Pediatric Forearm Fractures

Resident Comprehensive Fracture Course

Pediatric Considerations

- Periosteum
- Greenstick / Incomplete fractures
- Remodeling
- Cast technique

Pediatric Periosteum

- Very thick
- May be intact on the concave side
- Use to aid in reduction and its maintenance

Greenstick / Incomplete Fractures

- Not all innocuous injuries
- Plastic deformation
- Poor remodeling
- Associated injuries
  - Monteggia variants
  - Not just angular deformities!

Remodeling

- Depends upon location and growth remaining
- Better closer to the physis
  - #NotAllPhyses
- Diaphyseal may be incomplete
- Rotation may not improve

Cast Technique

- Requires practice
  - Requires proper instruction
- Well fitted cast to maintain alignment
- Consider splitting any acutely placed cast
  - Cast saw injuries are common in sedated kids
  - Never Event
- Cast padding as needed
  - beware thick application
Sometimes Padding May Already Be Present

Compare Cast Technique

What are considerations in cast application?
- Molding
- Amount of padding
- Swelling accommodation
- Thickness of cast
- Plaster vs. Fiberglass
- Definitive management

Banana Cast Deformations
Do NOT count on remodeling
- 30 year old anesthesiologist
- BBFF as 10 year old
- Current forearm alignment

13F Ehlers-Danlos fell at restaurant
ORIF by St. Elsewhere 3 yrs prior

1 wk after new CR LAC
1 wk after CR LAC – After Wedge

Wedge, 2nd attempt

9 week follow-up
Plates removed at 6 months

Full Pronosupination

Treatment Principles

- Recognize the injury
  - Assess entire extremity
  - What fracture is most often missed?
  - The second one
- Restoration of Alignment
- Appropriate immobilization
- Avoid iatrogenic physeal injury
  - Late reduction?
- Understand potential for remodeling

Classification

- Diaphyseal Fractures
- Distal Forearm Fractures
  - Galeazzi Fractures
- Monteggia Fractures
  - If you can’t see the elbow well on two views
    GET DEDICATED FILMS!

Forearm Fractures - Principles

- High quality radiographs
  - Adequate views
  - Comparison if needed
- Thorough exam
  - Assess for associated injuries in polytrauma
- Appropriate immobilization
  - Well molded casts and splints
- Detailed instruction
  - Elevation, cast care, signs/symptoms to return
  - Timely return to clinic
  - Family contact information
Diaphyseal Fractures

- 5-10% of pediatric injuries
- Majority managed without surgery
  - But, easier to manage with surgery early than late
  - Beware near skeletal maturity
- Discuss with family clinical vs. radiographic assessment
  - As early as possible
  - At first and every subsequent visit
  - Likely pronation and supination loss from callus
  - Prominent callus on ulnar border
  - What’s the difference between and excuse and and explanation?

Fracture Acceptability

- Remodeling potential
  - Distal fractures remodel more than proximal fractures
  - Angular deformity remodels more than radius
  - Sagittal plane deformity remodels more than coronal plane
- Bayonet apposition remodels well
- Shortening is well tolerated and also remodels well.

Diaphyseal Forearm Fractures

- Surgical Treatment Indications
  - Open injuries
  - Poorly aligned fractures
  - Skeletally mature
- Surgical Treatment Options
  - Single or both bone fixation
  - Intramedullary fixation
    - Avoid multiple passes of the implants
    - Plate fixation

Normal Anatomic Landmarks - Rotation

- Straight Ulna
- Radial bow in midshaft (60%)
- Radial styloid opposite to biceps tuberosity
- Ulnar styloid opposite to coronoid process

Distal Forearm Fractures

- Spectrum of injury
  - Buckle fracture
  - Physeal injuries
    - ? Need for long-term evaluation for arrest
    - Ulnar arrests more likely
  - Articular injuries
  - Galeazzi fractures
    - Distal radial fracture with DRUJ disruption
    - Often managed without surgery in supinated cast in kids
    - Important to recognize, but overall rare in children

Distal Forearm Fractures

- Vast majority treated with reduction and casting
- Significant remodeling as 75-80% of forearm growth occurs distally
- Surgical indications potentially controversial
  - Open injuries, associated injuries (SCH Fx), displaced articular injuries
  - Difficult to assign strict amounts of angulation or shortening
Distal Forearm Fractures

- Immobilization dependent upon surgeon
  - Evidence supports splinting or minimal immobilization for many injuries
  - Often cast if considered unstable or significantly uncomfortable

Monteggia Fractures

- Treatment principle
  - Don’t Miss This!
  - Restoration of ulnar length
  - Reduction of radio-capitellar joint
  - Maintenance of alignment and reduction

Monteggia Fractures

- Recognition of injury most important
- Ulnar fracture may be incomplete
- Good neurovascular exam before and after any treatment
- Close follow-up, especially when treated by casting
  - Difficult treatment when discovered late

Conclusion

- Nonsurgical management is common
- Avoid pitfalls
- Recognize all injuries
- Close follow-up if concerns for loss of reduction
- Discussions with families throughout treatment about expectations