 mo). Tendon ruptures included 5 FPL, 3 flexor digitorum profundus, 1 EPL, 1 extensor carpi radialis brevis, and 1 flexor carpi ulnaris. Two patients had multiple tendon ruptures; the FPL and flexor carpi ulnaris were involved in 1 patient, and the FPL and flexor digitorum profundus to the ring and middle fingers were involved in the other. Although tendon rupture after volar plating was often attritional in nature, early detection allowed for primary repair of 7 ruptures; only 1 patient required a palmaris longus autograft.

TREATMENT GOALS

Anatomical restoration
Avoid malunion, nonunion
Early range of motion
Functional painless motion
Painless weight bearing
Distal Radius Fractures, Do They All Need to be Fixed?

**ORIF IF UNSTABLE?**

**DEFINITIONS OF UNSTABLE DISTAL RADIUS FRACTURE**

1. Failure of reduction
2. Lafontaine: Following factors are present:
   - dorsal angulation exceeding 20°
   - dorsal comminution; intra-articular radiocarpal fracture
   - associated ulnar fracture; and age over 60 years
3. A volarly displaced fracture (Smith or volar Barton fracture)
4. An irreducible fracture
5. An AO type C2

DOI: 10.1055/s-0035-1556860

**ASSESSMENT OF INSTABILITY FACTORS IN ADULT DISTAL RADIUS FRACTURES**

- Kristin S. Nesbitt, MD, Detroit, MI; Joseph M. Fallis, MD, Southfield, MI; Clifford Les, DVM, PhD, Detroit, MI
- Closed reduction/sugar tong splint
- 50 patients, 3 Lafontaine factors
- Radiographs at 4 weeks

**THE UNSTABLE DISTAL RADIUS FRACTURE—HOW DO WE DEFINE IT? A SYSTEMATIC REVIEW**

Monique M. J. Walenkamp, MD, MSC, Lara M. Vos, MD; Simon D. Strackee, MD, PhD; J. Carel Goslings, MD, PhD; and Niels W. L. Schep, MD, PhD, MSC

- Systematic lit review
- Any study on “unstable distal radius fracture”
- 2500 citations
- 479 included
- 54% authors defined unstable
- 7 descriptions repeatedly applied
ASSESSMENT OF INSTABILITY FACTORS IN ADULT DISTAL RADIUS FRACTURE

- 2 Lafontaine: following factors are present:
  - dorsal angulation exceeding 20°; dorsal comminution; intra-articular radiocarpal fracture;
  - associated ulnar fracture; and age over 60 years.

- 46% maintained an adequate reduction.
- Of the 54% of fractures that failed to maintain an adequate reduction, age was the only statistically significant predictor of secondary displacement.

Table 2. Percent Risk for Displacement Based on Age and Time from Reduction with 3 Lafontaine factors

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>After Reduction</th>
<th>1 Week After Reduction</th>
</tr>
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<tbody>
<tr>
<td>30</td>
<td>17%</td>
<td>6%</td>
</tr>
<tr>
<td>40</td>
<td>27%</td>
<td>10%</td>
</tr>
<tr>
<td>50</td>
<td>50%</td>
<td>25%</td>
</tr>
<tr>
<td>70</td>
<td>66%</td>
<td>42%</td>
</tr>
<tr>
<td>80</td>
<td>77%</td>
<td>57%</td>
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</tbody>
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Distal Radius Fractures, Do They All Need to be Fixed?

- ORIF IF UNSTABLE?
- WHAT IS BETTER
- Volar or dorsal platting?

Tendon ruptures
- Mechanical and vascular insults to the tendon have been the 2 most accepted etiologies. **SUMMARY**
  - occur with 3% closed treatment: EPL at 9wks
  - Volar platting as high as 12%.
  - #1 is the flexor pollicis longus (FPL).
  - reports of flexor digitorum profundus, extensor digitorum communis, and EPL ruptures after volar plate fixation.
  - dorsal platting
  - EPL 2-8%, presents as late as 6 months

Volar platting resulted in a significantly better Gartland-Werley score compared with dorsal platting.
- There was no significant difference in the DASH scores.
- Volar collapse was documented in 5 of the 20 patients in the dorsal platting group.
  - which resulted in a relation of protection compared with the volar platting group.
  - No collapse occurred in the volar platting group. In addition:
    - the difference in the percentage of end range of motion compared with the contralateral and the final score.
- Dorsal platting was associated with a rupture extensor indicis tendons in 7 patients.
- Secondary surgical procedures were required in patients (tenolyses and radial styloidectomy).
- Volar platting was associated with median nerve neuropathy in 3 patients and intersection syndrome in one.

Distal Radius Fractures, Do They All Need to be Fixed?

J HAND SURG AM. 2006
JAN;31(1):9-16.
VOLAR VERSUS DORSAL PLATING IN THE MANAGEMENT OF INTRA-ARTICULAR DISTAL RADIUS FRACTURES.
RUCH DS, PAPADONIKOLAKIS A.
A PROSPECTIVE RANDOMIZED TRIAL COMPARING NONOPERATIVE TREATMENT WITH VOLAR LOCKING PLATE FIXATION FOR DISPLACED AND UNSTABLE DISTAL RADIAL FRACTURES IN PATIENTS SIXTY-FIVE YEARS OF AGE AND OLDER. JBJS 2011

ROHIT ARORA, MD, MARTIN LUTZ, MD, CHRISTIAN DEML, MD, DIETMAR KRAPPINGER, MD, PHD, LUZIAN HAUG, MD, AND MARKUS GABL, MD

INVESTIGATION PERFORMED AT THE DEPARTMENT OF TRAUMA SURGERY AND SPORTS MEDICINE, MEDICAL UNIVERSITY INNSBRUCK, INNSBRUCK, AUSTRIA

RESULTS

- Dorsal radial tilt, radial inclination, and radial shortening were significantly better in the operative treatment group than in the nonoperative treatment group at the time of the latest follow-up (p < 0.05). The number of complications was significantly higher in the operative treatment group (thirteen compared with five, p < 0.05).

- Achieving anatomical reconstruction did not convey any improvement in terms of the range of motion or the ability to perform daily living activities in our cohorts.

Distal Radius Fracture Management in Elderly Patients: A Literature Review

Samantha Y. Solomon, MD & James B. Wolfel, MD, Rock H. Korf, MD

Noted with external fixation and K-wire stabilization. Stratifying patients into groups may improve the management of distal radius fractures in elderly patients. Low demand patients do well with deformity.

1) Volar tilt: neutral
2) Radial height: 0
3) Radial inclination: <21 degrees

Ulnar impaction?

Distal Radius Fractures, Do They All Need to be Fixed?

- No
- Closed reduction
- Serial radiographs
- Patients do not benefit from remanipulation as the incidence of complex regional pain syndrome (CRPS) Type I is higher in such patients.
- Dependent patients with low functional demands for daily living in whom fracture malunion may be better tolerated.
Distal Radius Fractures, Do They All Need to be Fixed?

- Open fractures
- Failed closed treatment
- Age over 60?
- Volar fixed-angle plate systems have made plate osteosynthesis popular for elderly individuals with osteoporotic bones
- Independent fixed-angle plates have been used
- High demand?
- Age: 58, 60, 65
- Inverse relationship to post-reduction stability
- Women with a distal radius fracture
  - 85% have low BMD
  - 51% have osteoporosis

Amputate above or below the elbow?

24 yo male

Lower versus upper extremity limb salvage

1st step: debride everything non-viable
SINGLE VESSEL FLOW TO HAND
NOT IDEAL FOR HEALING

Acute shortening to close/cover flexor tendons

External fixation = Taylor spatial frame

Flight simulator
6 degrees of freedom

Can move hand in any direction

Negative pressure for a few days

"old school"
5 months later

September 2012

“NO REGRETS ABOUT ALL THE SURGERIES AND TRYING TO SAVE MY ARM”

I JUST WANT TO PLAY MY DRUMS AND SHIFT MY CAR