Common Fractures – Case Studies on When to Treat and When to Refer

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Overview

• Majority of pediatric fractures are treated nonoperatively
• Great remodeling potential
Statistics:

- Ward & Rihn, JBJS (A) 2006 “The Impact of Trauma in an Urban Pediatric Orthopaedic Practice”
- 32% of office-related RVU’s fracture-related
- 34% of OR-generated RVU’s from fracture treatment
Statistics:

• Ward & Rihn: most common locations:
  – 23% Distal radius
  – 14% Forearm
  – 13% Tibia
  – 10% Elbow
Pediatric Fractures

• Majority of fractures just need immobilization
  – Most are straight-forward & benign behaving
  – Parents perceive fracture as major event in child's life
  – Even the possibility of a fracture is anxiety-provoking
Pediatric Fractures

- Find the right balance of observation and intervention
- Avoid over-treatment
- Be aware of pitfalls and potential disasters
Disclaimer

- Not a comprehensive review
- Discuss fractures seen in outpatient/office setting
Jarka’s Rules

• “Rules” or approaches to pediatric fractures seen in outpatient setting

• Goals:
  – Put clinical situations into perspective
  – Reminder to perform complete evaluation
  – Awareness of immobilization effect
  – When to escalate degree of intervention
Jarka's Rule #1

- If you have to look that hard to find the fracture, the person will do well
- Doesn't mean there is not an injury or even a fracture
- Treatment determined by
  - Pain & disability
  - Likelihood & gravity of suspected fracture
  - (Parental anxiety)
Occult Fractures

- “Hidden”
- Suspected if
  - Appropriate mechanism of injury
  - Still painful after about 3-4 days
Occult Fractures

• Just about* all occult fractures from low-energy injuries have benign courses:
  – Distal radial Salter Harris I fractures
  – Type I supracondylar humeral fractures
  – Radial neck fractures
  – Salter Harris I distal fibular fractures (more later…)
  – Salter Harris I distal tibial fractures
  – Tibial shaft fractures - usually distal third, "toddler fracture"
Occult Fractures

- * doesn’t apply to femoral neck fx’s
- * doesn’t apply to scaphoid fx’s
Jarka's Rule #2:

- When all else fails, examine the patient
- Be aware of normal variants which don't correspond to area of pain nor with mechanism of injury
Normal Xray or Variant

- Pain at base of 2nd & 3rd metatarsals but referred for fracture at lateral aspect of foot
Normal Xray or Variant

- Pain at base of 2nd & 3rd metatarsals but referred for fracture at lateral aspect of foot
- This is the normal apophysis:
  - Females 8-12 yrs
  - Males 10-14 yrs
Normal Xray or Variant

- Lateral epicondyle diagnosed as "avulsion fracture" when pain was at olecranon from fall on flexed elbow
- Irregular trochlear ossification called “comminuted fracture”
• Lateral epicondyle diagnosed as "avulsion fracture" when pain was at olecranon from fall on flexed elbow
• Irregular trochlear ossification called "comminuted fracture"
Specific Benign-Behaving Fractures

• Discuss fractures which can be reliably managed in outpatient primary care setting
  – How to immobilize
  – Duration of immobilization

• Discuss which fractures should be referred primarily
Clavicle Fractures

• “The clavicle fracture will heal if the ends are in the same room”
• Very benign fracture
Clavicle Fractures

- Clinical healing precedes radiographic healing - follow-up films rarely add useful information (avoid getting them routinely!)
- Patients often discard immobilization prior to return visit
Clavicle Fractures

- Immobilized with shoulder immobilizer
- (“Figure of 8” strap rarely used)
- Duration: 3-4 weeks
Clavicle Fractures

• When to refer:
  – Open fracture: appropriate irrig. & debridement
    • continuous ooze/bleeding
  – ORIF if segmental/unstable?
Clavicle Fractures

• Some controversy regarding operative indications in older adolescent
  – shortening >2cm
  – dominant arm

• Early refractures extremely rare - late refractures functionally new injuries
Proximal Humeral Metaphyseal Fractures

- Fairly common
- Most are benign and stable
Proximal Humeral Metaphyseal Fractures

- Buckle fractures
Proximal Humeral Metaphyseal Fractures

- Minimally angulated
- 13+6 yo boy fell from zipline
Proximal Humeral Metaphyseal Fractures

- One month later
Distal Radial/Ulnar Fractures

• Almost always from a fall on outstretched hand
• Wide range of severity
• Will discuss the straightforward ones
• Will point out the problematic ones
Distal Radial/Ulnar Fractures

- Buckle fractures very common!
- Typically “crimp” on the dorsal aspect
Distal Radial/Ulnar Fractures

- 10 yo boy, fell in gym class
- Note “crimping” on VOLAR aspect
- Fell on dorsum of hand/wrist
Distal Radial/Ulnar Fractures

• Immobilized for comfort
  – Rigid cast
  – Peelable cast
  – Wrist splint

• 3-4 weeks
Metadiaphyseal Distal Radius Fractures

- More proximal than typical distal radius fx
- Known tendency to angulate despite immobilization
- Refer these to ortho
Distal Radial/Ulnar Metaphyseal Fractures

- if angulated beyond "a certain amount" - typically reduced
- if not reduced - impressive amount of remodeling
Distal Radial/Ulnar Metaphyseal Fractures
Hand & Forearm Fractures

- 1.5% of all ER visits (all ages)
  - Radius 44%
  - Phalanges 23%
  - Metacarpals 18%
  - Carpal 14%
Hand Fractures

- Proximal phalanx: 49%
- Fifth ray: 40%
Hand Fractures

• Distal phalanx – typical mechanism of injury:
  – Slammed in door
  – Stepped on
Hand Fractures

• Distal phalangeal/tuft fractures:
  – Treat like soft tissue injuries
  – **No intervention*** if the nail plate is intact and in place
  – * If acute, PAINFUL expanding hematoma (within 12 hrs), numb the finger and puncture the nail plate
17 y/o

- Church
- Hand stepped on
17 y/o

- Church
- Hand stepped on
Seymour Fracture

- distal phalanx
- physeal or juxtaphyseal
- avulsion of proximal nail
- laceration of nailbed

Open Fracture

JUXTA-EPIPHYSIAL FRACTURE OF THE TERMINAL PHALANX OF THE FINGER
N. Seymour, Sheffield, England
From the Orthopaedic Department, Royal Infirmary, Edinburgh, Scotland

JBJS
Vol. 48 B, No. 2, May 1966
Hand Fractures

• Seymour Fractures: Retrospective Analysis and Therapeutic Considerations
• 24 patients retrospective f/u 1-18 y
• 15 **operative tx** 23/24 did well
• **Complications:**
  – *Nail deformity* - 6
  – *Growth* - 5
  – *ROM* - 1
  – *Infections* - 0
Complication of Pediatric Distal Phalanx Fractures

- Lankachandra
- Wells
- Cheng
- Hutchison
  - Retrospective
  - 2011-2012
  - 206 patients
Conclusion

• Complications – 31%

• Seymour:
  – 62% infected primary treatment in ER
  – 0% primary treatment in OR
17 y/o ER reduction
17 y/o 2 days
17 y/o 1 month
Seymour Fracture

• Treatment:
  – Remove nail
  – Irrigate
  – Remove interposed tissue
  – Reduce
  – Stabilization nail plate or Kwire
  – Repair matrix
  – Replace nail
Seymour Fracture

Reduce sans irrigation

- Infection
- Osteomyelitis
- Growth disturbance
Hand Fractures

- Undisplaced mallet fractures
- Stack splint, not buddy taping
Hand Fractures

- Phalangeal fx’s
Never * Use an AI Splint for fractures
Indications for Aluminum Splint for Fx

- Per Rick Hutchison:
  - No immobilization or protection is really needed
  - OK if they take it off
  - OK if they never wear it
  - May be useful to rest finger for a day or two
Hand Fractures

• Buddy tape
Hand Fractures

• Displaced phalangeal fractures
  → REFER
Undisplaced Tibial Fractures in Young Children

- May be the result of minor or unwitnessed injury
- Classic: "toddler's fracture"
Toddler's Fracture

- 1-3 yrs of age
- Spiral fx at junction of middle & distal third
- Present with pain/limp/refusal to walk
• Initial film may be negative
• May not see fx line or periosteal healing until clinically healed
Toddler's Fracture - Treatment

- **Cast vs. cam boot?** Patient comfort and parental "comfort"
- **~3-4 weeks immobilization**
- **Long vs. short leg cast?** Typically do well with short leg
- **After, often limp & walk w/ limb externally rotated for ≥ few weeks** - alert families!
- **Follow up films?** Consider necessity
Distal Fibular “Fractures”

• “Magnetic resonance imaging of clinically suspected Salter–Harris I fracture of the distal fibula”, Boutis K et al, *Injury* 2010
  – 18 pts 2008-09
  – Mean age 8.2 (2.0)
  – NONE had a SH I distal fibula fx
  – In almost 90% of these patients, MRI identified ligamentous sprains and/or bony contusions
Foot Fractures

• Metatarsal shaft & neck fractures:
  – Virtually NO surgical indication, even with displaced fractures
  – Immobilize for comfort, full WB’ing

• Do NOT use an MRI to assess healing!
Jarka's Rule #4

- A foot MRI after >4 weeks of immobilization will NOT be normal
- Patchy intraosseous edema from altered weight bearing in cast/cam boot
Jarka's Rule #4

• Pediatric foot stress fractures are rare
• Occult fx's are NOT the same as stress fx's
• Complex regional pain syndrome is not as rare in peds as previously thought
Midfoot Injuries

- Can have midfoot sprains +/- undisplaced fx’s
- Often have swelling on dorsum of foot
- But consider mechanism of injury
- If considerable force, may have “Lisfranc injury”
  - Significant midfoot disruption
  - Too painful to weight bear
  - Look for bruising on sole of foot
  - REFER TO ORTHO
Great Toe Fractures

- Undisplaced fractures managed in a post-op shoe (stiff-sole)
- (Cam boot probably a little over-kill)
- Beware of displaced, intra-articular fractures!
Lesser Toe Fractures

• Managed for symptoms
• Only surgical treatment is for open fractures
• “Buddy taping” only prevents the injured toe from catching on something – great & 5th toes.
The “Fat Pad” Sign – Explained!

- You don’t see the fluid/effusion (= blood) in the elbow
- You see the more radiolucent fat displaced by the fluid
The “Fat Pad” Sign – Explained!

• Anterior fat pad sign is normal (often see a small anterior stripe)
• “Posterior is pathologic”
Fractures Which May Be Problematic
Lateral Humeral Condyle Fractures

- Second most common fracture about the elbow frequently requiring surgery
- Age range: 5-10 yrs
Lateral Humeral Condyle Fractures

- 2 views of elbow - may not see fx
- Int. oblique typically demonstrates fracture line
Lateral Humeral Condyle Fractures

• division between:
  – undisplaced - <2mm displacement
  – displaced - 2mm or greater displacement
Lateral Humeral Condyle Fractures
Lateral Humeral Condyle Fractures
Subtle Monteggia fx’s

- May be missed if radiocapitellar joint not assessed in all views
Thank You!

http://go.to/funpic