

# Common Pediatric Fractures



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# Pediatric fractures

- 20% of injured kids found to have fracture on evaluation
- Between birth and age 16, 42% risk of fracture for boys and 27% for females
- Most common injury sites are distal radius, hand, elbow, clavicle, radial shaft, tibial shaft, foot, ankle, femur, humerus

# Pediatric fractures

- Today, will cover Salter-Harris fractures, distal radius fractures, clavicle fractures, tibial shaft fractures, radial head subluxation

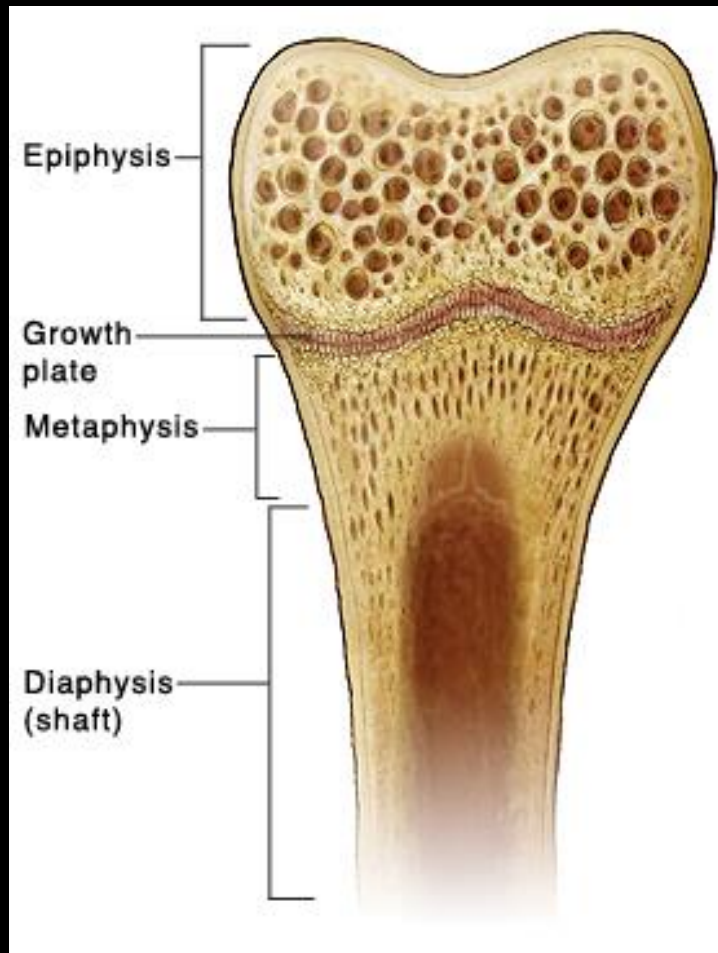
# Pediatric fractures

- Compressive forces usually cause torus/buckle fracture
- Immature bone usually bows instead of breaking
  - Plastic deformation (bowing of immature bone) may occur in long thin bones
- Fracture of shaft usually leads to greenstick fracture (only break of one cortex)

# Salter-Harris classification

- Major regions of growing bone include epiphysis, physis (growth plate), metaphysis, and epiphysis
- Over time, ossify and become visible on radiographs
  - Lack of ossification of epiphyses in young children can make fracture identification difficult
  - Comparison of unaffected side can assist in detecting fractures in skeletally immature children

# Growing bone



# Salter Harris classification

- Injuries to growth plate comprise 20% of skeletal injuries in children and can disrupt bone growth
- Females get growth plate injuries earlier than boys
- Important factors prognosis include severity of injury, displacement, age, injured physis, and radiographic type

# Salter Harris classification

- Type I: disruption of physis without injury to epiphysis/metaphysis
- Type II: extend through portion of physis and obliquely through metaphysis (most common)
- Type III: intraarticular fracture through epiphysis from physis to periphery
- Type IV: fracture traverses through epiphysis, physis, and metaphysis
- Type V: crush injury of physis (very rare)



# Salter Harris classification



# Salter Harris classification

- Non-displaced type I-II fractures can be managed by casting and usually heal well
  - Should be monitored for 3-6 months after initial injury to ensure that normal bone growth resumes
- All type III-V fractures should be referred to an orthopedist

# Case

- A 10 yo M presents to the office after for evaluation of right forearm pain sustained after he fell off a skateboard and braced his fall with his hand. He only reports pain in his forearm but reports no numbness, tingling, or weakness. Examination reveals him to be tender over the dorsal distal radius. X-rays show the following.

# Case



# Torus fracture

- Simple buckle fracture of cortex caused by axial force applied to immature bone
- Metaphysis vulnerable in children because of thin cortex
- Presentation is usually of FOOSH mechanism
- AP & lateral views of wrist are sufficient
  - Can be subtle, but best seen on lateral views
- Torus fractures typically non-displaced

# Torus fracture

- Can be safely treated with removable volar splint
- Faster return to function than casting
- Ibuprofen for pain control
- Heal well with no complications after immobilization for 2-4 weeks
  - At 2 weeks after injury, if no tenderness, may discontinue immobilization and start ROM exercises
  - May use volar splint for 2 more weeks to prevent re-injury
- Repeat radiographs not indicated

# Torus fracture



# Greenstick fracture

- Severe bending force applied to distal radius leads to compression fracture at dorsum of distal radius with disruption of volar surface





# Greenstick fracture

- If non-displaced, short arm cast
- If displaced  $> 15$  degrees of angulation, use long arm cast
  - Long-arm cast applied, with elbow placed in 90 degrees of flexion, forearm in neutral rotation, and wrist in neutral flexion-extension
- Repeat radiographs weekly to assess healing
- May remove cast at 4 weeks if healing clinically and radiographically
  - Use volar splint for protection for 1 more week as needed

# Distal radius fractures

- Emergent referral to orthopedics indicated if open fracture, compartment syndrome, vascular compromise
- Non-emergent referral is indicated for Salter-Harris type III-V, displaced Salter-Harris I-II, severe local soft tissue injury, failure to achieve adequate reduction by closed methods

# Case

- 12 yo presents to the urgent care after a fall sustained after a bicycle crash. He landed on his shoulder and now reports pain with moving his shoulder. His arm is held against his chest at this time and there is bruising and swelling noted on his clavicle. On palpation, he is point tender in the middle third of his clavicle and there is some crepitus felt.

# Case



# Clavicular fracture

- Most commonly occur in middle third of clavicle following fall onto shoulder, but may be direct blow to clavicle or impulsive force from FOOSH injury
- Complains of pain with shoulder motion with arm held to chest to prevent motion
- Bulge often visible at fracture site
- Tenderness, crepitus, ecchymosis, and skin tenting may be present
- Complications may include pneumothorax, hemothorax, vascular compromise

# Clavicular fracture

- Initial treatment involves figure-of-eight clavicle strap or arm sling
  - Sling preferable for nondisplaced fractures
  - Followup in 1 week to assess pain and healing
- Immobilize for 3-6 weeks until fracture site is non-tender
- Follow-up every 2-3 weeks
- Repeat imaging at 6 weeks to assess callus
- ROM as pain permits
- Avoid contact activities/sports for 1-2 months after healing
- Advise that bony deformity may be possible

# Clavicular fracture

- Emergent referral indicated if open fracture, neurovascular compromise, skin tenting present
- Non-emergent referral indicated for complete displacement (with comminution or shortening), malunion/nonunion, concomitant glenoid neck fracture

# Case

- 8 year old boy presents to the ED for evaluation of leg pain. While playing with his friends, he jumped off a wall and then developed pain in the anterior aspect of his leg. He has good pulses and there is no numbness, tingling, or weakness. X-ray examination shows the following.



# Case



# Tibial shaft fracture

- Commonly occur from result of low-energy fall with twisting motion or from a fall from a significant height
- Present with pain and swelling over fracture site, and inability to bear weight
- Concurrent fractures both fibula and tibia may occur in up to 30% of cases
- Usually non-displaced
- Compartment syndrome much less common in children than in adults

# Tibial shaft fracture

- Bowing/torus fractures are usually stable and heal with 3-4 weeks of immobilization in short-leg walking cast
- Non-displaced tibial shaft fractures should be managed with a bent knee long-leg cast
  - Weekly radiographs should be obtained
  - Cast may be changed to short-leg walking cast for 4-6 weeks if callus present
  - Usually healing occurs by 6-10 weeks
  - Some varus deformity may happen but should remodel if less than 10 degrees

# Tibial shaft fracture

- Orthopedic referral indicated if open fracture, pathologic fracture, displaced fracture (with > 10 degrees anterior angulation, > 5 degrees varus/valgus angulation, > 1 cm shortening)
- Concurrent tibia/fibula fractures should be referred as well

# Toddler's fracture

- Distinct type of tibia fracture seen in young children
  - Occurs in children younger than 2 learning how to walk
  - Torsional force to foot may lead to spiral fracture of distal or middle tibia
  - Often no history of trauma and brought in for evaluation due to reluctance to bear weight
- Pain can be elicited over fracture site
- AP & lateral view of tibia and fibula should be obtained with typical findings of non-displaced tibia spiral fracture

# Toddler's fracture



# Toddler's fracture

- Need to distinguish toddler's fracture from child abuse related fracture
  - Evaluate for bruising and other soft tissue trauma over buttocks, back of legs, head, or neck
  - Bruising on shins, knees, elbows, and forehead are typical in children
- Treatment involves immobilization in bent knee long-leg cast for 3 weeks and then 2 weeks in short leg walking cast, with weightbearing as tolerated

# Toddler's fracture





# Case

- A 3 yo M presents to the ED after he complains of elbow pain after playing with his older cousin. His older cousin was holding him up by his hands and helping him play as Superman. He reports that his elbow hurts and is not using his arm.

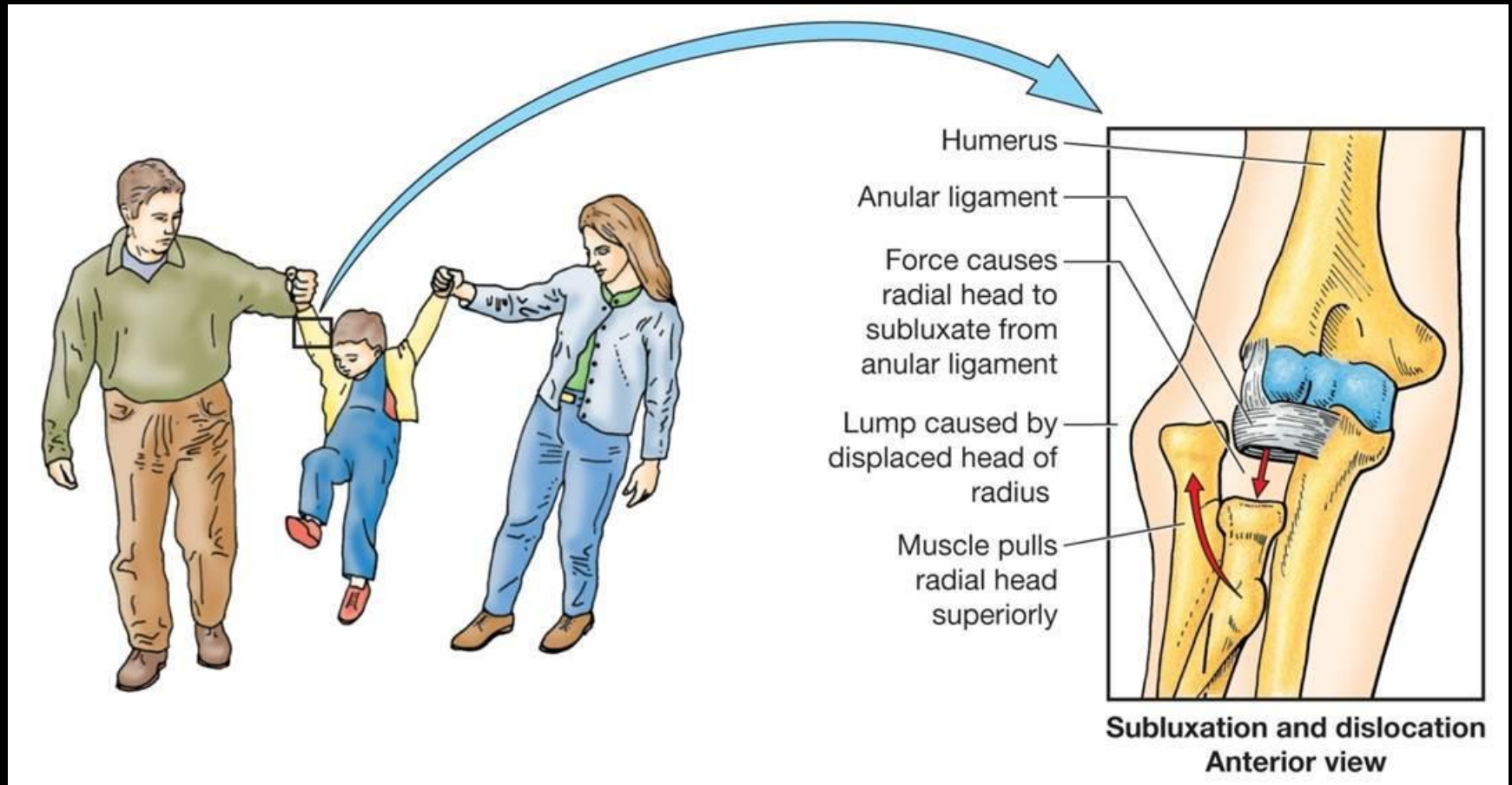
# Case



# Radial head subluxation

- Commonly referred to as “nursemaid’s elbow”
- Peak incidence from age 2-3
- Caused by sudden longitudinal traction on arm with elbow extended, leading to annular ligament (which attaches radial head to the adjacent ulna) to slip in between the radius and capitellum

# Radial head subluxation



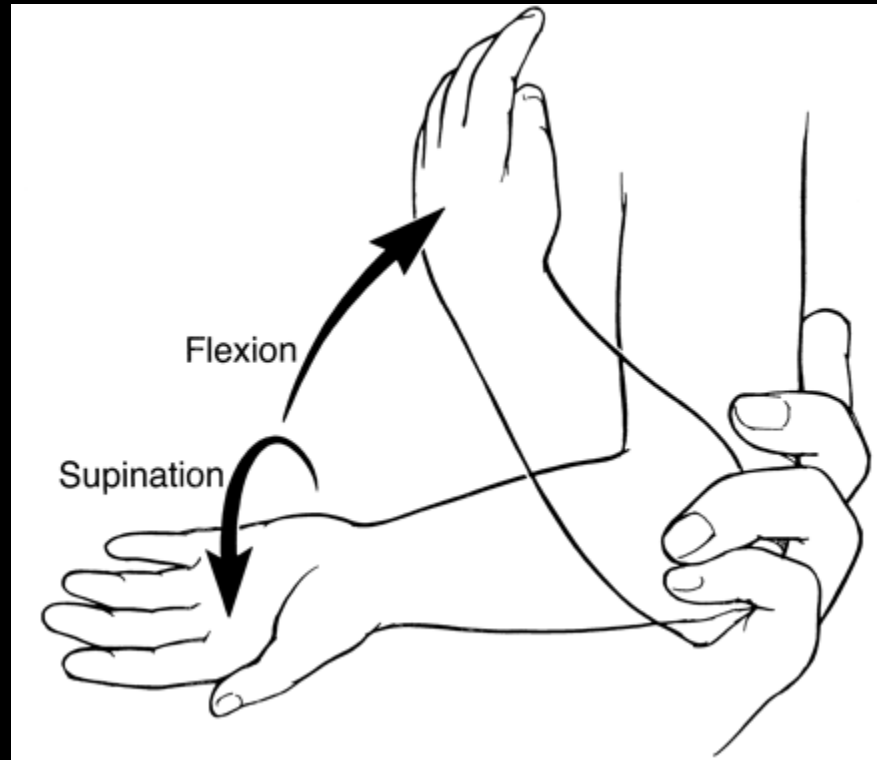
# Radial head subluxation

- Typical signs are pain and disuse of affected arm, with arm usually held in flexed position
- Attempts to move arm cause pain, with supination eliciting pain the most
- Radiographs generally normal and not indicated

# Radial head subluxation

- Reduction does not require analgesia or sedation and can be done in the office
- Preferred method is supination/flexion
  - Initially, forearm is supinated and then the elbow is smoothly flexed and pronated while maintaining pressure on radial head
  - Usually feel release of resistance and “pop” of radial head reduction
  - Child can use arm immediately
  - No immobilization necessary
- If no improvement, further evaluation indicated including x-rays

# Radial head subluxation



Questions?



# Summary

- Salter-Harris fractures: injury to growth plates in children. Type I-II treatable by casting, other types referred to orthopedics
- Distal radius fracture: commonly buckle fracture or greenstick fracture. Volar splint to treat buckle fracture for 4 weeks, and short arm cast for non-displaced greenstick fracture for 4 weeks
- Clavicle fracture: usually affects middle 1/3. If non-displaced, sling with weekly follow-up and biweekly radiographs for total of 3-6 weeks
- Tibial shaft fracture: usually non-displaced. May be treated with short leg or bent-knee long leg cast for 4-6 weeks
- Radial head subluxation: common injury in children, presenting with pain and resistance to elbow movement with annular ligament slippage. Can treat with supination/flexion. Radiographs not indicated

# References

- Eiff, M. Patrice, and Robert Hatch. Fracture Management For Primary Care. 3rd ed. Philadelphia: Elsevier Saunders, 2012. Print.
- <http://radiopaedia.org/>