Slipped Capital Femoral Epiphysis, Emergency?

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- AAOS/POSNA Five Pediatric Orthopaedic Problems that Should Get You Out of Bed at Night
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AGENDA
- Septic Hip: Work-up and Treatment
- Hip Fractures in Children and Adolescents: Pitfalls and Pearls
- Before, During, and After: Pulses and Supracondylar Humerus Fractures
- Urgent Treatment of Unstable Slipped Capital Femoral Epiphysis
- Compartment Syndrome: Defusing the Ticking Time Bomb
Why I Work with Kids
SCFE

- Disruption of the proximal femoral physis with instability and displacement of the femoral head on the neck
Most common disorder of the hip in adolescents

- Affects 0.7 to 3.4 children per 100,000
- Regional variations outside this range
SCFE

- Typical patient is obese
  - 50–60% pts fall in 95th percentile in weight
- Higher incidence among African-Americans
- Boys affected more than girls
  - Boys peak age 14 (13.1 to 15.7)
  - Girls peak age 12 (11.1 to 13.1 years)

– Loder RT; JPO 1993
SCFE

• **Etiology**
  • **Mechanical**
    – Average increased external rotation
    – Shear forces related to obesity
  • **Endocrine**
    – Hypothyroidism
    – Hypogonadism
      - Growth hormone treatment
    – Renal dysfunction
Pathophysiology

- Physeal disruption occurs through the irregular zone of hypertrophy, similar to Salter-Harris Type I fractures.
Traditional Classification

- **Acute**: symptoms for <3 wks (15%)
- **Chronic**: symptoms for >3 wks (85%)
- **Acute on Chronic**: Acute exacerbation of mild chronic symptoms
  - Often associated with minor trauma
Stable vs. Unstable

- Loder et al, JBJS 1993: depends on whether child is able to ambulate
  - **Stable**: Pt able to ambulate with or without crutches
  - **Unstable**: Pt unable to ambulate
- Predicts prognosis
  - **Stable**: 95% Satisfactory, 0% AVN
  - **Unstable**: 47% Satisfactory, 47% AVN
- Other studies AVN rate 10-47%
Exam

• Stable
  • Walks with leg held in external rotation
  • Hip externally rotates with flexion
  • “obligate external rotation”

• Unstable
  • Severe pain with any attempted ROM of leg
  • Mimics acute hip fracture
Radiographs – Klein’s Line
Radiographs - Stable Slip
Radiographs – Unstable Slip
Treatment Options

- **Stable SCFE**
  - In Situ fixation
  - Open Epiphysiodesis with bone graft
  - Multiple Pins
  - Spica Casting

- **Unstable SCFE**
  - Fixation with/without gentle CR
  - Surgical hip dislocation
In Situ Screw Fixation

• Most common current treatment

• Single screw preferred over multiple
  • Karol et al, JPO 1992
    – Lower incidence of joint penetration
    – Only 30% more stiffness with second screw

• High success rate, low risk of complications
In Situ Screw Fixation

• Technical goals
  • Center-center screw position on AP & lateral views
  • Perpendicular to the physis
  • At least 5mm from subchondral bone
  • 4-5 threads across
In Situ Screw Fixation

- Slip is posterior, therefore entry point is anterolateral
- Percutaneous large cannulated screw
- Do not attempt closed reduction in chronic SCFE
- Use live fluoro to make sure screw contained in epiphysis
Treatment – Stable Slip

- Contralateral hip can develop slip up to 37% of the time
- Prophylactic pinning of other hip controversial
- Probably indicated for children with significant growth remaining
Open Epiphysiodesis

- Has fallen out of favor
- First described by Ferguson and Howorth in 1931
  - Avoids risk of pin protrusion
  - More rapid physeal closure
    - 12 wks
Open Epiphysiodesis

- Anterior Approach
- Cortical window with corticocancellous ICBG strips
- No immediate fixation
  - Progressive slippage in 42% to 59%
    - Ward & Wood, JPO 1990
    - Rao et al, JPO 1996
Stable Slip Treatments

- **Multiple Pins**
  - Higher risk for intra-articular penetration
  - Higher risk of damaging intra-epiphyseal blood supply

- **Spica Casting**
  - Higher rates of chondrolysis
  - Not recommended
Epiphyseal Blood Supply

- Disruption leads to avascular necrosis (AVN)
- Lateral epiphyseal artery
  - Primary blood supply to epiphysis
  - Ligamentum teres secondary
Controversies- Unstable Slips

- Timing
- Reduction
- Number of screws
- Capsular decompression
Timing

Urgency of treatment unclear

- Petersen et al JPO ‘97
  - 91 unstable hips
    - 42 hips fixed at <24hrs → 7% AVN
    - 49 hips fixed at >24hrs → 20% AVN

- Loder et al JBJS ‘93
  - 30 unstable hips
    - 8 hips fixed at <48hrs → 88% AVN
    - 22 hips fixed at >48hrs → 32% AVN
Timing

- Acute displacement may kink epiphyseal vessels, compromising blood supply
- Case reports of angiograms studies demonstrating reperfusion of femoral head after reduction of acute SCFE
- Survey of POSNA members
  - 57% favored urgent <8 hrs
  - 31% emergent
  - 12% elective
Closed Reduction

Closed manipulation of unstable SCFE

- De Sanctis el al JPO ‘96
  - 81 unstable hips tx’ed with gentle CR & screw fixation
    - 4% chondrolysis, 2% AVN

- Petersen & Green JPO ’97
  - 91 unstable hips tx’ed with CR
    - 14% AVN

- “Spontaneous reduction” under GA w/ positioning
Closed Reduction

• POSNA Survey
  • Incidental reduction in OR 84%
  • Full reduction 11.8%
Screw Number

- Increased stiffness with 2 screws
- Difficult to put either one in “perfect” spot
- POSNA Survey
  - 57% single screw
  - 40% double screw
Capsular Decompression

- Injection of fluid acutely into hip capsule shown to increase pressure and decrease perfusion
- Little morbidity
- Aspiration or open

- POSNA Survey
  - 64% No
  - 35% yes
    - 26% open
    - 73% closed
Open Reduction

- Surgical dislocation technique
- Allows for correction of deformity at the site
- Increasingly utilized for unstable slips
- Can shorten neck to take tension off of blood supply
Complications

- Avascular Necrosis
  - Related to acute nature and severity of displacement
  - Diminished blood from epiphyseal disruption, kinking of vessels or elevated pressures
  - Attempted reduction of chronic SCFE
  - Superolateral quadrant pin/screw placement
Avascular Necrosis - Early
Avascular Necrosis - Late
Complications

• **Chondrolysis**
  - Joint space loss >50% or measuring <3mm
  - Etiology unknown
    - Screw penetration
    - Prolonged spica casting
    - Correlates with severity of slip
    - Autoimmune response?
Complications

• Other complications
  • Slip progression
  • Neck fracture
  • Subtrochanteric fracture
Summary

- SCFE is a common condition
- Inappropriate management of a stable slip can lead to devastating consequences
- Unstable slips can lead to devastating consequences with the best management
  - Get out of bed for this one