The Pediatric Knee and Ankle: Orthopaedic Perspectives

Scott B Rosenfeld, MD
Division of Pediatric Orthopaedics
Texas Children’s Hospital
Disclosures

• I have no disclosures
Talk Outline

• Most common knee and ankle problems treated surgically by a pediatric orthopaedic surgeon

• What imaging modalities we use in the work up

• What the problem looks like on the inside compared to pre-operative images
Why are the knee and ankle important?

- Most commonly injured joints in sports activity

- 30 million children participate in organized sports in the U.S.

- 3 million sports injuries/year in U.S.
  - 70% from youth sports – *Pediatrics 2001*

- Injuries: >10 million pediatric PCP office visits/year (1 in 10)
  - Sports injuries ~ ¼ of all pediatric injuries
Epidemiology of Pediatric Injury-Related Primary Care Office Visits in the United States

Simon J. Hambidge, MD, PhD*†; Arthur J. Davidson, MD, MSPH§‖; Ralph Gonzales, MD, MSPH§‖; and John F. Steiner, MD, MPH§‖

| TABLE 4. Leading Causes of Pediatric IRVs to PCP Offices in the United States |
|-------------------------------------------------|---------|----------------|----------|
| Cause (ICD-9-CM E-Code)                         | Sample Size | Office Visits (in 1000s) | % IRVs* |
| Sports-related†                                 | 62       | 2739            | 19       |
| Accidental fall (E880–E888)‡                   | 50       | 2386            | 16       |
| Natural factors (E900–E909)§                    | 55       | 2284            | 15       |
| Accidents caused by cutting instruments (E920–E920.9) | 26       | 1217†          | 8        |
| Motor vehicle accident (E810–E825)             | 13       | 739†           | 5        |
| Intentional injury|||11 | 529† | 4 |
| Bums (E890–E899, E924–E924.9, E925, E926.2)   | 10       | 367†           | 2        |
Besides Sports

• Location of common congenital and developmental problems
  - Discoid Meniscus
  - OCD

• Location of foreign bodies

• Common site of infection
Children are not small adults!

- Different problems/injuries with different treatments
- Anatomy is different
  - Joint hyper-mobility
  - Apophyses
  - Physis
    - Weaker than ligaments
- Growth allows for remodeling
- May heal without surgical intervention
Common Knee and Ankle Problems

• Osteochondritis
  Dessicans of the knee

• Discoid Meniscus

• Osteochondral fracture
  of the talus

• Ankle infections
Osteochondritis Descicans - Knee

- Acquired lesion of subchondral bone

- Proposed etiologies
  - Epiphyseal ossification abnormality (like Perthes)
  - Traumatic
  - Vascular

- 25% bilateral

- 70% located at lateral border of medial femoral condyle
Osteochondritis Dessicans - Knee

• Clinical Presentation
  - +/- history of injury
  - Knee pain
  - Swelling/Effusion
  - Tenderness over condyle
  - Catching, locking
  - Loss of terminal extension or flexion
Osteochondritis Dessicicans - knee

• Goals of imaging
  - Location
  - Size
  - Stability

• Modalities
  - Radiographs
  - MRI
Osteochondritis Dessicans - knee

• Prediction of stability
  - Based on MRI appearance
  - Classifications made for adults
  - Don’t translate well to kids
    • Specificity of only 11% and 15% (DeSmitt, Haywood)
  - No high level evidence in juvenile OCD
Osteochondritis Dessicans - knee

- **Treatment**
  - Skeletal maturity
    - Open or closed physis
    - Perceived stability

- **Activity Modification**
  - Decreased weightbearing
  - Immobilization
  - Range of motion

- **Surgery**
  - Arthroscopic vs open
  - Drilling
  - Reduction and fixation
Osteochondritis Dessicans - knee

• Case 1

• 10 year old female cheerleader

• 2 week history of left knee pain, swelling, popping

• Full knee ROM, mild effusion

• TTP medial joint line

• AP, lateral, notch view, sunrise view knee
• Treatment decision making
  - Open physis
  - Cartilage intact = stable
  - No locking
  - Full ROM

• Non-operative
  - Activity modification
  - Knee immobilization
  - PT for ROM
4 months later…
Osteochondritis Dessicans - knee

• Case 2

• 15 year old female with right knee pain for 6 months
  - Swelling, catching, locking

• Basketball player
  - No injury

• Knee effusion

• Block to terminal extension

• Ordered AP and lateral knee radiographs
• Treatment decision making
  - Closed physes
  - Displaced OCD fragment
  - Block to full extension

• Surgical treatment
  - Reduction and fixation
  - Removal and microfracture
One year later....
Discoid Meniscus

• Common congenital anomaly
  - Discoid shape not a stage in development

• Incidence 0.4%-17%
  - Only the symptomatic ones

• 99% lateral meniscus

• 20% bilateral

• Most are asymptomatic
Discoid Meniscus

• Classifications
  - Watanabe
    • 1. Complete discoid
    • 2. Incomplete discoid
    • 3. Incomplete discoid no posterior attachment
  - Jordan, et al
    • Stable vs Unstable
    • Shape
    • Symptomology
    ➢ Direct treatment plan

*Andrish JT
Discoid Meniscus

• Presentation
  - Type 1 and 2 – horizontal and radial tears
    • Knee pain and swelling
  - Type 3 – snapping knee syndrome
    • Block to full extension

• What I order
  - AP, lateral radiographs
  - MRI
Discoid Meniscus

- Case 3

- 7 y.o. female with painful snapping right knee

- Occasional swelling

- Block to terminal extension

- Visible snapping in lateral compartment
Discoid Meniscus
Discoid Meniscus

• Treatment Plan
  - Arthroscopy
  - Partial meniscectomy (saucerization)
  - Probable meniscal repair
Ankle

• Injuries
  - Sprains
  - Fractures
  - OCD lesions

• Infections
  - Septic arthritis
  - Osteomyelitis
Talus Osteochondral Lesion

• Case 4

• 12 year old s/p MVC

• Right ankle pain and swelling

• Diffusely TTP
Talus Osteochondral Lesion

• Looks like a lateral osteochondral lesion

• Ordered MRI

• What I want to know
  - Where is it?
  - Is there bone attached?
  - Is the cartilage intact?
Treatment Decision

• Displaced anterior-lateral osteochondral fragment
  - Cartilage disrupted
  - Bone attached

• Open reduction and internal fixation
3 months later…
Infections

• Acute hematogenous osteomyelitis
  - Affects 1 in 5000 children < 13 y.o.
  - More resistant and virulent bacterial strains make course and treatment more complicated
    • Septic arthritis
    • Subperiosteal abscess
Infections

- Imaging
  - Radiographs
    • No changes in first week of infection
  - Bone scan
    • Help localize focus
    • May be cold
    • Doesn’t distinguish specific location of infection
  - MRI
    • Very sensitive
    • Detects edema early
    • Pinpoints abscess/osteo
Infections

• Septic arthritis
  - MRI helps better understand the infectious disease
  - Are there adjacent infections that need to be treated simultaneously?

<table>
<thead>
<tr>
<th>Joint</th>
<th>Adjacent infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee</td>
<td>47%</td>
</tr>
<tr>
<td>Hip</td>
<td>63%</td>
</tr>
<tr>
<td>Shoulder</td>
<td>100%</td>
</tr>
<tr>
<td>Ankle</td>
<td>80%</td>
</tr>
<tr>
<td>Elbow</td>
<td>63%</td>
</tr>
<tr>
<td>Wrist</td>
<td>0</td>
</tr>
</tbody>
</table>
Infections

• Septic ankle
  - Aspiration in ED showed pus

• Pre-op MRI
  - Adjacent osteomyelitis and distal tibia subperiosteal abcess
Infections

• Case 5

• 2 y.o. boy with 2 day history of
  - fever, refusal to bear weight, swollen lower leg and ankle

• Xrays negative
Infections

- MRI with contrast

- What I want to see
  - Where is the infection?
    - Osteomyelitis?
    - Intramuscular abscess?
    - Subperiosteal abscess?
    - Ankle joint effusion?
  - Localizer mode
Thank you