Epiphyseal Ischemia of the Proximal Femur

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Femoral Epiphyseal Ischemia

- Anatomy and DDH
- Idiopathic Osteonecrosis
- Synovial Distention
- Sickle Cell Disease and other marrow Disorders
- Growth Arrest

Milgram
• Deep branches of the medial circumflex artery
• Course along the femoral neck covered by synovium
• Perforating vessel: lateral epiphyseal artery (posterosuperior branch of MCA)
Epiphyseal Vascular Canals
Epiphyseal Vascularity
Abduction and Femoral Ischemia

• Compression of venous drainage and arterial supply

• Progressive abduction:
  – decreased diastolic flow preceding arterial compromise

• Progressive decrease in peak systolic velocity with persistent abduction
Abduction in Spica Cast

- "Safe zone": between inadequate hip reduction and decreased perfusion
- Difficult to determine clinically
- Gadolinium-enhanced fast T1-weighted images repeated
Evaluation of Perfusion of Hips in Spica Cast
Global decrease in perfusion: 10-fold increase in odds of AVN
Absent Perfusion
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Milgram
7 y/o boy with intermittent pain in the right hip
Epiphyseal Enlargement – Coxa Magna

- Large, broad epiphysis
- Cartilage grows from synovial fluid
- Hypervascularity stimulates epiphyseal growth
Metaphyseal Cystic Changes

presentation  4 m  11 m
Metaphyseal Changes

- Anterior metaphysis
- Rests of cartilage vs. cysts
- Metaphyseal ischemia
- Poor prognosis
Joint Space

- Synovial inflammation & cartilaginous proliferation
- Decreased containment & congruity
- Hinge abduction
AVN - Anterior Involvement

- Frog lateral – anterosuperior aspect
- Sagittal imaging
Patterns of Reperfusion

Peripheral

Central

Poor prognosis
DWI

- Increased ADC with AVN
- ADC remains elevated until disease heals
Metaphyseal Cysts: Physeal Involvement
Increase in Metaphyseal ADC: Poor Prognosis
Epiphyseal Dysplasia
Femoral Notch
Femoral Epiphyseal Ischemia

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Milgram
Inflammatory Disorders

- Toxic synovitis
- Septic arthritis
- Pelvic osteomyelitis
- Juvenile idiopathic arthritis
Septic Arthritis and Ischemia

- Sudden increase in synovial pressure
- Absent enhancement (AJR 2007; 189:437-445)
- Sometimes re-establishment of perfusion after tapping
Osteomyelitis

- Proximal femoral metaphysis
- Pelvis adjacent to the acetabulum
- Suspected if:
  - Signs of infection, negative tap
  - Positive tap, no response to treatment
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Milgram
Secondary Ischemia in Children

- Sickle cell disease
- Infection
- Steroids
- Gaucher disease
- Leukemia
- Others
Sagittal imaging in osteonecrosis: better indicator of disease
ADC in Sickle Cell
Gaucher Disease
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Milgram
Epiphyseal Ischemia and Physeal Injury

- Epiphyseal vessels
  - Supply physis
- Epiphyseal ischemia leads to growth arrest
  - Treated DDH
  - Legg-Calve-Perthes
  - Septic Arthritis
Physeal Injury – O’Brien’s Lines

• Greater trochanter—normally should grow slower than femoral head
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Milgram