PEDIATRIC UPPER EXTREMITY FRACTURES

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- Nothing to declare

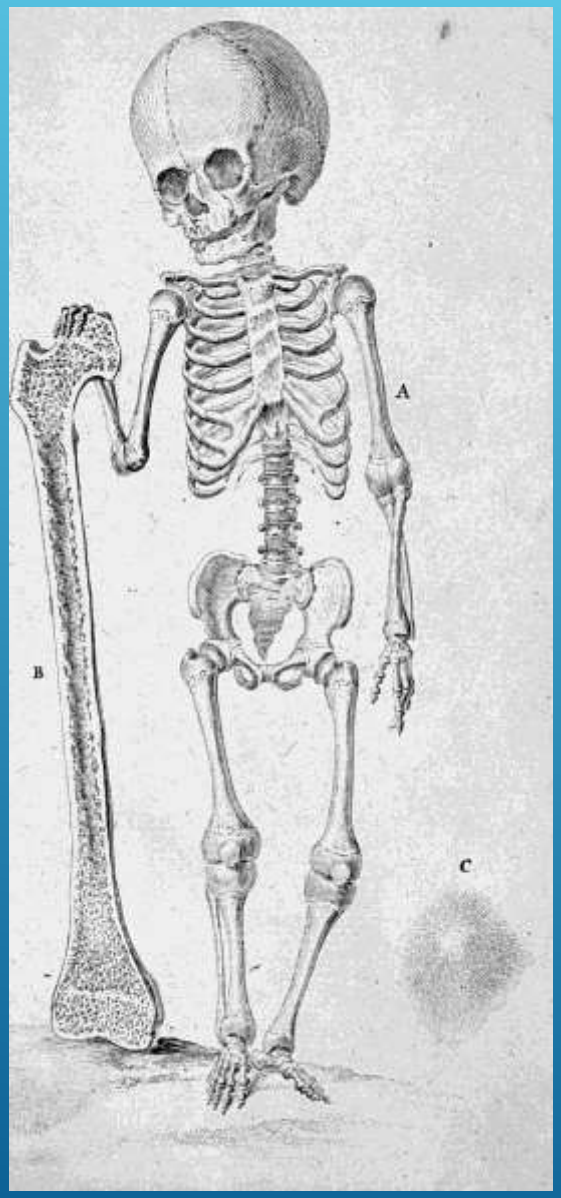
OBJECTIVES

- Identify common pediatric ambulatory fractures
- Discuss typical treatment strategies
- Reinforce “do not miss” scenarios

Introduction

"Pediatric Fractures are not simply fractures in small adults. They are an entirely different entity, altogether."

Mercer Rang, M.D.



Agenda

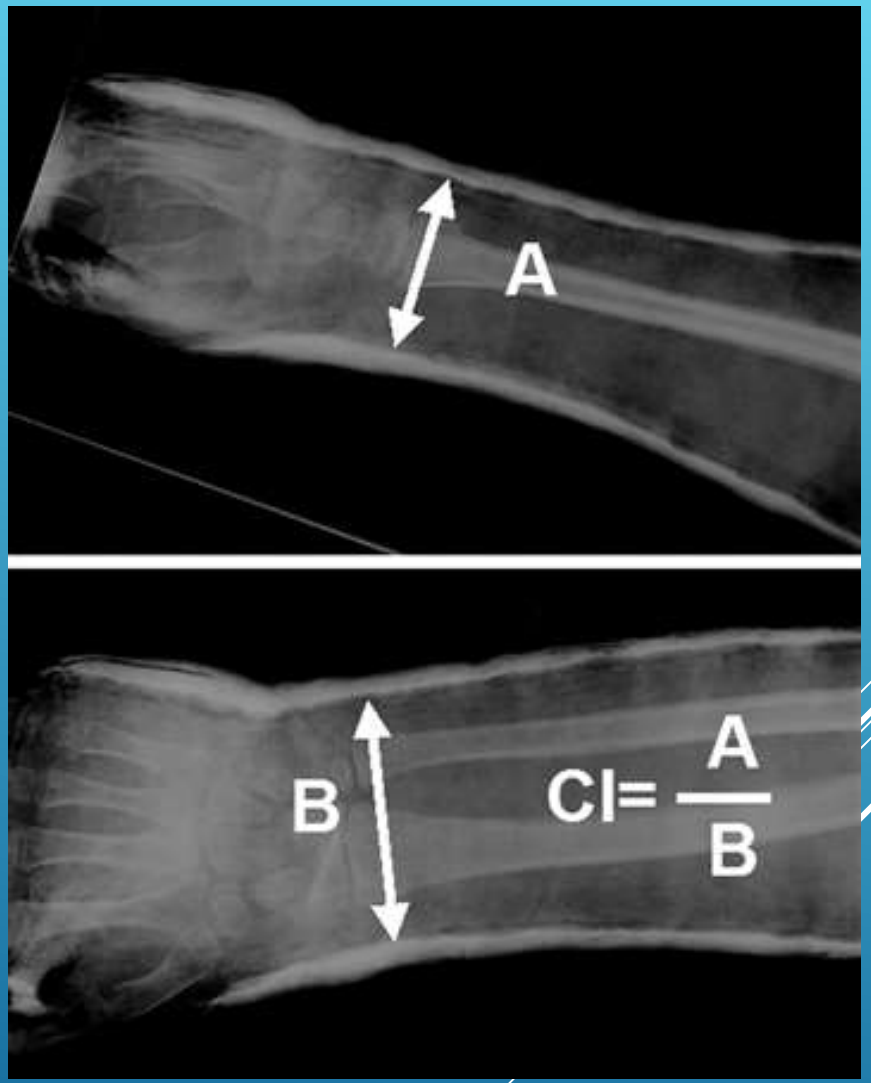
- General Treatment Strategies for fractures
- Proximal Humerus
- SCH
- Lateral Condyle
- Medial Epicondyle
- Radial Neck
- Forearm
- Wrist

GENERAL TREATMENT STRATEGIES FOR FRACTURES

- Never hesitate to get more xrays
  - Extremity xray=.001 mSv
    - 3 hrs backround radiation
    - (pelvis series=1 mSv or 3 months)

GENERAL TREATMENT STRATEGIES FOR FRACTURES

- Cast/Splint application technique matters
  - Contoured to fit bones
  - Molded to prevent loss of reduction of slipping
  - Appropriate padding (but not too much)



Cast index=A/B
Should be less than 0.7

PROXIMAL HUMERUS FRACTURES

- Large remodeling potential
  - 80% of humerus growth proximally
- Usually metaphyseal fx
  - not involving growth plate
- Almost always treated nonop
  - Hanging arm cast or sling
- Little league shoulder: SH I fx through growth plate (pitchers)

12 y/o M

3 months later

PROXIMAL HUMERUS FRACTURES

- Displaced Fx in adolescent may need surgery
  - Often high energy or polytrauma
  - RARE
- Rx: closed reduction percutaneous pinning vs ORIF

SCH FRACTURES

- SC Hum fx: most common elbow injury in children
- Most common fx requiring surgery in children
- Peak incidence: 5 to 7 years old

SCH FRACTURES

- Classification:
- Type I: nondisplaced
- Type II: posterior periosteum intact
- Type III: complete disruption of periosteum

SCH FRACTURES

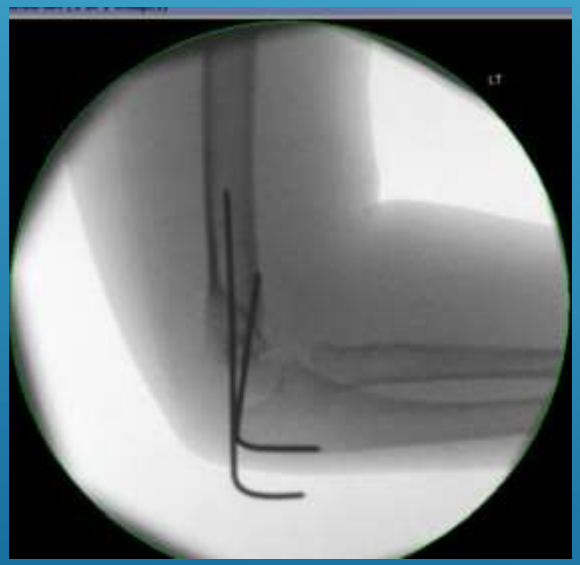
- "Occult" SCH fx
  - No obvious fx
  - Elbow effusion
  - 76% will have evidence of callus/nondisplaced SCH on f/u xray
    - Skaggs, JBJS 1999

SCH FRACTURES

- Type 1 fractures
  - "completely" nondisplaced
  - Must ensure there is no subtle rotation
    - Oblique radiographs!
  - Can be treated nonop in long arm cast (3-4 weeks)

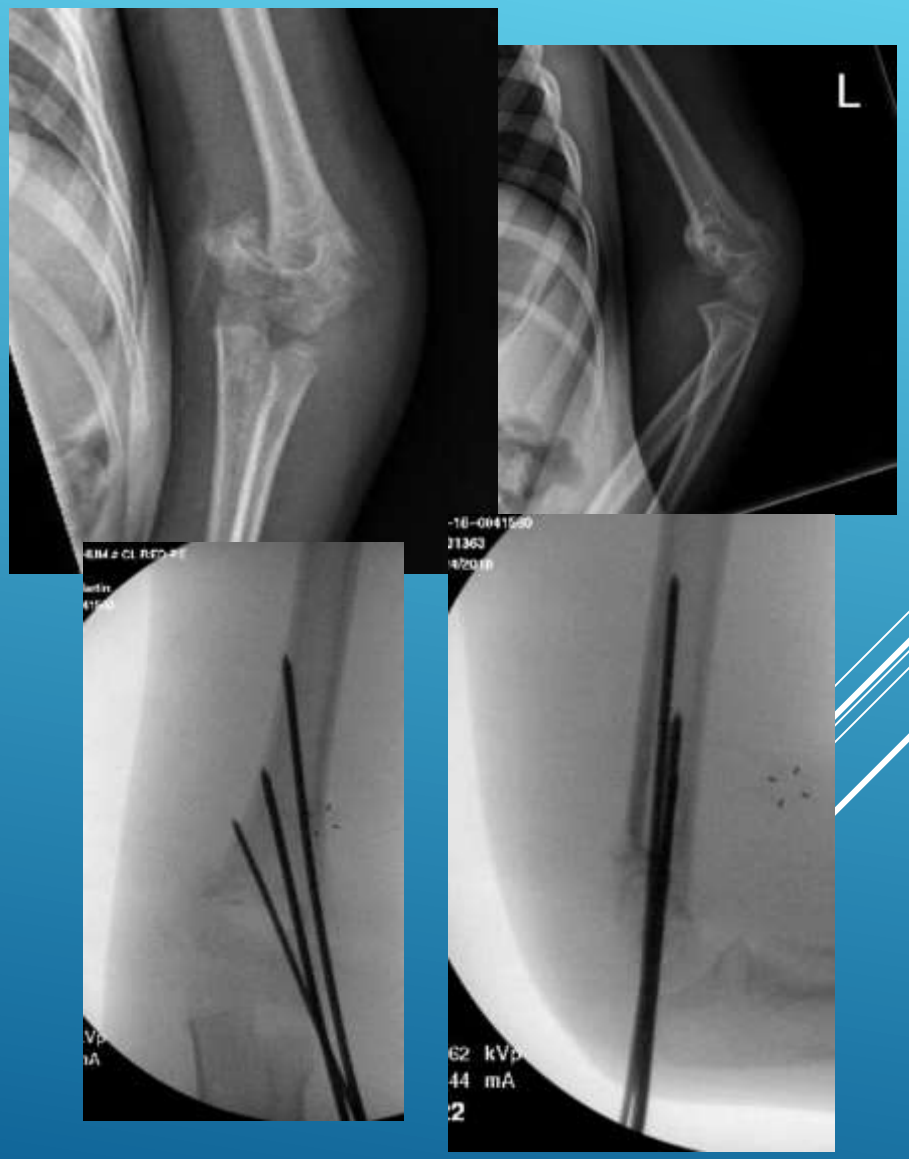
SCH FRACTURES

- Type 2 fractures
  - Any rotation
  - extension/flexion on lateral
  - Typically operative
    - Rare exceptions: extremely minimally displaced, young child <5 yrs old



SCH FRACTURES

- Type 3 fractures
  - Usually seen in ED
  - Highest rate of NV compromise
  - Treated with CRPP
  - 95% are back to full activities at 3 months post-op



LATERAL CONDYLE FRACTURE

- Second most common pediatric elbow fx
- Similar ages, risk factors as SCH fx
- Often significant lateral ecchymoses
  - Tear of lateral muscular fascia

LATERAL CONDYLE FRACTURE

- Intra-articular fx
- Often needs open reduction to facilitate anatomic joint reduction
- Can be fixed with pins or screws

LATERAL CONDYLE FRACTURE

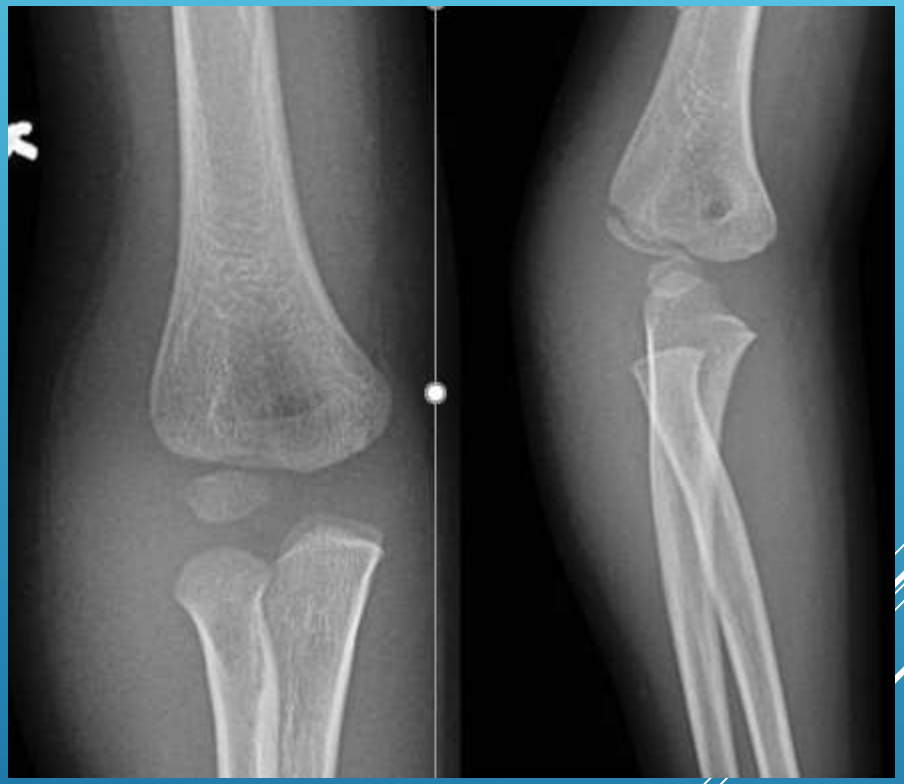
- Fracture is bathed in joint fluid
  - Small risk for nonunion

LATERAL CONDYLE FRACTURE

- If unrecognized, can present with coxa valga and tardy ulnar palsy
- Rx : ORIF and osteotomy

LATERAL CONDYLE FRACTURE

- If non-displaced, can be treated non-op
- Need internal oblique radiograph to prove no displacement
- Early x-ray f/u to ensure no loss of reduction

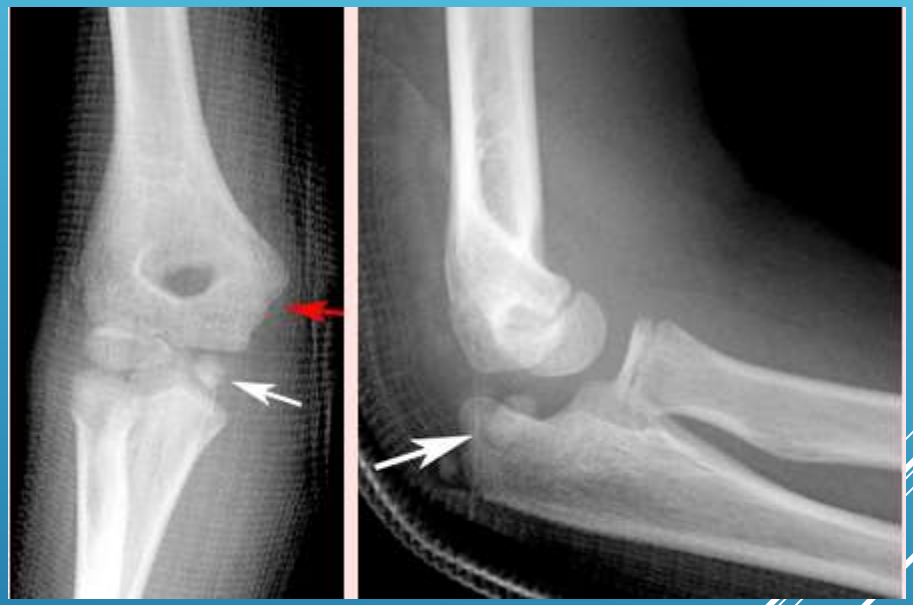


MEDIAL EPICONDYLE FRACTURE

- Occur in older children, 9+ yo, from valgus stress
- Most are treated nonoperatively

MEDIAL EPICONDYLE FRACTURE

- Indications for surgery:
- Widely displaced fracture in a competitive, throwing athlete
- Entrapment within the joint



MEDIAL EPICONDYLE FRACTURE

- Surgery
  - ORIF

RADIAL NECK FRACTURE

- Significant remodelling potential
- Surgery hazardous
  - Radial nerve
  - Proximal radial physis extremely sensitive
  - Risk of AVN
- Rx: observation if angle < 30 degrees
- Otherwise, closed vs open reduction

FOREARM SHAFT FRACTURE

- Forearm fx are most common fx in childhood
  - 45% of all childhood fx's
  - 62% of all peds UE fx's
- Usually in midshaft or distal radius
- Various types:
  - Buckle (Torus) Fx
  - Greenstick Fx
  - Complete Fx

FOREARM SHAFT FRACTURE

- Torus/buckle fx
- Incomplete, plastic deformation of one cortex
- Usually occur less than 7 yo
- Most always distal radius/ulna
- Rx with simple immobilization, then activity as tolerated

FOREARM SHAFT FRACTURE

- Torus/buckle fx
  - CAUTION: If cortical deformation causes ANY angulation, needs cast immobilization
  - If not, Velcro wrist brace is ok

FOREARM SHAFT FRACTURE

- In child <10 yo can accept significant displacement
  - bayonet apposition up to 1 cm
  - 20° angulation
  - Remodeling will usually occur

FOREARM SHAFT FRACTURE

- In child >10 yo can still accept some displacement
  - 10 to 15° angulation
  - Less as approach physeal closure

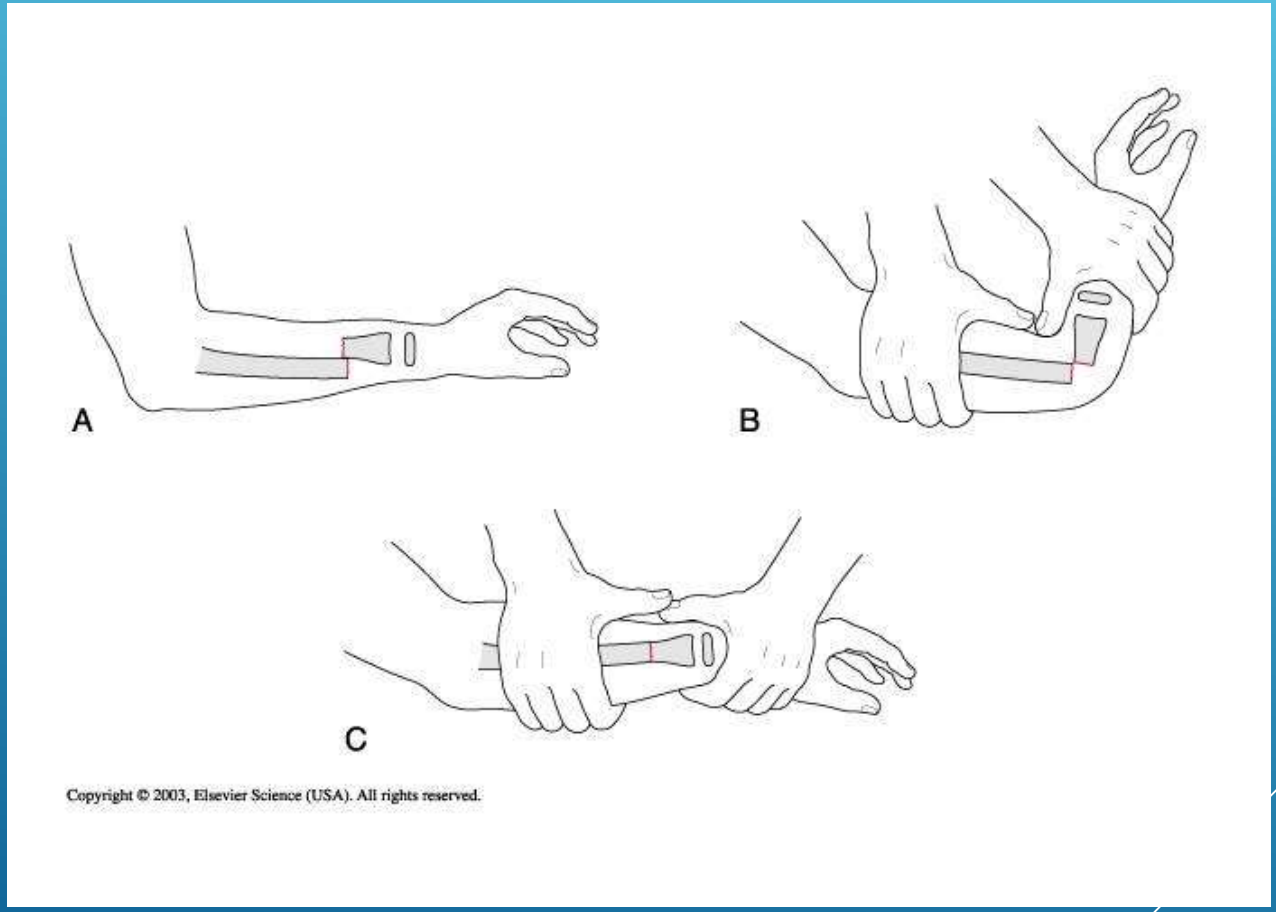
FOREARM SHAFT FRACTURE

- Displaced fx requires closed reduction
- Often done in ER w/ sedation
- Occasionally done in OR w/ anesthesia

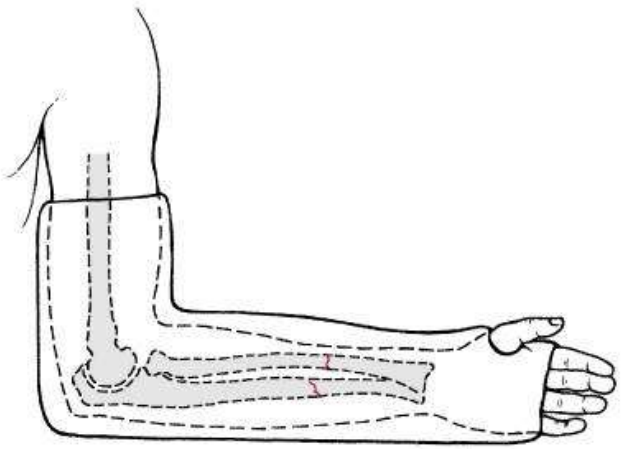
FOREARM SHAFT FRACTURE

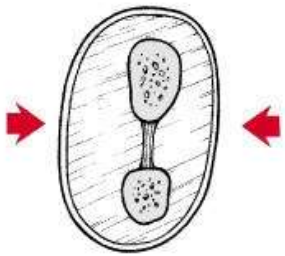
- Typical Protocol:
  - Early xray to check alignment within first week
  - Change from splint to cast at 10-14 days
    - Early healing has occurred
    - Decreased risk for loss of reduction
  - Xray for alignment check after 1 week in cast
  - 6 weeks total immobilization
  - No sports/PE for 3 months
  - 5% risk re-fracture

FOREARM SHAFT FRACTURE



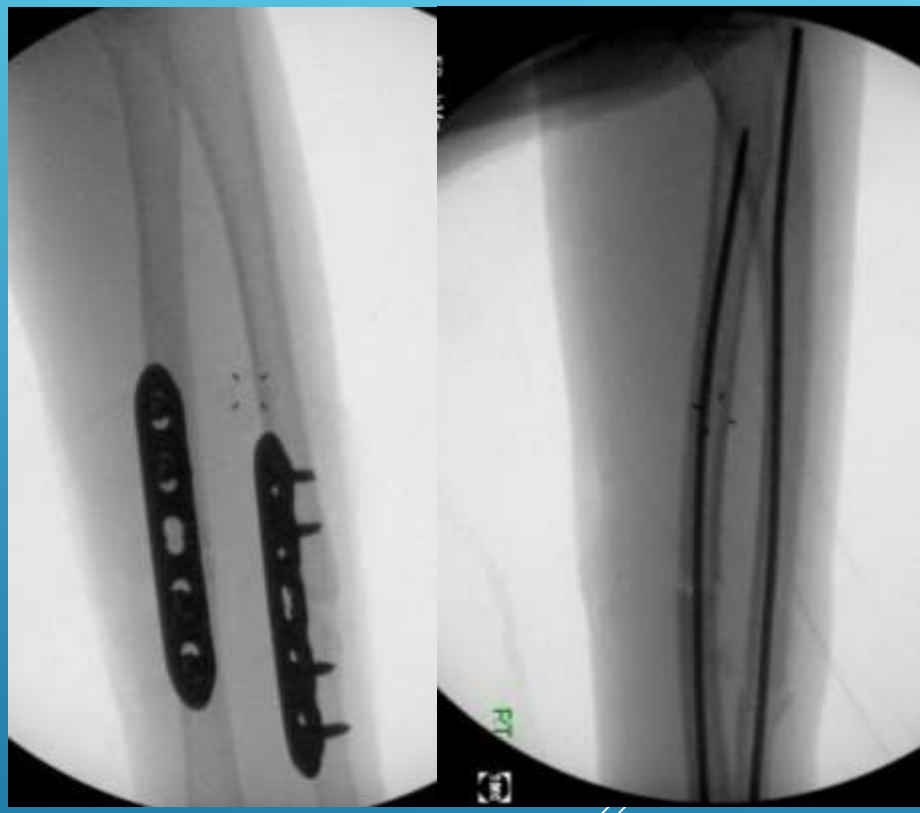
FOREARM SHAFT FRACTURE





FOREARM SHAFT FRACTURE

- Failure of closed reduction:
  - closed vs open reduction
  - intramedullary nails or plate and screw fixation
    - Depending on age and fx pattern



MONTEGGIA FRACTURE-DISLOCATION

- Fracture of ulna, dislocation of radial head
- Can be missed easily
- One of the most litigated injuries in pediatric orthopedics

MONTEGGIA FRACTURE-DISLOCATION

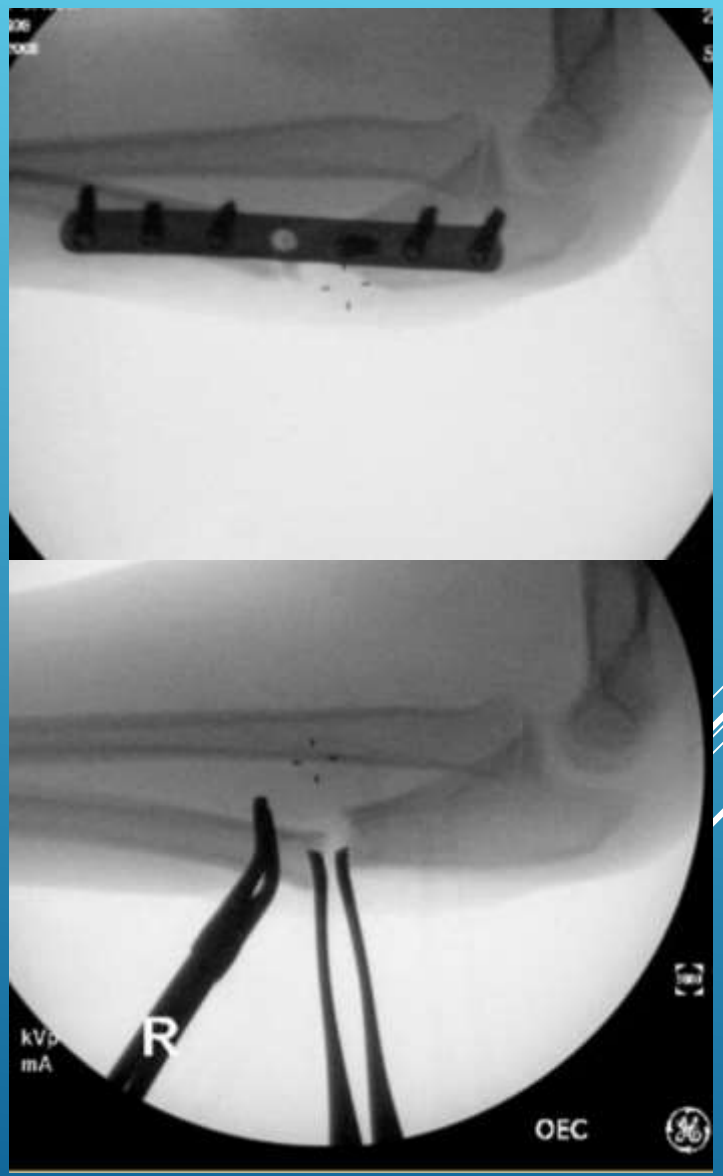
- My practice:
  - Any wrist, forearm, elbow injury-
    - Must personally see/evaluate proximal radiocapitellar joint
- Radial head must intersect middle of capitellum on all x-ray views

MONTEGGIA FRACTURE-DISLOCATION

- Rx: closed reduction of ulna
  - often reduces radial head dislocation

MONTEGGIA FRACTURE-DISLOCATION

- Failed closed reduction or missed injury:
  - Open reduction, ulnar lengthening, plate fixation
- Last resort-open RC joint reduction



GALEAZZI FRACTURE-DISLOCATION

- Distal radius fracture w/ distal radius-ulna dislocation
- Rare in children
- More commonly, Galeazzi equivalent:
  - Distal radius fx
  - Distal ulna physeal fx

GALEAZZI FRACTURE-DISLOCATION

- Rx: closed reduction of radius (typically reduces DRUJ)
- Adolescents rx'ed like adults: ORIF radius
- If DRUJ still unstable after reduction of radius, may need pinning of DRUJ

DISTAL RADIUS FRACTURE

- Distal radius involved in 75% of peds forearm fx's
- Most are metaphyseal
- Recommended Rx:
  - Closed reduction, LAC, usually in ER under anesthesia

DISTAL RADIUS FRACTURE

- Acceptable displacement in child <10 y/o:
  - 30 degrees angulation in sagittal plane
  - 15-20 degrees in coronal plane
  - Up to 1 cm bayonet apposition

DISTAL RADIUS FRACTURE

- Acceptable displacement in child >10 y/o:
  - 20 degrees angulation in sagittal plane
  - 10 degrees in coronal plane

DISTAL RADIUS FRACTURE

- Failed reduction:
  - Closed vs Open reduction w/ percutaneous pin fixation
  - Teenagers or comminuted, unstable fxs may need ORIF w/ internal fixation

PHYSEAL DISTAL RADIUS FRACTURE

- Some fractures involve distal radius physis
- Most treated with closed reduction
  - NEED TO DO WITHIN FIRST WEEK
- Displaced SH3 or 4 sometimes require open reduction
- Typically distal radial physis resilient to growth arrest

TAKE HOME POINTS

- Never be afraid to get more x-rays
- Keep an eye on fractures while they are healing
- Very young children have huge remodeling potential
- Always check the radiocapitellar joint on every upper extremity fracture
- Timing and cast quality just as important as initial reduction

QUESTIONS?

- THANK YOU!