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Toddler's Fracture; False Positive Radiologic Considerations

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1. Abstract

Toddler's fracture is an undisplaced or minimally displaced fracture, typically seen in toddlers, usually in the tibia. It is known as a difficult diagnosis to establish, considering both the clinical symptoms and radiologic findings may be subtle. In this case we represent a case which was suspected of having tibial Toddler's fracture based on the clinical and radiologic findings, and suggest a normal variant in the differential diagnosis.

2. Introduction

Fracture of the tibia is a well-known, often occult cause of limping and leg pain in young children following a low energy trauma and twisting injury. This fracture which is typically known as "Toddler's fracture" forms a hairline, oblique fracture in the shaft of tibia [1]. The diagnosis of a Toddler's fracture could be puzzling at the time of presentation as the history of trauma is often vague, the physical examination of the limping child is mostly inconclusive and the radiological evidence may be subtle. Due to this confusing clinical picture, most experts recommend that in cases with a strong suspicion of Toddler's fracture, even if no radiographical evidence existed, limb support should be offered with a cast or splint, for a duration of 3–4 weeks. Conversely, it is recently suggested that there may be no difference in recovery time between treatment of a Toddler's fracture with or without immobilization [2]. A variety of other fractures that are less well known and just as difficult to detect can occur in the tibia and the foot in young children. These fractures include plastic bowing and buckle-type fractures, especially of the fibula; impaction, compression, or stress (fatigue) fractures of the tibia and fibula. On the other hand, some normal anatomic variations can be remarkably similar to the non-displaced spiral tibial fracture in their clinical appearance and should be kept in mind before deciding to expose the child and his family to an unnecessary and annoying treatment strategy. Here, we present a normal anatomic variation misdiagnosed by fracture line in tibial x-ray of a limping toddler [3-6].

3. Case Scenario

A ?-year-old male presented to the pediatric rheumatology clinic with leg pain. Two days before, the child had a history of falling down, and his mother reported pain and limping in his left leg since then. However, the child had been playing happily throughout the past two days. His mother was understandably concerned. The patient was otherwise healthy [7,8].

On physical exam, vital signs were normal, the child was sitting comfortably and he was freely moving his left leg and foot. No evidence of ecchymosis or obvious deformity was visible in both legs and they were neurovascularly intact. However, by compression of the leg, the child expressed some discomfort in the proximal tibia [9]. Even though, no obvious tenderness was detectable, the mentioned discomfort, raised the suspicion to Toddler's fracture. X-ray radiographs of the leg were obtained (Figure 1). The radiographs revealed obliquely oriented lucent line in the proximal tibia suggestive of Toddler's fracture. The child underwent casting for 2 weeks. After cast removal, the child's mother was concerned due to the continuance of limping and pain in the left leg. The child underwent repeated X-ray study which showed the previously visualized lucent line being unchanged (Figure 2a) and casting was repeated for another two weeks. Two weeks later (four weeks after the onset of symptoms) the cast was removed. However, not only the pain and limping in the left leg was not resolved, pain in

the right leg was also reported, without any history of recent trauma. As before, physical examination revealed no findings other than discomfort in compressing proximal tibias. Radiographs were obtained of both tibias, revealing the lucent line in the left proximal tibia being unchanged (Figure 2b), and a similar lucent line depicted in the right proximal tibia with more vertical orientation (Figure 2c). The lines presumed to be irrelevant to the trauma, so the child was followed without any treatment. Clinical symptoms were resolved two weeks later.

Figure 1: Obliquely oriented lucent line (arrows) in the proximal tibia in the anteroposterior and lateral radiographs of the left leg, presumed to be Toddler's fracture, in the child with related history, sign and symptoms.

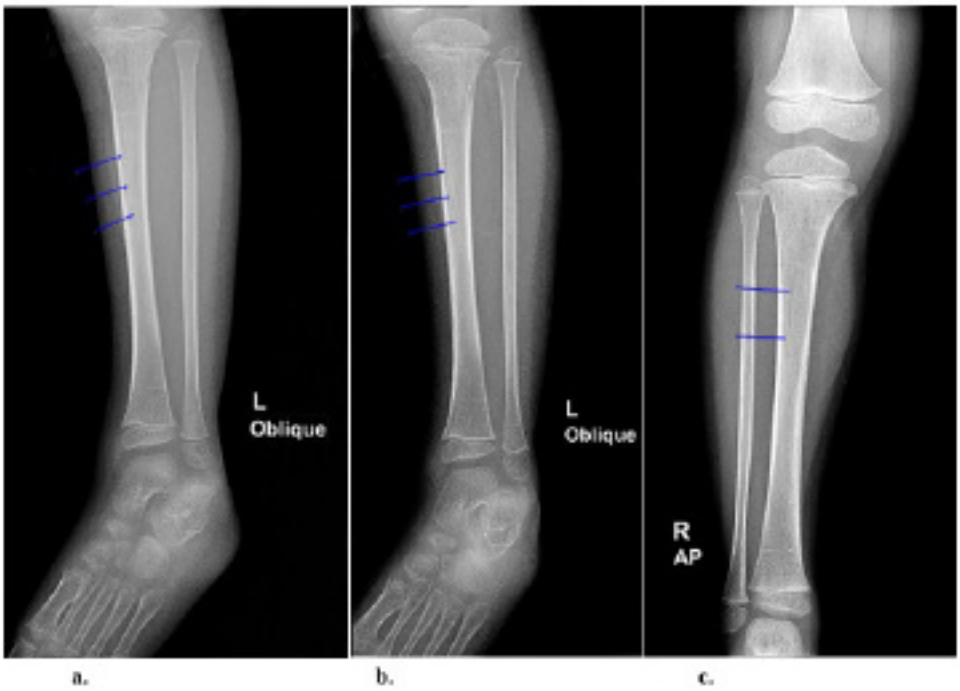

Figure 2: (a, b) Obliquely oriented lucent line (arrows) being unchanged after two and four weeks of casting, respectively.
(c) Similar lucent line (arrows) being visible in the proximal right tibia, but with more vertical rather than oblique orientation. Well corticated margins, more vertical orientation and lack of obvious cortical disruption in the affected bone are indicative hints which could be against the existence of true fracture.

4. Discussion

Initially described in March 1964, by Dunbar et al, Toddler's fracture was defined as a subtle non-displaced or minimally displaced fracture of the tibia in children aged between 9 months and 3 years. In a toddler with difficulty in weight bearing, not only the clinical data may be limited, but also the plane radiographs may be confusing with the fracture line being only be visible in one view and obscured in the rest. The initial radiographs may even be negative for fractures, however, in a highly suspected Toddler's fracture, immobilization has to be considered and follow-up radiographs should be obtained.

In our case, in addition to the highly indicative clinical picture, the initial radiographs were also suggestive of Toddler's fracture, hence immobilization could have been an accurate choice. However, during the follow up, our patient became symptom-free despite lacking changes in the radiographic findings. Interestingly, this case highlights the importance of considering false positive possibilities in initial radiographs of limping toddlers. The presence of radiographic findings in both legs and lack of resolution during the follow up suggests anatomic variations as the most probable explanation. Of normal anatomic structures in the bones, the feeding vessels are known to mimic oblique fractures in the plane radiographs. Furthermore, some authors believe certain fractures in the tibia can either initiate from the nutrient vessel foramen or its superomedial aspect. So the appearance, location and course of a normal feeding artery may be similar to a fracture in the tibia. To differentiate between the normal vessel and fracture, one should inspect well corticated margins and more vertical rather than more horizontal orientation of an oblique feeding vessel. Another clue which could be an aid in differentiating such cases, is the cortex of the affected bone (i.e. tibia), in which cortical disruption would be detected in real fractures.

It is reported that following the suspected diagnosis of Toddler's fracture, placement in a cast or splint is associated with a larger number of orthopedic follow-up visits and repeated radiographs resulting in greater exposure to ionising radiation, and thus leading to greater costs for the healthcare providers. This perspective should motivate the radiologist to put more effort in ruling out the possible differential diagnoses more efficiently.

5. Conclusion

In radiographic evaluation of a child with suspected Toddler's fracture, feeding arteries could mimic fracture line. Well corticated margins, more vertical orientation and lack of obvious cortical disruption in the affected bone are indicative hints which could be against the existence of true fracture.

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