Current Thinking of the Osteochondroses

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What is an osteochondrosis?

• Abnormal endochondral ossification and epiphyseal growth of epiphysis, apophysis, or round bone

  - Delayed Ossification
  - Vulnerable Vascular Supply (vascular canals)
  - Decreased Bone Production
  - Increased Activity
  - AVN
• Axial Skeleton
  • Scheuermann disease

• Upper extremity
  – Panner
  – Kienbock

• Lower extremity
  – Legg-Calve-Perthes
  – Sinding-Larsen-Johansson
  – Osgood-Schlatter
  – Blount
  – Sever
  – Kohler
  – Freiberg
Osteochondrodoses - Stages

- necrosis of bone and cartilage
- revascularization
- granulation tissue invasion
- osteoclastic resorption of necrotic segments
- osteoid replacement
- formation of mature lamellar bone
<table>
<thead>
<tr>
<th>Histology</th>
<th>MRI</th>
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<tbody>
<tr>
<td>1. necrosis of bone and cartilage</td>
<td>1. Lack of enhancement</td>
</tr>
<tr>
<td>2. revascularization</td>
<td>Loss of marrow fat signal</td>
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<tr>
<td>3. granulation tissue invasion</td>
<td>2. New enhancement</td>
</tr>
<tr>
<td>4. osteoclastic resorption of necrotic segments</td>
<td>(transphyseal?)</td>
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<tr>
<td>5. osteoid replacement</td>
<td>3. Fragmentation and collapse</td>
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<tr>
<td>6. formation of mature lamellar bone</td>
<td>4. Healing</td>
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**Osteochondromes- Stages**
Osteochondrosis of the Capitellum: Panner Disease

- children <10 years
- Hx of throwing
- XR: fragmentation, sclerosis of capitellum
- MRI: low SI on T1 and high SI on T2
- intact articular cartilage
Panner Disease

- Tx: rest, anti-inflammatories
- normal capitellar growth resumes without long-term sequelae
Osteochondrosis of the Lunate
Kienböck’s Disease

- AVN of entire lunate
- 20 to 40 years of age
- Manual labor
- 75%: negative ulnar variance
Osteochondrosis of Vertebral Ring Apophyss
Scheuermann Disease
• 5 year-old boy with limping and pain in the right hip for the last 4 weeks
Legg Calve Perthes Disease - DWI

- Increased ADC with AVN
- ADC remains elevated until disease heals
13-year-old boy with knee pain
Osgood-Schlatter Disease

- Stress injury in the tibial tubercle
- Transition from fibrocartilage to hyaline cartilage
- Changes in soft tissues>> ossification irregularity
Sinding-Larsen-Johansson Disease
Blount Disease

- Stress to the medial compartment of knee
- Epiphyseal and physeal changes in the tibia and femur
- Medial meniscal hypertrophy
10-year-old girl with heel pain
Sever’s Disease

- 9-11 years of age
- Activity
- XR not diagnostic
- MRI: edema
  - Calcaneal apophysis
  - Metaphyseal equivalent
  - Surrounding soft tissues
  - Tendon thickening
5-year-old girl with midfoot pain
Köhler’s Disease

- Osteonecrosis of tarsal navicular
- Sclerosis and fragmentation can be normal
- Compared to normal variant, disease affects older children and is painful
02467558 Kingsborough 7 y/o boy

4-05 T1 (not T2 images were obtained)
15-year-old girl with pain in the forefoot
Freiberg’s Disease

- Second or third metatarsal head osteonecrosis
- Repeated trauma
- More common in women
- Association with high heels
Does it make sense to talk about Osteochondrosis?

• Most are descriptions based on findings from early radiographic era

• A category makes sense if it enhances understanding or facilitates remembering
Etiology

- Trauma
  - Scheuermann
  - Panner
  - Kienboch
  - Sinding-Larsen-Johannson
  - Osgood-Schlatter
  - Blount
  - Sever
  - Freiberg

- Osteonecrosis
  - Panner
  - Kienboch
  - Legg-Calve-Perthes
  - Kohler
  - Freiberg
Radiographs: Fragmentation and Increased Density

• Can be normal
  – Inferior patellar pole (Sinding-Larsen-Johannson)
  – Tibial tubercle (Osgood-Schlatter)
  – Calcaneal apophysis (Sever)
  – Tarsal navicular (Kohler)

• Always pathologic
  – Vertebral endplate (Scheuermann)
  – Capitellum (Panner)
  – Proximal femur (Legg-Calve-Perthes) *
  – Proximal tibia (Blount)
  – Lunate (Kienboch)
  – Metatarsal (Freiberg)
MRI:

- Cartilage abnormality
  - All except Kienboch and Freiberg

- Decreased enhancement
  - Panner
  - Kienboch
  - Legg-Calve-Perthes
  - Kohler
  - Freiberg
Take Home Points

- Tendency to move away from Osteochondrosis
- MRI:
  - Soft tissue edema
  - Cartilaginous abnormalities
  - Decreased enhancement (in some)