The Unstable Slipped Capital Femoral Epiphysis
Rate of AVN in Unstable SCFE - What Should the Young Orthopaedist Do?
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Introduction
• The ultimate goal of the management of SCFE is to prevent or correct femoral head deformity that might lead to early symptoms and gait abnormalities, and late osteoarthritis.
• This is achieved by interventions to achieve the following objectives:
  1. Stabilize the physis
  2. Minimize the eventual deformity by:
     ▪ Early reduction, &/or
     ▪ Stabilizing physis and inducing early closure to prevent further slip
     ▪ Later corrective osteotomy (if necessary)
  3. Avoid complications especially AVN
• The success of an intervention should be judged by its effectiveness to achieve these 3 objectives.

Avascular Necrosis (AVN)
• Avascular necrosis might be a consequence of
  1. The natural history of some SCFE
     A. The original insult
     B. Compounded by other factors: eg. delay in treatment
  2. The treatment itself
     A. The reduction maneuver
     B. The surgical approach; some types of osteotomies
     C. Malpositioned screw/s in the femoral head
• Risk factors associated with AVN and incidence \(^1,2,3,4\)
  1. Most prognostic risk factor: Physeal stability
     A. Unstable Slip: AVN rates vary 10% to 60% \(^2\)
     B. Stable SCFE: Practically 0%
  2. The unstable slip with severe displacement is at highest risk

What is an “Unstable Slip”?
• Definition of the Unstable Slip (Loder): “Classified a slip as unstable if the child had such severe pain that walking was not possible even with crutches, regardless of the duration of the symptoms.”
• This definition has been shown to be the most prognostic factor for risk of AVN\(^1,2,4,5,6\)
• An Unstable slip by this definition is a relatively uncommon event: only 10% -20% of all SCFE

Problems with the definition
  1. Definition is variably interpreted in the literature:
A. Patient who presents non-weight bearing but walking with crutches is often misclassified as unstable. This was meant to be stable. An unstable slip is so painful akin to a fracture.

B. All unstable slips are acute, but not all acute slips are unstable. The term “acute” slip is often used interchangeably with “the term “unstable” and therefore misclassified as unstable.

2. It is a proxy for instability
   A. Recent study suggests that some “stable” slips are intra-operatively shown to be “unstable” (Ziebarth et al)

Consequences of Misclassification
1. Might explain the huge variation in the reported rates of AVN in “unstable” SCFE
2. Might explain a disproportionately high rate of “unstable” SCFE in some series
3. Estimates of the effectiveness of treatments to reduce the rate of AVN are unreliable.
   • Inclusion of some “stable” slips misclassified as “unstable” will have a dramatic reduction of the rate of AVN, independent of the method of treatment!!
   (assuming that the Loder definition of unstable is as prognostic as we believe it to be)

Reducing the Risk of AVN
AVN is best managed by prevention and next best by minimizing the consequences. This requires:
   • Understanding which slips are at risk and performing an intervention that can reduce that risk by restoring the blood supply before irreversible necrosis has occurred.
   • Understanding what aspects of our treatment contribute to the risk of AVN, and
     1. Avoiding these during our treatment: (eg. forced manipulations)
     2. Performing an intervention that allows us to achieve the objectives listed in the introduction, that has a lower or no risk of inducing AVN.
   • Mitigating the effects of established AVN
     1. Early detection (Rhoad et al) allows for early intervention
     2. Role of bisphosphonates, etc? (Ramachandran et al)
     3. Late: ??

Current Management Strategies for the Unstable SCFE 7-15
1. A “gentle” or “positional” reduction of the slip followed by in situ stabilization with 1 or 2 screws, (with or without capsulotomy to evacuate hematoma); Deal with residual deformity later.
2. An open reduction by
   a. Surgical dislocation that includes strat’egies to remove impediments to the blood flow, followed by internal fixation (Slongo et al; Ganz et al)
   b. Capsulotomy, evacuation of hematoma, and “controlled gentle reduction followed by internal fixation (Parsch)

• Questions that arise
  1. Which is better?
  2. In whose hands?
3. What is the optimal timing?16
4. Our experience at the Hospital for Sick Children
   • High complication rate with our initial experience of open reduction by surgical dislocation for truly unstable slips. No reduction in AVN rate.

My Recommendations to the “Young” Orthopaedist
1. A “gentle” or “positional” reduction of the slip followed by in situ stabilization with 1 or 2 screws
   • If this is truly unstable, they will reduce anyway
   • Use fracture table: position affected limb in internal rotation to get patella anterior. (Don’t force) Move c-arm not the leg.
   • Consider evacuation of hematoma20
2. Meanwhile, learn how to do a open reduction by safe surgical dislocation (while you are “young”)
   • The safe surgical dislocation is extremely useful procedure to have in your armamentarium: with many potential applications (Rebello et al)
   • Open reduction technique for SCFE is more than just the technique of surgical dislocation
3. After you have learned this technique, you can adopt it:
   • If the evidence shows true effectiveness of this procedure for unstable SCFE, or
   • Contribute to the evidence of its true effectiveness (or not) by studying your patients prospectively (ideally in the context of a trial).
4. Meanwhile we (young and old) should be studying SCFE prospectively:
   • To standardize our definitions and classification systems of SCFE
   • Validate these (and the prognostic factors associated with AVN)
   • Contribute to or await the results of other treatments to mitigate the effects of AVN when it does occur (as we are unlikely to ever eliminate that risk entirely.)

References: