Case Report

ED point-of-care ultrasound in the diagnosis of ankle fractures in children

Abstract

In pediatric ankle injury, radiography is the current standard used to differentiate fracture from ligamentous injury; however, the associated cost, increased time, and radiation exposure pose a significant downside to this imaging modality. Point-of-care ultrasound may be an attractive alternative in this setting, as illustrated by this patient case. A 14-year-old boy presented to the emergency department with a left ankle inversion injury sustained while playing soccer. An emergency physician performed ultrasound examination that revealed findings consistent with a nondisplaced Salter-Harris I fracture of the distal fibula. The results of a formal radiograph confirmed this diagnosis. This case report presents the successful use of point-of-care ultrasound for detection of a Salter-Harris I ankle fracture, describes a stepwise approach for this new diagnostic technique in detail, and discusses its value in the setting of pediatric ankle injury.

Ankle injuries are frequent in children, especially in the setting of sports-related trauma. The differential diagnosis for ankle injury in a child includes ankle sprain (ligamentous damage) or fracture. Radiography is the criterion standard used to differentiate fracture from sprain; however, the associated cost, increased time in the emergency department (ED), and ionizing radiation exposure pose a significant downside to this imaging modality. Patel et al [1] demonstrated the utility of point-of-care, clinician-performed ultrasound in detecting fractures of the forearm and wrist in pediatric patients. Existing radiology literature also suggests that sonography can detect occult fractures of the pediatric ankle [2]. We believe that point-of-care ultrasound should be considered as an alternative or adjunct to radiography in the setting of pediatric ankle injury. The prevention of exposure to ionizing radiation makes it a particularly attractive modality for use in this population. The case below highlights the ability of point-of-care ultrasound in the ED to diagnose a pediatric ankle injury, in this instance, a Salter-Harris I (SH I) fracture.

A 14-year-old boy presented to the ED with a left ankle inversion injury sustained while playing soccer. The patient stated that he heard a pop and subsequently was unable to ambulate secondary to pain. Physical examination was notable for mild swelling and bony tenderness over the lateral malleolus.

The treating emergency physician performed a point-of-care ultrasound ankle examination using a 13-6 MHz linear array transducer (SonoSite MicroMaxx, Bothell, WA). First, the fibular bone shadow was located 5 cm proximal to the point of maximum tenderness of the injured ankle using a transverse view. Once the bone shadow was centered on the screen, the transducer was rotated 90° to a longitudinal view of the fibula. From this position, the probe was moved distally down the leg past the lateral malleolus to assess for breaks in the continuity of bone cortex, abnormalities of the physis, or fluid under the periosteum. Using the same technique, this examination was then repeated on the nonaffected ankle to provide a reference for normal anatomical appearance.

Sonographic images of the injured left ankle revealed subperiosteal fluid at the level of the metaphysis and distal fibula and widening of the physis (Fig. 1) as compared with the uninjured right ankle (Fig. 2). These findings were consistent with a nondisplaced SH I fracture of the distal fibula. A subsequent radiograph (Fig. 3) as read by the attending radiologist revealed a slight widening of the distal fibular physis with adjacent soft tissue swelling, consistent with the diagnosis of SH I fracture. The patient’s ankle was immobilized with a removable brace, and he was discharged home with instructions to ice the ankle and to avoid weight-bearing activities until the pain subsides.

We enthusiastically present this case as an example of the diagnostic ability of point-of-care ultrasound to assess pediatric ankle fractures. This is the first description of a diagnosis of SH I ankle fracture made by emergency physician by performing point-of-care ultrasound in the ED. Other authors have demonstrated that point-of-care ultrasound may be comparable to radiography in the diagnosis and management of upper extremity fractures in the pediatric population [1]. We believe that the same may hold true for lower extremity fractures. Simanovsky
et al [2] showed that ultrasound is effective for the detection of radiographically silent fractures of the pediatric ankle. This suggests that ultrasound may even have certain diagnostic advantages over radiography.

In our opinion, there is a need for alternatives to radiography in this clinical situation. Existing literature shows that, at most, 17% of radiographs taken for pediatric ankle injuries reveal a visible fracture [3]. Despite this low positive yield, most of these children undergo radiography. Clinicians often apply the Ottawa Ankle Rules (OAR) in adults with ankle injury to reduce the number of radiographs ordered. Yet literature suggests that patients younger than 16 years are not routinely screened with the OAR [4]. In the pediatric ED, ankle radiographs may be overused without application of the OAR. In this situation, point-of-care ultrasound could be the answer. Sonography has already been proven to reduce the number of required radiographs in the diagnosis of pediatric long bone fractures [5]. A large prospective study is needed to assess whether it is diagnostically comparable to radiography and to measure its impact on time and monetary savings.

We introduce the successful use of point-of-care ultrasound for detection of a bony SH I ankle fracture and describe this new technique in detail. Emergency department physician–performed point-of-care sonography as compared with radiography can potentially provide a faster diagnosis without the harmful effects of ionizing radiation. Further research should directly compare point-of-care ultrasound to radiography with respect to accuracy, patient satisfaction, time, and cost.

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