DEM Journal Club

Article Appraisal

Article: Boutis, Plint, Stimec et al. Radiograph-negative lateral ankle injuries in children: occult growth plate fracture or sprain? JAMA Pediatr 2016;170(1):e154114. doi: 10.1001/jamapediatrics.2015.4114.

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Background and Study Objective(s):

Our understanding of pediatric growth plate injuries stems from a landmark paper by Salter and Harris published in 1963 in which they state: “epiphyseal plates in children are weaker than surrounding ligaments and are therefore more likely to be disrupted by traumatic forces”. Thus, radiographic-negative injuries in children near growth plates are presumed to represent occult Salter-Harris I (SH I) injuries and are managed with 3 to 6 weeks of immobilization. Children are followed by an orthopedic surgeon for up to a year and subjected to numerous repeat radiographs. This paper challenges the long-standing dogma that children sustain physeal injuries before sustaining ligamentous injuries, and proposes less aggressive management for simple lateral ankle injuries in children.

Study Design:

Prospective cohort study of 140 children aged 5-12 years with presumed occult distal fibular SH I fracture based on: 1) negative radiographs, 2) tenderness and swelling over the lateral aspect of the distal fibula at the level of the physis, and 3) limited weight-bearing. All children were treated with removable air stirrup ankle braces and followed for 3 months. Participants underwent an MRI of both ankles within 7 days of injury. All children were seen by an orthopedic surgeon one month after the injury was sustained, and had repeat radiographs done. Functional outcomes were assessed by asking parents to complete a validated questionnaire about the physical function of their child at baseline and one month after injury. Parents were also questioned about return to usual activities and weight-bearing status at one and three months post-injury.

The primary outcome was the proportion of children with Salter-Harris I Distal Fibular Fractures (SHIDF). The secondary outcomes were the functional recovery of children with and without a proven growth plate fracture at 1 month, the return to full weight bearing “most of the time”, and the proportion of other injuries identified in the ankle.

Results:

Four children (3.0%) had an MRI confirmed SHIDF. One hundred and eight children (80%) had ligament injuries, 34% of which were associated with occult avulsion fractures. There were no statistically significant differences in functional outcomes between children with either SHIDF or avulsion fractures and children without fractures. At one month post-injury, 72% of children achieved full painless weight bearing, and this improved to 96% at three months post-injury.

Validity of Results:

This was a well-designed study with careful attention to mitigating biases in the collection and analysis of results. Each image was reviewed by 3 different radiologists who were blinded to diagnosis, original reports, and each other's reports. The patient's unaffected ankle was the internal control for the MRI analysis. Research assistants conducting follow-up calls were also blinded to the patient's MRI results, but orthopedic surgeons assessing the patients in clinic were unblinded.

While the study was adequately powered to determine the incidence of SHIDF (primary outcome), it was under-powered to determine whether a statistically significant difference in functional outcomes exists between those with a proven growth plate injury and those without (secondary outcome). In addition, though not an objective of this paper, three months is likely inadequate follow-up time to determine whether or not SHIDF have any long-term functional consequences. A parental questionnaire may not be the most objective or reliable measure of functional outcome, and further objective measures maybe helpful to examine the functional outcome of children who sustain lateral ankle injuries. Finally, the Journal Club noted that the population of children aged 5-12 years is a heterogeneous group encompassing a variety of developmental stages of the physis, however the authors did not include a subgroup analysis with respect to outcomes.

Generalizability of Results:

The study results can be generalized to children between the ages of 5 to 12 years with radiographic-negative lateral ankle injuries. The results cannot be generalized to management of younger patients or those with occult growth plate injuries at other sites such as distal tibia and radius.

The Bottom Line:

This paper has convincingly debunked the long-standing dogma that kids will sustain physeal injuries before they sustain ligamentous injuries in lateral ankle injuries. The Journal Club agreed that the authors present strong evidence that children aged 5-12 years with radiographic-negative lateral ankle injuries do not need casting and should be managed with a removable brace and return to activities as tolerated. This is a practice-changing paper for some physicians, and affirms existing practice for others. The Journal Club agreed that current evidence does not support the need for routine orthopedic consultation. Instead, primary care follow-up with selective referral for children who fail to return to baseline functional status at three months post-injury is probably appropriate.