Imaging SCFE: Diagnosis, Treatment & Complications

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Learning Objectives

- Recognize imaging findings of SCFE using radiographs, MR, CT, US
- Understand surgical management and normal post-operative appearance.
- Recognize imaging findings of immediate and delayed post-operative complications.

Imaging SCFE

- Slipped capital femoral epiphysis is a common disorder in pediatric patients.
- Can lead to limitation of function of the hip, early osteoarthritis, avascular necrosis.
- Important to not only recognize SCFE on initial presentation, but to be aware of imaging findings of the post operative hip and complications that can arise.

SCFE

- Diagnosis
  - Radiographs
  - MR/CT/US
- Treatment/Post Operative Appearance
  - In Situ Fixation
  - Reduction
  - Osteotomies
- Complications
  - AVN
  - Chondrolysis
  - FAI

Diagnosis of SCFE

Radiographs
  - Frontal
  - Frog
  - True lateral
  - MR
  - CT

- Radiographs are the primary modality for evaluating SCFE
- Both hips should be imaged to allow comparison with asymptomatic side and because a significant amount of SCFE is bilateral.
- Frog lateral view is more sensitive than frontal for detection of SCFE.
- True lateral has increased sensitivity to detect abnormal head shaft angle and decreased risk of further displacement of epiphysis during positioning.

Diagnosis of SCFE

Radiographs
  - Findings
    - physeal widening
    - loss of epiphysial height
    - medial/posterior slip
      (Gait’s line)
  - MR
  - CT
Diagnosis of SCFE

Radiographs
Findings
- physeal widening
- loss of epiphyseal height
- medial/posterior slip (Klein’s line)
MR
CT

Diagnosis of SCFE

Radiographs
Findings
- physeal widening
- loss of epiphyseal height
- medial/posterior slip (Klein’s line/Green’s modification)
MR
CT

Diagnosis of SCFE

Radiographs
Findings
- physeal widening
- loss of epiphyseal height
- medial/posterior slip (Klein’s line/Green’s modification)
MR
CT

Diagnosis of SCFE

Radiographs
- Valgus Slip
MR
CT

- Rare
- Displacement of the femoral head is superior/lateral and posterior
- Usually seen in patients with coxa valga: more horizontal orientation of physis.
- Klein’s line will continue to intersect femoral head as it slips.
Diagnosis of SCFE

Radiographs
Valgus Slip
MR
CT

Diagnosis of SCFE

Radiographs
MR
“Pre-slip” or early SCFE
CT

Diagnosis of SCFE

Radiographs
MR
“Pre-slip” or early SCFE
CT

Diagnosis of SCFE

Radiographs
MR
“Pre-slip” or early SCFE
CT
Diagnosis of SCFE
- Radiographs
- MR
- CT
- pre-op planning

Characterization of SCFE
- Stable vs Unstable
- Acute vs Chronic
- Mild/Mod/Severe
- There are different categorization schemes for SCFE, which determine management.

Characterization of SCFE
- Most important characterization
- Clinical assessment based on patient's ability to walk.
- Unstable has higher risk of AVN
- Stable SCFE is not amenable to reduction.

Characterization of SCFE
- Stable vs Unstable
- Acute vs Chronic
- Mild/Mod/Severe
- Acute - less than 3 weeks since onset of symptoms
- Patients may have acute on chronic history of pain.
- Lower risk of AVN in chronic cases
Characterization of SCFE

Stable v Unstable
Acute v Chronic
Mild/Mod/Severe

- Measure Southwick angle to determine amount of slip.
- Mild - 0-30 degrees
- Moderate -30-50 degrees
- Severe – greater than 50 degrees
- More inclined to attempt reduction of unstable SCFE with higher slip angles

Surgical Management of SCFE

Pin/Screw Fixation
  In Situ v Reduction
  Complications
  Osteotomies
  Cuneiform
  Base of Neck
  Intertrochanteric
  Modified Dunn

Surgical Management of SCFE

Pin/Screw Fixation
  In Situ v Reduction

Osteotomies

- Attempt at reduction, only possible in unstable SCFE.
- Some advocate reduction in all cases of unstable SCFE, while others will reduce only severe cases.
- Gentle reduction in OR, or closed reduction with traction for 1-2 weeks, or accidental in OR following anesthesia and positioning

Surgical Management of SCFE

Pin/Screw Fixation
  In Situ v Reduction

Osteotomies
Surgical Management of SCFE

Pin/Screw Fixation
- In Situ v Reduction
- Osteotomies

Complications
- Screw impingement
- Joint transgression
- Growing off screw
- Loosening
- Osteotomies
Surgical Management of SCFE

Pin/Screw Fixation

Complications
- Screw impingement
- Joint transgression
- Growing off screw
- Loosening

Osteotomies

Osteotomies
- Cuneiform
- Base of Neck
- Intertrochanteric
- Modified Dunn

- Improve orientation of the femoral head
- At time of original surgery or subsequent to in situ fixation to address ongoing symptoms
- Techniques divided by level of osteotomy

Surgical Management of SCFE

Pin/Screw Fixation

Complications
- Screw impingement
- Joint transgression
- Growing off screw
- Loosening

Osteotomies

Osteotomies
- Cuneiform
- Base of Neck
- Intertrochanteric
- Modified Dunn

Wedge of bone removed from metaphysis

Greatest potential for anatomic realignment

Highest risk of AVN
Complications of SCFE

AVN
Chondrolysis
FAI
Labral/Cartilage Injury

- Risk factors for AVN
  - severity of slip
  - over-reduction of acute slip
  - attempted reduction of chronic slip
  - screw placement at posterosuperior quadrant of femoral head
  - cuneiform osteotomy

Complications of SCFE

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Complications of SCFE

AVN
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Complications of SCFE

AVN
Chondrolysis
FAI
Labral/Cartilage Injury

- Joint space loss
  - Cartilage thickness measuring 2 mm less than other side, or joint space less than 3 mm
- Risk factors
  - Screw tip in joint space
  - Severe slip
  - Early osteotomy
Complications of SCFE

AVN
Chondrolysis
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Complications of SCFE

AVN
Chondrolysis
FAI
Labral/Cartilage Injury

- Abnormal contact between the femoral neck and acetabulum with hip flexion.
- Metaphyseal prominence with decreased head-neck offset.
- Major cause of joint damage in SCFE.

Complications of SCFE

AVN
Chondrolysis
FAI
Labral/Cartilage Injury

- Prominent metaphysis enters acetabulum causes anterior-superior quadrant acetabular cartilage loss.
- Labral degeneration

Complications of SCFE

AVN
Chondrolysis
FAI
Labral/Cartilage Injury

- Conventional MR
- Arthrography
- Cartilage Imaging
  - T2 mapping
  - dGEMRIC- GAG content of cartilage.
Complications of SCFE

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- Chondrolysis
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- Labral/Cartilage Injury

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