



Distal Radius Fractures: Considerations and Treatments

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Updated 2016

Incidence

- Upward of 1/6th of all ER fractures
 - >250,000 / yr in USA
- Bimodal distribution
- >35 yo
 - 4 F : 1 M
- >60 yo
 - 7 F : 1 M



Incidence

- Common injury which is steadily becoming public health issue
 - Among **woman > 60** years risk of fracture
 - ***Distal Radius*** ***17%***
 - Hip **14%**
 - ***4 times greater with lowest quintile of BMD***
 - Gardsell Calc Tissue Int., 1989
 - Hui Ann Int Med, 1989
- Younger adults
 - Higher energy injuries; post-traumatic arthrosis; functional disabilities

BMD mechanical effect

- Post menopausal
- Increased diameter
- Decrease strength
- Decreased Estradiol levels

↓ 1SD : ↑ 3.8 rr



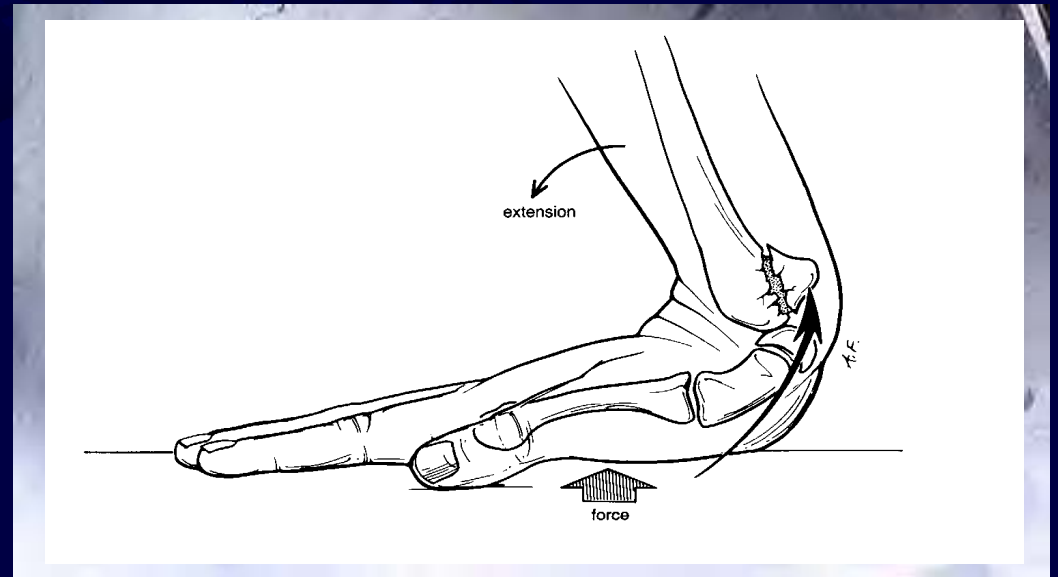
➤ **Correlate better with BMD than with radiographs*

Mechanisms of Injury



Mechanism of injury

- Fall
 - Onto outstretched hand
 - Bending
 - Shearing
- High Impact



Abraham Colles - 1814

- “The absence of crepitus and of the other usual symptoms of fracture rendered the diagnosis extremely difficult”
- “One consolation only remains, that the limb will at some remote period again enjoy perfect freedom in all its motions and be completely exempt from pain”.
- ???????



Robert William Smith - 1847

- “A fracture of the lower end of the radius - to 1 inch from the articular surface, in which the lower fragment and the carpus were displaced forwards in relation to the forearm”



John Rhea Barton - 1838

- “Subluxation of the wrist, consequent to a fracture through the articular surface of the carpal extremity of the wrist”



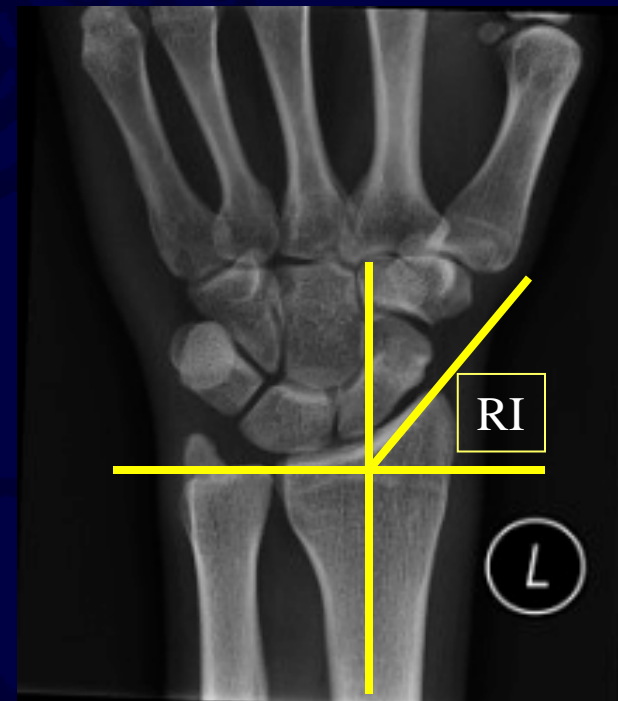
Anatomy

- Distal radius: 80% load
- Metaphyseal flare
- Biconcave articular surface - triangular in shape
- Two facets for scaphoid and lunate



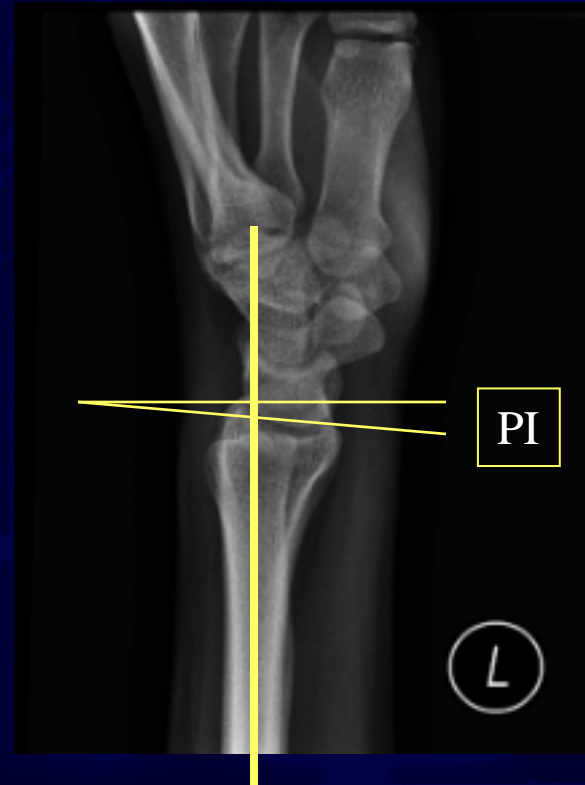
Radiological Assessment

- Radial Inclination
 - 22-23°
- Palmar inclination
 - 11-12°
- Radial length
 - 11-12mm
- Ulnar variance



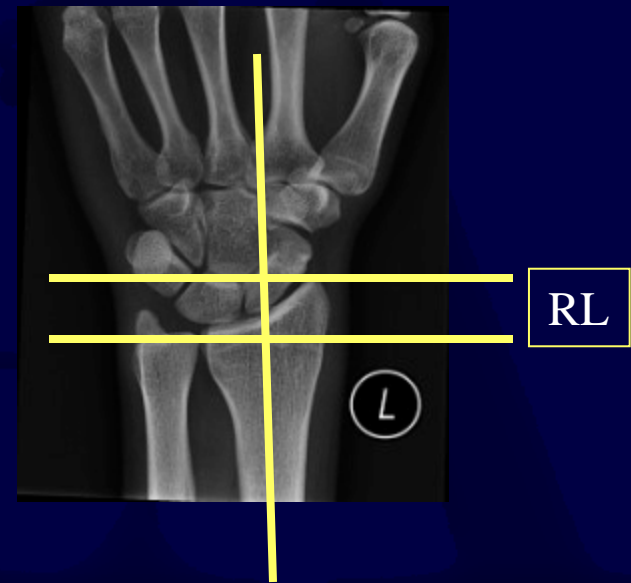
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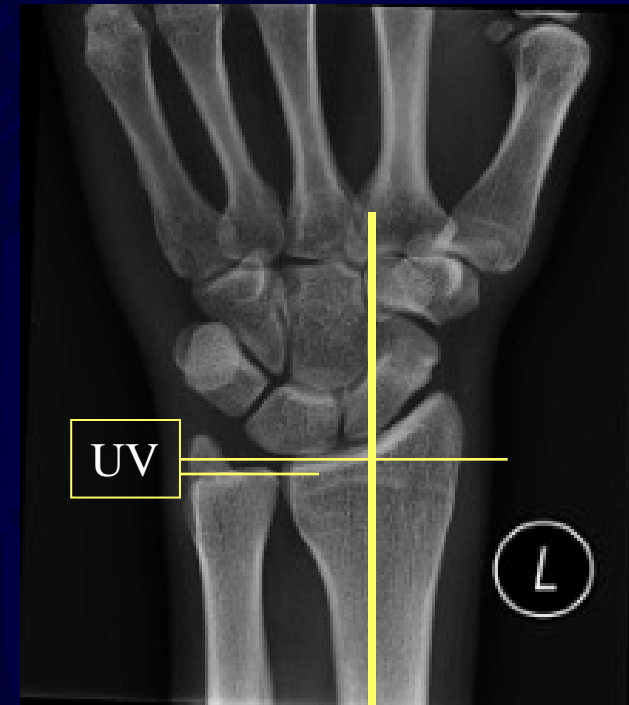
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MANY Classifications – Anatomy means most...

- Destot - 1923
- Taylor & Parsons – 1938
- Nissen-Lie – 1939
- Gartland & Werley – 1951
- Lidstrom – 1959
- Older – 1965
- Frykman - 1967
- Sennwald & Segmuller - 1984
- Jenkins – 1989
- Rayhack – 1990
- Cooney - 1990
- Mayo - 1992
- Melone – 1993
- McMurty – 1993
- Fernandez
Classification

Overall Evaluation

- Volar Tilt
- Radial height
- Articular incongruity
- Concomitant Instability
 - DRUJ
 - Carpal: DISI, VISI, etc.



Stability

| | Dorsal Angulation | Comminution | Radial Length Shortening |
|---|-------------------|-------------|--------------------------|
| Stable (Closed Red. Success) | < 9° | Mild | < 4mm |
| 2° Instability (Closed Red. Failure) | >10° | Moderate | > 5mm |
| Unstable | >20° | Severe | > 10mm |

Treatment Options

- Conservative
 - Reduction
 - Splinting
 - Casting
- Operative
 - Pinning
 - Ex-fix
 - Plate



The illustration shows a doctor in a dark suit and white shirt sitting in a large, ornate chair, holding a cup of coffee. A woman in a plaid dress and apron stands behind a table, pouring coffee from a large glass pot. A sign above the table reads "COFFEE". The scene is set in a room with a patterned rug and a small table with a coffee pot and cups.

Just what the Doctor ordered

IT'S common knowledge that coffee is an invigorating tonic, and that there's nothing so good as a cup of coffee in the morning and after dinner. And now the doctor has prescribed coffee for you.

And what makes it better, you may say, is the fact that it's so good for you. And what makes it better, you may say, is the fact that it's so good for you.

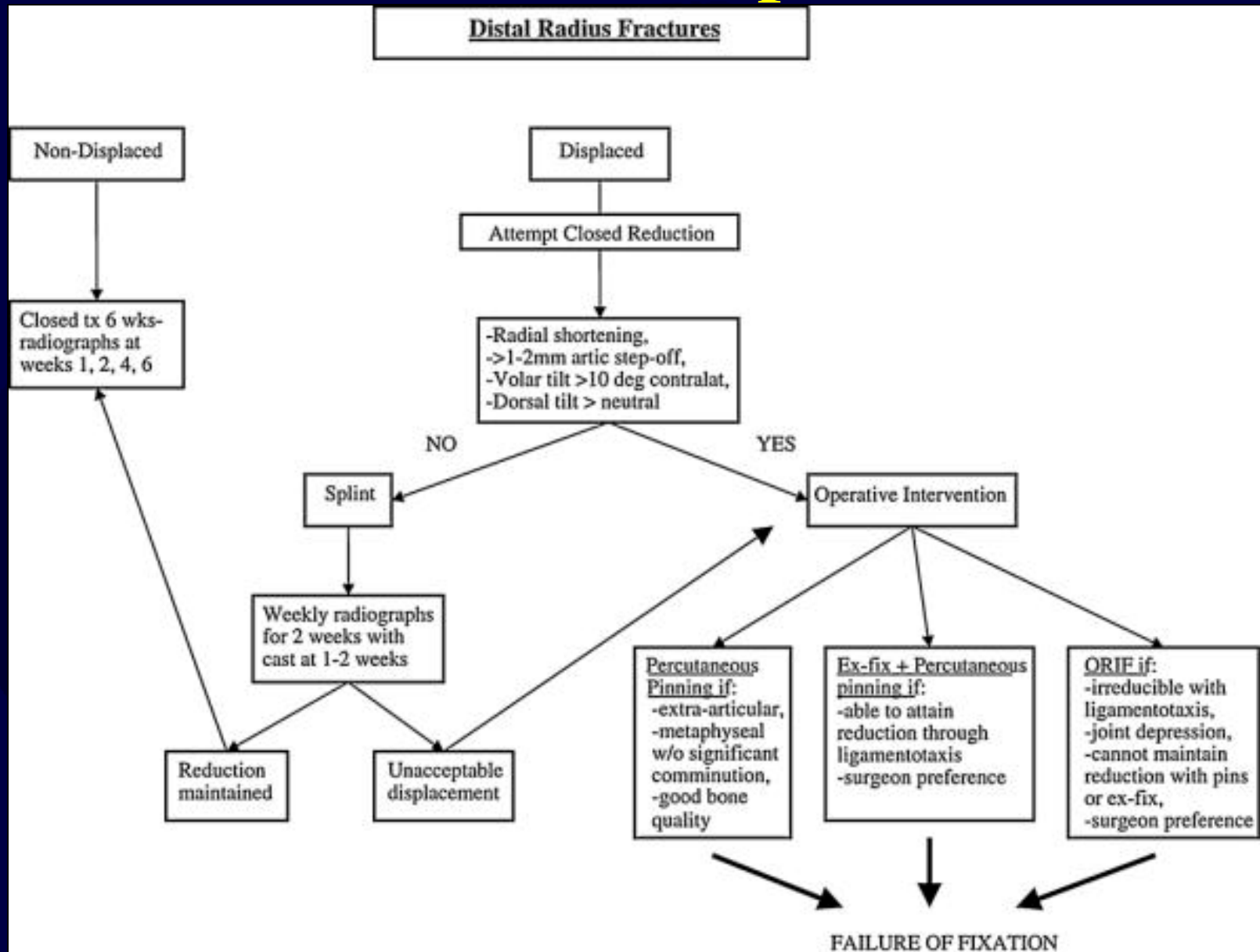
So why not get yourself a cup of coffee today? It's the best thing you can do for yourself.

MADE BY THE COFFEE TRADING COMPANY, NEW YORK, N.Y.



Coffee
perks you up!

Treatment options



Functional Bracing

- Sarmiento
 - Study of 44 patients
 - 82% good to excellent results
 - 73% -reduced grip strength
 - 39% -significant deformity
- ***“The method does not entirely prevent collapse of the fracture”***

Closed Tx

- Early Instability (1wk)
 - Radial shortening
 - Volar tilt >20 deg
- Late Instability (6wks)
 - Radial inclination <10 deg
 - Radial shortening
 - Age > 65
 - Volar tilt > 20 deg



Operative Tx

- Intrafocal pinning
- ***Ex-fix***
 - ***Bridging***
 - ***Non-bridging***
- ORIF
 - Dorsal / Volar
 - Dorsal plating btw. 20-40% extensor tendon problems
 - Fragment Specific Fixation (Trimed)
 - Standard Plating / LOCKED PLATING
 - Locked Plating with better maintenance of reduction after cyclical loading
- Osteobiologic Supplementation
- Concomittant Ulnar Styloid fixation / DRUJ

Closed Tx vs Fixation

- Parameters historical
 - 20 degrees dorsal tilt
 - 50% dorsal comminution
- Reduction loss usually within 1 week
- Mathematical Formulas do not provide the answer
- ***Displaced Fx's (Good or Excellent results)***
 - Closed tx – 43%
 - ***Ex-fix / ORIF – 60-80%***

Complications of cast treatment

- Finger stiffness
- RSD
- Carpal tunnel syndrome
- Skin breakdown



Bridging ex-fix vs cast

- Kreder H: 2006 JOT
 - 113 patients
 - 2 yr f/u
 - SF-36 and grip strength
 - ***Improved results for ex-fix ± k-wires***



Functional Deficit after Casting

- Prospective study found 40% impairment of pronation
 - **50% reduction (6-27 months):**
 - *Flexion / Extension*
 - *Radial / Ulnar deviation*
 - **Less functional impairment in those with fixation, no cast**

Byl NN, Kohlhase W, Engel G. *J Hand Ther* 1999

Complications of Non-Operative Treatment

- Malunion..... “ Just let it heal and if it bothers her I’ll do a Darrach”
- Outcomes of Darrach procedure run from 91% to 50% Good and excellent
- Pain is improved, grip strength is not
- Patient still had surgery

Field J, Majkowski
RJ, Leslie JJ.
JBJS 1993

Tulipan DJ, Eaton RG,
Eberhart RE
JHS 1991

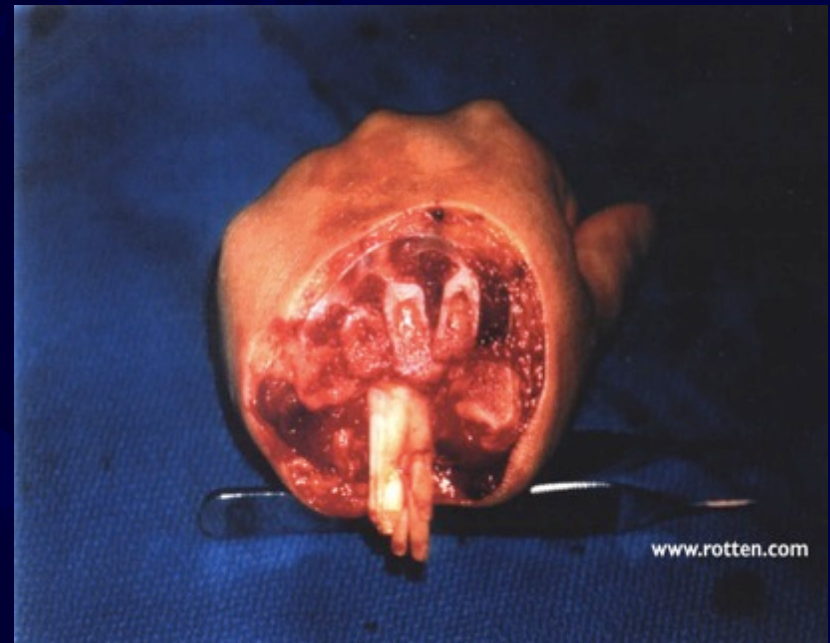
Operative Tx - Principles

- Articular surface restoration
- Length
 - Radial styloid
 - Ulna variance
- Volar Tilt
- Buttress as needed



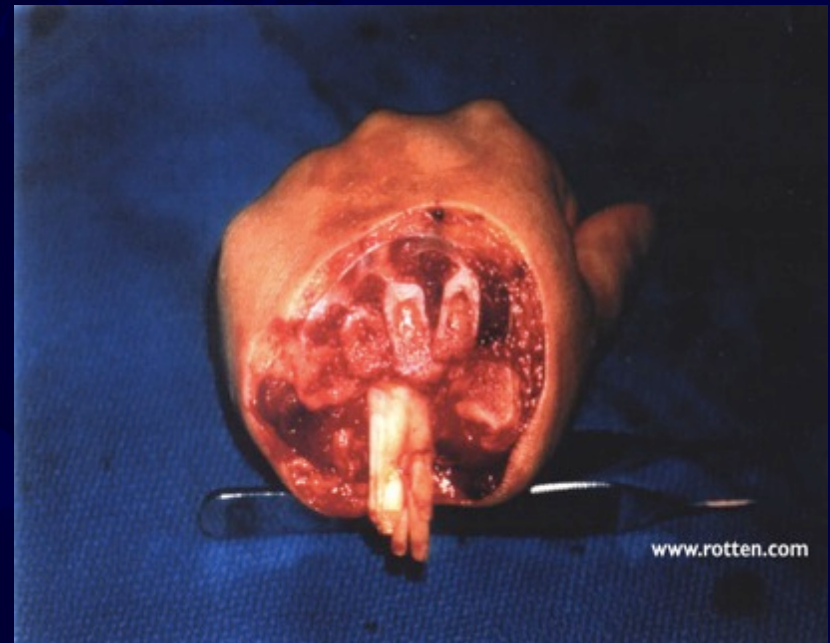
Indications

- Absolute
 - Open Fracture
 - Significant soft tissue trauma
 - Acute Median n. Sxs
- Failure to achieve satisfactory reduction



Indications

- High-energy injury
 - Secondary loss of reduction
 - DRUJ incongruity
 - Multi-extremity injury
-
- *Loss of volar buttress*
 - *Articular comminution, step-off, gap*



Radiographic Reduction Criteria

| Result | Deformity | Dorsal Angulation | Shortening | Radial Deviation |
|-----------|-----------|-------------------|------------|------------------|
| Excellent | none | <0° | <3mm | <4° |
| Good | slight | 1-10° | 3-6mm | 5-9° |
| Fair | moderate | 11-14° | 7-11mm | 10-14° |
| Poor | severe | >15° | >12mm | >15° |

- ***Displacement of >2mm, Shortening of >5mm, and Dorsal Angulation of >20° has shown to cause an increased incidence of arthritis, decreased wrist motion, 50% decrease in grip strength, and wrist instability in the long run.***

Factors Affecting Functional Outcome

| <u>Author</u> | <u>Length</u> | <u>Radial Tilt</u> | <u>Volar Tilt</u> | <u>Gap</u> | <u>Step-off</u> |
|----------------------|---------------|--------------------|-------------------|------------|-----------------|
| ARO (1988) | ++++ | + | 0 | 0 | 0 |
| VILLAR (1987) | ++++ | + | 0 | 0 | 0 |
| WOLFE (1994) | ++ | + | 0 | 0 | 0 |
| JUPITER (1986) | 0 | 0 | 0 | + | ++++ |
| BACORN (1953) | ++ | ++ | 0 | + | 0 |
| OLDER (1966) | ++ | ++ | ++ | 0 | 0 |
| TRUMBLE (1994) | ++++ | -- | -- | ++++ | ++++ |
| McQUEEN (1989, 1995) | ++ | -- | ++++ | ++ | +++ |
| TALIESNIK (1984) | 0 | ++ | ++++ | 0 | 0 |

Factors Affecting Functional Outcome

- Stability
 - Age
 - Radial Length
 - Initial dorsal angulation
- Radial shortening
 - Decreases functional tendon length --> Decreased grip strength

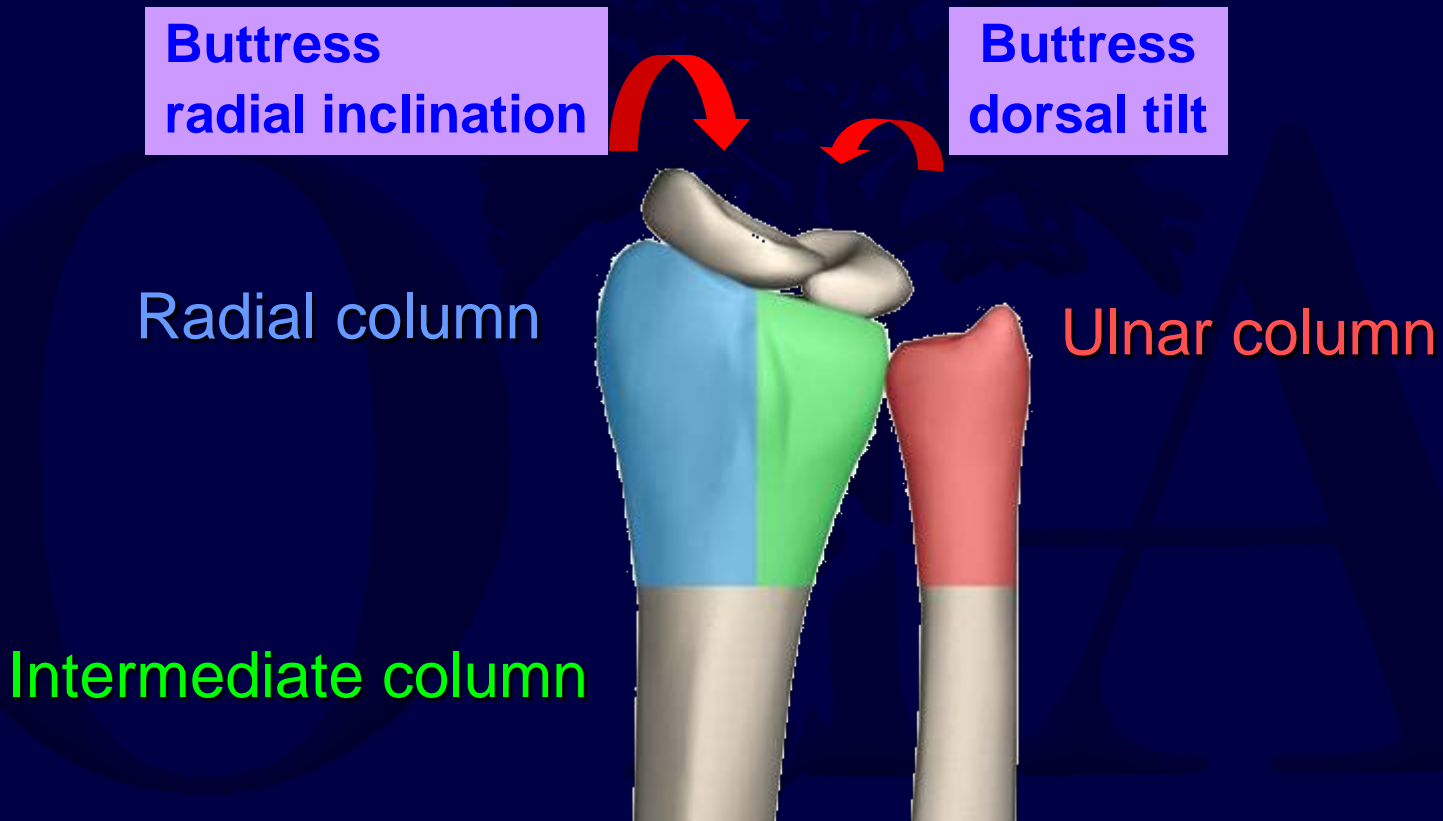


- Can we think of the

Distal Radius as the

Tibial Plateau of the Upper Extremity?

Column Theory (Rikli / Regazzoni)



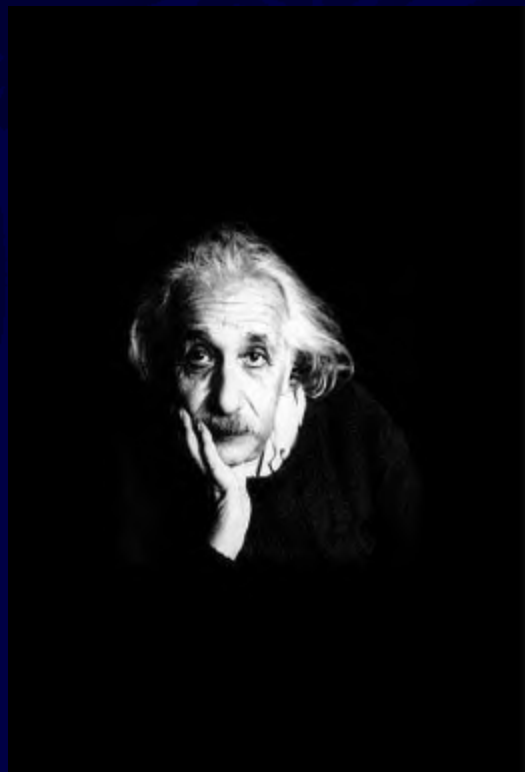
- How to “think” about fixation needs?
- What about the 3 joints of the wrist?
- What about the 3 columns of the wrist?

What can we do when we fix it?

- Ex-fix
- ORIF volar
 - Henry
 - Extended CTR
- ORIF dorsal

External Fixation

- Dynamic or Static
- Bridging or Non-Bridging



External Fixation vs Cast

- Meta-analysis have shown *superior results with external fixation* compared to non-op

- Functional
- Radiographic

Kreder H et al: JOT 2006

Cochrane review 2000

Paksima et al 1998

External fixation of *intra-articular* fractures of the distal radius in young and old adults.

- 40 patients (18-89 years old, mean 58 years)
- ***AO-type C 2 or C 3***: 2.3 years
- **82.5% Good and Excellent** radiological and functional results.

Huch K, Hunerbein M, Meeder PJ.

Arch Orthop Trauma Surg 1996

Dynamic External Fixation

- Maintain joint distraction
- *Center of wrist rotation* must be maintained in the *head of the capitate*
- Bending motions occur at the joint not the fracture site.
- *No benefit but increased complications*

Dynamic

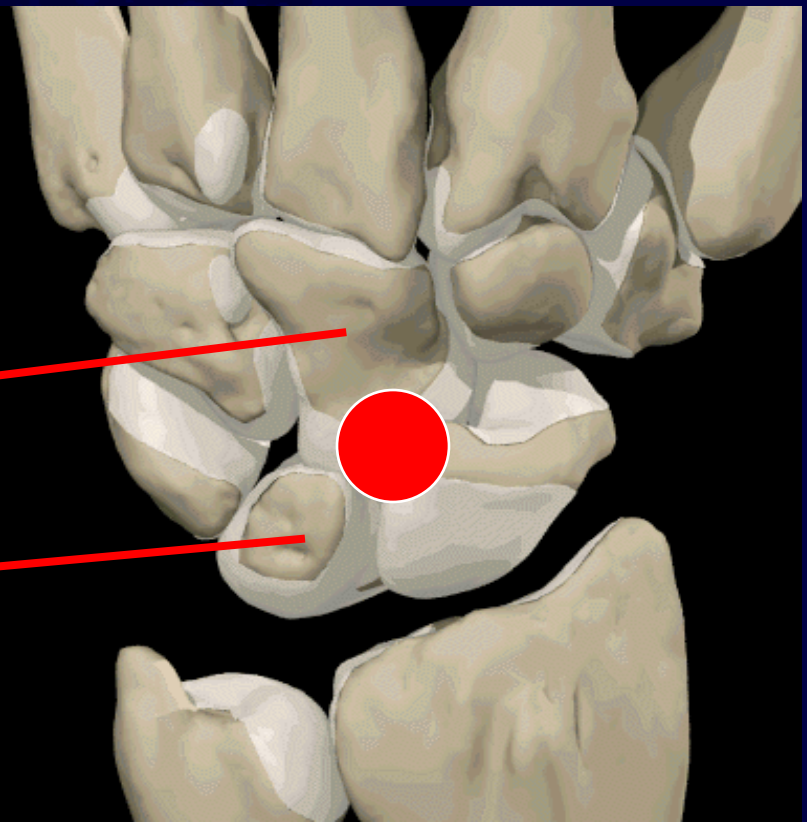
COR: head of capitate

Anterior View

Center of rotation

Capitate

Lunate

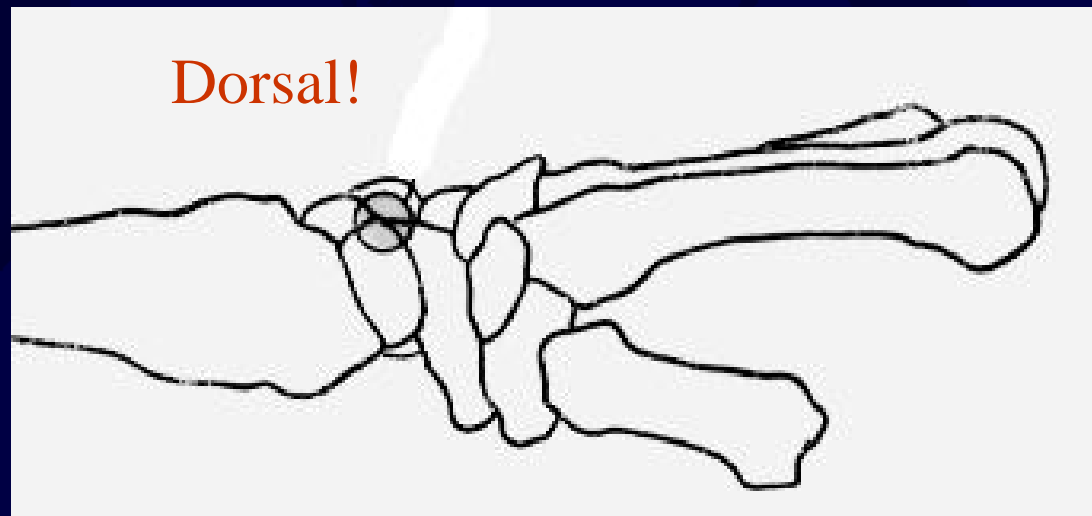


Dynamic

Lateral View

COR- head of capitate

Dorsal to the
Center of Radius



Dynamic

- Ishikawa (1999): carpal kinematics significantly altered with **wrist distraction**
 - distraction preferentially increases strain in the volar intrinsic ligaments to the proximal carpal row, thus **limiting flex/ext motions of the radial-carpal joint and producing greater flex/ext motions in the mid-carpal joint.**
 - felt to be the source of clinical inefficacy of most dynamic fixators
 - **Result: Pain, Worse Function, Decreased Grip Strength**
- Kawaguchi S (1998) JHS:
 - **Dynamic exfix did not consistently stabilize Colles fractures w/ pre-op dorsal angulation > 20 degrees**

Non-Dynamic Fixators: Restoration of Anatomy

| <u>Type</u> | <u>Length</u> | <u>Radial Tilt</u> | <u>Volar Tilt</u> | <u>Gap</u> | <u>Step-off</u> |
|--------------------|---------------|--------------------|-------------------|------------|-----------------|
| SPANNING | +++++ | +++++ | ----- | ++ | ----- |
| NONSPANNING | +++++ | +++++ | +++++ | ++ | ----- |

Non-Bridging

- Radio-Radial fixator
- Metaphyseal pins
- **Provided the distal fragment is large enough, and of good quality*



Factors Affecting Functional Outcome

- McQueen (1996): *carpal alignment after distal radius fractures is the main influence on final outcome*
 - malalignment has significant negative effect on function
 - failure to restore *volar tilt* predisposes to carpal collapse and carpal malalignment

Non-Bridging vs. Bridging Fixator

- McQueen, JBJS-B, 1998
- Prospectively studied 30 spanning vs 30 non-spanning fixator patients
- 50% less complications
- **Non-spanning** better preserved *volar tilt, prevented carpal malalignment, gave better grip strength and hand function* (all with $p < .001$)

Similar results:

Gradl G and Jupiter JB: 2005 JHS-A
Uchikura C: 2004 J Orthop Sci

Bridging Ex-fix

- Metaphyseal fracture
- \pm Simple joint
 No depression
- Damage control
- Soft tissue injury
- Reduction tool
- Surgeon preference



25yo m s/p
Multi-GSW
w/ iliac a. injury



Bridging Ex-fix & >65 yrs old

- Kamiloski V: 2006

Prilozi

- ~80% *G to E results*
- *Low operative risk*

- Ochman S: 2006

Unfallchirurg

- *87% excellent / good*
- *100% union rate*

Bridging Ex-fix & >65 yrs old

- Is non-bridging better?
- Atroschi I: 2006 Acta Orthop
 - Non-bridging: better radial length
 - **Shorter OR time bridging vs non-bridging**
 - **No diff DASH scores**
 - **No diff ROM, grip, satisf.**
 - **Overall no clinical diff**
- Bridging w/ supplemental k-wire
- Fu Y: 2006 J Trauma
 - 32 pts >65 yo vs 66 pts <60 yrs old
 - 18 mo f/u
 - **87.5% excellent / good**
 - **No diff in radiographic radial length or volar tilt**

Bridging Ex-fix

- Metaphyseal fracture
- \pm Simple joint
 No depression
- Damage control
- Soft tissue injury
- Reduction tool
- Surgeon preference



25yo m s/p
Multi-GSW
w/ iliac a. injury



Bridging Ex-fix

- Avoid
 - Mid carpal distraction
 - Excessive ulna deviation
 - Excessive palmar flexion

VOLAR LIGAMENTS

-stout

DORSAL LIGAMENTS

-lax with zig-zag pattern

Papadonikolakis A: 2005 JHS
>2-5mm distraction at jts
affects ability of FDS on MCPs

***RELIES ON
LIGAMENT DISTRACTION***

Bridging Ex-fix

- Avoid
 - Mid carpal distraction
 - Excessive ulna deviation
 - Excessive palmar flexion



“Cotton-loader” position

- Nerve Sxs
- Contractures
- Stiffness
- Poor tendon length

Bridging Ex-fix

- Avoid
 - Mid carpal distraction
 - Excessive palmar flexion
 - Excessive ulna deviation

****Becomes neutralization device with pins***



25yo m s/p
Multi-GSW
w/ iliac a. injury



REMEMBER ALL 3 JOINTS



19 yo m s/p GSW
Fall in gravel
Very contaminated



REMEMBER ALL 3 JOINTS



19 yo m s/p GSW
Fall in gravel
Very contaminated



REMEMBER ALL 3 JOINTS



19 yo m s/p GSW
Fall in gravel
Very contaminated



Don't forget the DRUJ!

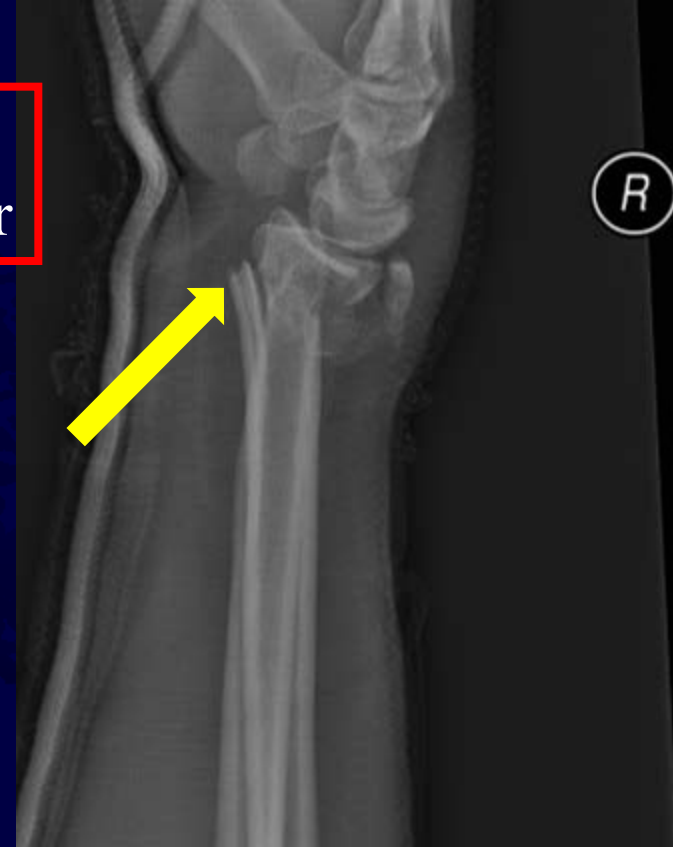
Remember???



19 yo m s/p GSW
Fall in gravel
Very contaminated



37 yo m
Fall 25 feet off ladder



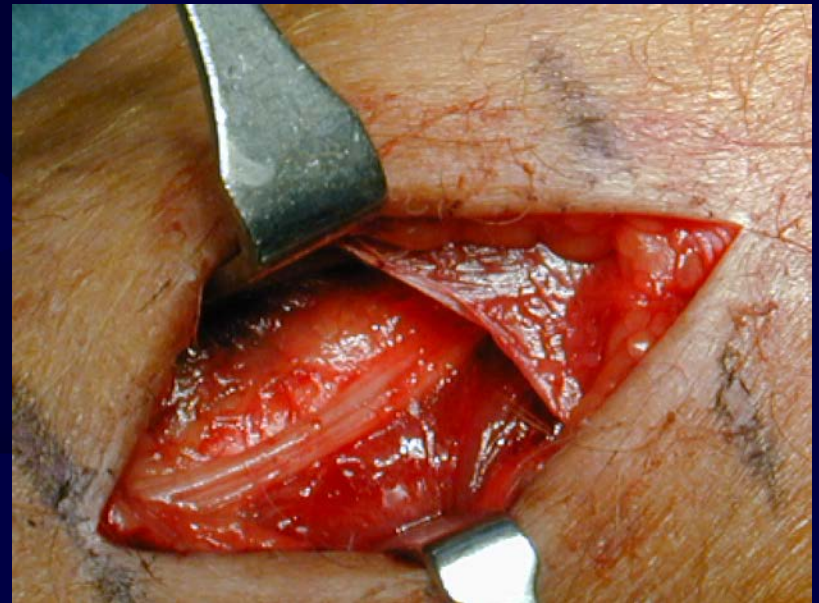


Ex-fix as a
temporary
reduction
tool



Dissection

- Beldner S: 2005 JHS-A
 - *SRN emerges from under brachioradialis 9cm proximal to radial styloid*
- Superficial radial n.
 - Btw. Brachioradialis & ECRL
- Go btw ECRL & ECRB



Supplements w/ ex-fix

- Wolfe SW (1999): JHS -A
 - **Supplemental k-wires** improve rigidity in 3 planes of rotation
- Moroni A (2001): JBJS - A
 - **Hydroxyapatite-coated** tapered pins w/ increased extraction vs insertion torques
- Tobe M (2004): Tech hand Up Extrem Surg
 - **Calcium phosphate augmentation**

Treatment of external fixation pins about the wrist: a prospective randomized trial

- Egol KA: 2006 JBJS-A
- 120 wrists
 - Dry dressing changes q wk
 - Daily H₂O:H₂O₂
 - Biopatch (chlorhexidine)
- **19% pin tract infections**
 - All tx'd w/ po abx
- **No difference btw groups**



Bridging Ex-fix

- Risks
 - Stiffness
 - Wrist
 - Fingers
 - Pin track infections
 - Delayed Loss of Reduction
 - RSD



Vitamin C – Avoid RSD / CRPS?

- AAOS 2010 CPG
 - Moderate Strength
 - 500mg / q day
 - 50 days



Vitamin C – Avoid RSD / CRPS?

No strong evidence in Meta-analysis or RCT

Vitamin C to Prevent Complex Regional Pain Syndrome in Patients With Distal Radius Fractures: A Meta-Analysis of Randomized Controlled Trials

JOT 2015

Nathan Evaniew, MD, Colm McCarthy, MD, CM, Ydo V. Kleinlugtenbelt, MD, Michelle Ghert, MD, FRCSC, and Mohit Bhandari, MD, PhD, FRCSC

The Influence of Vitamin C on the Outcome of Distal Radial Fractures

JBJS 2014

A Double-Blind, Randomized Controlled Trial

Ingri Ekrol, MRCSEd, Andrew D. Duckworth, MSc, MRCSEd, Stuart H. Ralston, MD, FRSE, Charles M. Court-Brown, MD, FRCSEd(Orth), and Margaret M. McQueen, MD, FRCSEd(Orth)

Investigation performed at the Edinburgh Orthopaedic Trauma Unit, Royal Infirmary of Edinburgh, Edinburgh, United Kingdom

A meta-analysis of outcomes of external fixation vs plate osteosynthesis for unstable distal radius fractures

- Margaliot Z: 2005 JHS-A
- 917 patients
- **No difference**
 - **Pain**
 - **Grip strength**
 - **ROM**
 - **X-ray**
- Exfix-> hardware failure, infection, neuritis
- ORIF-> tendon complications, ROH



Paksima N (2007) AAOS: No diff @ 6 months

Ex-Fix and ORIF: Is there a difference? If there is, when???

External Fixation vs ORIF

Thomas Weisheit, Stefan Plank, Stephan Schuberth, Axel Winter, Thomas Frey (2011)
Stephan Weisheit

Outcome after surgery of distal radius fractures: no differences between external fixation and ORIF

- **Retrospective**
 - 168 Fractures: A3 or C2
 - 18-month Follow-up
 - ORIF: Volar or Dorsal
 - Ex-Fix had more complications (15%):
 - pin tract infections
 - radial sensory neuritis
 - pain syndromes
 - Plating complications (4-6%):
 - tendon rupture
 - carpal tunnel
- Conclusions:**
- **No Significant Differences**
 - ORIF with palmar plate had best radiographic and functional outcomes with less complications

Ex-Fix vs Plate Fixation

Comparison of External and Percutaneous Pin Fixation with Plate Fixation for Intra-articular Distal Radial Fractures

By Friedrich Kling, FRCS, from Karl Th. von Wilmsen, D.O., Christ, FRCS, and Hans-Peter Grosse, MD, FRCS

This comparison was based on a review of the literature.

- **Prospective, Randomized**
- **Level I Evidence**
- 137 pts with 144 intra-articular C3 fractures
- 2-year follow up
- ORIF: dorsal, volar, or combined plating

Conclusions:

- **Plate fixation** had significantly better Gartland and Werley and radiographic arthritis grading
- **Plate fixation** is better than Ex-Fix and pinning for intra-articular distal radius fractures

Volar ORIF vs Ex-Fix

Functional Outcome of Unstable Distal Radius Fractures: ORIF With a Volar Fixed-Angle Tine Plate Versus External Fixation

Thomas W. Wright, MD, Marshall Mandel, MD, Colman W. Owen III, MD, MS, Winston, VA

The Journal of Bone and Joint Surgery [Am. Vol.] 2004; 86A: 1000

- **Retrospective:** Ex-Fix, 11 pts, F/U 47 mos
- **Prospective:** Volar ORIF Tine Plate, 21 pts, F/U 17 mos
- **Level III Evidence**

Conclusions:

- **Stable reduction & early ROM possible with Volar ORIF**
- **Equivalent DASH scores**
- **Volar ORIF** better intra-articular step, volar tilt, & radial length

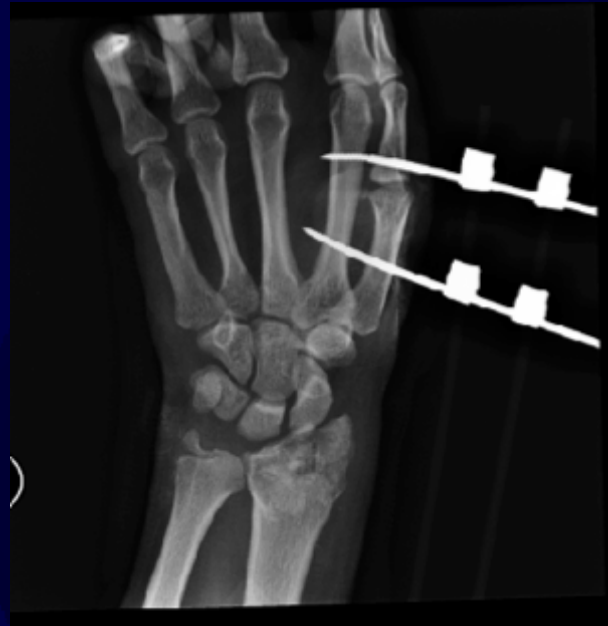
Ex-Fix and ORIF: Is there a difference?
If there is, when???

NO – Not when done for the right indications and done well!

Don't use EX-FIX with:

- Isolated Articular injury: “dye punch”
- Independent articular fragments
- Shear (B1-type) injuries

Ex-fix: NOT always the answer



19 yr old
Roofer
Fall 20 feet
Presents 4 wks out

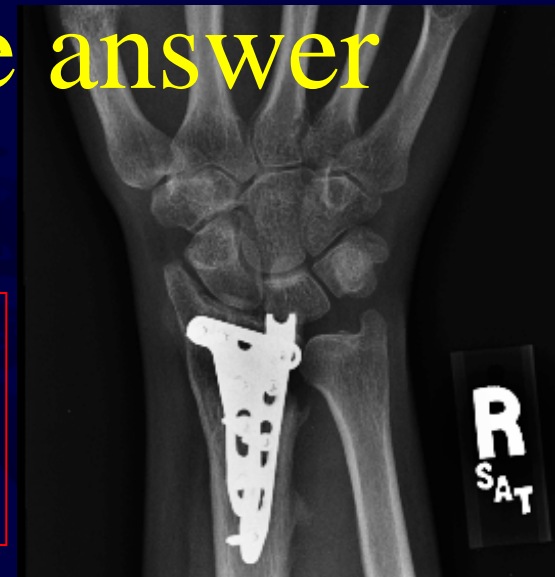


Ex-fix: NOT always the answer



Articular Depression

Articular Comminution



4 YEARS OUT





Internal Fixation Strategies

Internal fixation

- Simple screws
- Buttress plate
- Locked / Non-locked plates
- Combinations



ORIF Technique

- Find FCR
- Draw incision
- Can be extended to carpal tunnel

****Pre-incision Allen's Test***

****Post-op DRUJ exam***



ORIF Technique

- Incise FCR volar sheath
- Retract FCR ulnarly
- Incise FCR dorsal sheath



ORIF Technique

Reflect FCR Ulnarly



Pronator Quadratus



ORIF Technique

- Incise Pronator Quadratus
- “L-shaped” incision
- ***Avoid Radiocarpal Joint arthrotomy**

Pronator Quadratus Reflected



ORIF Technique

- Can release Brachioradialis for styloid exposure
- Can bone graft dorsally from volar incision
- **Watch for 1st dorsal compartment*



37 yo m s/p 25' fall off "cherry picker"



Like a Shatzker 5



35 yo M s/p
“hammer injury” –
Yet he’s not a
carpenter...

Like a Shatzker 5





41 yo m s/p fall off of ladder



Radial shortening,
Intra-articular
Dye punch

Like a Shatzker 5



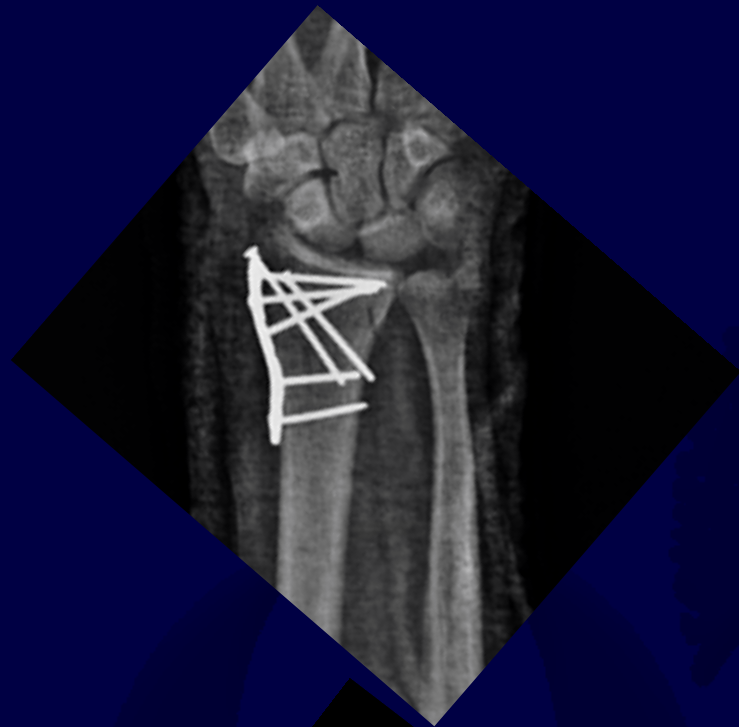
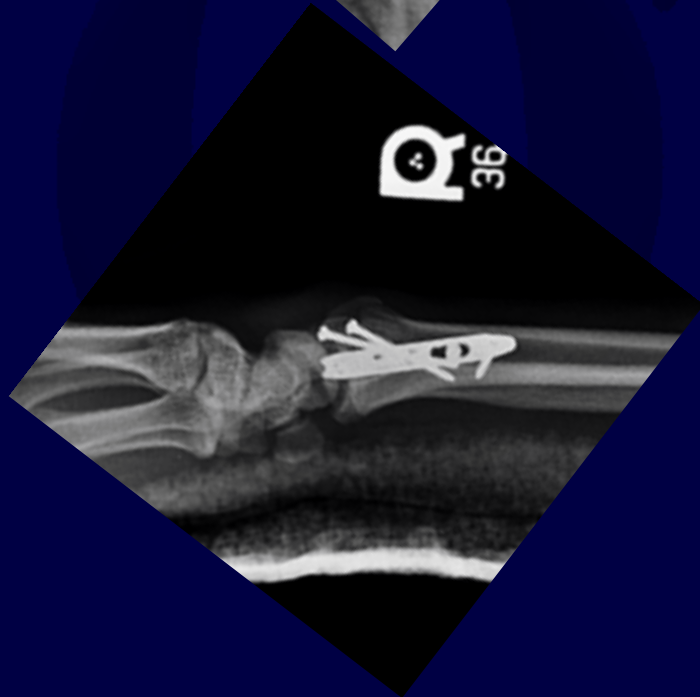


21 yo male
B/L injuries
after climbing
fence, while
“fleeing”



Like B/L Shatzker 5

21 yo male
B/L injuries
after climbing
fence, while
“fleeing”





21 yo male
B/L injuries
after climbing
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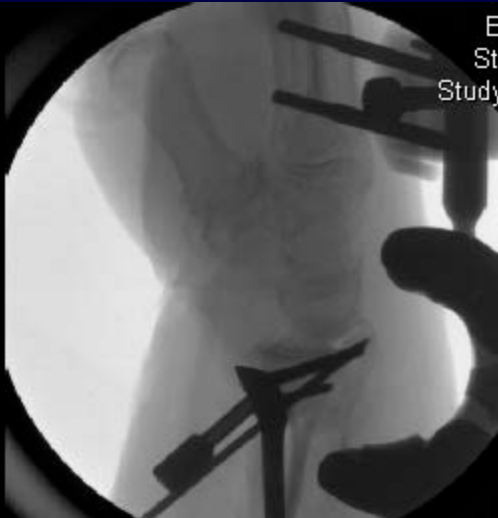
Like a Shatzker 6

84 YO F mva DISTAL RADIUS



84 YO F mva DISTAL RADIUS

INTRA-OP



Ex-fix as a reduction tool
(like a Femoral Distractor)



84 YO F mva DISTAL RADIUS POST-OP



Nascent Malunion - Missed Injury

33 yo M w/ pelvic ring injury, open floating knee,
ipsilateral hip fracture

- Multi-trauma w/ 5-10%
- Distal aspects of UE & LE
- Contra-lateral films !!!



Ring D: CORR 2005

Nascent Malunion - Missed Injury

33 yo M w/ pelvic ring injury, open floating knee,
ipsilateral hip fracture



4 weeks from DOI
Intubated

Ring D: CORR 2005

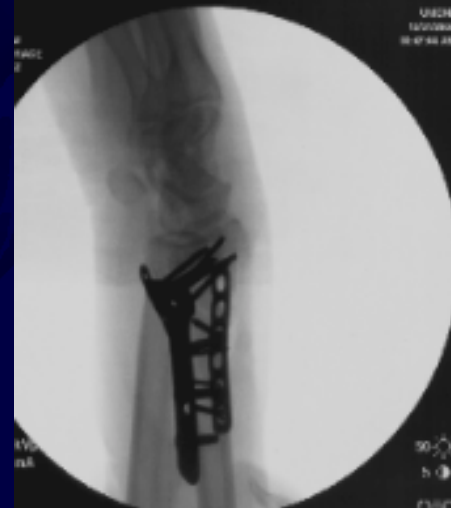


Nascent Malunion - Missed Injury

33 yo M w/ pelvic ring injury, open floating knee, ipsilateral hip fracture

Principles:

- columns - buttress
- bone graft / joint
- frag. stabilization
- bridging fixation



Ring D: CORR 2005

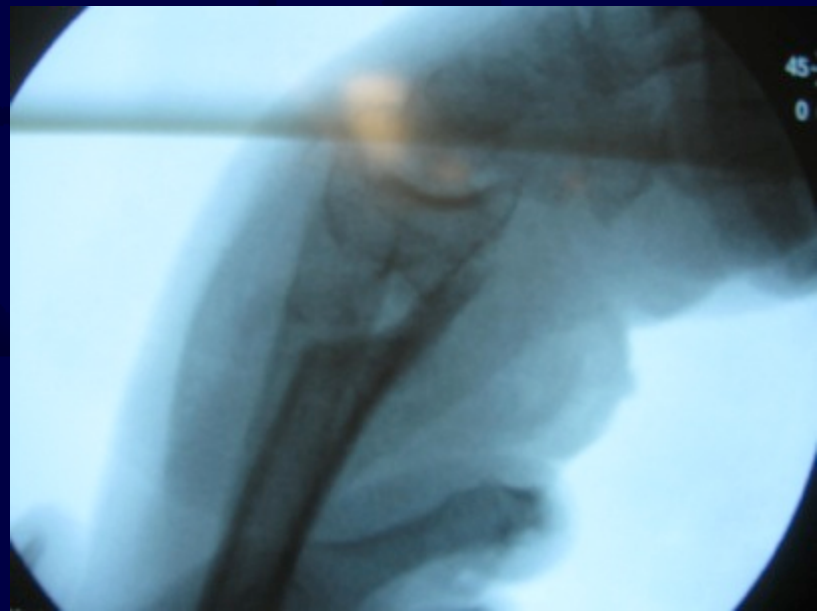
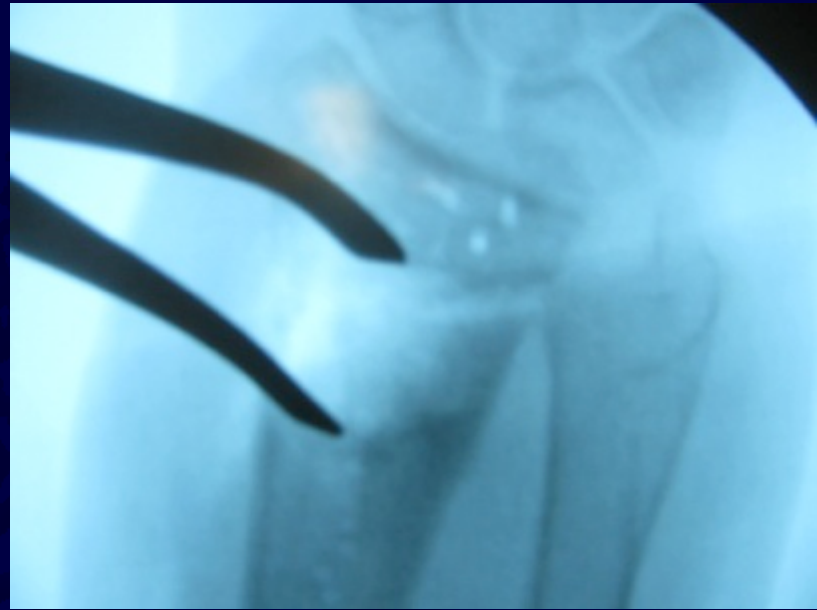
What about the more chronically
missed injury?

WH



- Shortened Dorsally
- Contracted Dorsal Tissues & Extensor Tendons

WH



WH



- Multi-planar Fixation
- Volar approach
 - Dorsal grafting
- Supplemental stability
- Allows “robust” volar FA plate

Prommersberger KJ et al:
Tech Hand Up Extrem Surg 2004

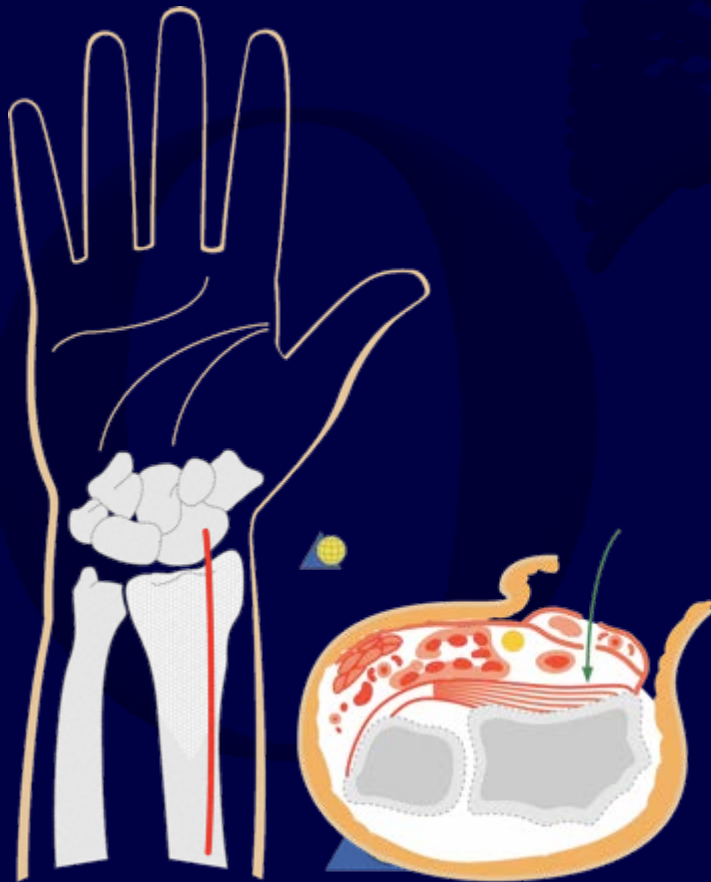
Volar Ulna Fragment - Alternate Approach (Extended CTR)



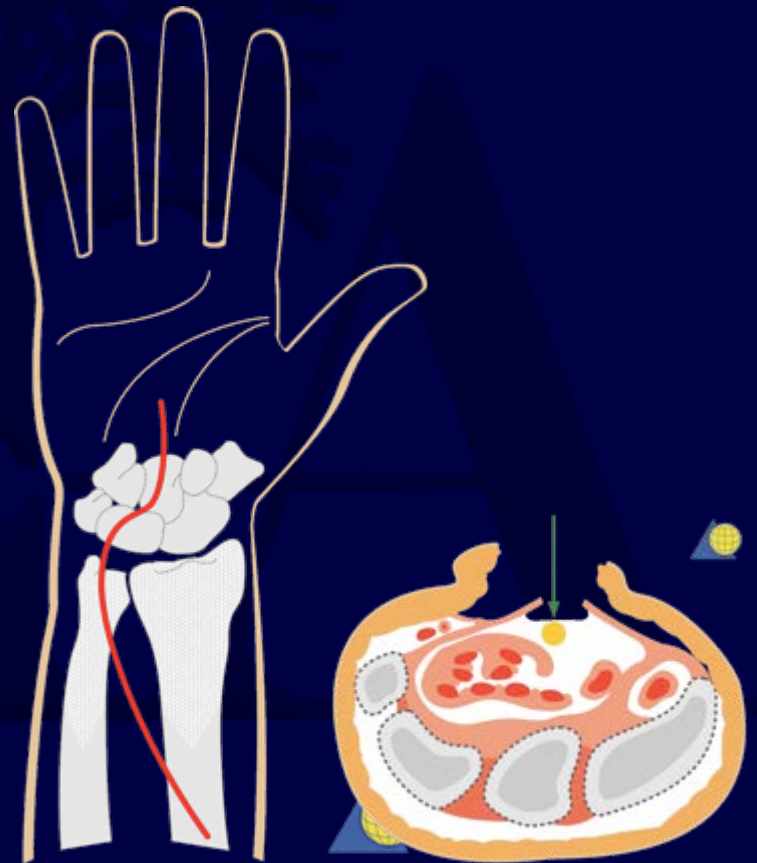
56 y.o. male MVA,
multit trauma

VOLAR

Classical Henry approach



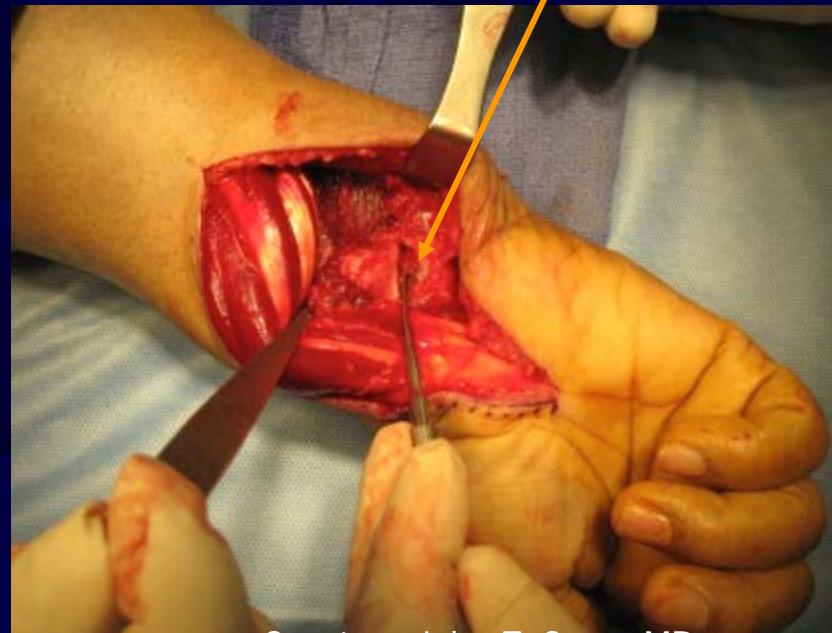
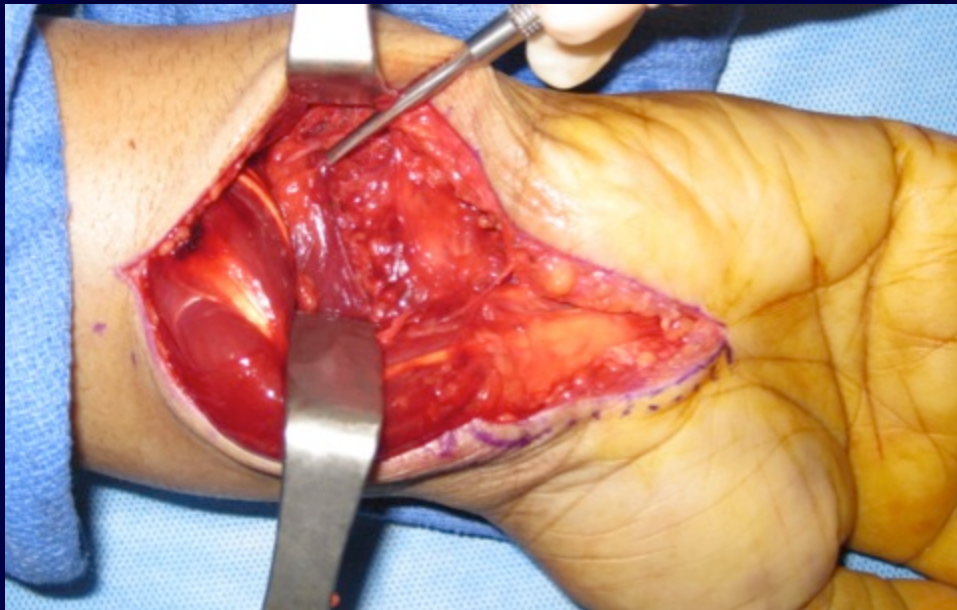
Extended carpal tunnel approach



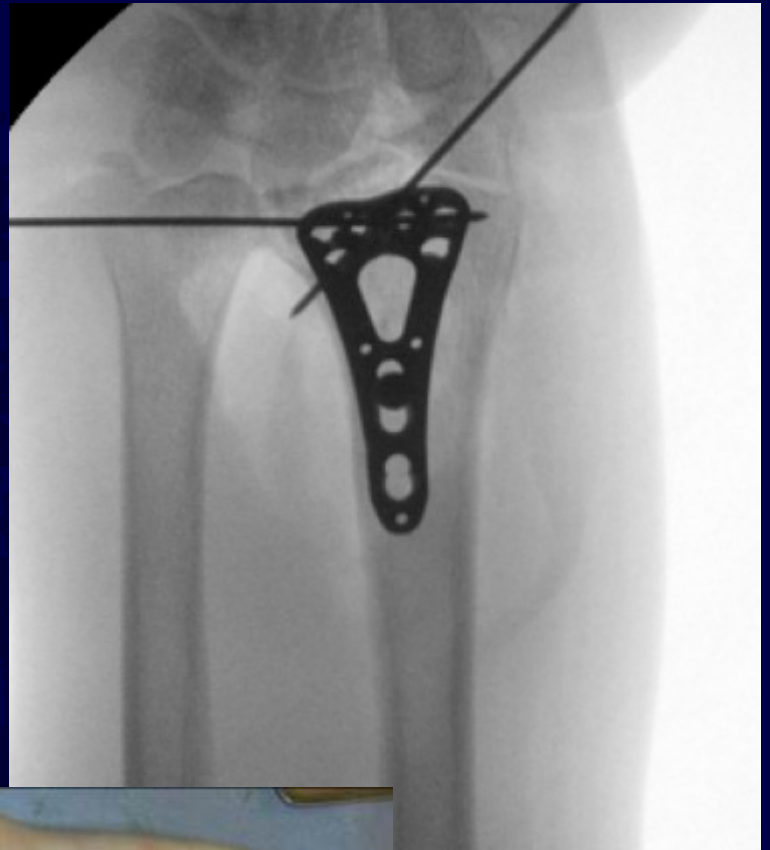
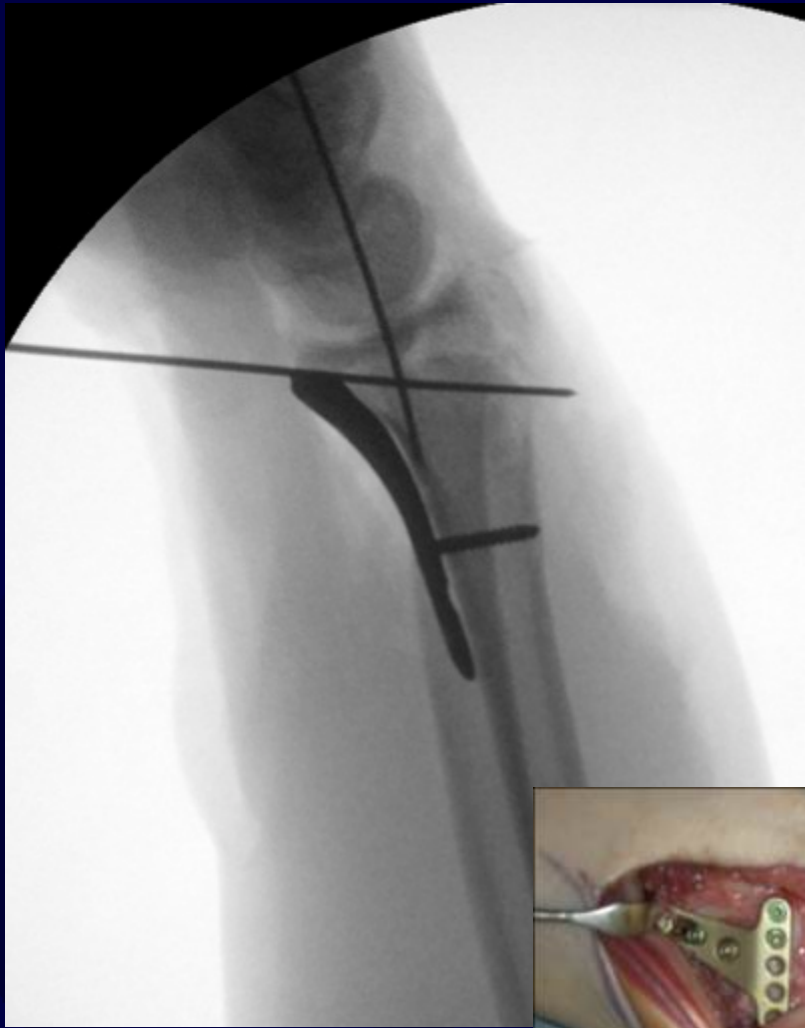


Ulnar Extensile Exposure

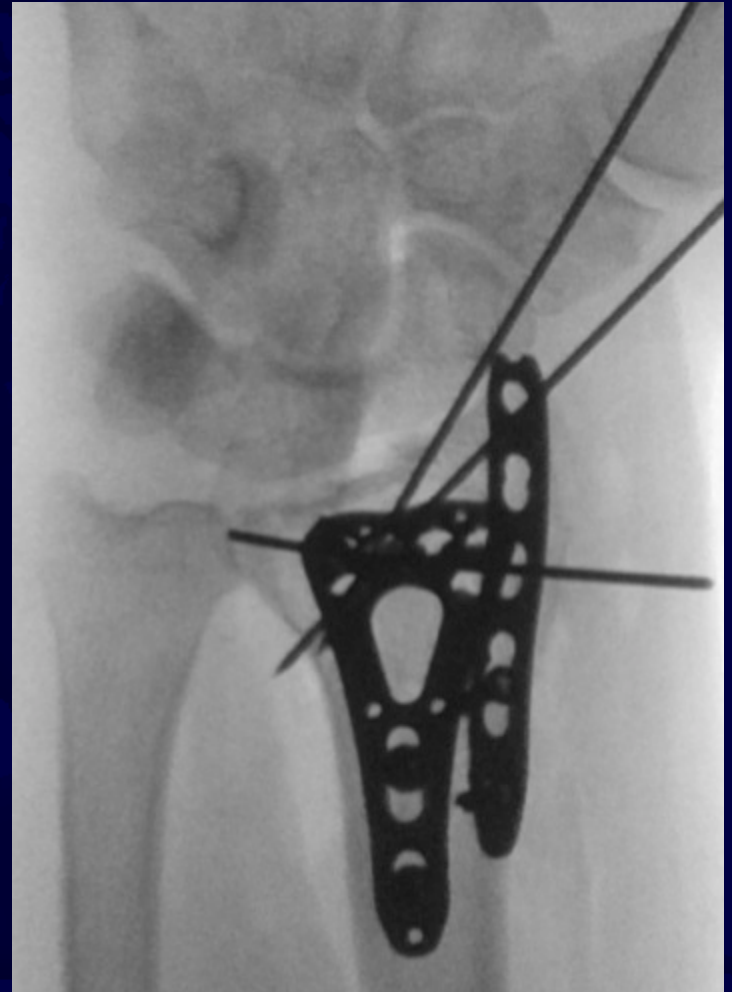
Excellent access to volar ulnar fragment

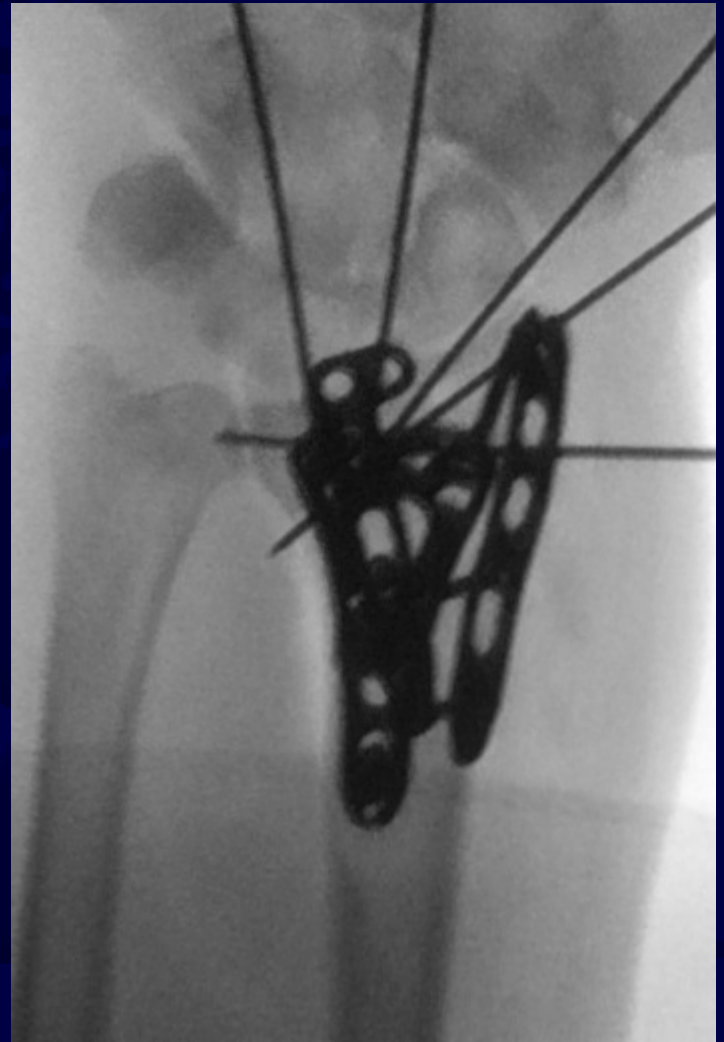


Courtesy John T. Capo, MD

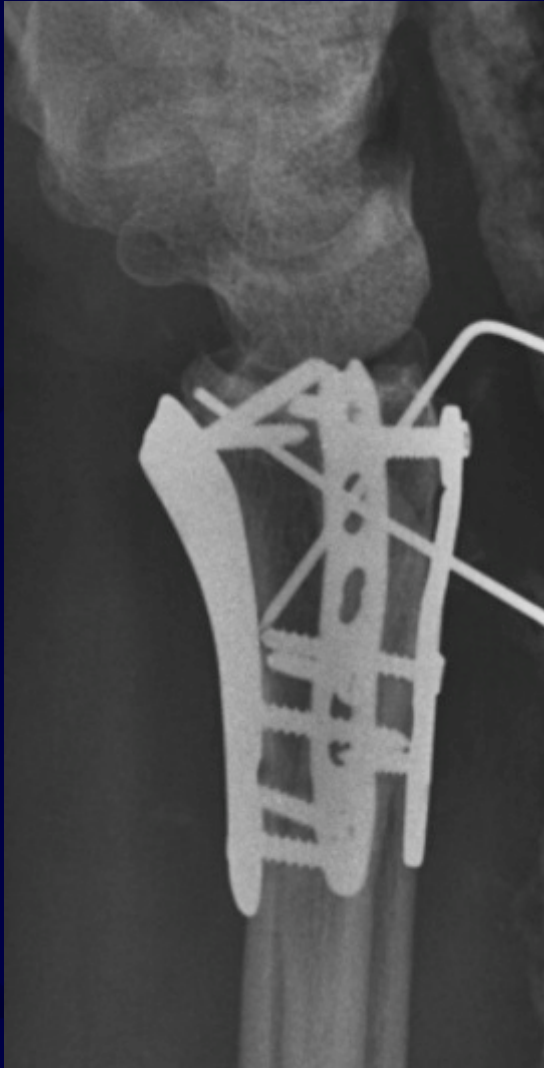


Courtesy John T. Capo, MD





Courtesy John T. Capo, MD



Courtesy John T. Capo, MD



What about the Ulna Column?

Do we need to fix the distal ulna?

- Base of ulna styloid with low incidence of concomitant DRUJ problems

May MM et al: J Hand Surg 2002
Noda K et al: J Hand Surg 2009
Souer JS et al: JBJS Am 2009

- Test DRUJ and that is your answer if you fix

- What about the **distal ulna shaft / articular surface?**
 - Significant comminution
 - Osteoporosis
 - Prevent Instability / Supply support

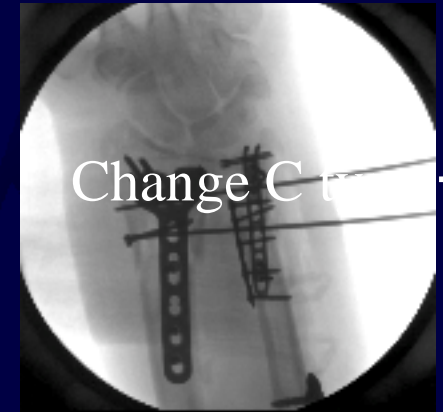
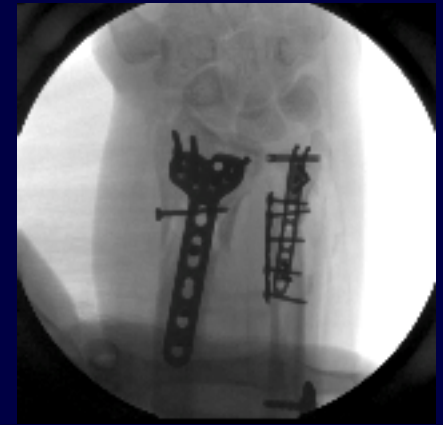
TD



TD

COLUMN THEORY:

1. Stabilize Radial / Intermediate
2. Stabilize Ulna articular surface
3. Multiplanar stabilization
4. Protect DRUJ & Fixation



MC



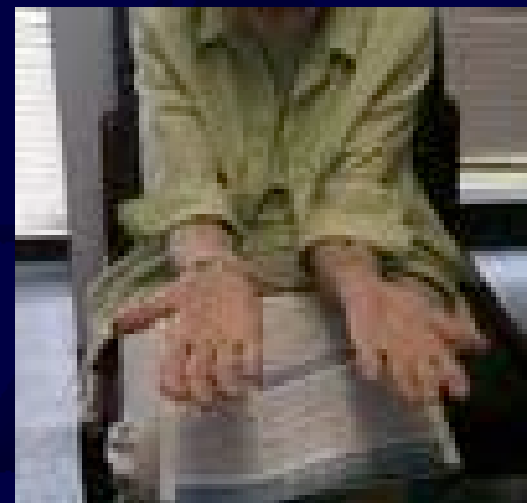
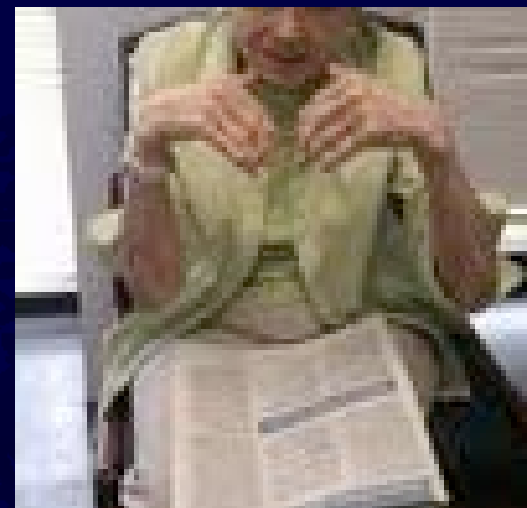
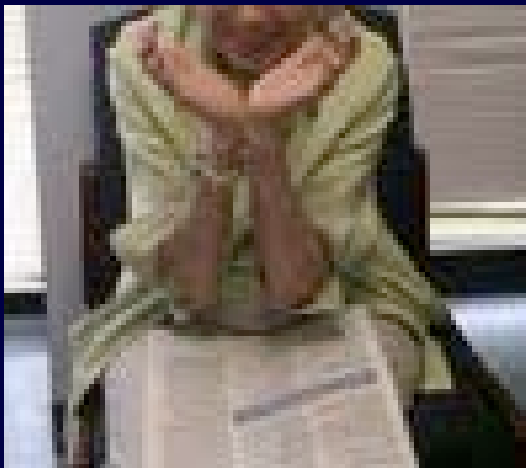
3 – COLUMNS affected!
VOLAR displacement (very unstable)!

MC



3 – COLUMNS affected!
VOLAR displacement (very unstable)!

MC
6 months





Go dorsal?

Benefits of dorsal? Should we go retro?

- More resistance to mechanical deformity?
 - No
- Not many complications?
 - No
- Capture Dorsal Ulna Fragment?
 - Yes
- If no volar access?
 - Yes

Benefits of dorsal? Should we go retro?

- More resistance to mechanical deformity?

- No

| |
|--|
| Liporace et al: JOT 2005 Capo JT, Tan V, et al: Hand 2009 |
|--|

- Not many complications? _____

- No

| |
|--|
| Hove LM et al: Acta Orthop Scand 1997 Axelrod TS et al: J Hand Surg 1990 Carter PR, et al: J Hand Surg 1998 Ring D, et al: J Hand Surg 1997 |
|--|

- Capture Dorsal Ulna Fragment?

- Yes

| |
|-------------------------------------|
| Tavakolian JD et al: Hand Clin 2005 |
|-------------------------------------|

- If no volar access?

- Yes



How do we go dorsal?

Reduce fracture and stabilize with low profile fixation



Reduce fracture and stabilize with low profile fixation



Reduce fracture and stabilize with low profile fixation



Close Retinaculum! Leave EPL free!

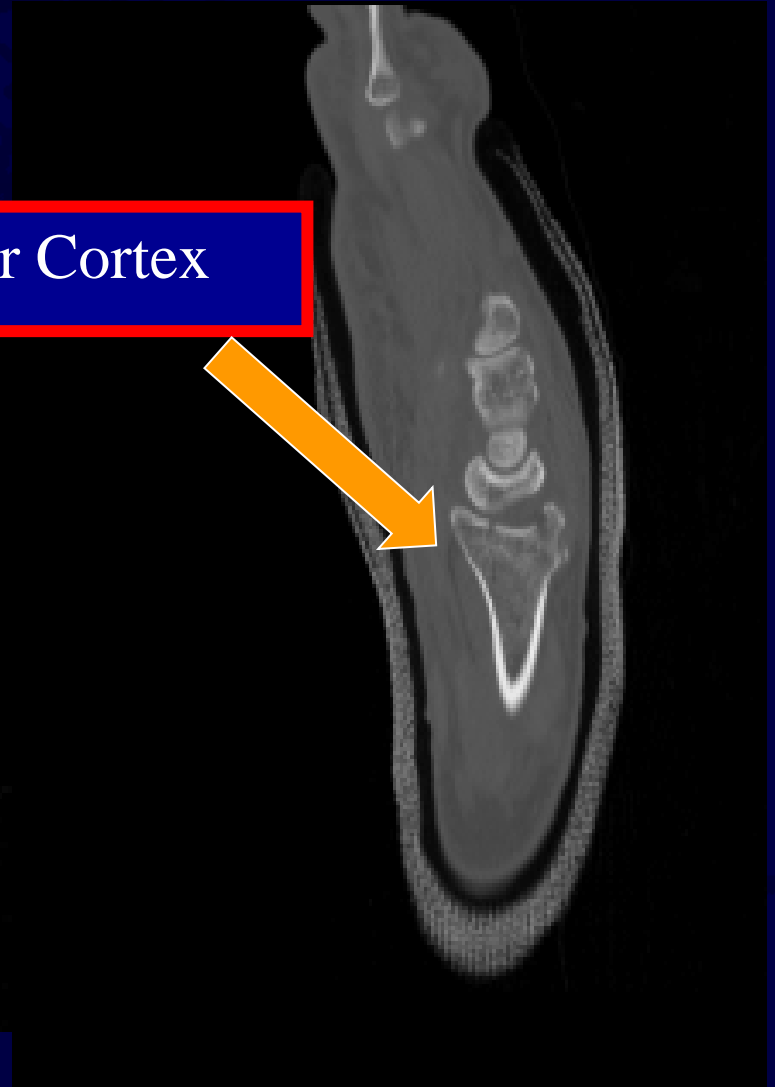


RF



RF

Intact Volar Cortex

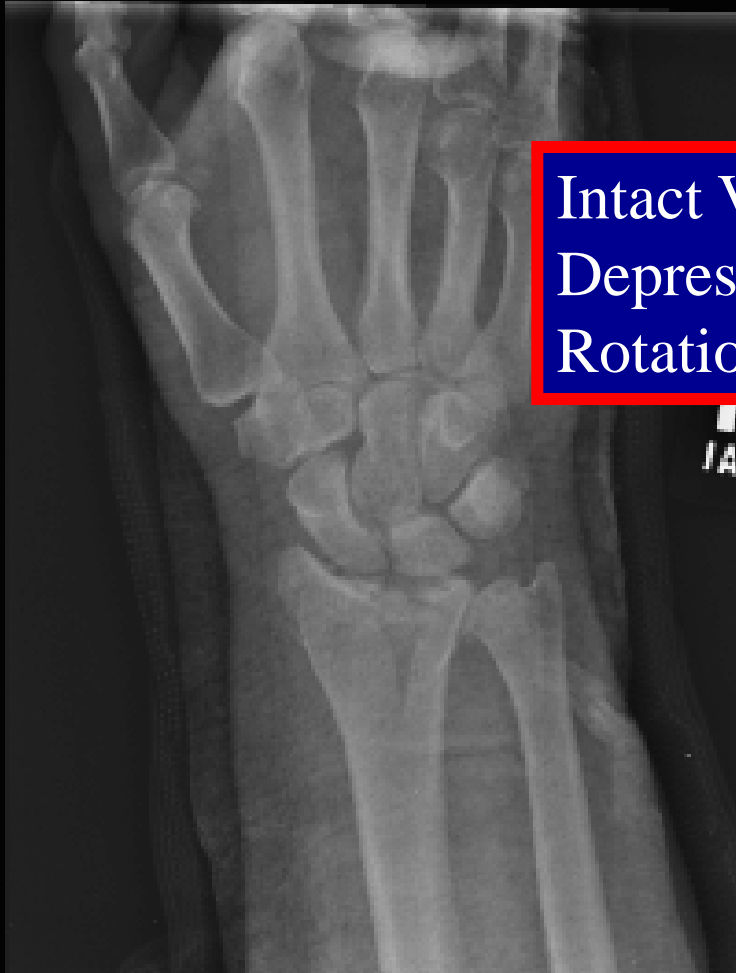


RF

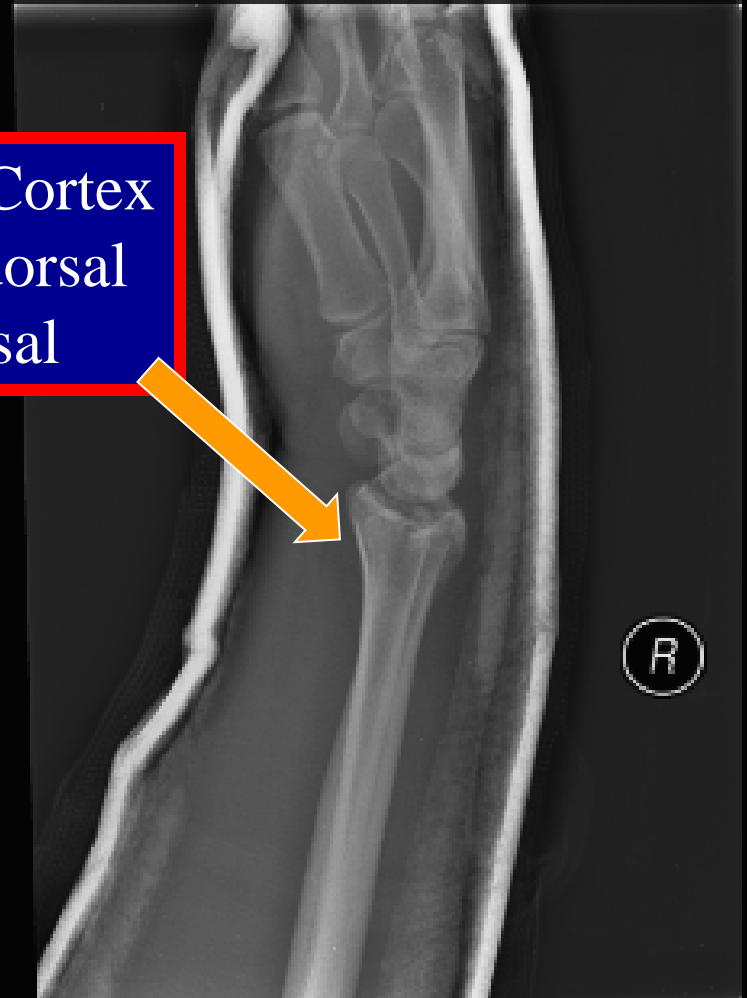


- Bone Graft
- Subchondral Support
- Reconstruct facets

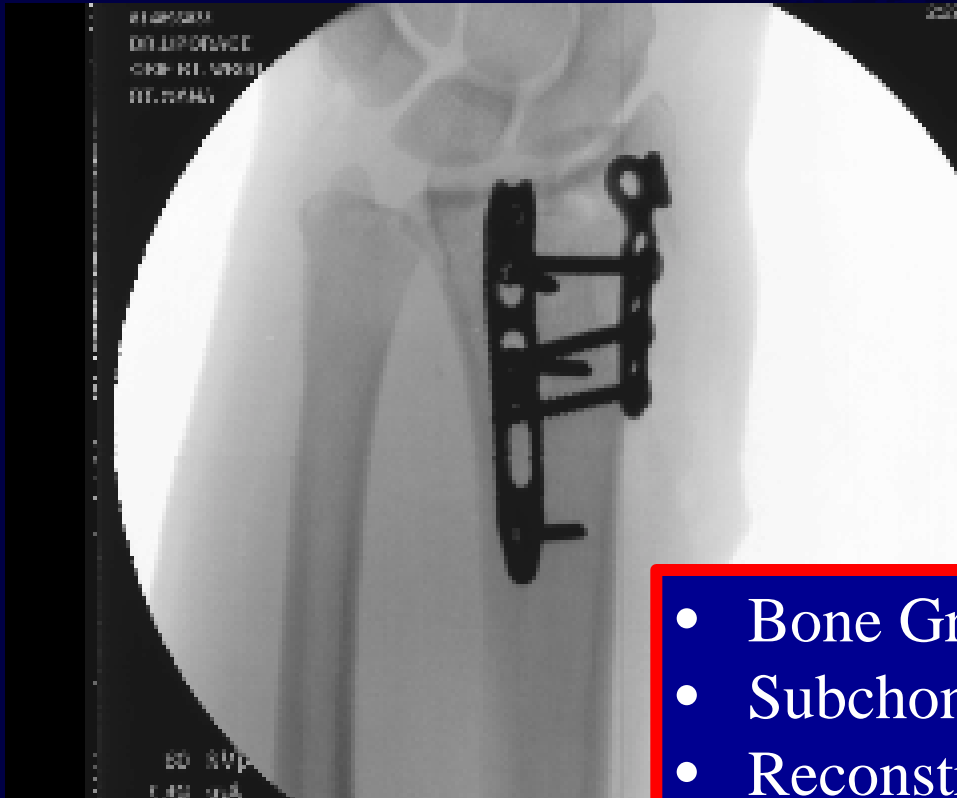
TP



Intact Volar Cortex
Depression dorsal
Rotation dorsal



TP



- Bone Graft
- Subchondral Support
- Reconstruct
 - Scaphoid facet
 - Lunate facet
- Buttress columns

Radiographic Reduction Criteria

| Result | Deformity | Dorsal Angulation | Shortening | Radial Deviation |
|-----------|-----------|-------------------|------------|------------------|
| Excellent | none | <0° | <3mm | <4° |
| Good | slight | 1-10° | 3-6mm | 5-9° |
| Fair | moderate | 11-14° | 7-11mm | 10-14° |
| Poor | severe | >15° | >12mm | >15° |

- Displacement of >2mm, Shortening of >5mm, and Dorsal Angulation of >20° has shown to cause an increased incidence of arthritis, decreased wrist motion, 50% decrease in grip strength, and wrist instability in the long run.

Complications of Neglect in Treatment

- Malunion..... “ Just let it heal and if it bothers her I’ll do a Darrach, Suave Kapanje, Osteotomy, Fusion...”
- Outcomes of Darrach procedure run from 91% to 50%
Good and excellent – ALLEGEDLY
- Pain is improved *at times*, grip strength is **NOT** !
- Patient still had surgery !

Field J, Majkowski RJ, Leslie JJ.
JBJS 1993

Tulipan DJ, Eaton RG, Eberhart RE
JHS 1991

Malunion & Salvage

- Osteotomy
- Arthrodesis
- Prox row
Carpectomy
- Wrist
Arthroplasty
- Suave Kapandji

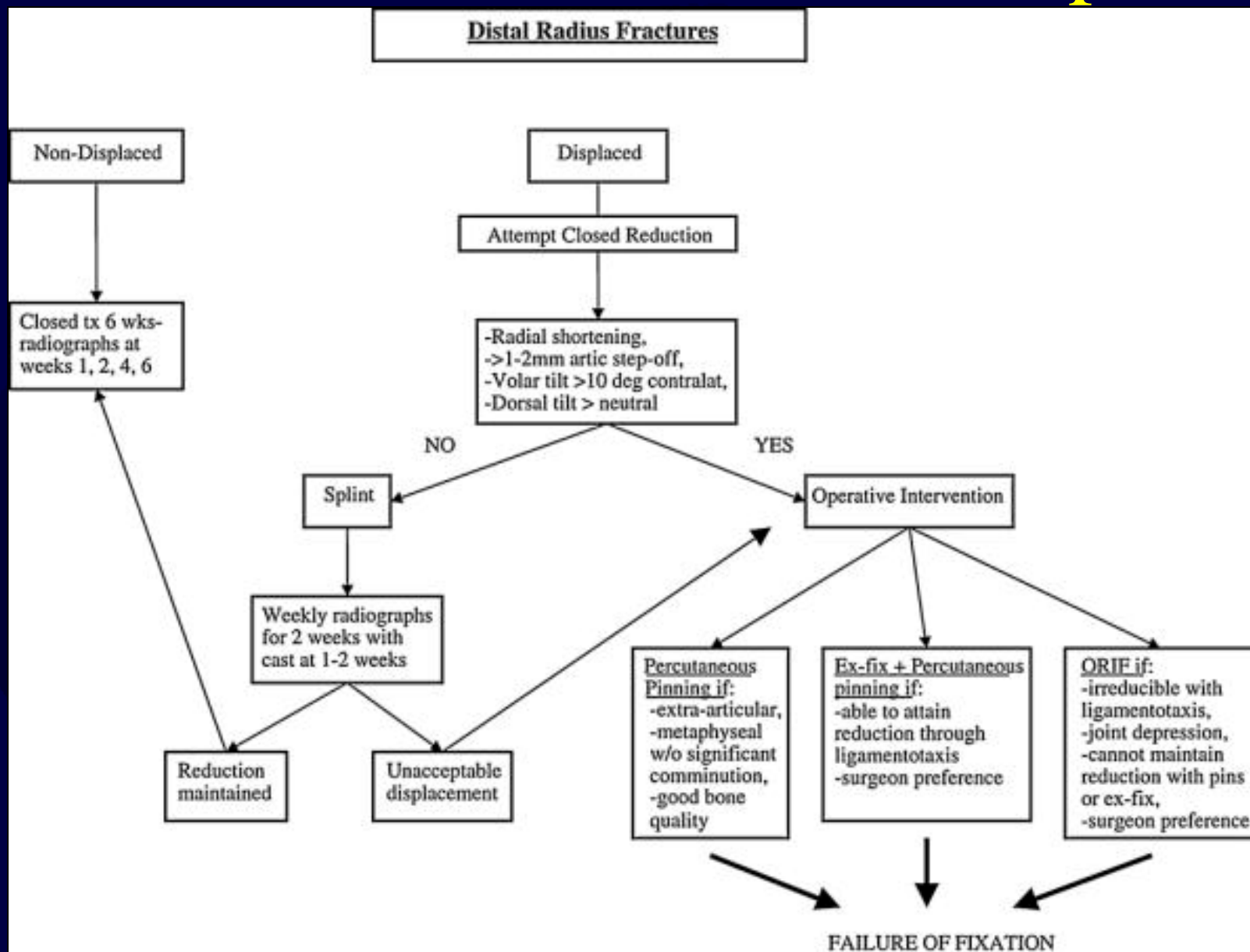


Remember: Malunions → BAD!

- Change in load-bearing from NORMAL
(80% DR, 20% DU)
- *Arthritis*
 - *1mm scaphoid fossa*
 - *2-3mm lunate fossa*
- DISI
- DRUJ instability



REMEMBER → Treatment options



Take home messages...

- 1) Evaluate all 3 joints of the wrist
- 2) Determine which columns are affected
- 3) Start reconstruction with “simple side”
- 4) Think like a tibia plateau
- 5) Consider Fragment Specific Fixation
- 6) Don't forget the ulna for mechanical supplementation
- 7) Use low profile dorsal fixation when necessary
- 8) If dorsal approach:
 - Keep EPL free after approach, repair retinaculum
- 9) Test for stability of DRUJ at end of procedure
- 10) Are the goals achieved? Ready for Early ROM?

Volar Standard



Radial Border FCR
Radial a. → R
FPL & FCR → U
PQ release R → U
BR release

Extended CTR



Ulna to Palmaris
Btw Ulna NV &
muscles /
median n.

Dorsal



Mid Radius
Open 3rd comp
Btw 2 & 4
Btw 1 & 2

THANK YOU

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