Evaluation of Common Fractures

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Objectives

- Characteristics of pediatric bone and fractures
- Treatment, evaluation, and management of fractures
- Recognize patterns associated with child abuse
1. Obtain at least 2 view X-rays of the area of concern
2. Manage select fractures in your office
   • Birth injuries
   • Buckle fx
   • Toddler fx
   • Clavicle fx
   • Proximal humerus fx
   • Fibula fractures
3. Refer physeal fractures and fractures needing surgery to pediatric orthopedics
Facts

• Fracture rates increasing
  – Sports
  – Obesity

• Male predominance
  – 40% of boys and 25% of girls will sustain a fracture by 16

• 15-30% involve the growth plate
Properties of an Immature Bone

- More porous
- More flexible
- **Thicker periosteum** (lining around the bone)
- Growth plate (physis) is present
- Leads to unique fracture patterns
Fractures Unique to Children

- Buckle fractures
- Plastic deformation
- Greenstick fractures
- Physeal fractures
Physis

- The physis is made of cartilage
- Responsible for longitudinal growth
- Area of relative weakness
Classification of Physeal Injuries: Salter Harris

Salter-Harris Fractures

Injury to Growth Plate

Type 1: Through growth plate
Type 2: Through growth plate and metaphysis
Type 3: Through growth plate and epiphysis
Type 4: Through all three elements
Type 5: Crush injury of growth plate

I can't feel my epiphysis!
You're lookin' at the most common type. I'm so cool.
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Physis is Our Friend

When the bone is angulated, the physis will guide growth so that the physis will become parallel REMODELING
The Physis is Our Friend

- Process is more robust in younger patients
- Remodeling is faster closer to the physis
The Physis can be our FOE

- Damage to the physis can be irreversible
- Resulting in progressive deformity
History

Mechanism of injury?

- Home
- Sport
- MVA
- Unknown?
  - Abuse
Signs of Fracture

- Pain
- Swelling
- Warmth
- Refusal to move extremity
Physical Exam

- Examine on parent’s lap
- Encourage active rom
- Neurovascular exam
- Inspect and palpate opposite extremity first
- Palpate suspicious area last focusing on joint about and below
Upper Extremity Nerve Exam

ROCK (Median Nerve)

- Motor: opposition of thenar muscles, FPL, FDP
- Sensory: index finger pulp
Upper Extremity Nerve Exam

PAPER (Radial Nerve)

- Motor: wrist, finger, thumb extension
- Sensory: 1st dorsal webspace
Upper Extremity Nerve Exam

SCISSORS (Ulnar)
- Motor: abduction/adduction of fingers
- Sensory: small finger pulp
Lower Extremity Nerve Exam

- Femoral nerve
  - Motor – quadriceps – knee extension
  - Sensation – anterior knee
- Tibial nerve
  - Motor – gastroc-soleus and post tibialis – plantarflexion, foot inversion
  - Sensation – plantar aspect of foot
Lower Extremity Nerve Exam

- Superficial peroneal nerve
  - Motor – peroneals – foot eversion
  - Sensory – dorsum of foot
- Deep peroneal nerve
  - Motor – tib ant – ankle dorsiflexion
  - Sensory – 1\textsuperscript{st} dorsal webspace
Who Needs X-rays?

- Obvious deformity
- Loss of function/unwilling to use extremity
- Still hurts the following day
X-rays

- Always get at least 2 views of the area of interest – AP/Lateral view

- Consider X-rays of neighboring joints based on tenderness and swelling
Simple Fracture Immobilization

- Splints – prefab material
- Use pillows/towels with tape or ace wrap
- Splint in the position of comfort
When and Where to Refer

• **Urgent**: To the ER – Significant swelling, neurovascular compromise, open fracture

• **Semi-urgent**: Office visit (w/i 3 days of injury) – fracture involving the physis or joint surface, anything you think may need surgery

• **Within a week**: All other fractures that you are not going to definitively manage
Open Fracture Management

• If there is an open wound – cover with sterile gauze
• Further evaluation in ER
• Avoid giving food or drink as patient may require surgery or sedation for further treatment
• Ideally send all imaging studies with the patient
Management of Common Fractures

1. Distal radius – buckle fracture
2. Humeral shaft – newborn fracture
3. Clavicle
4. Proximal humerus
5. Toddler fx (Tibia)
6. Fibula fractures – avulsion/non-displaced
Distal Radius Buckle Fractures

- Torus fracture
- Bone is compressed on one side
- Stable fracture
- Treatment: removable wrist brace for 3-4 weeks
Buckle Fracture

• Ideal fracture for treatment by Primary Care
• No follow up needed
• Brace is easy to apply
• Cost savings to family
Plastic Deformation

- These can be subtle injuries
- Bone has a gradual bend
- May not have much pain after a couple of days
- REFER: May require operative treatment because it doesn’t remodel
Clavicle/Humerus Birth Fractures

- Associated with a larger baby, difficult delivery
- May be associated with brachial plexus injury
- Exam may reveal “pseudo paralaysis” in the neonate
Clavicle/Humerus Birth Fractures

• Heal rapidly in 2-4 weeks
• Treatment: Safety pin the sleeve at the wrist to the chest
Clavicle Fractures

- Second most common fracture
- Typical mechanism is fall onto the shoulder
- Exam: pain, swelling, crepitus
- Treatment: sling
- Very few operative indications
- Inform parents of “bump” – callous related to healing
Promimal Humerus Fractures

• Children < 8 y/o can all be treated non-operatively
  – Significant remodeling potential and shoulder joint compensates for displacement

• Treatment: sling

• Older patients with significant displacement – referral
Toddler Fracture

- Subtle fracture of the tibia
- May only see the fracture line on one X-ray view
- Child reluctant to bear weight
- Mechanism: low energy
- Differential: infection if no evidence of fracture
Toddler Fracture

- Treatment is a splint or a CAM boot
- Important to apply the splint appropriately
- Avoid equinus at the ankle and appropriately pad the heel
Greenstick Fractures

- Incomplete fracture
- Fails on the tension side
- Treatment is with a cast
- Refer to orthopaedics
Greenstick Fracture

9 months later
- Proximal tibia is known for developing this deformity
- Unhappy family

We didn’t know this could happen
Ankle Injuries

- Typically an inversion injury
- Tenderness to tip of fibula or 1-2 cm proximal (fibular physis)
- Avulsion fx=ankle sprain
  - Lace up ankle brace
    - 2-4 weeks
- SH I/II fracture – CAM boot
  - 4 weeks
Child Abuse

• Remember child abuse has no zip code

• 50% of fractures in children under the age of 1 are child abuse

• 30% of fractures in children under age 3 are child abuse

• Femur and tibia fractures are rare in children who are not walking
Child Abuse

- History may be inconsistent or not seem plausible to cause injury
- May seek care in several different facilities
- Delay in seeking care
- X-rays: fractures in various stages of healing, corner fractures
Summary

- Always obtain at least 2 X-rays to evaluate for fracture
- Many fractures can be safely managed by primary care providers
- Prompt referral for displaced or physeal fractures