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CORR Insights®: Is Assessment of Femoral Head Perfusion During Modified Dunn for Unstable Slipped Capital Femoral Epiphysis an Accurate Indicator of Osteonecrosis?

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Where Are We Now?

Few conditions are guaranteed to generate controversy amongst pediatric orthopaedic surgeons as much as unstable slipped capital

This CORR Insights® is a commentary on the article “Is Assessment of Femoral Head Perfusion During Modified Dunn for Unstable Slipped Capital Femoral Epiphysis an Accurate Indicator of Osteonecrosis?” by Novais and colleagues available at: DOI: 10.1007/s11999-016-4819-y.

The author certifies that he, or a member of his immediate family, has no funding or commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.

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This CORR Insights® comment refers to the article available at DOI: 10.1007/s11999-016-4819-y.

femoral epiphysis (SCFE). Loder [3] coined the term “unstable SCFE” in 1993, and defined it in clinical terms as a patient with a SCFE who is unable to weight bear, even with crutches. However, even that simple definition is not entirely agreed upon [3, 7, 8]. No published studies, individually or in systematic review, have been sufficiently powered to answer basic questions regarding unstable SCFE [8]. Among the questions: What should be the diagnostic criteria? What is the optimal timing for treatment? Which treatment is best?

There is agreement that osteonecrosis of the femoral head is the most dreaded complication and is not a rare occurrence. The proportion of patients who develop avascular necrosis (AVN), its causes, the risk factors, and the effects of various treatments of unstable SCFE all

remain unclear [2–4, 6–8]. A multicenter study designed to determine results of contemporary treatment, sponsored by the Pediatric Orthopedic Society of North America had to be discontinued [1].

The current report by Novais and colleagues is a step towards better understanding of the viability of the epiphysis in patients who have an unstable SCFE. While performing the modified Dunn procedure, the authors assessed vascularity of the epiphysis by observing blood flow from a drill-hole in the epiphysis and by using an intracranial pressure monitor. Total lack of blood flow before dissection and after fixation revealed a risk of osteonecrosis of the femoral head.

Where Do We Need To Go?

We need to know whether the diagnostic techniques described in the current study or other techniques such as laser Doppler flowmetry are generally reliable to assess epiphyseal viability. We need to

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know why the risk of AVN seems to vary so widely, especially between the United States and Europe. Perhaps essential differences in the populations, such as BMI or genetic or racial differences could account for observed different risks of AVN. Indeed, in the current study, BMI was a confounding factor. The incidence of SCFE differs considerably across various racial groups. The highest incidence in the world is amongst male Maori children, almost one per 1000, almost 10 times that of the general incidence in the United States [5]. Perhaps there may also be genetic differences in terms of risk of osteonecrosis. Reports such as that by Palocaren and colleagues [4] have suggested the risk of AVN in unstable SCFE may be higher amongst females and African Americans. Definitive conclusions cannot be made because studies have been underpowered and methodology often suboptimal. There may be heretofore unmeasured patient factors that influence results. Investigators typically have not accounted for comorbidities such as autism, which may be detrimental to outcome. For example, an overweight child with severe behavior problems and poor nutrition may be more likely to develop AVN and collapse of the femoral head because of poor bone quality and inability to cooperate with weight bearing restrictions.

How Do We Get There?

The results of the present report are promising. The authors made a 2-mm drill-hole in the proximal femoral epiphysis then recorded the presence or absence of blood flow both before and after performing a modified Dunn procedure. Further they placed an intracranial monitor into the drill-hole and observed presence or absence of pulsations prior to and following reduction of the epiphysis. In order to definitely demonstrate reliability and reproducibility of these tests, a larger cohort will be necessary. A well-powered study with adequate numbers of patients with unstable SCFE would be attainable only by recruiting dedicated surgeons at several centers. Given the pace of technologic advances, it is safe to assume we soon will have even more sophisticated techniques to evaluate blood flow in bone. Currently, the refinement of diffuse correlation spectroscopy for measurement of blood flow may be promising [2].

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