



# Slipped Capital Femoral Epiphysis: Management Approaches

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WELCOME



EMERGENCY

# Disclosures

I have no conflicts of interest to disclose for this presentation.

# Objectives

- Discuss conventional management approaches for slipped capital femoral epiphysis
- Discuss current controversies in the management of slipped capital femoral epiphysis

# Definition – Slipped Capital Femoral Epiphysis (SCFE)

- Displacement of the femoral neck relative to head through the growth plate (anterolateral translation and external rotation)
- Unknown etiology with antecedent epiphysiolysis, slow displacement, intact periosteum/perichondrium
- Can result in hip or referred knee pain with loss of motion, premature OA, physical disability



# Epidemiology

## Typical

- Most common hip disorder in adolescents 10-15 years (peak growth velocity)
- Obesity
- Boys:girls 2:1

## Atypical

- Endocrine (hypothyroidism, growth hormone deficiency, panhypopituitarism)
- Renal osteodystrophy
- Radiation therapy



# Classification

## Chronicity



Acute <3 weeks



Chronic  $\geq 3$  weeks



Acute on chronic

## Severity

### The Journal of Bone and Joint Surgery

*American Volume*

VOLUME 49-A, No. 5

JULY 1967

#### Osteotomy through the Lesser Trochanter for Slipped Capital Femoral Epiphysis\*

BY WAYNE O. SOUTHWICK, M.D.†, NEW HAVEN, CONNECTICUT

*From the Department of Surgery, Section of Orthopaedic Surgery,  
Yale University School of Medicine, New Haven*

Mild <30<sup>d</sup>  
Moderate 30-60<sup>o</sup>  
Severe >60<sup>o</sup>

## Stability

### “epiphyseal stable vs unstable”

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#### Acute Slipped Capital Femoral Epiphysis: the Importance of Physeal Stability\*

BY RANDALL T. LODER, M.D.1, ANN ARBOR, B. STEPHENS RICHARDS, M.D.1, DALLAS, TEXAS,  
PAUL S. SHAPIRO, M.D.3, DETROIT, LISA R. REZNICK, M.D.1, ANN ARBOR, AND DAVID D. ARONSON, M.D.4, DETROIT, MICHIGAN

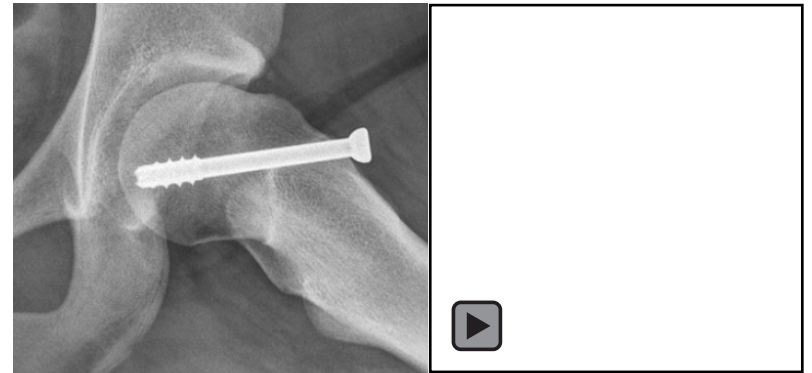
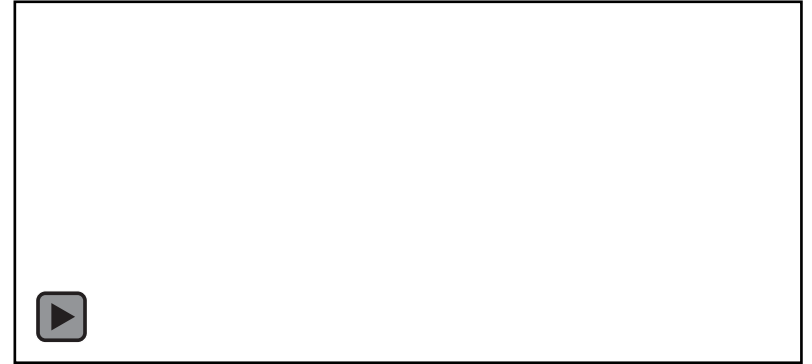
*Investigation performed at the Department of Orthopaedic Surgery, Children's Hospital of Michigan, Wayne State University, Detroit;  
the Section of Orthopaedic Surgery, C. S. Mott Children's Hospital, University of Michigan, Ann Arbor;  
and the Texas Scottish Rite Hospital, Dallas*

**Stable:** Able to bear weight with or without crutches  
Minimal risk of osteonecrosis 0% (0/25)

**Unstable:** Unable to mobilize not even with crutches  
Risk of osteonecrosis up to 47% (14/30)  
(more recently shown to be 23.9% by Zaltz et al CORR 2013)

# Physical Exam

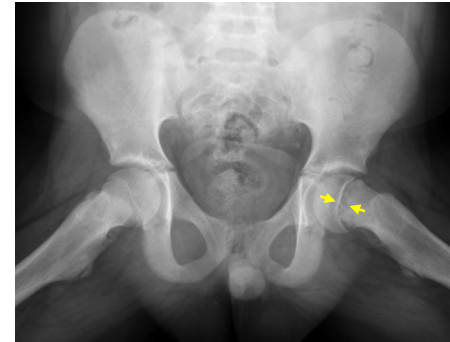
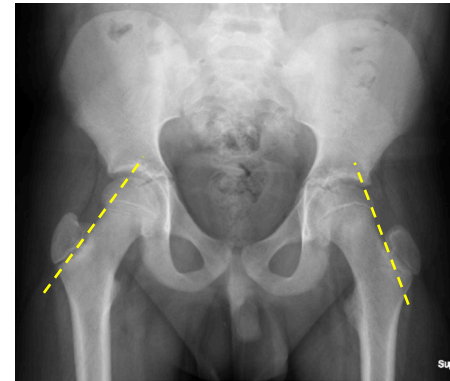
- Antalgic or Trendelenburg gait
- External foot progression angle
- Limited flexion, internal rotation, and abduction
- Hip, groin, thigh, or knee pain with hip internal rotation
- Obligate external rotation with hip flexion



# Imaging

Bilateral AP and frog lateral hip (cross table for unstable slips) x-rays

- Klein's line does not intersect the epiphysis
- Physeal widening and irregularity
- Metaphyseal blanching sign of Steele
- Measure Southwick (lateral epiphyseal-shaft) slip angle difference on frog lateral





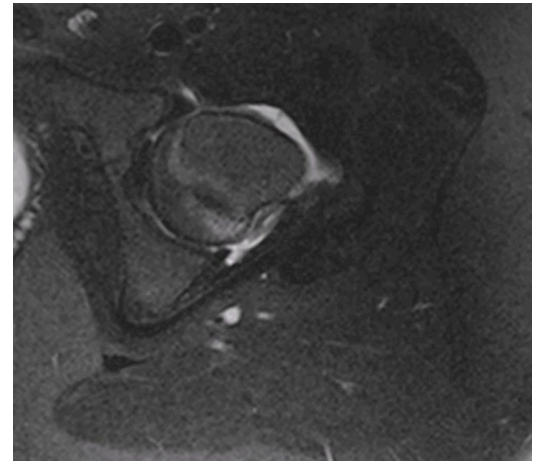
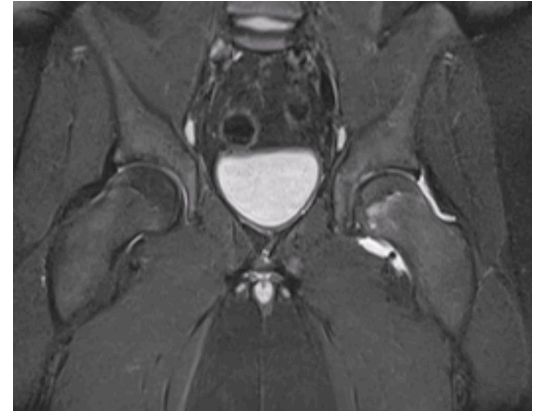
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## MRI

- Early slips without obvious radiographic findings
- Physeal edema and/or small joint effusion



# Treatment

## Initial management

- Once a diagnosis of SCFE is made, the child should immediately be made non-weight bearing, restricted to crutches or a wheelchair, and referred to an orthopedic surgeon for timely treatment
- Goals are to prevent further slipping, minimize AVN, avoid FAI, prevent early onset OA
- Patients <10 or >16 years old, below 50<sup>th</sup> percentile for height, weight, or BMI, and presenting with valgus slips should be considered for laboratory screening for atypical SCFE with endocrine or metabolic tests (e.g. TSH, PTH, CMP)

# Treatment

## Stable slip

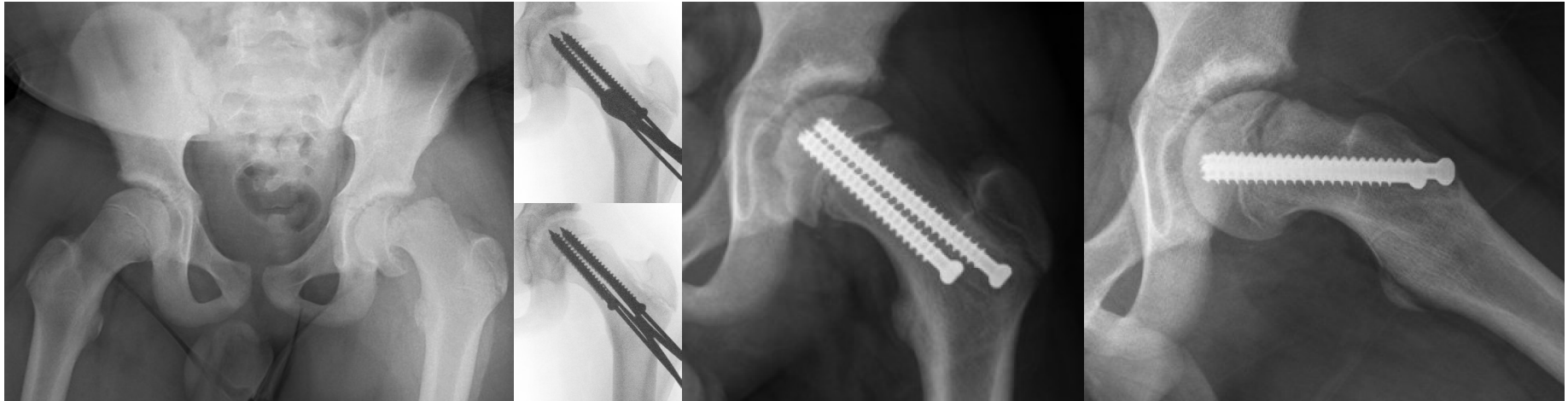
- In situ screw fixation with 1 screw
- Stainless steel fully threaded cannulated screw 6.5 or 7.3 mm
- Screw centered in epiphysis, perpendicular to physis, at least 5 threads across physis on one view, and no closer than 5 mm from tip to subchondral bone on all views (incremental fluoroscopic images or approach-withdrawal method)
- Concomitant osteochondroplasty has been described for more severe slips (controversial)



# Treatment

## Unstable slip

- “Incidental reduction of acute component” from standard patient positioning and percutaneous screw fixation with 2 screws. Capsular decompression and epiphyseal perfusion monitoring can be considered (controversial).



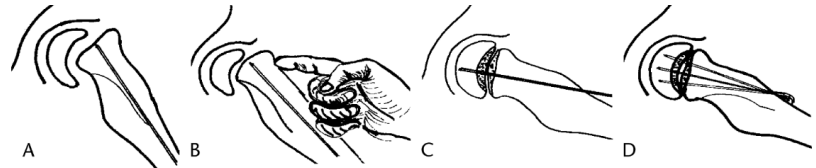
# Treatment

## Unstable slip

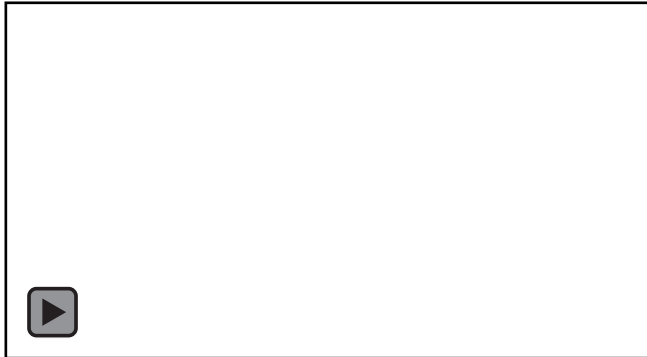
- “Incidental reduction of acute slip component” from standard patient positioning and percutaneous screw fixation with 2 screws. Capsular decompression and epiphyseal perfusion monitoring can be considered (controversial).
- Intentional closed vs open reduction (controversial)

## Open Reduction and Smooth Kirschner Wire Fixation for Unstable Slipped Capital Femoral Epiphysis

*Klaus Parsch, MD,\* Svenja Weller, MD,\* and Dominik Parsch, MD†*



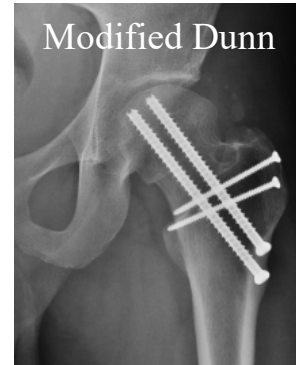
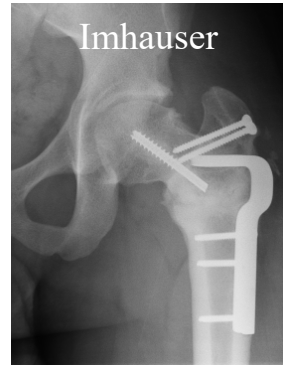
**FIGURE 1.** Surgical protocol. A, Unstable slip: K-wire is introduced, stopping short of metaphyseal border. B, Joggling maneuver with surgeon's fingertip controlling gentle reduction. C, After achieved reduction, the K-wire is advanced to fix the head. D, Two additional K-wires are introduced to guarantee stability of reduced slip.



# Treatment

## Unstable slip

- “Incidental reduction of acute component” from standard patient positioning and percutaneous screw fixation with 2 screws. Capsular decompression and epiphyseal perfusion monitoring can be considered (controversial).
- Intentional closed vs open reduction (controversial)
- In situ screw fixation + primary or delayed Imhauser osteotomy versus modified Dunn procedure via surgical hip dislocation (controversial)



# Treatment

Unstable slip

Safe ----- Controversy on modified Dunn ----- Unsafe


**Modified Dunn Procedure is Superior to In Situ Pinning for Short-term Clinical and Radiographic Improvement in Severe Stable SCFE**

Eduardo N. Novais MD, Mary K. Hill BA,  
Patrick M. Carry BA, Travis C. Hearse MD,  
Ernest L. Sink MD

**CORR 2015**    **7% (1/15) AVN for in situ pinning**  
**7% (1/15) AVN for MDP**

The Bone & Joint Journal, Vol. 101-B, No. 4 | Papers from the International Hip Society

**Patients with severe slipped capital femoral epiphysis treated by the modified Dunn procedure have low rates of avascular necrosis, good outcomes, and little osteoarthritis at long-term follow-up**

T. D. Lerch , S. Vuilleumier, F. Schmaranzer, K. Ziebarth, S. D. Steppacher, M. Tannast,  
K. A. Siebenrock

**Bone Joint J 2019**    **5% (2/40) AVN for MDP**

**The Role of Capital Realignment Versus In Situ Stabilization for the Treatment of Slipped Capital Femoral Epiphysis**

*Christopher D. Souder, MD, James D. Bomar, MPH, and Dennis R. Wenger, MD*

**JPO 2014**

**0% (0/64 stable SCFE) AVN for in situ fixation**  
**20% (2/10 stable SCFE) AVN for MDP**

VS

**Comparison of Surgical Outcomes Between a Triplane Proximal Femoral Osteotomy and the Modified Dunn Procedure for Stable, Moderate to Severe Slipped Capital Femoral Epiphysis**

*Jakub Sikora-Klak, MD,\* James D. Bomar, MPH,† Christina N. Paik, MPAP, PA-C,†  
Dennis R. Wenger, MD,† and Vidyadhar Upasani, MD\*†*

**JPO 2019**

**0% (0/12) AVN for TPFO**  
**29% (4/14) AVN for MDP**

**Modified Dunn should be limited to acute, severe, and unstable slips done in a timely fashion by an experienced surgeon.**

# Treatment

## Unstable slip

### Approach to the Hip for SCFE: The North American Perspective

*Daniel J. Sucato, MD, MS*

*J Pediatr Orthop* • Volume 38, Number 6 Supplement 1, July 2018

**“The poll of North American surgeons demonstrated an equal distribution choosing 1 of 3 options”**

1. In situ pinning followed by delayed reconstructive surgery for symptomatic hips (e.g. Imhauser osteotomy)
2. In situ pinning together with an intertrochanteric osteotomy
3. Corrective osteotomy through the physis (i.e. modified Dunn)



# Treatment

Bilateral slips can occur simultaneously or for the majority of patients within 18 months

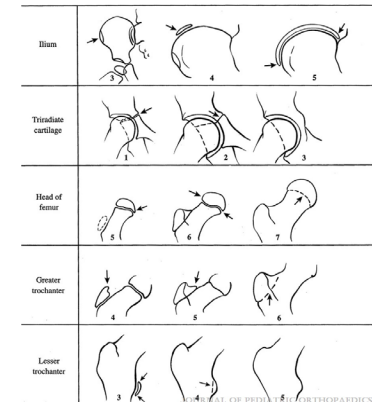
- Prophylactic in situ screw fixation of contralateral normal hip (controversial)
- Boys <12 yo and girls <10 yo
- Atypical SCFE
- Modified Oxford score <19 associated with 96% risk and triradiate score of 1 associated with 89% risk

## Prediction of Contralateral Slipped Capital Femoral Epiphysis Using the Modified Oxford Bone Age Score

Debra Popejoy, MD, Khaled Emara, MD, and John Birch, MD, FRCSC(C)

J Pediatr Orthop • Volume 32, Number 3, April/May 2012

Modified Oxford Bone Score	Developed Contralateral Slip	Remained Unilateral	Probability of Developing Contralateral Slip (%)
16	9	0	100
17	23	0	97
18	16	2	85
19	9	27	44
20	6	58	5
21	1	64	1
22	0	32	1
23	0	11	0
24	0	2	0
25	0	0	0
26	0	0	0
<b>Total</b>	<b>64</b>	<b>196</b>	



# Treatment

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- Boys <12 yo and girls <10 yo
- Atypical SCFE
- Modified Oxford score <19 associated with 96% risk and triradiate score of 1 associated with 89% risk

## What Are the Risks of Prophylactic Pinning to Prevent Contralateral Slipped Capital Femoral Epiphysis?

Wudbhav N. Sankar MD, Eduardo N. Novais MD,  
Christopher Lee MD, Ali A. Al-Omari MD,  
Paul D. Choi MD, Benjamin J. Shore MD, FRCS

Clin Orthop Relat Res (2013) 471:2118–2123  
DOI 10.1007/s11999-012-2680-1

**Table 2.** Incidence and complications of prophylactic fixation

Study	Number of patients	Fixation	Mean followup (years)	Periimplant fracture (number of patients)	AVN (number of patients)	Infection (number of patients)
Dewnany and Radford [8]	65	Single large (7.0-mm) cannulated screw	6.5	0 (0%)	0 (0%)	1 (1.5%)
Ghanem et al. [11]	74	Single large holothreaded screw	5.5	1 (1.4%)	0 (0%)	0 (0%)
Kumm et al. [16]	34	Single large (7.0-mm) cannulated dynamic screw	5.4	0 (0%)	0 (0%)	0 (0%)
Current study	99	Single large (6.5-/7.3-mm) cannulated screw	2.7	2 (2%)	2 (2%)	0 (0%)

AVN = avascular necrosis.



# Treatment

## Postoperative care

- Restricted weight bearing with crutches for 6+ weeks
- WBAT w/o crutches for stable slips and w/ crutches for unstable slips after 6 weeks
- Activities as tolerated for stable slips and wean crutches for unstable slips after 12 weeks
- Activities as tolerated for unstable slips after 6 months
- FU every 3-6 months until skeletal maturity

## Complications

- Postop slip progression
- Contralateral slip
- Femoral head avascular necrosis
- Chondrolysis
- Post SCFE femoroacetabular impingement +/- labral tear and chondral degeneration

# Conclusion

- SCFE is the most common hip disorder in adolescents
- Chronicity, severity, and stability classifications can help guide treatment
- Current standard of care for stable SCFE is in situ screw fixation
- Management of unstable SCFE is more controversial and evolving
- Evaluate presence and risk of bilateral SCFE
- Many controversies exist and further studies are needed to optimize patient care and long-term outcomes after SCFE

# Thank You!

Michael.Chau@ucsf.edu

