THE CORE INSTITUTE
Center for Orthopedic Research and Education®

UPPER EXTREMITY FRACTURES
PAOS 2022

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Disclosures

- Paid consultant and receive royalties from Arthrex

3 Categories of Pics on My IPhone: Airplanes, Bloody OR Pics and My Pooch

Outline

- Broad overview of common and interesting fxs and treatment options
- By no means meant to be all inclusive
- Going to show many cases examples that show you can successfully fix these fxs many different ways
  - Humeral shaft fxs
  - Distal Humerus/Elbow fxs
  - Distal Radius fxs
  - Hand Fxs

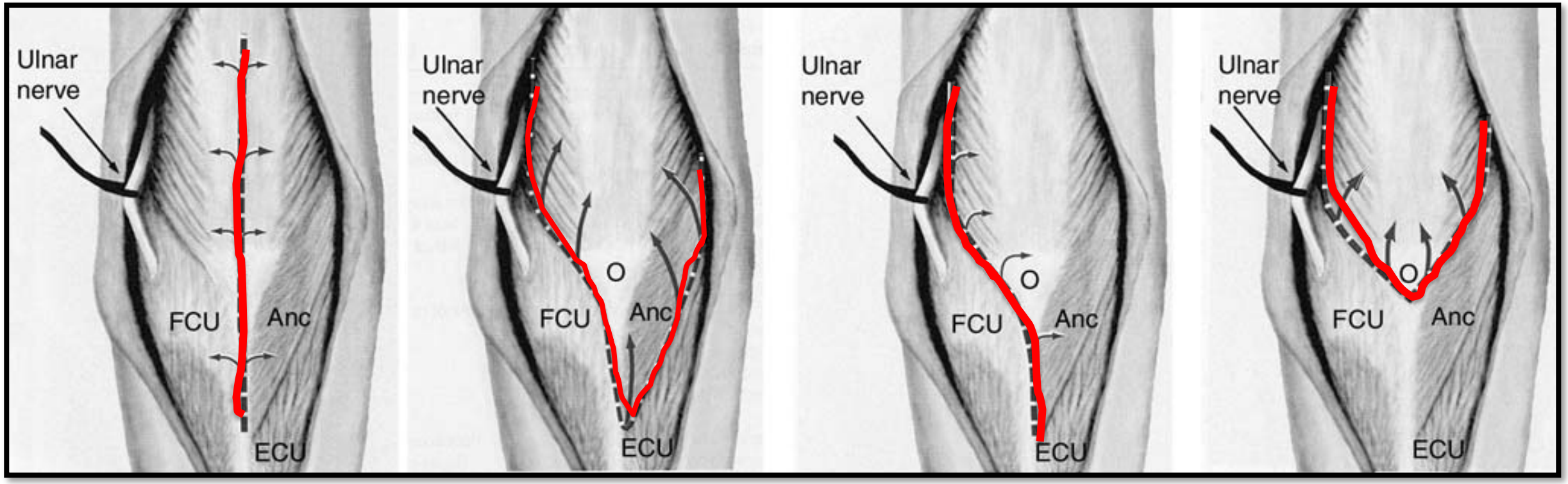
Humeral Shaft

- Very common
- Many types…
  - There are humeral fxs
  - … and there are humeral fxs!
- Classic teaching on acceptable alignment… but not really validated
  - No more than 30° A/P and 20° varus
  - No more than 3cm shortening

Humeral Shaft

- Relative indications for surgery
  - Comminution
  - Middle to proximal third
    - Sarmiento difficult to hold
  - Large breasted woman
    - Varus deformity
- Absolute indication for surgery
  - Open
- Nerve palsy at time of fx
  - 10% rate
  - 70% spontaneous recovery rate

Humeral Shaft Posterior Exposures



Triceps-split
Low extra-artic fx

Triceps-reflecting
Anconeus Pedicle

Bryan Morrey

Olecranon
Osteotomy

Humeral Shaft

Distal Humerus

- Tricky fractures with different personalities
  - Like DR fxs… no 2 are exactly the same
- Approaches
  - Triceps sparing and or windows and Olecranon osteotomy most common
    - Triceps splitting and reflecting
  - Osteotomy for distal most fxs and Triceps sparing or window approach for simple Intra-articular component or extra-articular
    - I tend to use windows and can get all extra articular fxs and simple intra fxs done with windows

Distal Humerus

- Indications for surgery
  - Almost any distal humerus fx should be considered
    - Health and mental status of patient may play role
- Plating Techniques
  - Recommend locking plates
  - Variable angle is helpful
- Orthogonal vs 180°
  - Biomechanically all over the place
  - Clinically both are solid choices and would recommend using whatever the fracture dictates
    - Often times difficult to fix the posterolateral fragment with direct lateral based on fx pattern
    - Also difficult with the lateral supracondylar ridge being so thin

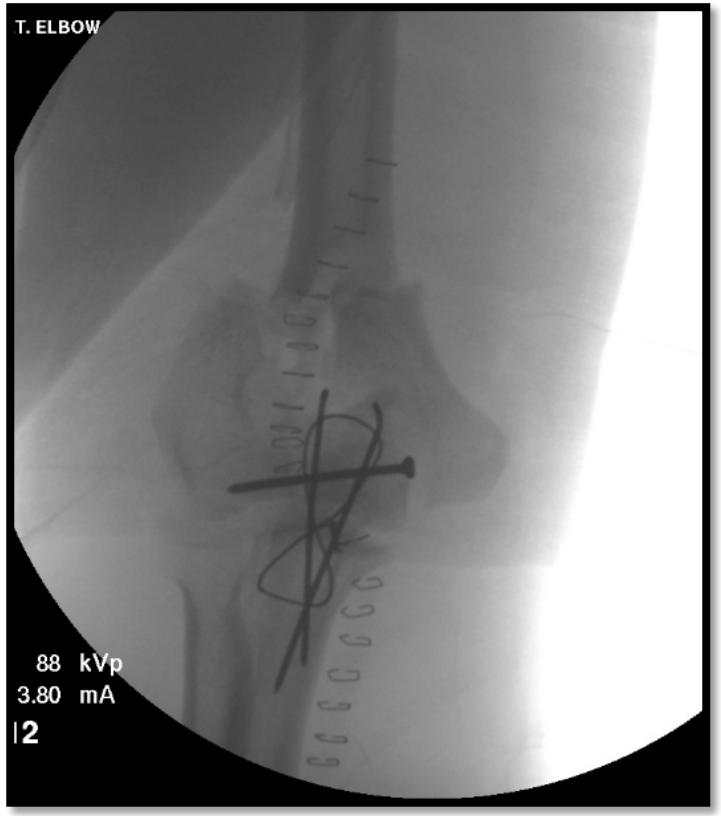
Distal Humerus

- Pitfalls
  - Nerve, Nerve, Nerve!
    - You have to see the nerve in the spiral groove and CAREFULLY mobilize it if you are going to plate proximally
  - Always feel anteriorly to make sure you didn't come out the front
  - And for the Love of Humanity… please don't do this…

Distal Humerus

Distal Humerus

- …or this



Distal Humerus

- Capitellar Sheer Fx
  - Very common
  - Fun to fix…normally
  - Lateral/Kocher approach
  - Once you get the frag back into the joint it almost reduces anatomically
  - Headless Compression Screws

Distal Humerus

Terrible Triad

- Radial head fx, elbow dislocation with coronoid fx
  - Highly unstable
  - Many different grades of severity
  - Goal: concentric stable joint
  - If 4 or more pieces to radial head will likely benefit from arthroplasty
  - If small coronoid fragment AND you are fixing radial head you can stabilize small coronoid frag with drill hole lasso technique

Terrible Triad

- Virtually all terrible triad injuries need to be surgically treated
- Often times restoring bony lateral anatomy (radial head) and repairing LCL with anchors gives good stability with small coronoid fxs
  - If not make sure coronoid is fixed
  - If still unstable make separate medial incision to repair MCL
  - Rare to need internal joint stabilizer!

Coronoid Fx

- If small frag and NOT anteromedial facet piece may be able to fix from lateral if radial head is going to be replaced
- Drill hole technique: through lateral side “lasso” small frag and anterior capsule with you can use FiberLoop and ACL guide
  - One drill hole, suture passer from A to P, cut the loop and tie over button on the posteromedial/posterolateral cortex
    - Don’t necessarily need pass separate limbs through 2 separate drill holes

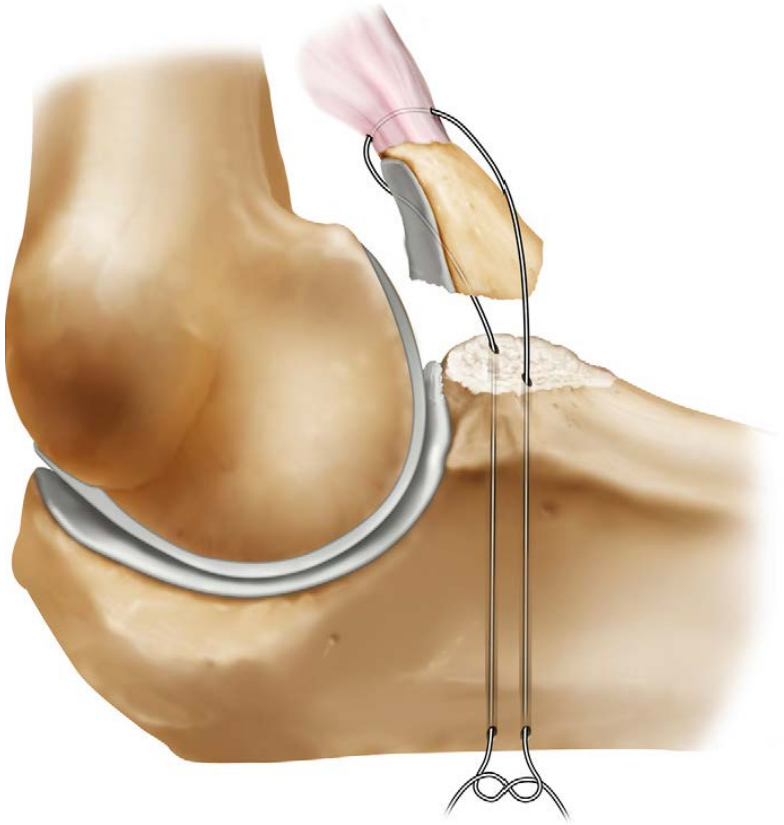


Fig. 3

Published in The Journal of bone and joint surgery. American volume 2011
Fixation of the coronoid process in elbow fracture-dislocations. G. Garrigues, Walter H. Wray, Anneluuk L. C. Lindenhovius, D. Ring, D. Ruch

Coronoid Fx

- Larger Anteromedial facet fragments need to be internally fixed
  - MCL attaches here and is critical for stability
  - Can use pre existing coronoid plate
    - Also can use small hand plate
    - Be aware of joint penetration
    - Just needs to be a buttress

Coronoid Fx

- Approach medially if radial head is intact or not replacing
- FCU Split vs “over the top” Hotchkiss
  - I prefer FCU split with great visualization
  - Need to identify and decompress (at the least) the ulnar nerve to safely access interval

Radial Head/Neck Fx

- Indications to fix
  - No great consensus
  - Isolated minimally displaced 2 part fxs may be treated nonop
  - Multi-fragmented likely best treated operatively
  - Patient factors play a role
  - 31 yo male with isolated injury
    - Active and a manual laborer who needed to get back to work

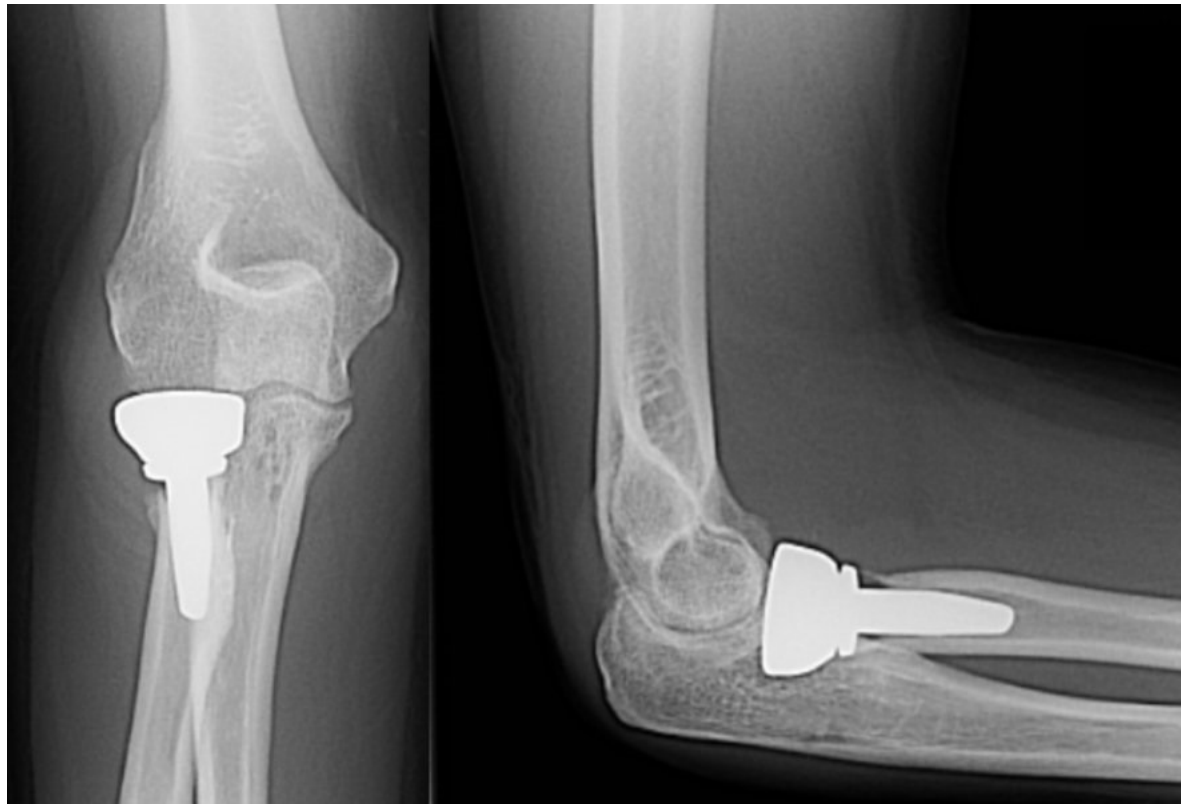
Radial Head/Neck Fx

Radial Head/Neck Fx

- Simple radial head fxs can be fixed with headless compression screws
- Highly comminuted is more controversial
  - Many articles suggesting that arthroplasty does significantly better than ORIF but many confounding factors

Radial Head/Neck Fx

- Arthroplasty works well but definitely need to avoid technical mistakes
  - Always check DRUJ to look for static signs of Essex Lopresti
  - DON'T overstuff
    - Both height and width are critical
    - Try to reconstruct frags on back table in sizer and if in doubt go one size down
    - Should sit perfectly in the PRUJ
    - Medial and lateral joint space of the proximal ULNA should be symmetrical
    - Could lead to stiffness and/or premature capitellar wear



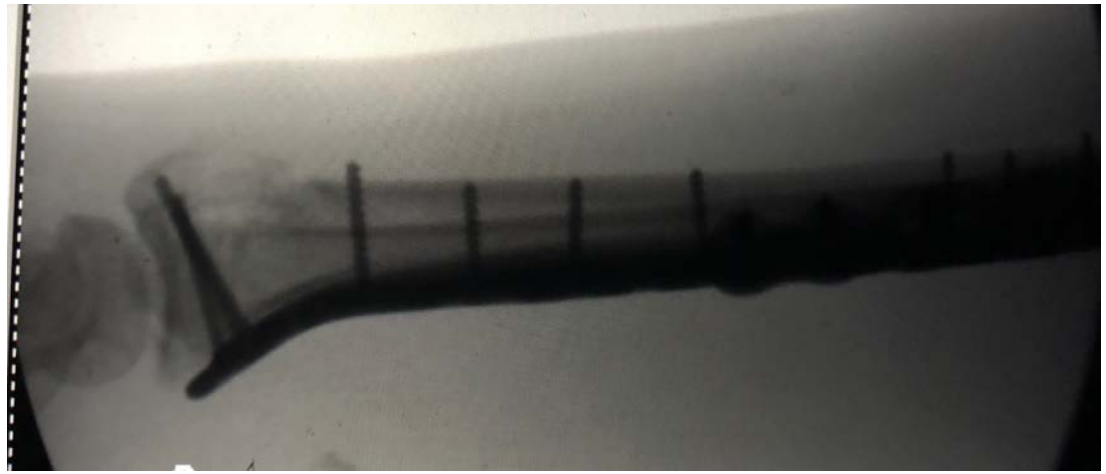
Radial Head/Neck Fx

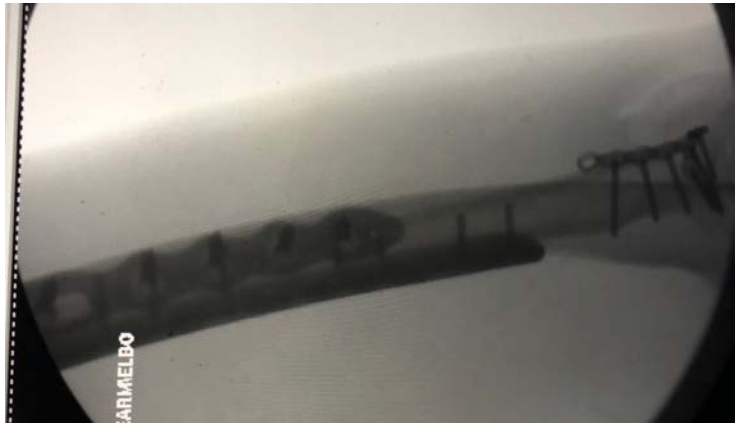
- The key to all of these injuries is stable fixation to allow for early ROM
- If you think your ORIF of radial head/neck is tenuous then opt for arthroplasty
  - Does no good for the patient to retain their unstable anatomy if you are going to have to immobilize for long time

Distal Radius Fx

- Approximately 1/6 of all fractures seen in the ER are distal radius
- Over half million distal radius fxs each year

Distal Radius Fx





Distal Radius Fx

- Indications to fix
  - All over the board
  - Open fx
  - >20° tilt; Loss of height >4mm
  - Highly comminuted
    - Especially in elderly
    - Base surgical decision off of pre reduction films
      - If unstable pre reduction then likely to lose reduction

Common Fracture

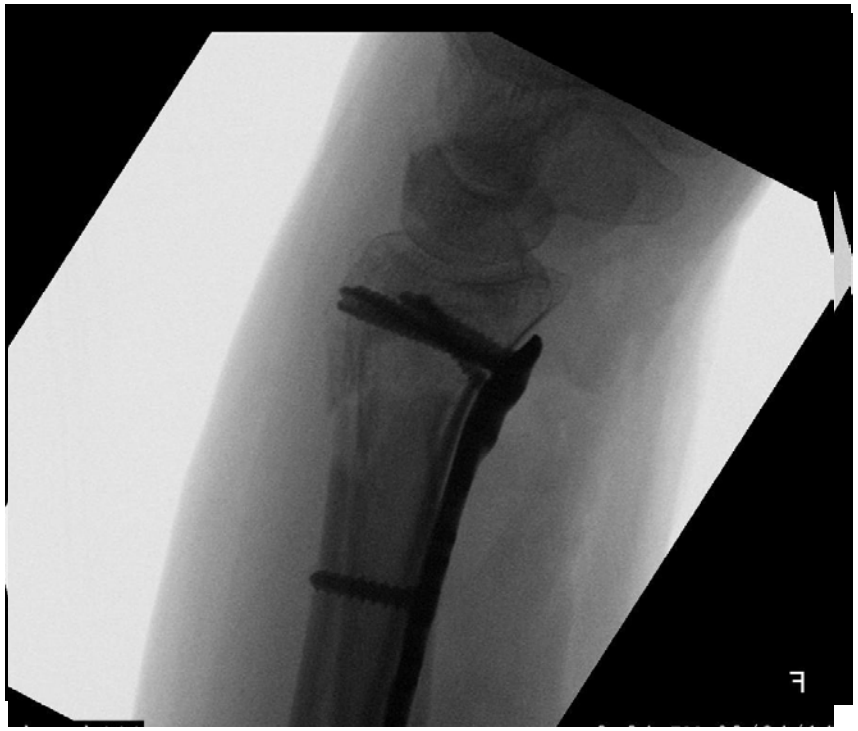
Common Fracture

ORIF

- Determine where the pathology is
  - Radial column
  - Intermediate column
  - Dorsal ulnar corner
  - Volar ulnar corner

ORIF

- Let the plate do the work for you
  - Tilt



Case Example: Osteotomy

Case Example: Osteotomy

Case Example: Simple Extra-Articular

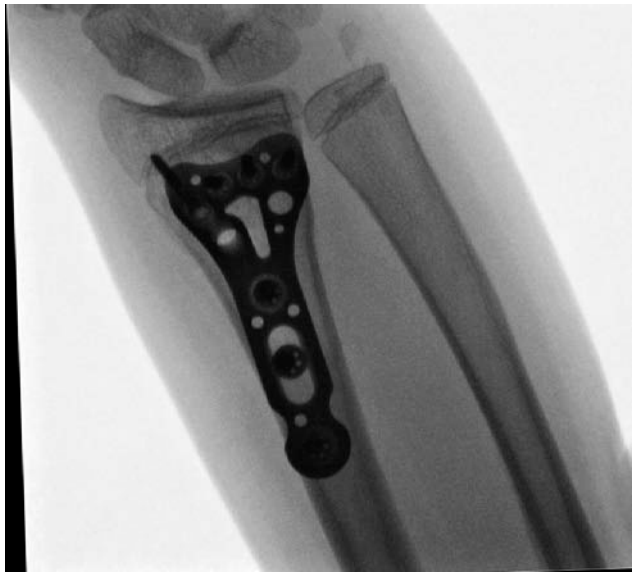
- 79 y/o tripped over her Chihuahua

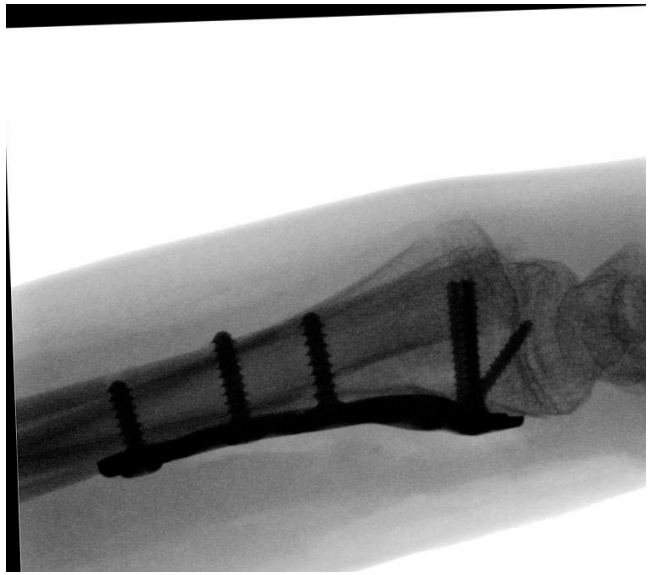
Case Example: Simple Extra-Articular

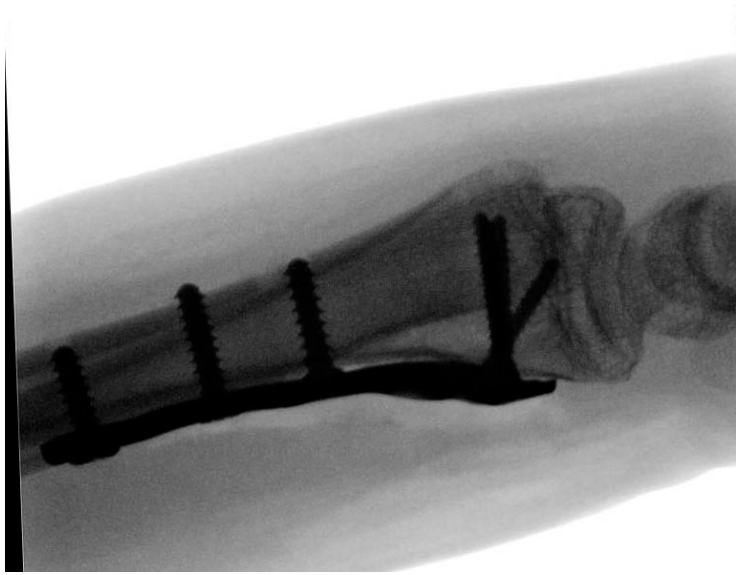
Case Example: Peds

- 15yo volar Barton's fx
- Mildly prominent dorsal ulna especially with her being a thin 15yo girl

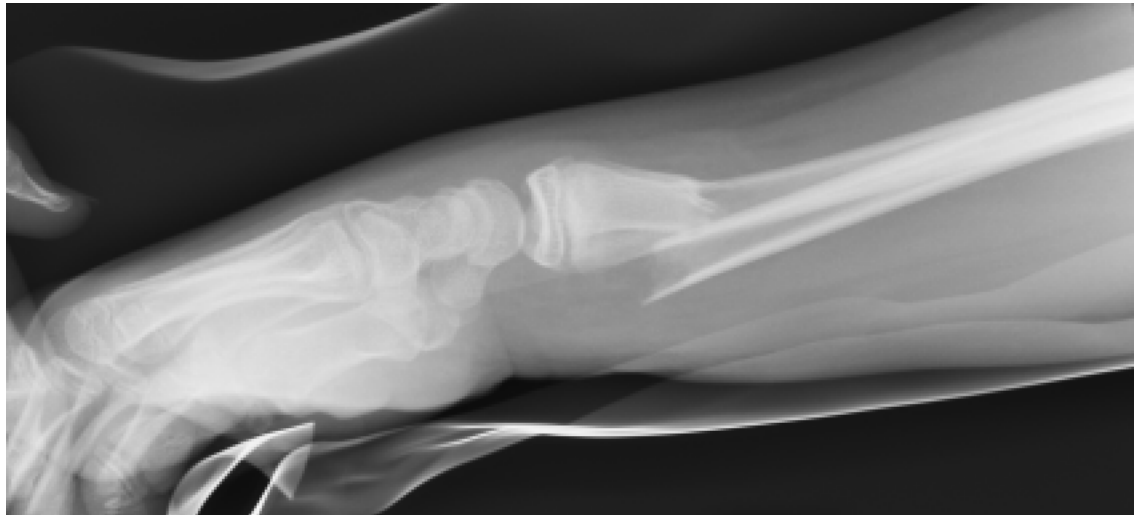
Case Example: Peds







Case Example: Peds



Case Example: Peds

Distal Radius Fx

- Must be prepared to approach the pathology directly
  - Can’t fix everything with a volar plate!
- May need to utilize fragment specific options and other approaches other than standard FCR volar approach
- May need to combine soft tissue reconstruction with h/w

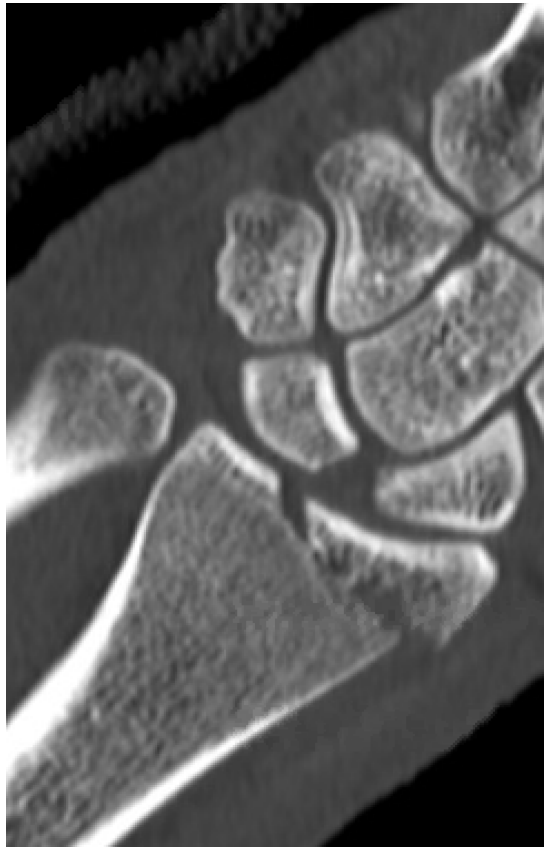
Wrist Trauma

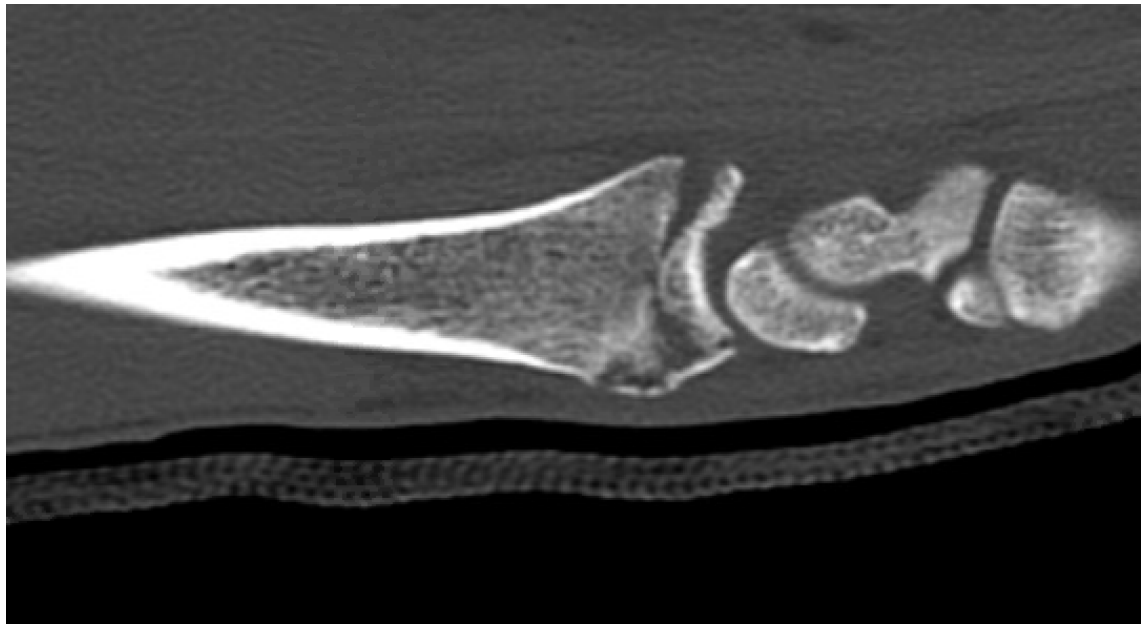
-28 y/o otherwise healthy male fall from a ladder
-Isolated injury

Wrist Trauma

Wrist Trauma

Frag Specific Case Example: Styloid





Frag Specific Case Example: Styloid

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Frag Specific Case Example: Dorsal

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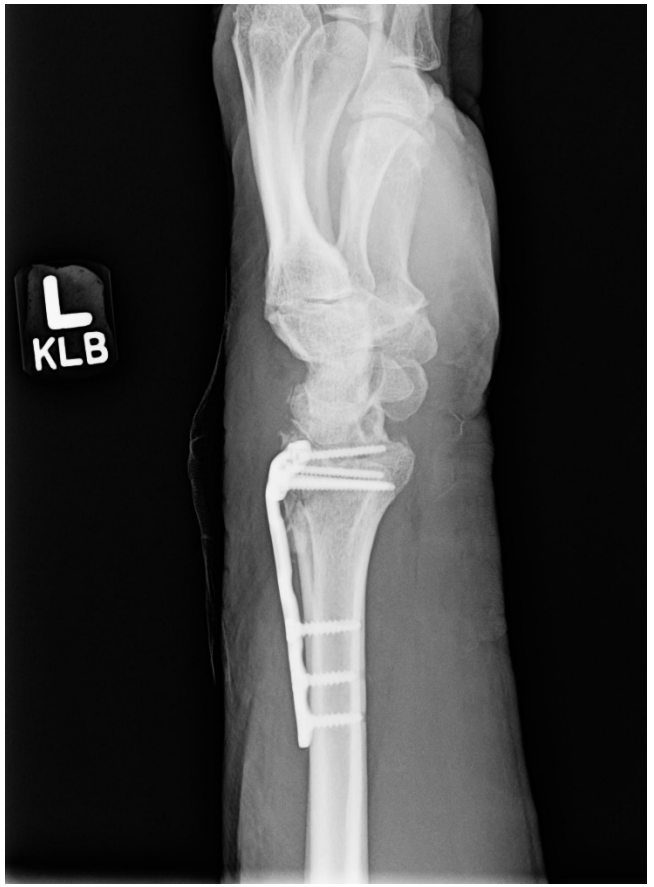

Case Example: Frag Specific Plating

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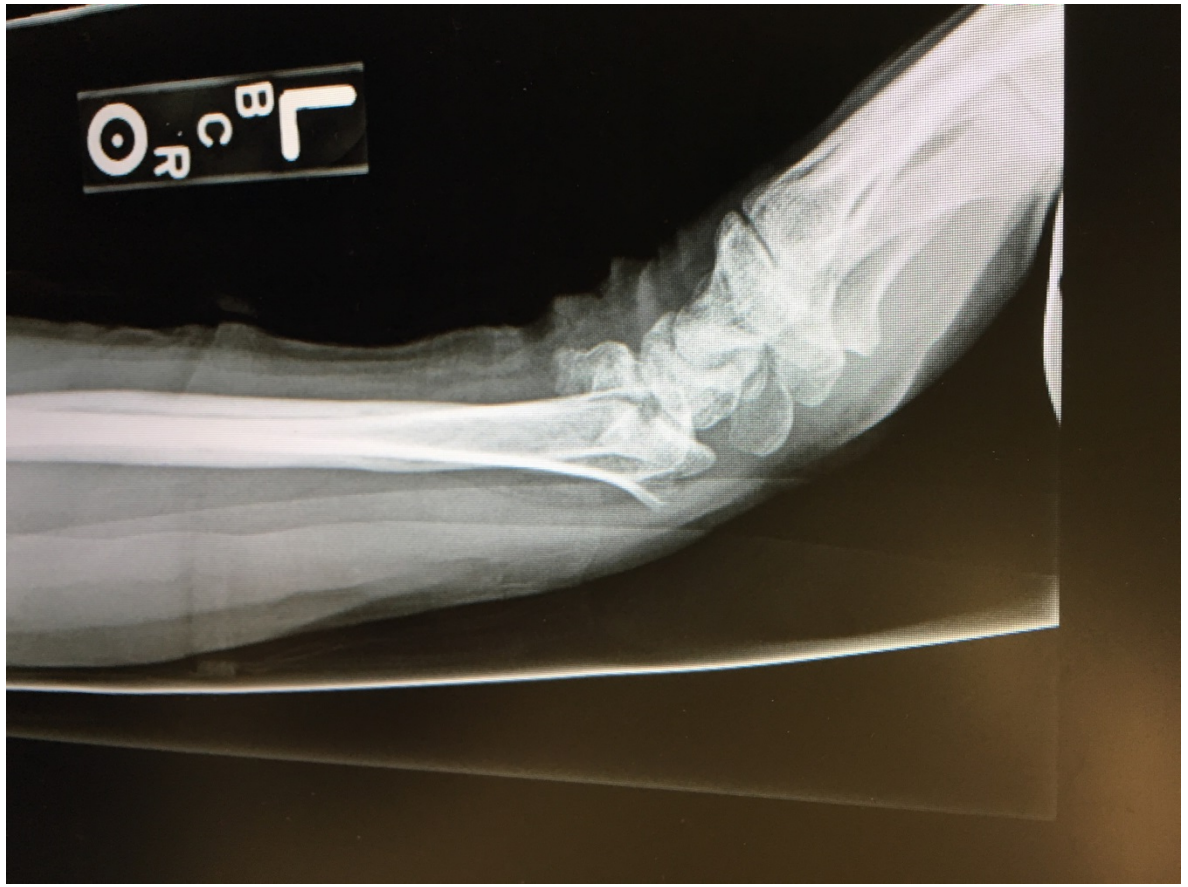
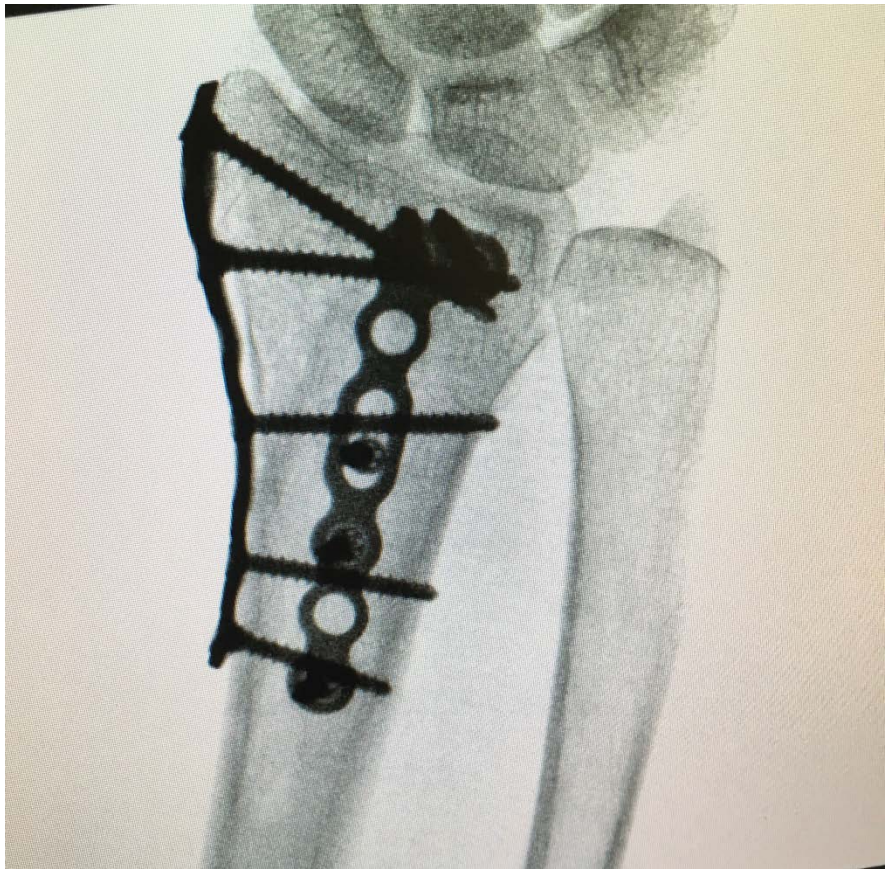


Case Example: Frag Specific Plating

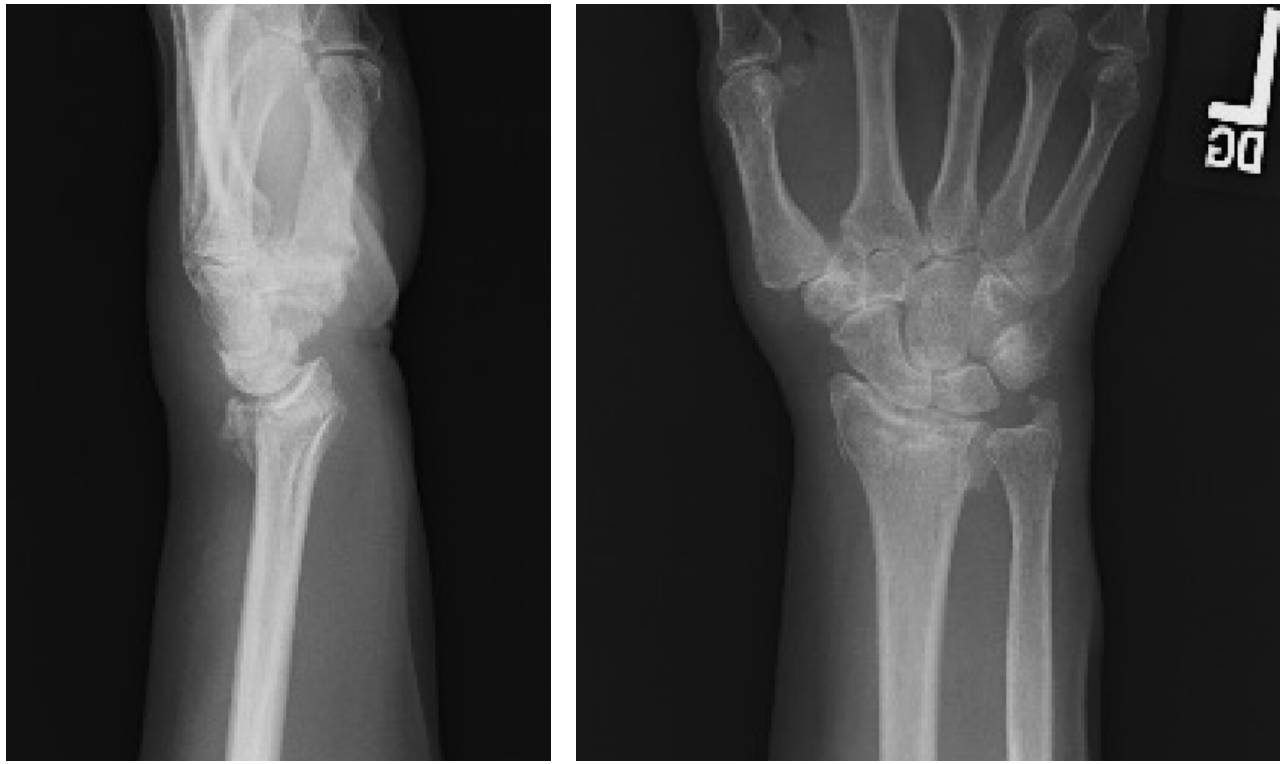


Distal Radius Bridge Plating

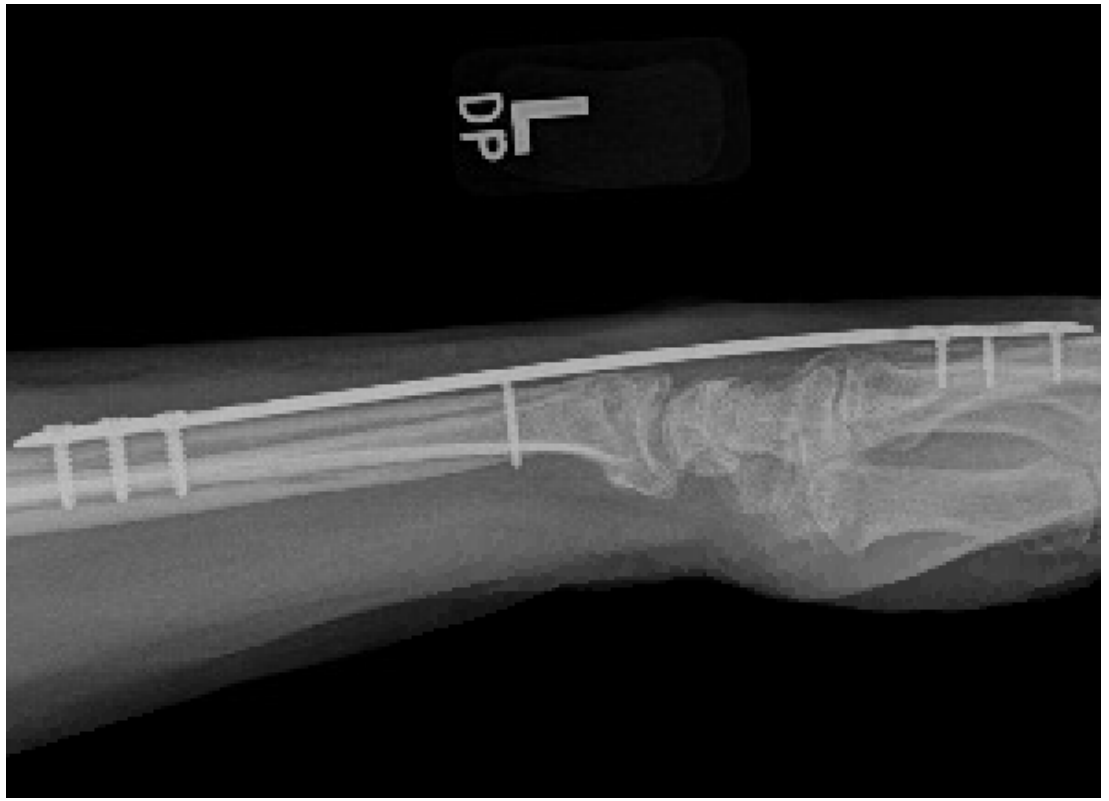
- Probably the most helpful technique that I've incorporated into my practice in the past 10 years
- Ideal for very distal fxs, highly comminuted fxs, severely osteoporotic bone
- Negative: second surgery

Case Example Bridge Plate

- 72y/o got caught up in dog leash
- Distal Fx
- Osteoporotic
- Likely impacted and comminuted



Case Example Bridge Plate



Case Example Bridge Plate

- 78 y/o fall over a parking block
- Distal fracture
- Osteoporotic
- Comminuted and very short

Case Example Bridge Plate

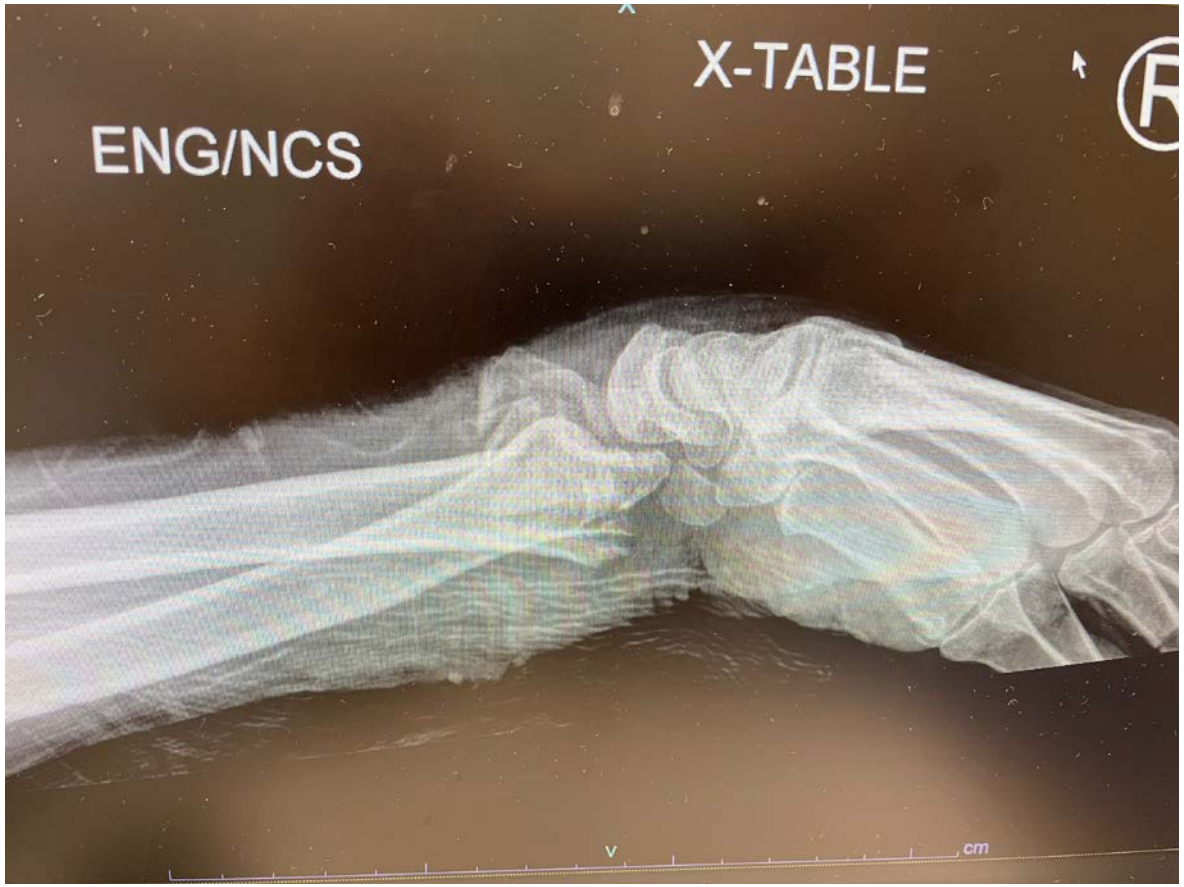
Case Example Bridge Plate

- She missed multiple appointments and finally showed up 3 mos postop
  - Fracture well healed
  - Plate starting to pull out distally but she is having no pain

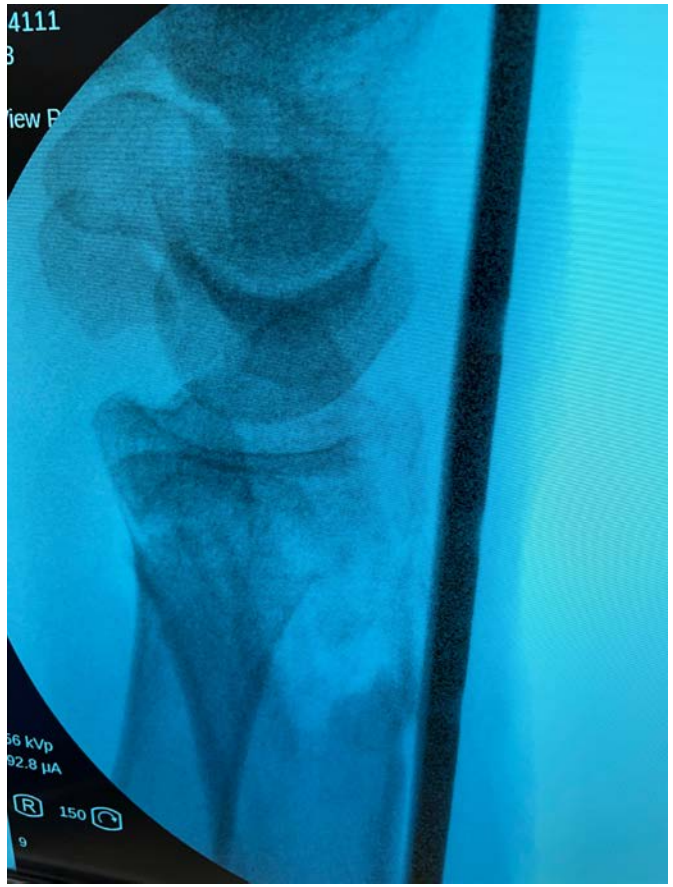
…and 1 More Bridge

- 74 y/o male fell off a step ladder
- No significant PMHx
- Open ulna fx

Case Example



Case Example



Distal Radius Fxs

- Critical to get their fingers moving ASAP
- Get the ER splint off and check for open fxs and get their fingers free
- Look the patient in the eye and give them your best cheerleader speech
  - Wrist can be perfect but if the fingers don't move you will be miserable and non functional

Scaphoid Fxs

- More common in young patients
- Need a high index of suspicion based on hx and PE
  - 4 view wrist…ALWAYS
- If negative xrays but painful (especially over snuff box) then either
  - Cast x 3 weeks and repeat x-ray
  - Obtain advanced imaging
    - CT or MRI but MRI more sensitive

Scaphoid Fxs

- Indications for surgery
  - Open fx
  - Some argue that any displacement qualifies
  - If you can see a fracture line it probably is displaced
- Nonsurgical for truly nondisplaced
  - Faster return to work with surgery
  - Longer casting time with nonop

Scaphoid Fxs

- Most commonly fixed with headless compression screw
- For nonunions, delayed presentation and AVN bone grafting is recommended
- Vascularized bone grafting for AVN is now being challenged with THOROUGH excavating of sclerotic bone and autograft + plate

Scaphoid Fxs

Scaphoid Fxs

Scaphoid Fxs

- Studies have shown up to 100% union rate in scaphoid nonunions treated with plates
  - Meticulous technique
  - Buttresses the deforming forces

Hand Fxs

- Metacarpal fxs
  - Critical to check rotational component
  - Need to try to have patient make a fist to accurately determine rotation
  - Significant shortening
    - Every 2mm causes 7° of extensor lag
  - Multiple ways to fix
    - K-wires
    - Plates
    - Lag screws
    - IM screws

Hand Fxs

- Metacarpal fxs
  - Certainly a role for plating
    - High comminution
    - Segmental loss
    - Need immediate rotational control
- If using isolated lag screws for either metacarpal or phalanx fxs must have fx longer than 2-3x the cortical width

Hand Fxs

- IM screws “new”
  - ~8 years
- Multiple articles showing excellent outcomes with IM screws
- Advantages
  - Small incision (percutaneous)
  - Immediate ROM
  - Extremely solid fixation

Hand Fxs

Hand Fxs

- IM Screws
  - Pitfalls
    - Over compression
    - Very narrow canal
      - Ring finger
    - Make sure you have long enough screws and drill the past the fracture site
      - Can get tight and can strip screw

Hand Fxs

- Proximal phalanx fxs
  - Same indications to fix as metacarpals
    - Rotational deformity is even less tolerated
    - Loss of articular congruity
  - Certainly can use k wires but plates or IM screws may be indicated
    - Advantage of screws/plates is decrease immobilization time
    - No protruding h/w

Hand Fxs

Hand Fxs

Hand Fxs

Hand Fxs

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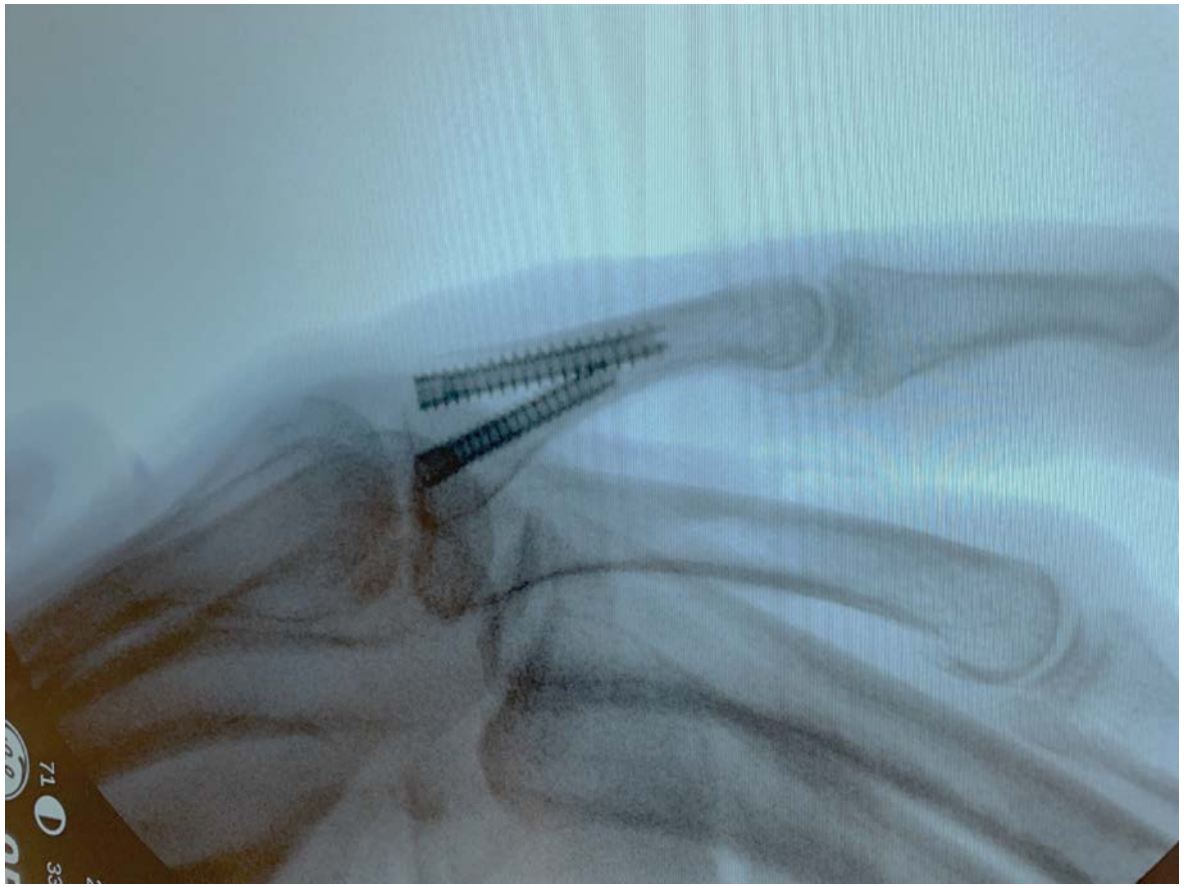
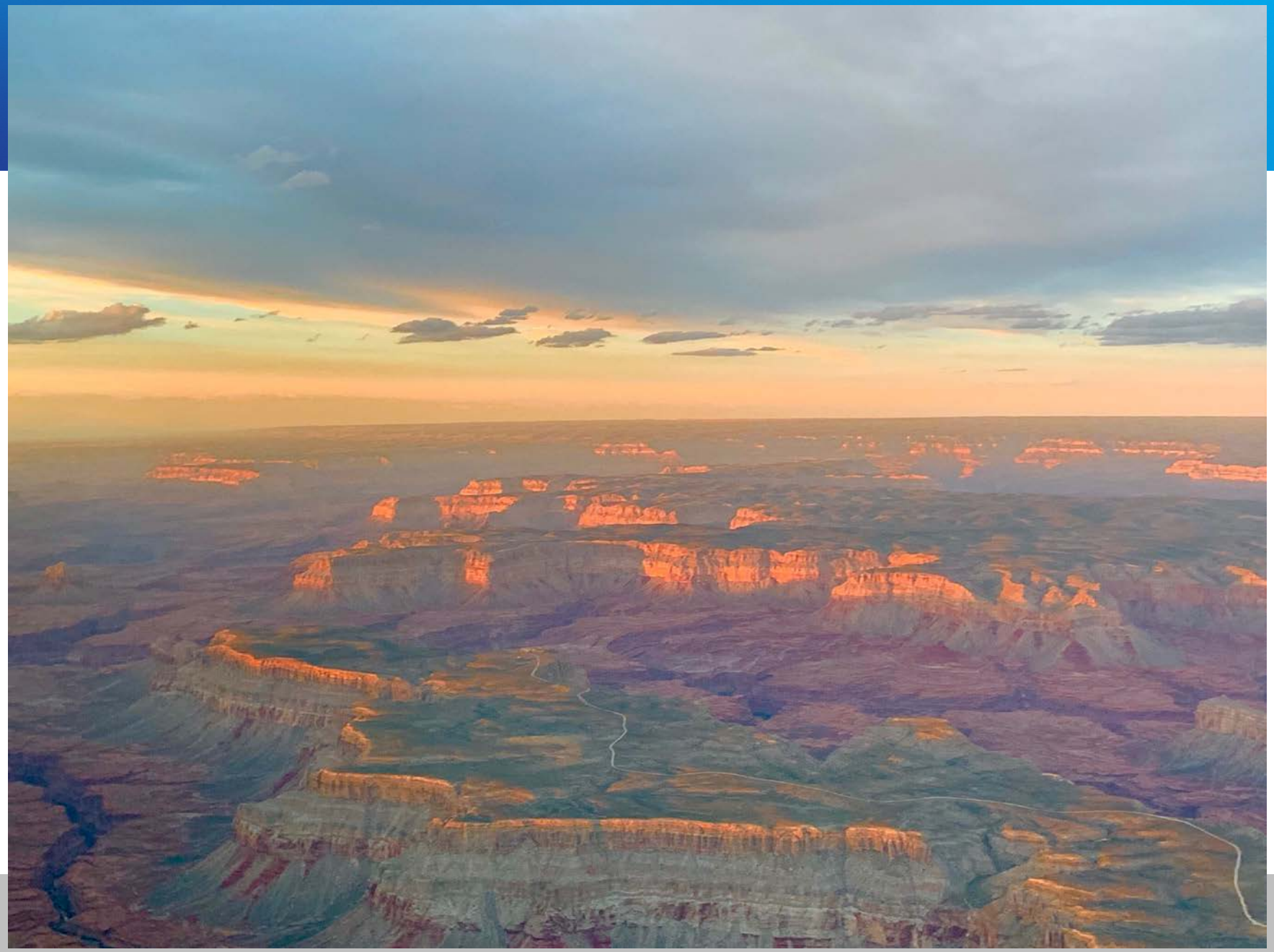
Hand Fxs



Conclusion

- Skipped over many other injuries
- Each one could be its own hour lecture
  - PIP fx/dislocations
  - Ligamentous injuries around the wrist
  - Forearm fxs
  - Biceps tendon ruptures
- Overall goal is to restore function
- Try to achieve stable reduction/fixation to allow for early ROM



Keep Life in Motion!
Questions?