



Slipped Capital Femoral Epiphysis, Emergency?

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AAOS-POSNA 2011 Course

- **AAOS/POSNA Five Pediatric Orthopaedic Problems that Should Get You Out of Bed at Night**Todd A. Milbrandt, MD, Webinar Director
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- **2011, CD-ROM**
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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

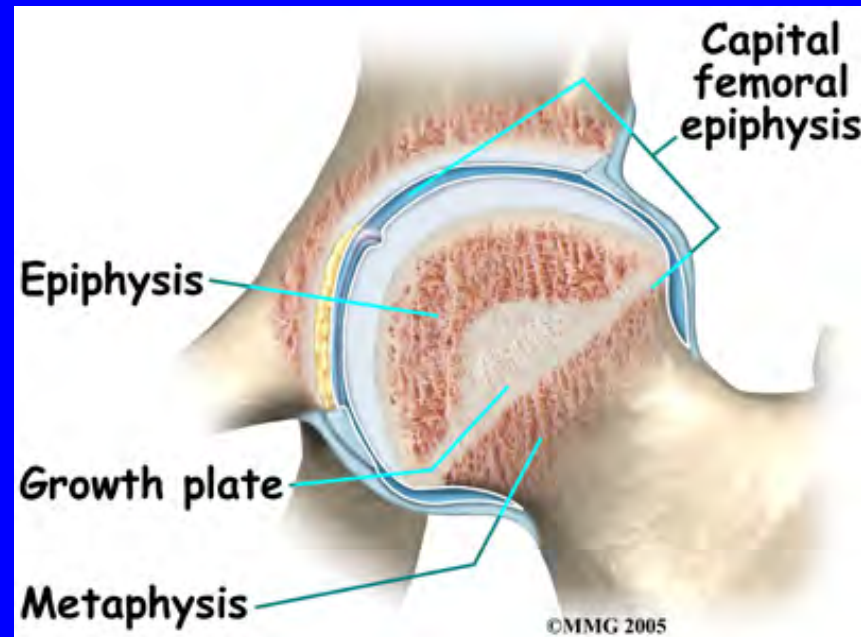


Why I Work



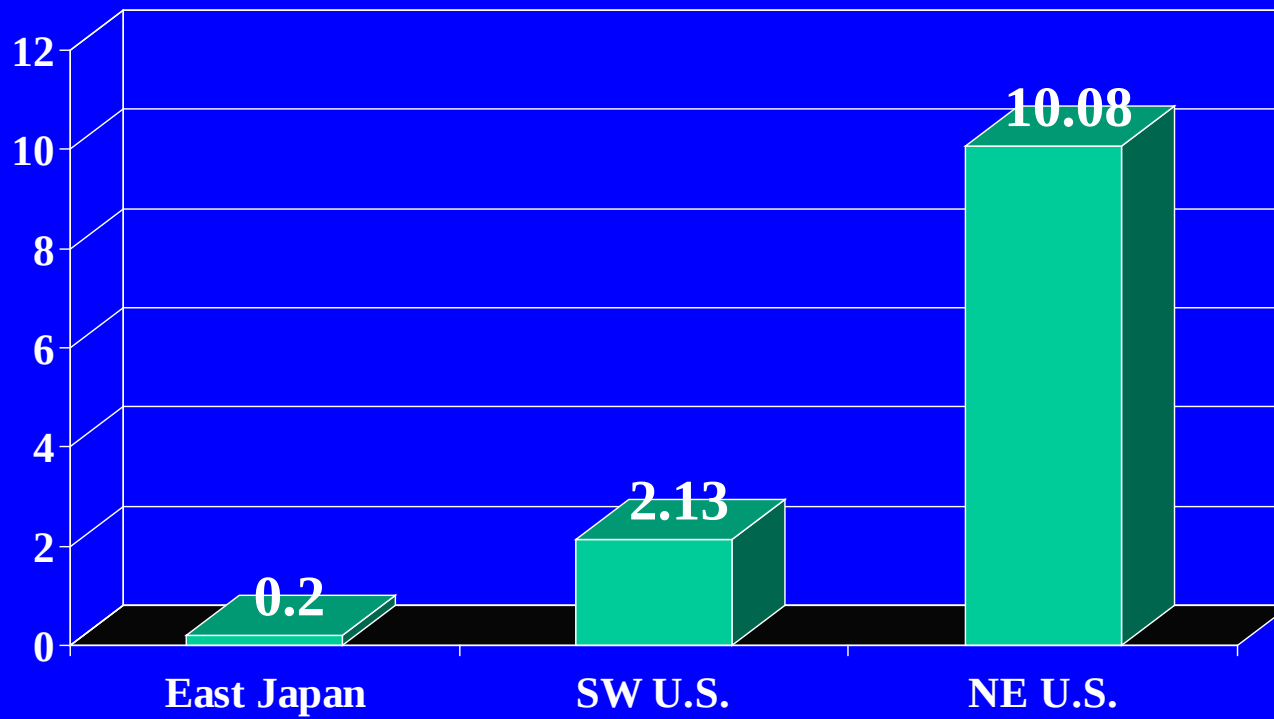
SCFE

- **Disruption of the proximal femoral physis with instability and displacement of the femoral head on the neck**



SCFE

- **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*

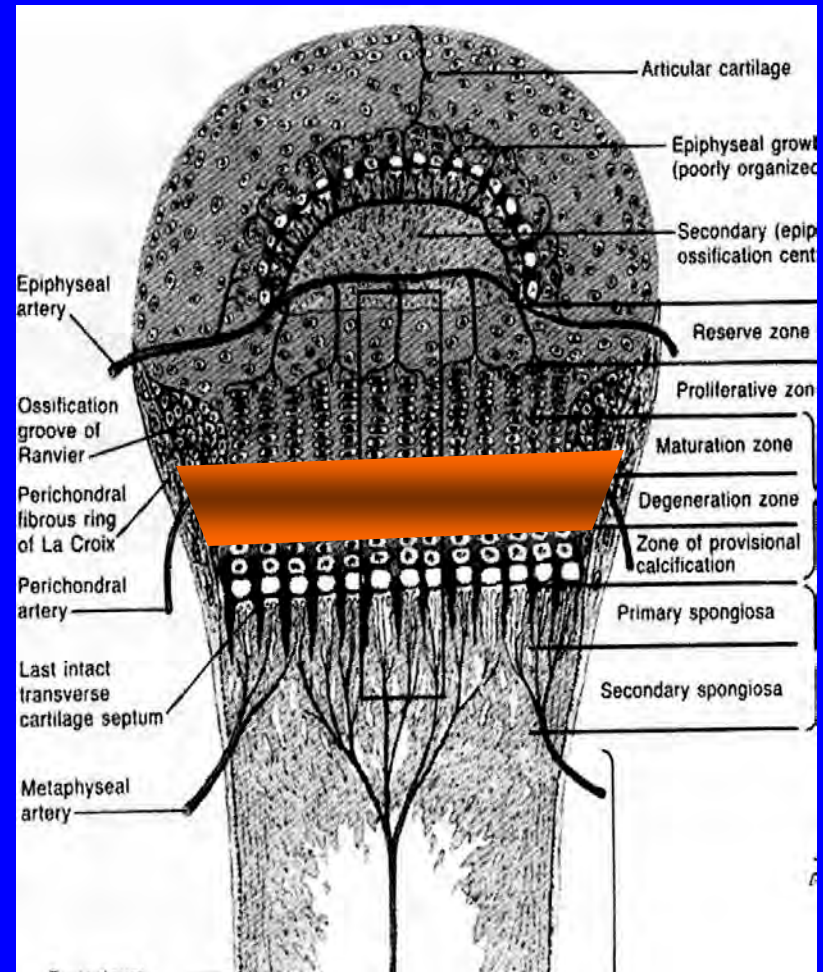


SCFE

- **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 >3wks (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**

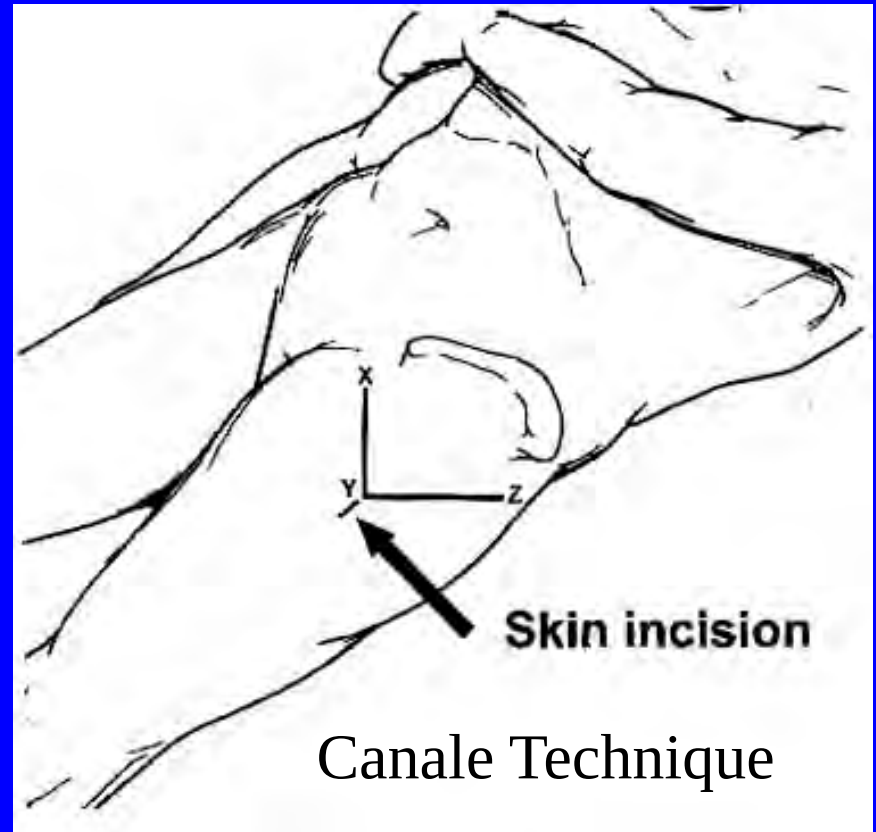
In Situ Screw Fixation

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



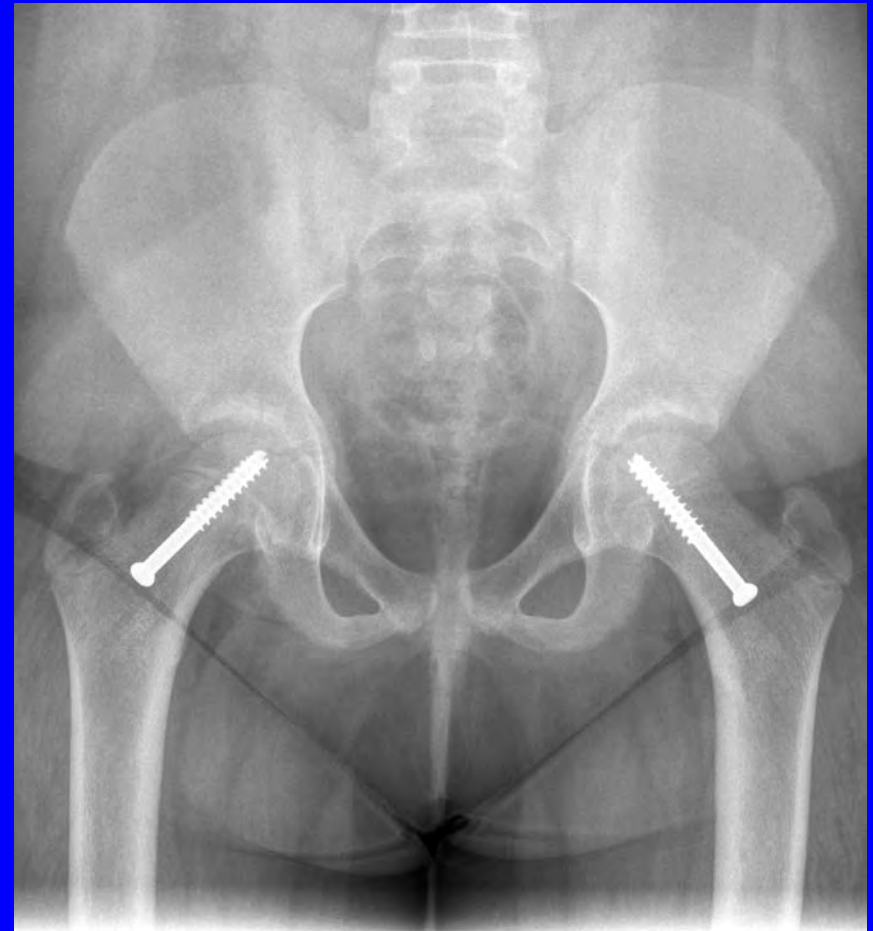
In Situ Screw Fixation

- 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



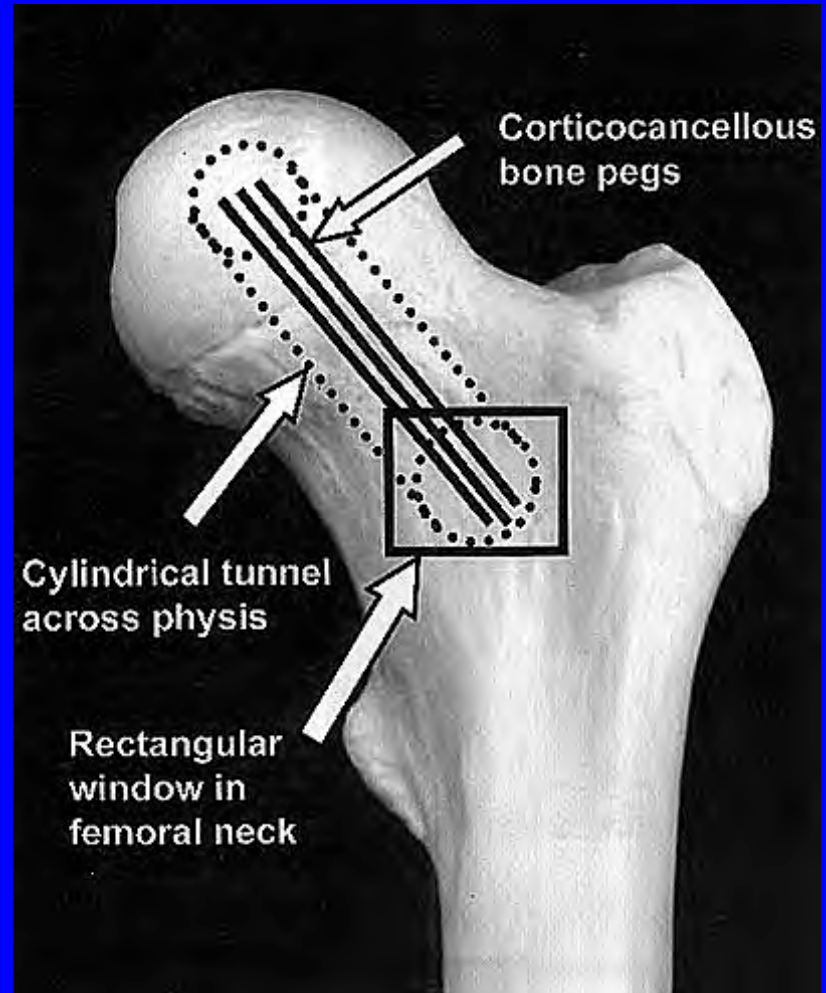
Treatment – Stable Slip

- 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



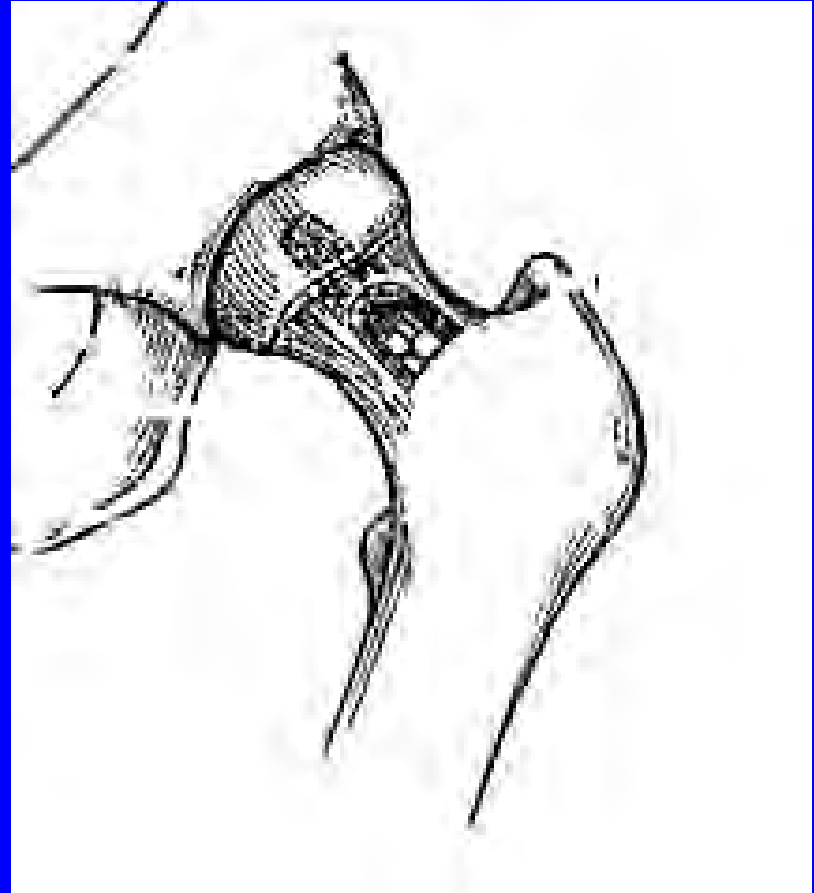
Open Epiphysiodesis

- 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

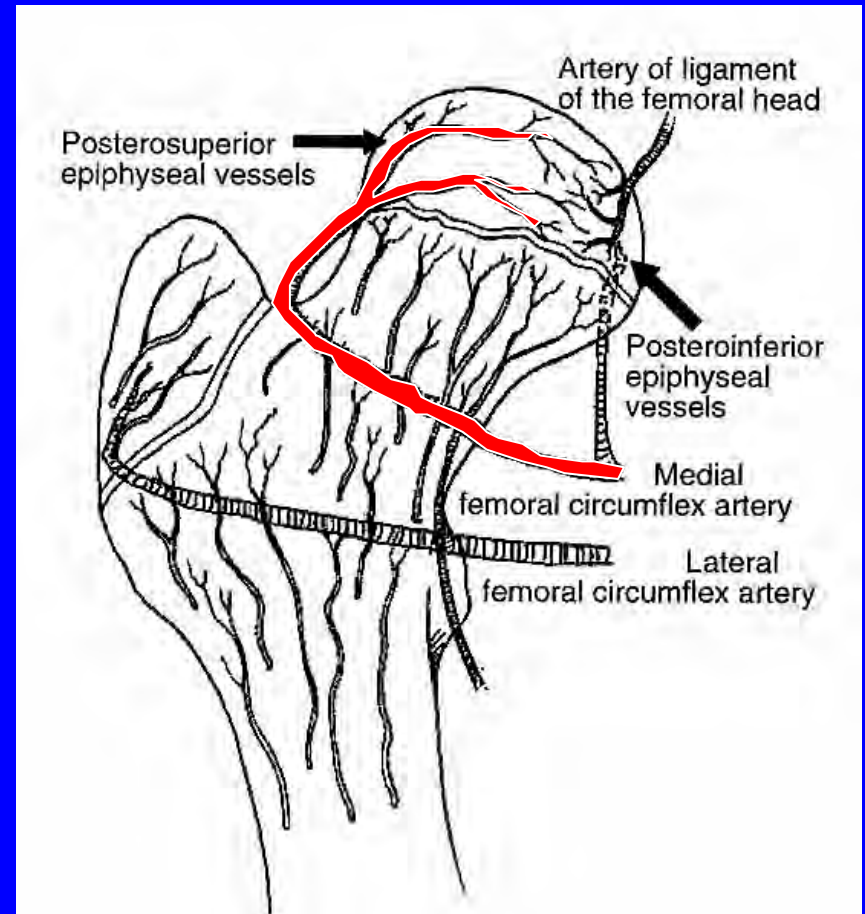


Stable Slip Treatments

- **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

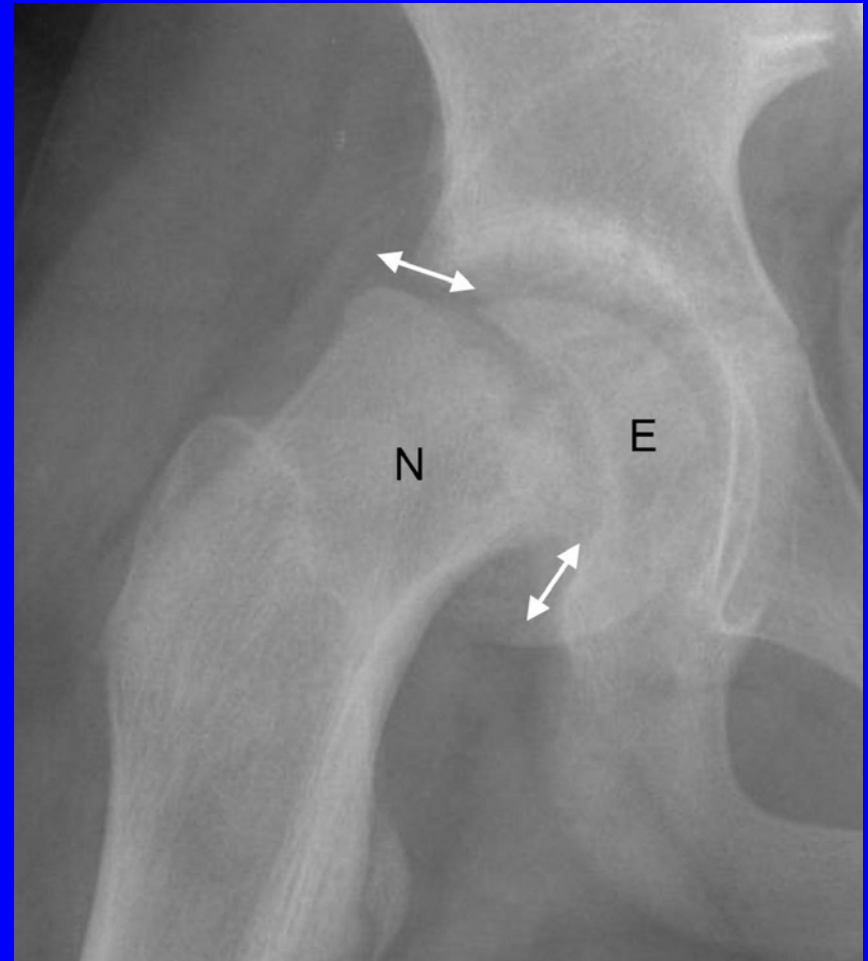
Closed manipulation of unstable SCFE

- **De Sanctis et 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

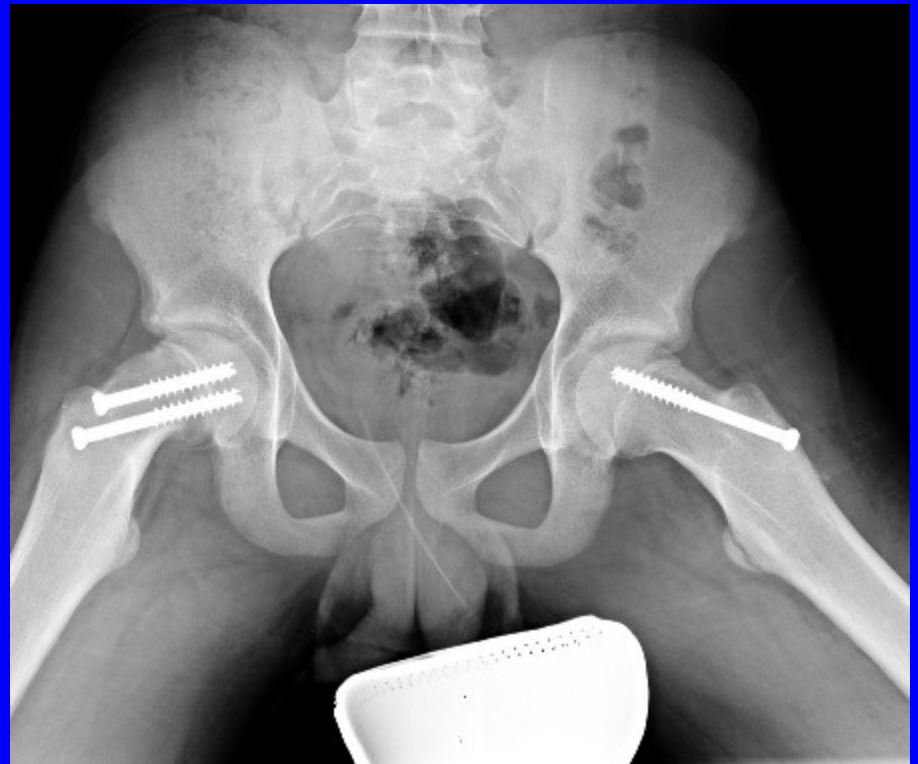
- **POSNA Survey**

- **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

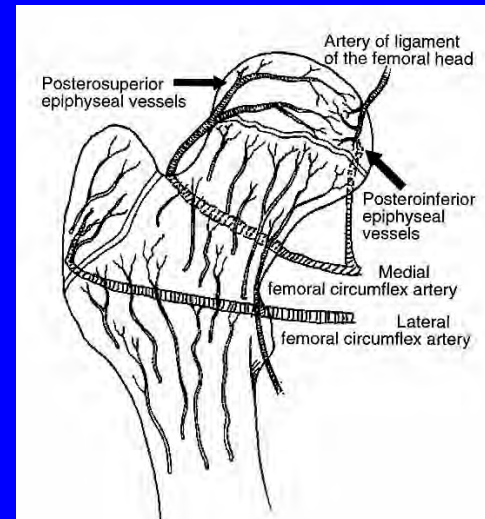


Capsular Decompression

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

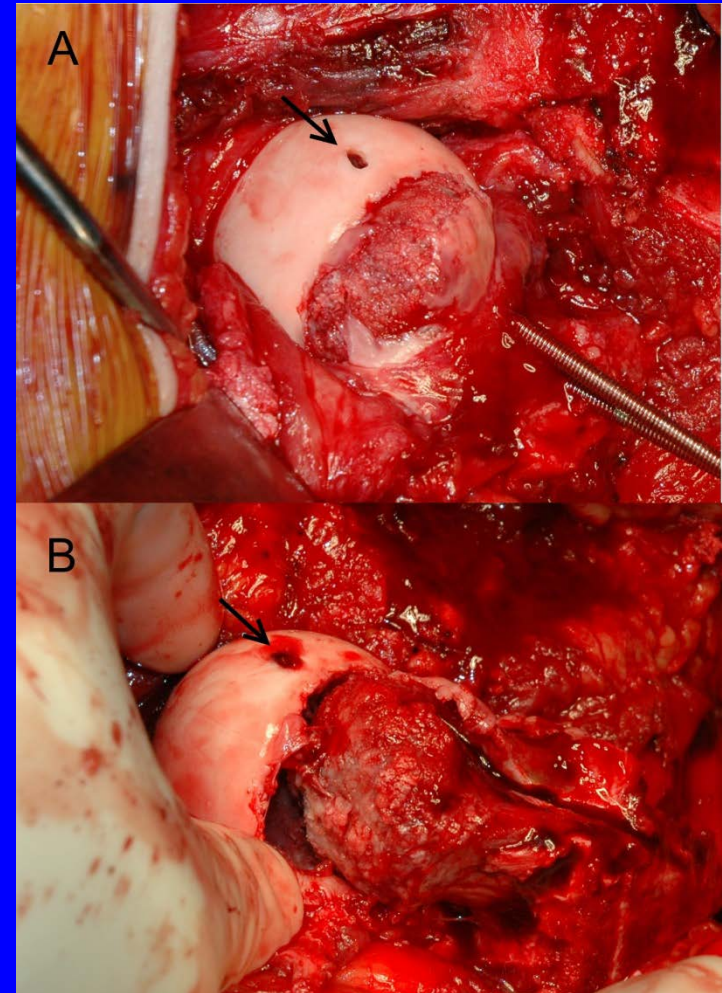
• POSNA Survey

- 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 flow 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 $<3\text{mm}$
- 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