Growth Plate (Physeal) Injuries

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Disclosures

• I have no conflicts of interest or financial support to disclose
Objectives

- Discuss impact of skeletal growth on injury risk
- Review Salter Harris fracture classification
- Highlight representative cases
Growth & Development

- Pubertal onset
  - Females age 8-15
  - Males age 10-15
- Peak height velocity (PHV)
  - Females – Tanner stage 2-3 (pre-menarche)
  - Males – Tanner stage 3-4
Skeletal Growth & Development

- Injuries common during adolescent growth spurt
  - Body mass, height increase
    - Imbalances in growth and strength
    - Lack of lean tissue mass
    - Joint hypermobility
  - Physis less resistant to physical stress
    - Changes to metaphyseal blood supply
  - Decrease in age-adjusted BMD before PHV
Anatomy

- Metaphysis
- Physis
- Epiphysis
# Salter Harris classification

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Complications</th>
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<tbody>
<tr>
<td>I</td>
<td>Physis</td>
<td>Physeal arrest</td>
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<tr>
<td>II</td>
<td>Metaphysis, physis</td>
<td>Physeal arrest</td>
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<tr>
<td>III</td>
<td>Epiphysis, physis</td>
<td>Articular incongruency, Physeal arrest</td>
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<tr>
<td>IV</td>
<td>Metaphysis, physis, epiphysis</td>
<td>Articular incongruency, Physeal arrest</td>
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<tr>
<td>V</td>
<td>Physis</td>
<td>Physeal arrest</td>
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Fracture Healing Principles

- 90% of physeal fractures treated non-operatively
  - Discuss risk of physeal arrest and need for follow up
- Remodeling occurs closer to physis
  - Proximal humerus, distal radius
  - Distal femur, proximal tibia
Injury Assessment

• Physis more susceptible to stress vs ligaments
• Palpate physis before testing ligaments
  – If tender over physis, treat as fracture
    • Splint
    • Remove from play
    • X-rays
      – Advanced imaging rarely needed
Cases
Shoulder

- 15 yo M RHD hockey athlete
- Direct blow to extended, abducted R arm during hockey tryouts
- Immediate pain, numbness, inability to move R arm

Shoulder dislocation?
Shoulder
Shoulder
Knee

- 11 yo F soccer athlete
- R knee injury – blocked kick with extended leg
  - Valgus stress
- “Snap,” swelling, unable to WB
- Pain not improving 1 week later despite RICE, crutches

MCL Sprain?
Knee
Knee
Knee

- 15 yo M soccer athlete
- Direct blow to medial distal thigh during soccer tournament
- Immediate deformity, unable to WB
- EMS transport to ED

Knee dislocation?
Knee
Knee
Ankle

• 13 yo F volleyball athlete
• R ankle inversion injury – landed from block on teammate’s foot
• “Pop,” swelling and bruising
• No evaluation, RTP after 1 week
• Ongoing pain, impaired vertical jump height 2 months post-injury

Ankle sprain?
Ankle
Ankle
Summary

• Physeal injuries common in children and adolescents
  – Growth arrest uncommon but possible

• Mimic ligamentous injury or dislocation
  – Palpatory exam critical
  – X-rays typically diagnostic
Thank you!

Questions?

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