Distal Radius Fractures: Evaluation & Decision Making

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Disclosures

- None

Outline

- Anatomy
- Radiographic Assessment
- Nonoperative Treatment
- Operative Treatment

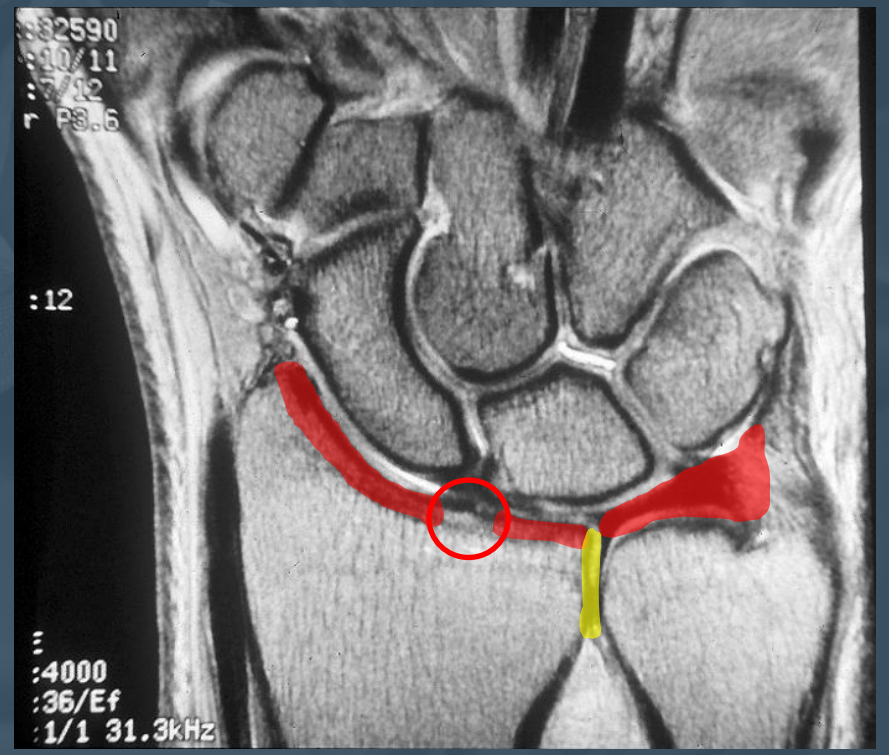
Distal Radius Fractures – Evaluation

Epidemiology

- Common injury: >450,000/yr. in USA
- 18% of all fractures in elderly
- Wide range of complexity
  - Young patients with high energy injuries
  - Older patients with low energy injuries
- High potential for functional impairment and frequent complications

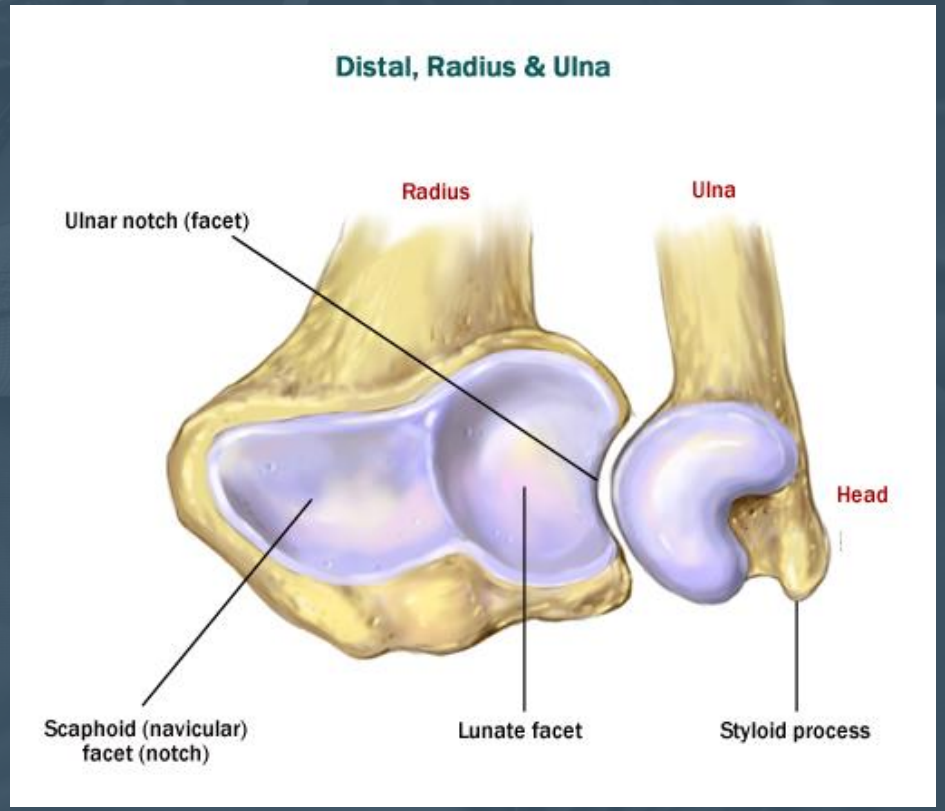
Anatomy

- **Scaphoid and lunate fossa**
  - Separated by interfossal ridge
- **Sigmoid notch**
  - Articular surface between distal radius and ulnar head
- **Triangular fibrocartilage complex (TFCC)**
  - Superficial and deep radioulnar ligaments
  - Central articular disk
  - Meniscal homologue
  - ECU subsheath

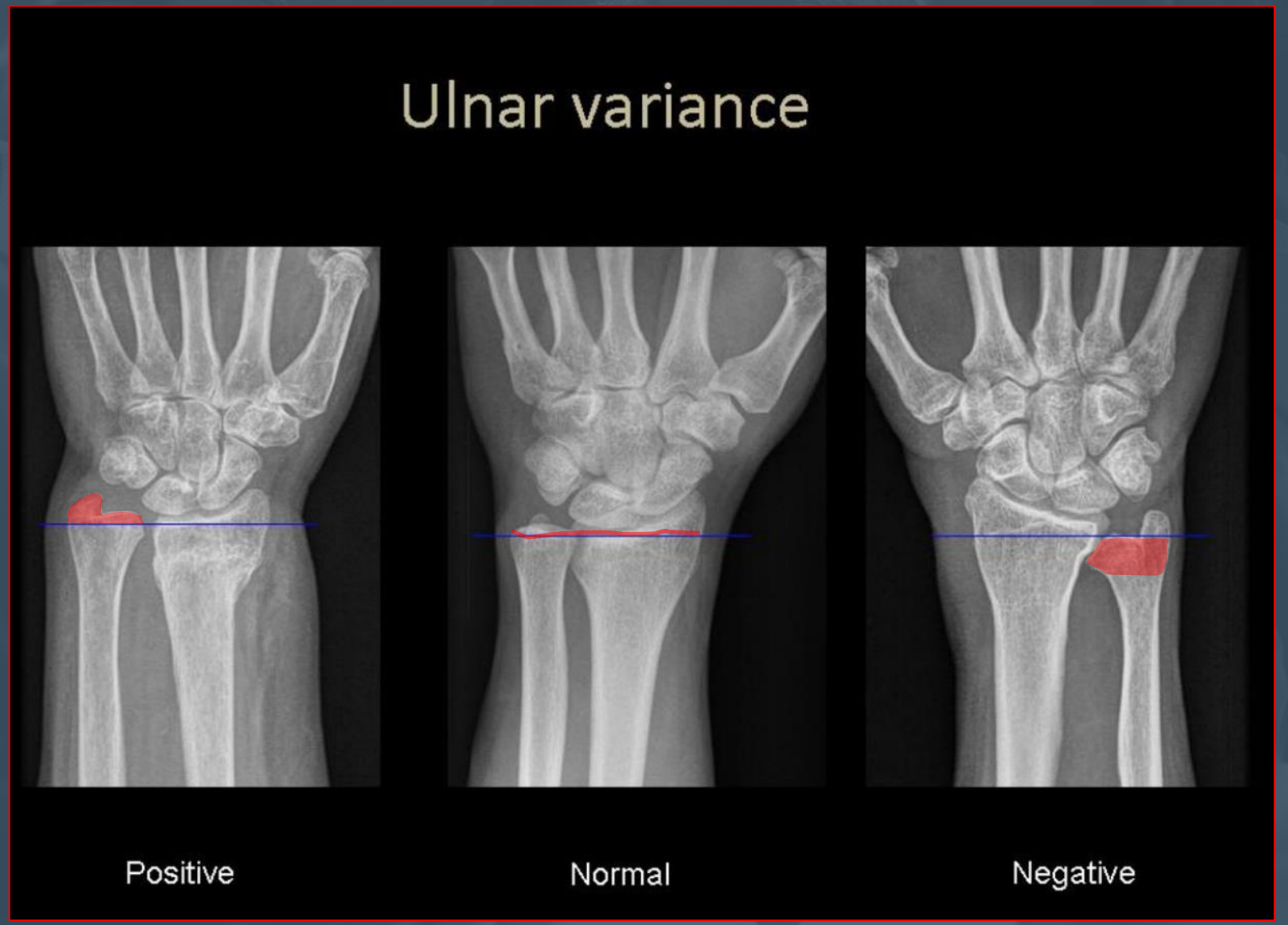


Osseous Anatomy

- **Radiocarpal joint – 80% of axial load**
  - Scaphoid fossa
  - Lunate fossa
- **Ulnocarpal joint – 20% axial load**

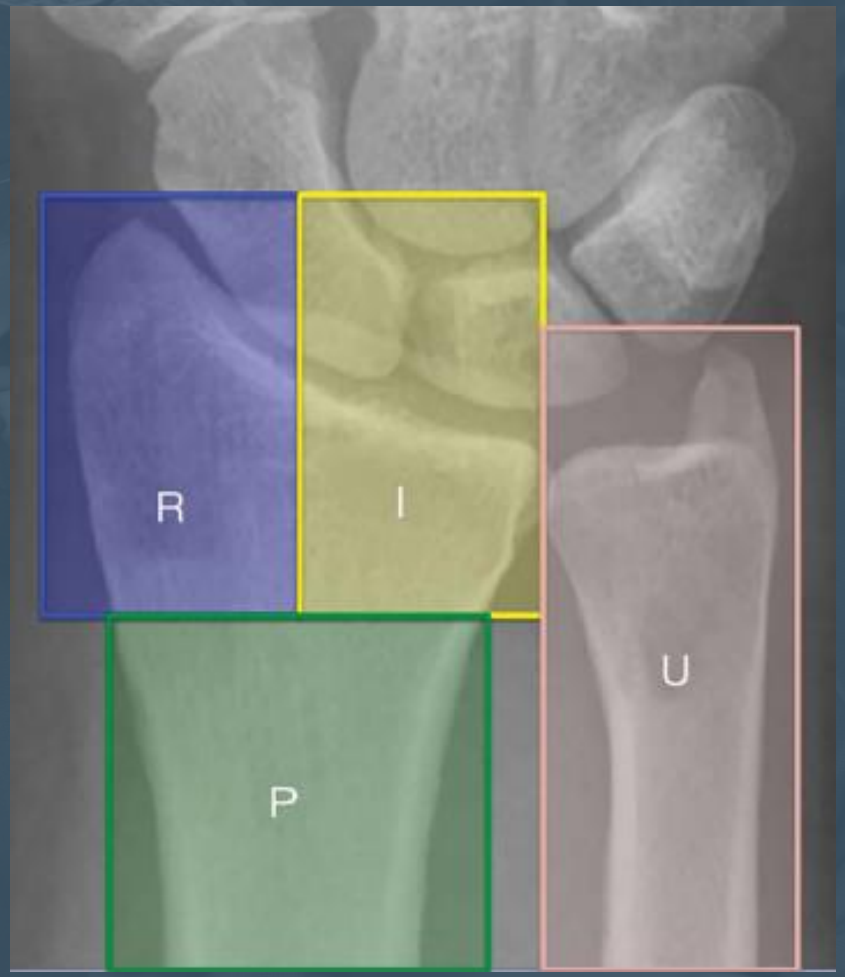


Osseous Anatomy



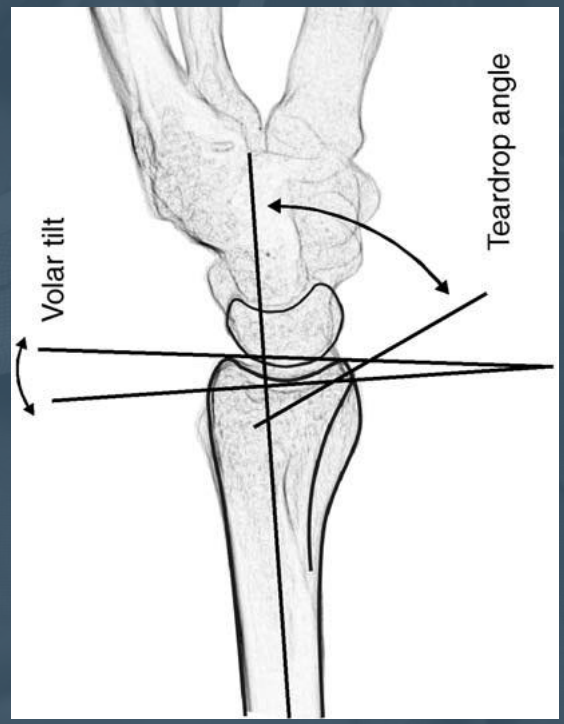
Column Theory:

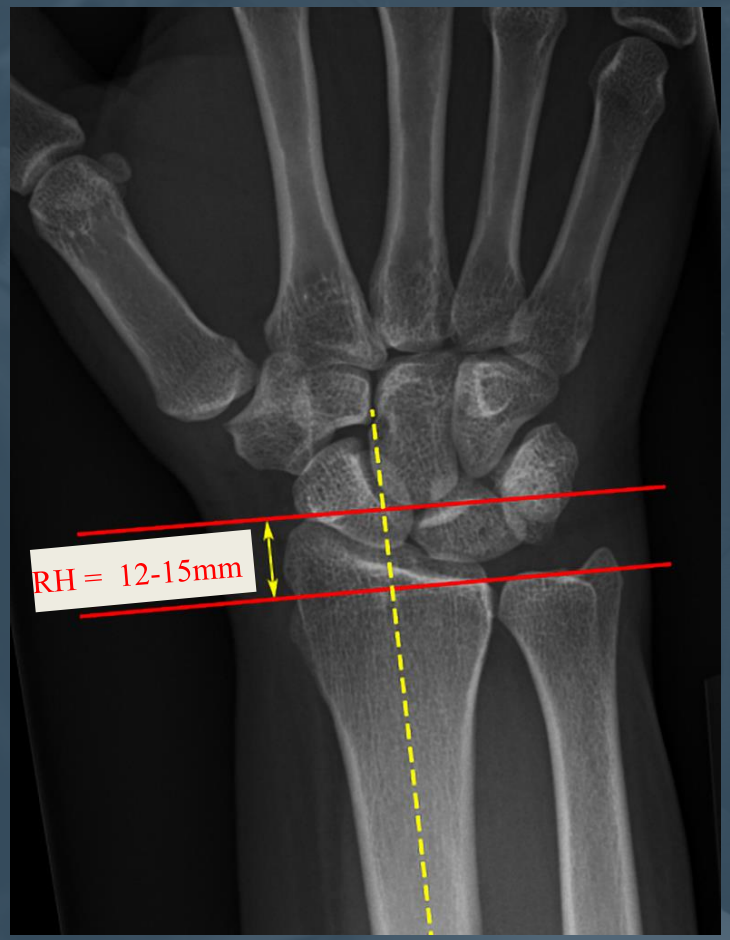
- Radial Column
  - Scaphoid fossa
- Intermediate Column
  - Lunate fossa
  - Sigmoid notch
- Ulnar Column
  - DRUJ
  - Ulnocarpal articulation



Key Anatomic Measures:

- Radial height = 12 - 15 mm
- Radial inclination = 21 - 25°
- Palmar tilt = 11 - 14°
- Teardrop angle = 70°




RH = 12-15mm

Radial Inclination

5º

Radial Inclination

Palmar Tilt = 10-12º

Dorsal Angulation = 15º

Assessment of X-rays

1. Is the fracture *extra-articular* or *intra-articular*

2. Assess involvement of dorsal or volar rim:
   - Is comminution mainly volar or dorsal?
   - Is one of four cortices intact?

3. Look for “die-punch” lesions of the scaphoid or lunate fossa

4. Assess degree of radial shortening

5. Look for DRUJ involvement

CT Scan

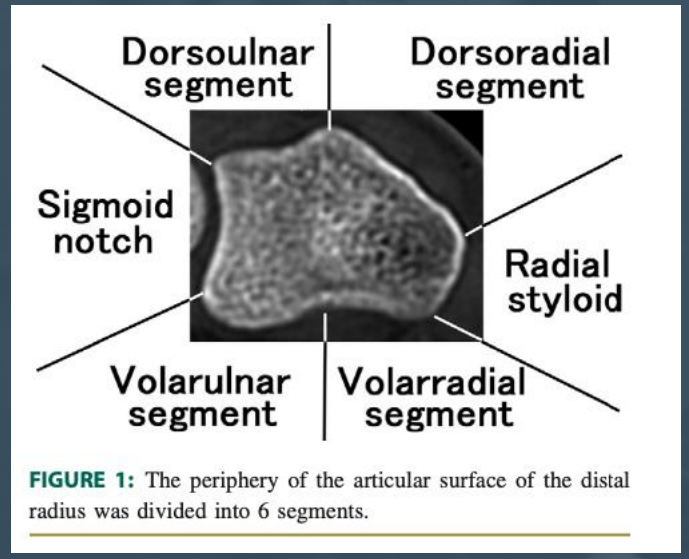
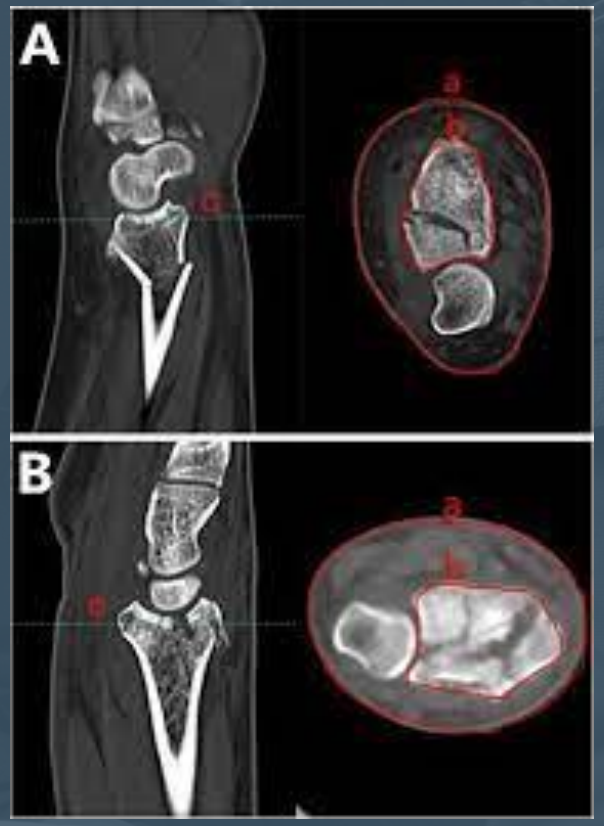


FIGURE 1: The periphery of the articular surface of the distal radius was divided into 6 segments.

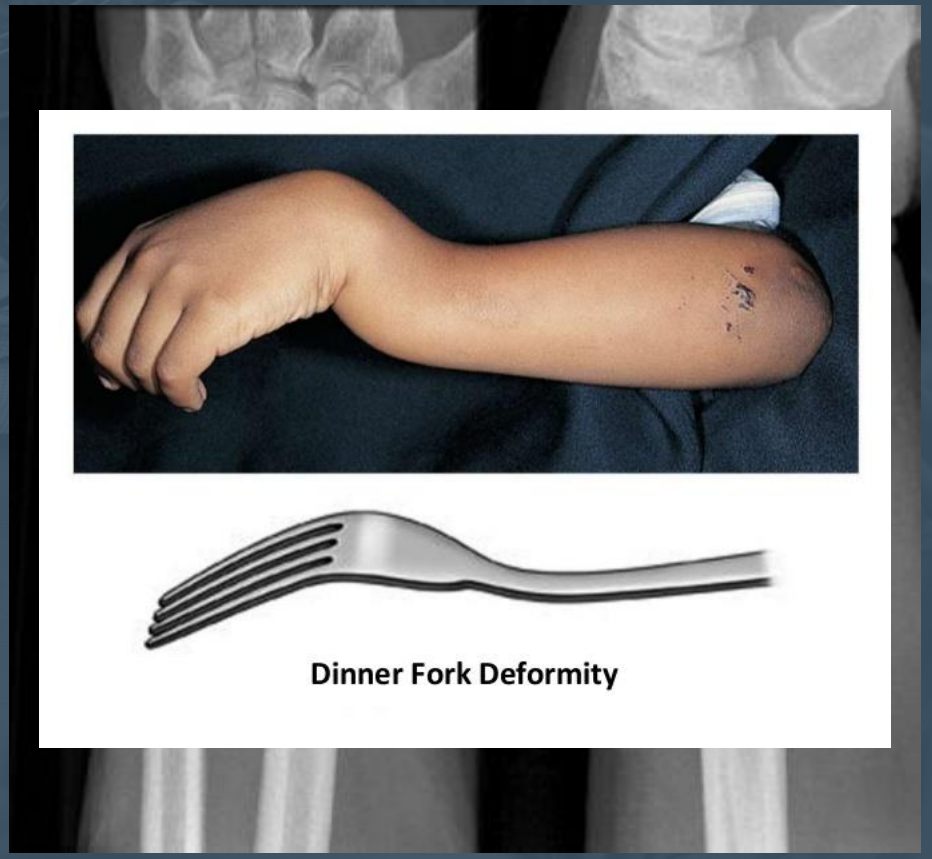


X-ray Eponyms

- Colles’ Fracture
- Smith’s Fracture
- Barton Fracture
- Reverse Barton
- Chauffer’s Fracture

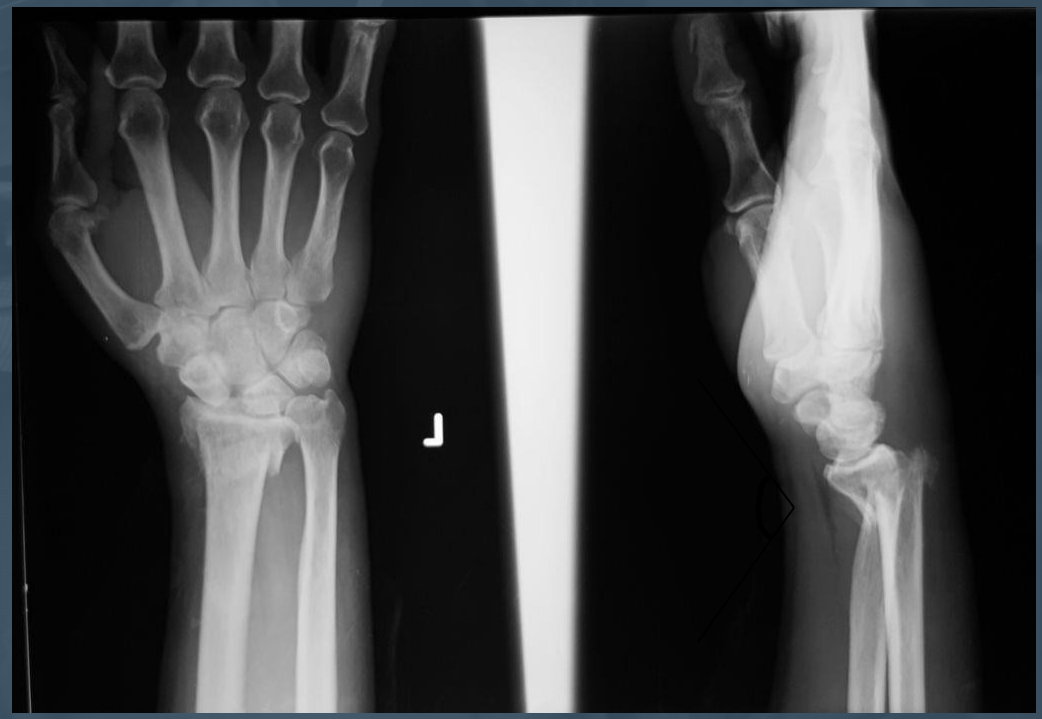
X-ray Eponyms

- **Colles' Fracture:**
  - Fracture of the distal metaphysis
  - **Dorsal angulation, apex volar**
  - Characteristic "dinner fork" deformity



X-ray Eponyms

- **Smith's Fracture:**
  - Fracture of the distal metaphysis
  - **Volar angulation, apex dorsal**
  - "Opposite" a Colles fracture



X-ray Eponyms

- **Barton's Fracture:**
  - Intra-articular shear fracture
- **Volar Barton's:**
  - Volar radiocarpal dislocation
- **Dorsal Barton's**
  - Dorsal radiocarpal dislocation

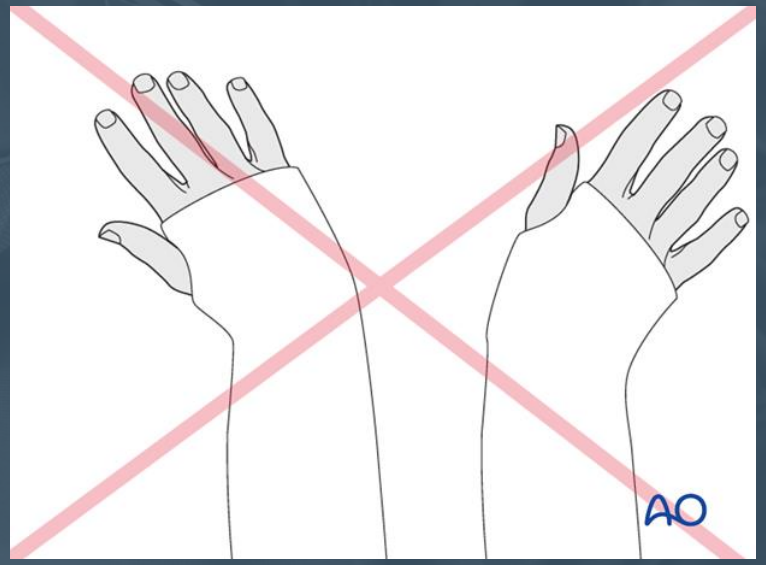
X-ray Eponyms

- **Chauffeur's Fracture:**
  - Intra-articular radial styloid fracture

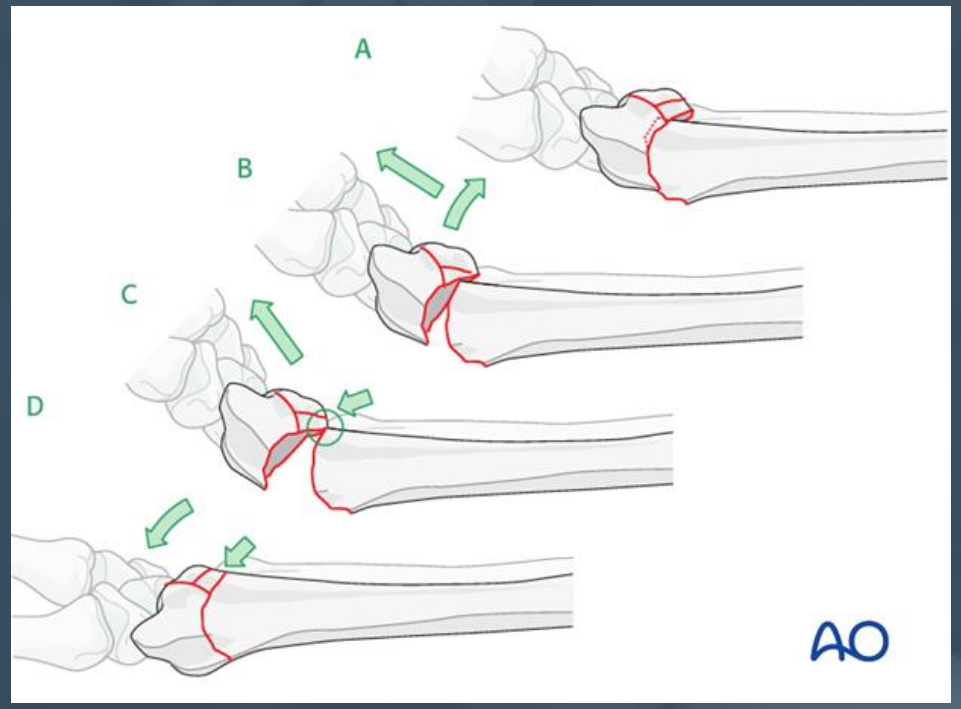
Distal Radius Fractures – Management

Closed Reduction Technique

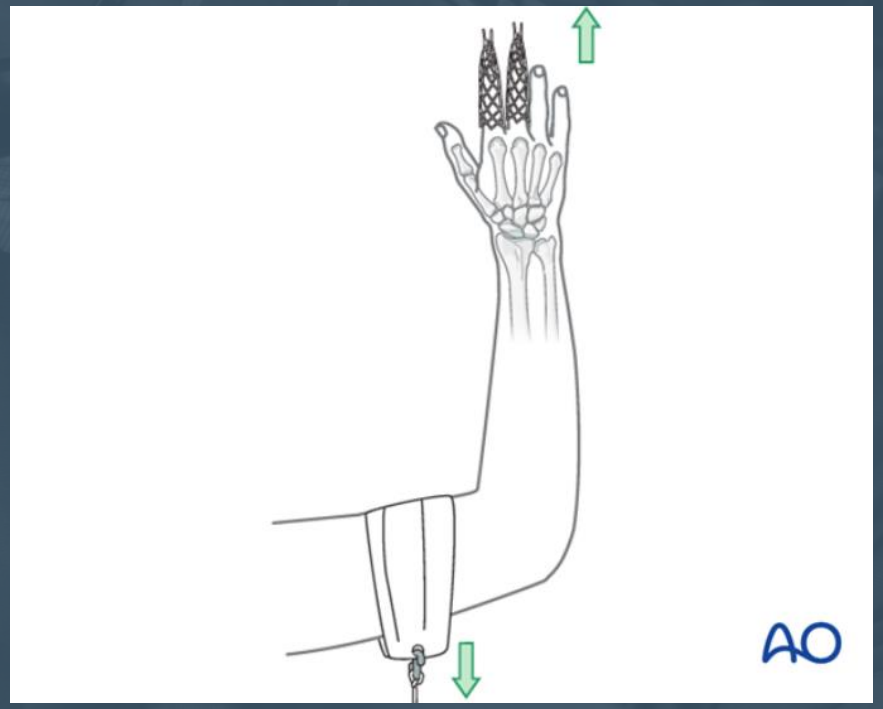
- Anesthesia
  - Hematoma block
  - Intravenous sedation
  - Bier block
- Traction
  - Finger traps, weights
- Reduction Maneuver (dorsally angulated fracture):
  - Hyperextension of the distal fragment
  - Maintain weighted traction and reduce the distal to the proximal fragment with pressure applied to the distal radius.
- Apply well-molded “sugar-tong” splint or cast, with wrist in neutral to slight flexion
- *Avoid Extreme Positions!*



Distal Radius Fracture Reduction

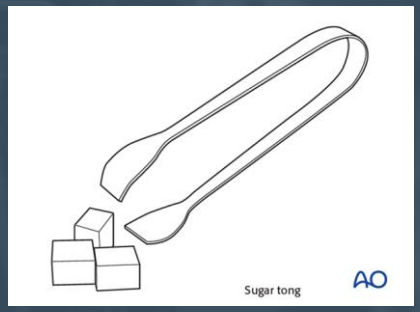


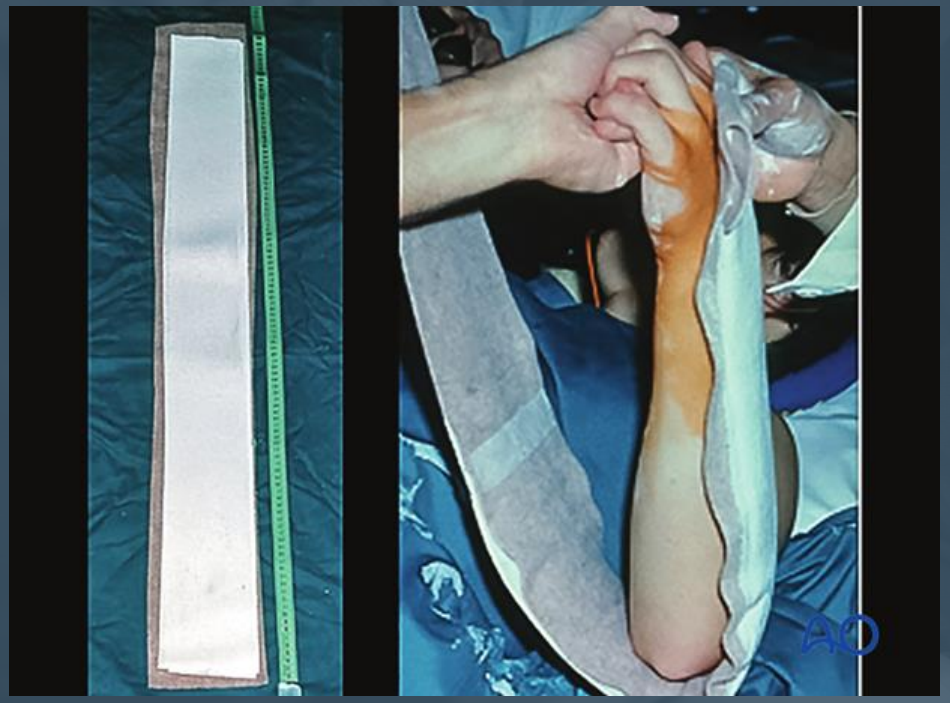
Hyperextension and reduction of the distal fragment



Weighted or manual traction to reestablish radial height, radial inclination

Distal Radius Fracture Reduction

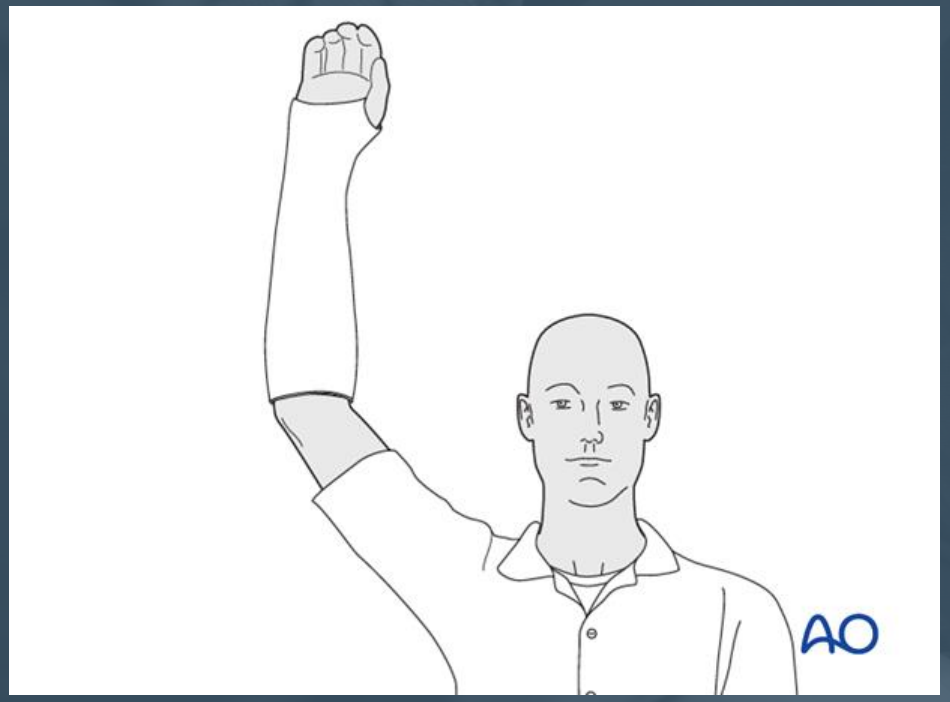




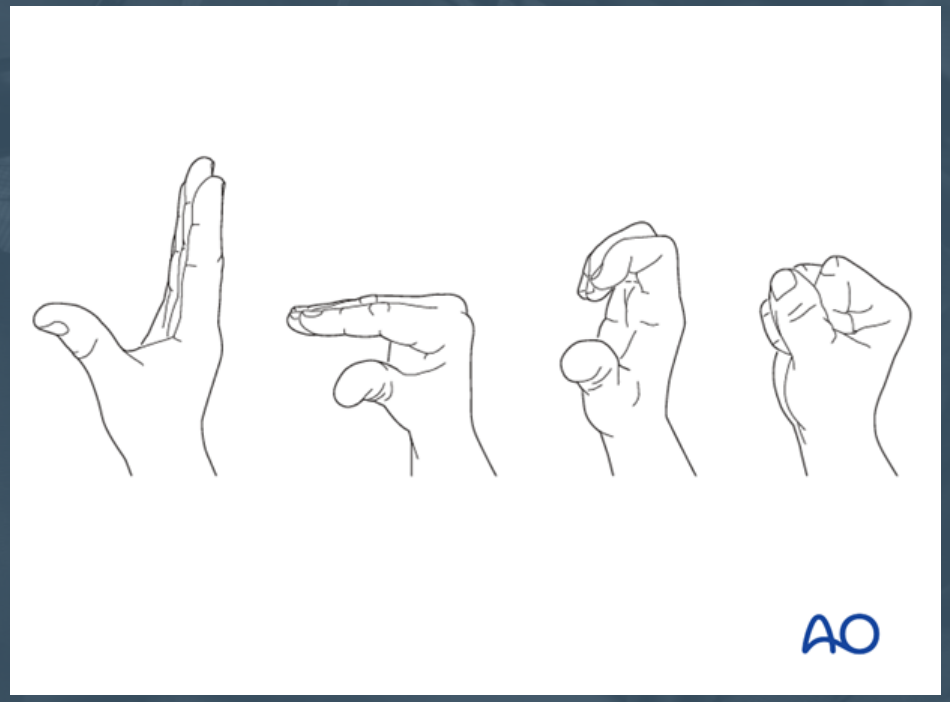
Application of a sugar tong splint

Application of padding to secure sugar tong splint

Distal Radius Fracture Reduction



Encourage elevation at or above heart level



“1, 7, 1, claw, 1, fist”

Acceptable Reduction Criteria

- Dorsal angulation < 10°
- > 15°of radial inclination
- Articular step-off < 2mm
- < 3 mm radial shortening
- DRUJ congruent

Distal Radius Fracture Reduction

Distal Radius Fracture Reduction

Postreduction Management

- Watch for median nerve symptoms
  - Paresthesias common but should diminish over several hours
  - If symptoms persist release pressure on cast, take wrist out of flexion
  - *Acute carpal tunnel*: symptoms progress; CTR required
- Follow-up x-rays needed in 1 weeks to evaluate reduction
- Change to short-arm cast after 2-3 weeks, continue until fracture healing

Postreduction Management

- Fracture union: usually 6-8 weeks
  - **Clinical:** absence of fracture site pain
  - **Radiographic:** evidence of bony bridging across fracture site
- After fracture union → convert to removable wrist orthosis
- OT beneficial for many patients for ROM, ADL training, return to work training

AAOS / ASSH 2020 CPG – Distal Radius Fractures

In the absence of sufficient evidence specific to distal radius fractures, it is the opinion of the workgroup that opioid-sparing and multimodal pain management strategies should be considered for patients undergoing treatment for distal radius fractures (consensus)

Inconsistent evidence suggests no difference in outcomes between a home exercise program and supervised therapy following treatment for distal radius fractures (limited strength)

Limited evidence suggests no difference in outcomes based on frequency of radiographic evaluation for patients treated for distal radius fractures (limited strength)

Inconsistent evidence suggests no difference in outcomes between use of arthroscopic assistance and no arthroscopic assistance when treating patients for distal radius fractures (moderate strength)

Moderate evidence supports that for nongeriatric patients (most commonly defined in studies as those under 65 years of age), operative treatment for fractures with postreduction radial shortening >3 mm, dorsal tilt >10°, or intra-articular displacement or step off >2 mm leads to improved radiographic and patient-reported outcomes (moderate strength)

Strong evidence suggests that operative treatment for geriatric patients (most commonly defined in studies as those 65 years of age and older) does not lead to improved long-term patient-reported outcomes compared to nonoperative treatment (strong strength)

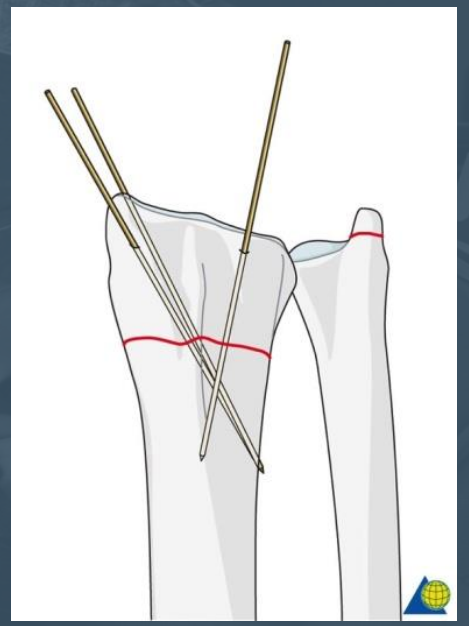
Strong evidence suggests no significant difference in radiographic or patient-reported outcomes between fixation techniques for complete articular or unstable distal radius fractures, although volar locking plates lead to earlier recovery of function in the short term (3 months; strong strength)

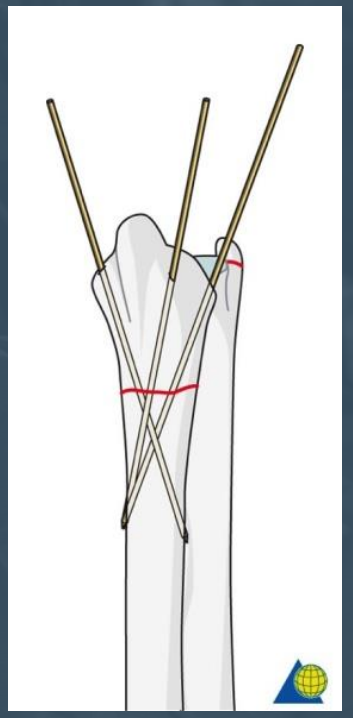
Operative Treatment Options

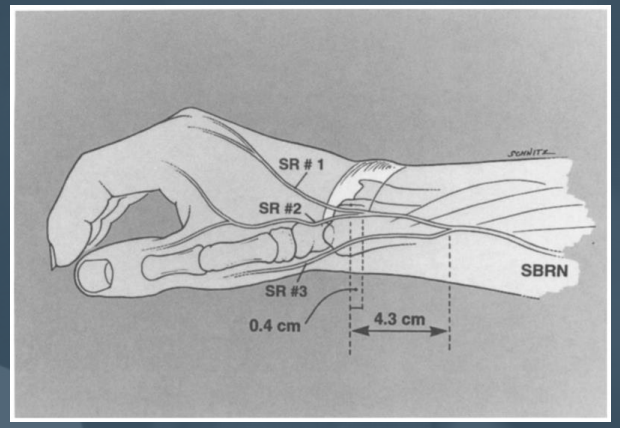
- Percutaneous pinning (“pins and plaster”)
- External Fixation
- Open Reduction and Internal Fixation
  - Volar plating
  - Dorsal plating
  - Combined volar and dorsal plating
  - Fragment specific
  - Dorsal spanning plate (Bridge plate)

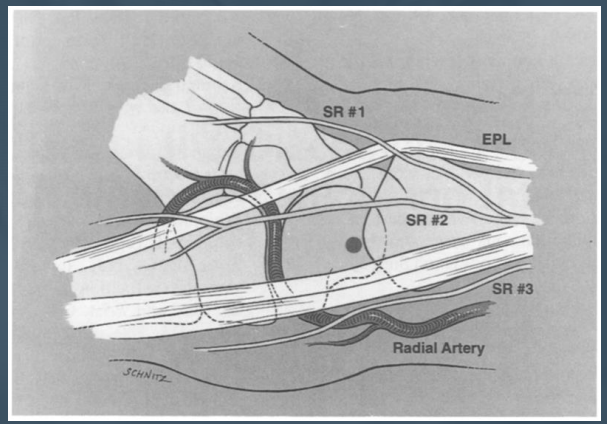
Percutaneous Pinning

- 2- and 3-part fractures
- Pros:
  - Minimally invasive, “simple”, cost effective
- Cons:
  - Limited fixation, infection, removal, tendon / nerve injury
- Minimum 3 wires
  - Dorsal radial styloid longitudinal wire
  - Volar radial longitudinal wire
  - Transverse radial styloid wire
  - Dorsal rim wire
  - Longitudinal K-wire at the dorsoulnar margin of the distal radius



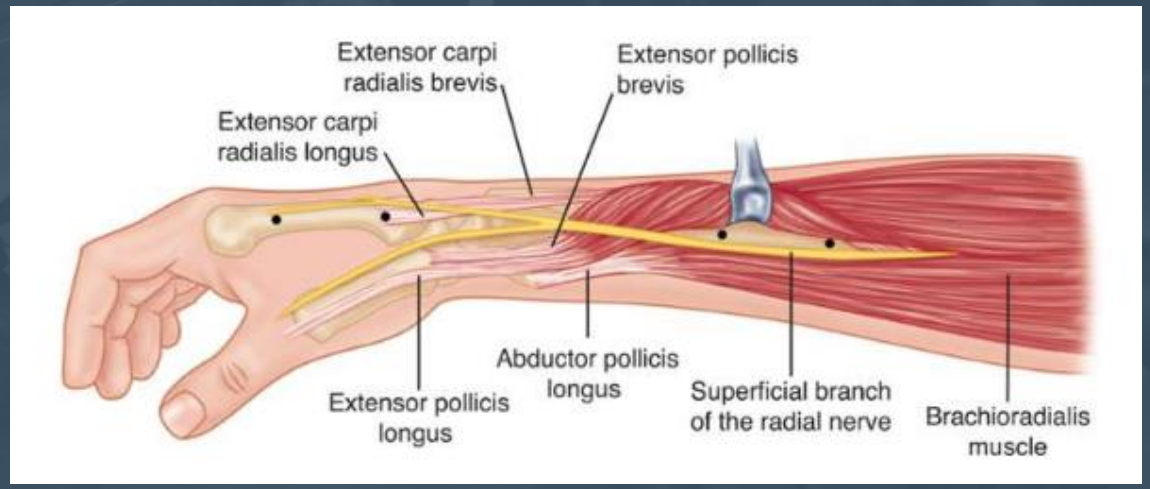


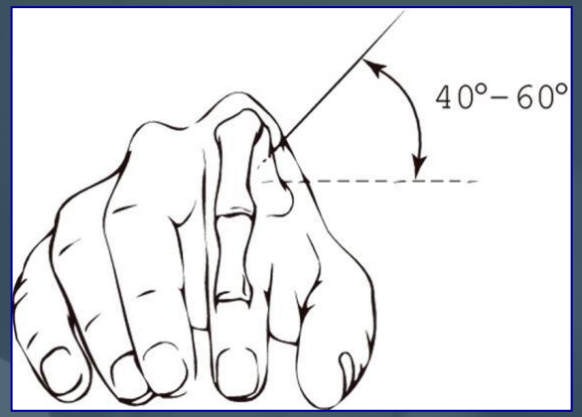


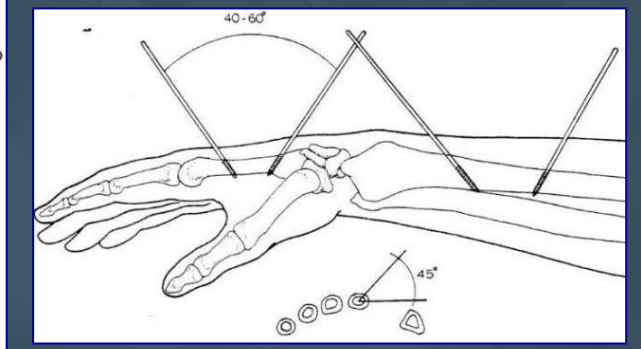


External Fixation

- Relative stability construct
- Relies on ligamentotaxis to maintain reduction
- Spanning or non-spanning
- Pros:
  - “Minimally invasive”, can be removed in office, can be used to stage fixation
- Cons:
  - Limited fixation, inferior resistance to axial compression, wrist and digit stiffness, pin site infections, SBRN injury, RSD
- Limit duration to 8 weeks

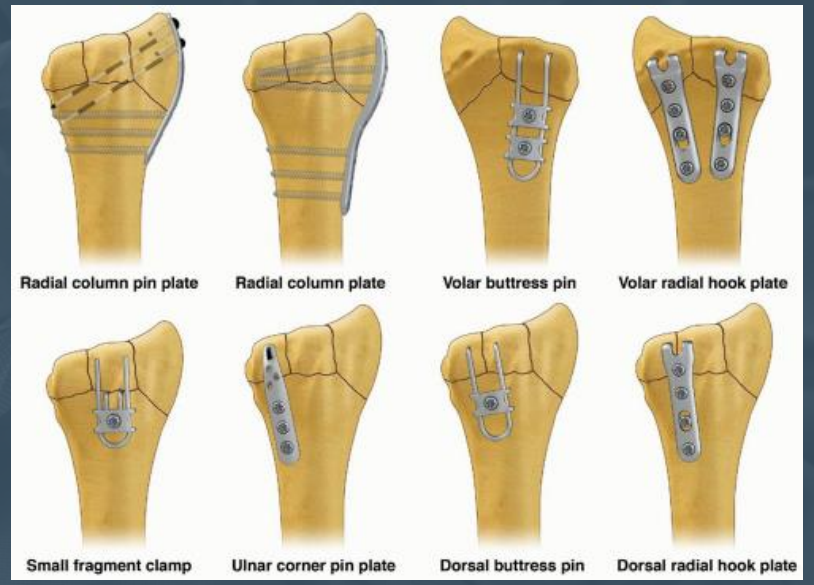






Open Reduction and Internal Fixation

- Multiple plating constructs, systems available
  - Locked volar plating gold standard
    - Improved support to subchondral bone
- Can be performed in conjunction with other modalities
  - Ex-fix, percutaneous pinning, arthroscopically aided reduction
- Pros:
  - Reduce under direct visualization, locking and non-locking fixation, support against axial compression, allows for early ROM
- Cons:
  - Time, cost, tendon rupture (FPL), intraarticular screw penetration, infection, prominent / painful hardware



ORIF – Volar Plating

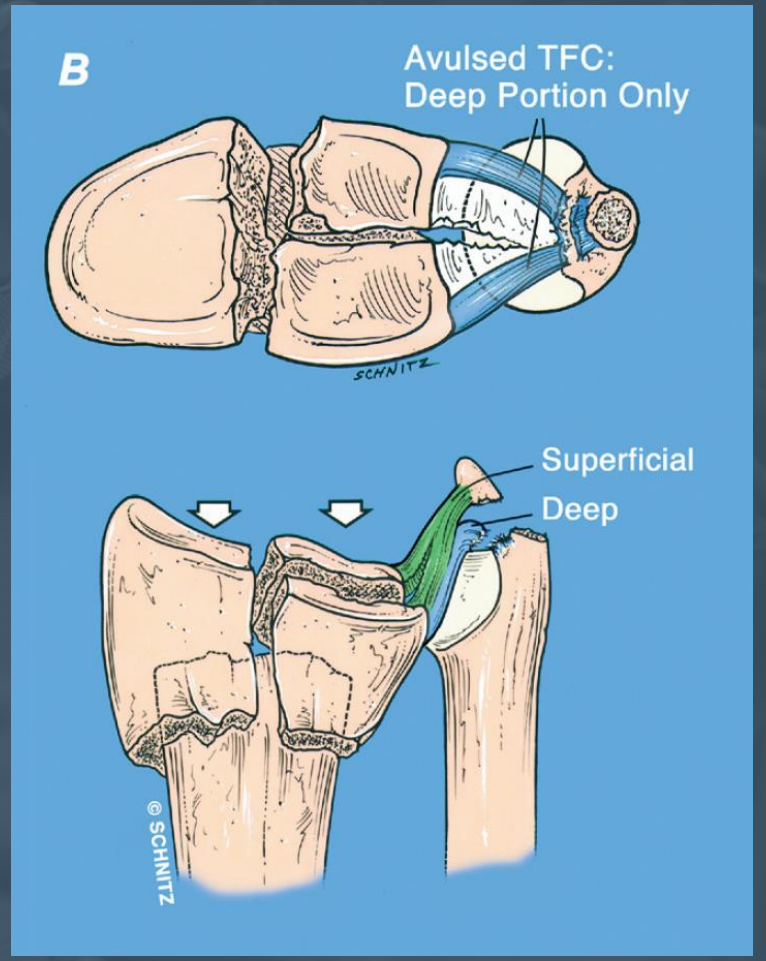
- Increasing in popularity:
  - Able to reduce multiple fracture patterns
  - Effective buttress of metaphyseal fragments
  - Less tendon complications than dorsal plating

- Fixed-angle locking plates allow load transfer from subchondral bone to radial shaft

- New technology improving control of distal patterns
  - “Rim plates”, hook plates

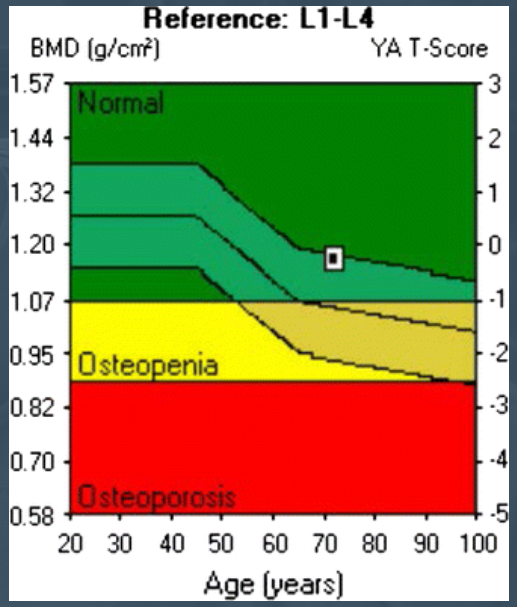
DRUJ Assessment

- Evaluate DRUJ stability in pronation, neutral, supination
- If stable in all positions → standard postoperative protocol
- If stable only in supination
  - Immobilize forearm in supination with above elbow orthosis x4-6 weeks
  - Consider fixation of ulna fracture if present
  - Consider open TFCC repair
- If unstable in all positions
  - Ulna fixation vs TFCC repair vs cross-pinning of DRUJ



Fragility Fractures / Bone Health

- Opportunity for screening and intervention
  - DRFs may present earlier than hip fractures
  - Elderly patients with a DRF have been shown to have a >5x risk of subsequent hip fracture within 1 year
- Recommend DEXA scan for postmenopausal women and men > 60yr with DRF
  - PCP vs Orthopedic Clinic - debated
- Calcium + Vitamin D Supplementation
  - Calcium Carbonate 600mg + Vit D 400 IU tab BID

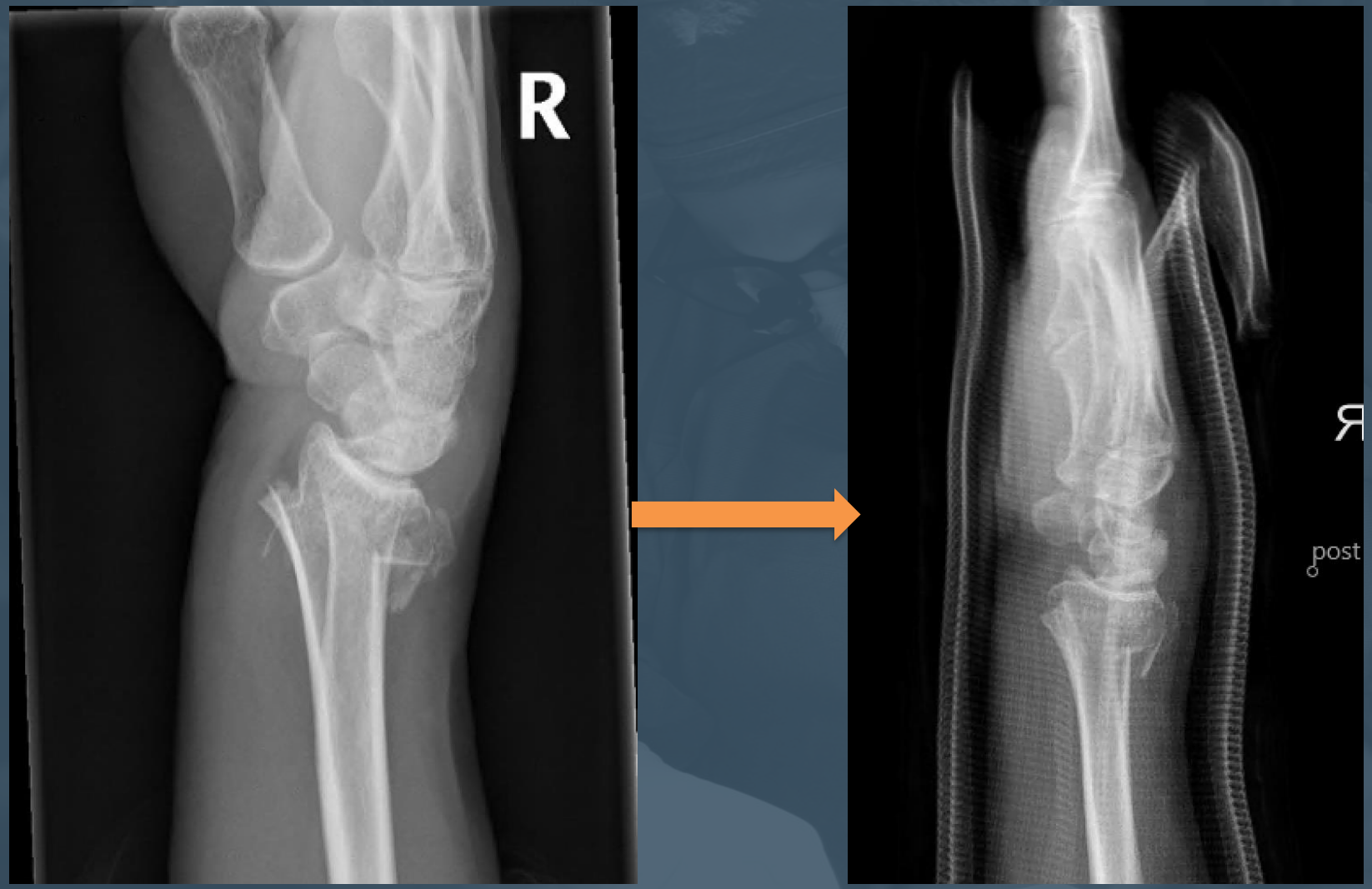


Conclusions

- Distal radius fractures are very common - 450,000+ encounters per year in US
- Initial treatment – closed reduction
  - Monitor for acute carpal tunnel syndrome
- Treatment dependent upon quality of reduction, assessment of stability
  - Acceptable reduction: Dorsal angulation < 10º, > 15 º of radial inclination, Articular step-off <2mm, <3 mm shortening , DRUJ congruent
- Multiple fixation options: goal is to restore articular congruity, capture volar lunate facet
- Always assess DRUJ stability following fracture fixation to determine need for additional treatment
- Remember fragility fracture screening, Calcium + Vit D treatment

Case #1

Case #1



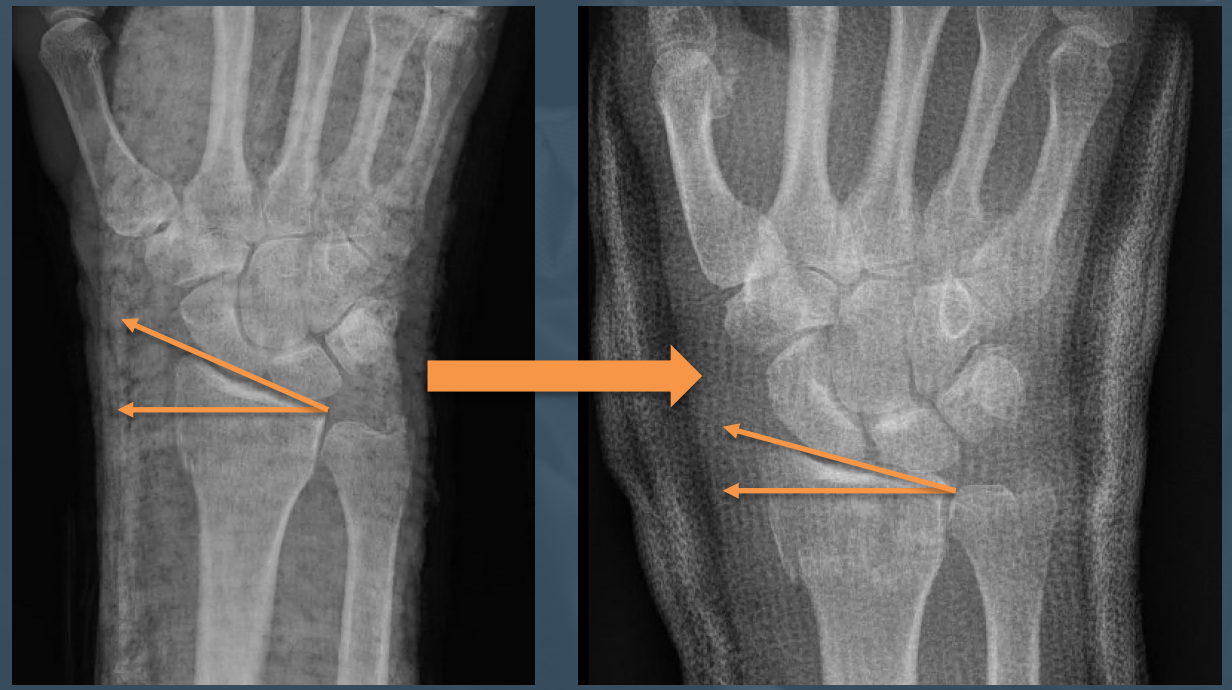
Case #1

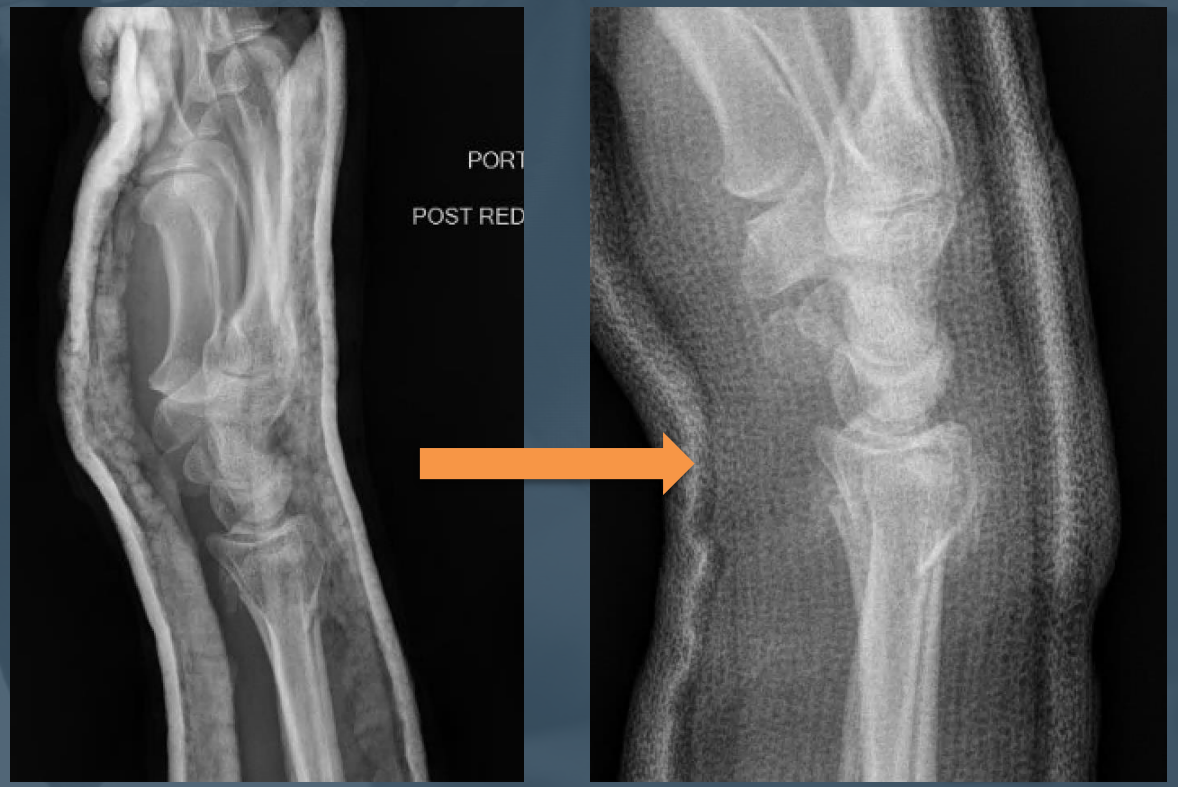
Case #1

Case #2

Case #2

Case #2





Case #2

Thank You!

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