Abstract:

An understanding of the pediatric bony anatomy is necessary to guide the evaluation and treatment of children who present with injuries of the ankle and foot. All bones can be involved in a fracture, including Salter-Harris fractures of the distal tibia and fibula and a variety of foot fractures. Of special consideration are the Tillaux, Triplane, Lisfranc, Jones, and avulsion of the fifth metatarsal fractures. Treatment of each patient must be individualized and determined by fracture type, severity and displacement, and patient age. The goal of treatment is satisfactory reduction with avoidance of complications, specifically physeal damage or arrest. Follow-up with an orthopedic surgeon after the acute visit is necessary for long-term monitoring. Instructions for patients after evaluation include cast care and reasons to return to the emergency department.

Keywords:

ankle fracture; foot fracture; Lisfranc fracture; Jones fracture; Triplane fracture; Tillaux fracture

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1522-8401

Pediatric Ankle and Foot Injuries

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Injuries of the ankle and foot are common complaints for pediatric patients presenting to primary care offices, urgent care centers, and emergency departments. Ankle fractures account for 5% of all pediatric fractures and 9 to 18% of growth plate injuries. The peak incidence of ankle fractures occurs between 8 and 15 years of age. [1-3] Foot fractures account for 5 to 8% of pediatric fractures.[2,4] Evaluation and management require understanding of the pediatric anatomy; a careful history; focused examination; and, often, radiographs to best care for the patient.

ANKLE INJURIES

Normal Anatomy

The ankle is a hinge joint stabilized by ligaments that include the medial and lateral collateral ligaments, medial superior deltoid ligament, anterior and posterior inferior tibiofibular ligaments, and the 3 lateral ligaments (anterior talofibular ligament, calcaneofibular ligament, and posterior talofibular ligament).

The tibia and fibula are both long bones. All pediatric long bones have 4 structural components: the diaphysis, metaphysis, physis, and epiphysis. The diaphysis consists of the shaft of the long bone. The metaphysis is the widened portion of the long bone between the diaphysis and the epiphysis. The physis is the growth plate between the metaphysis and epiphysis. The epiphysis is the rounded end of the long bone, covered with cartilage, that articulates with the other bones in the joint (Figure 1A).[5]

The bones of the ankle include the distal tibia and distal fibula, which articulate with the talus.[5] The medial and lateral malleoli are the bony projections of the tibia and fibula, respectively (Figure 1B).[5] Understanding the closure of the tibial

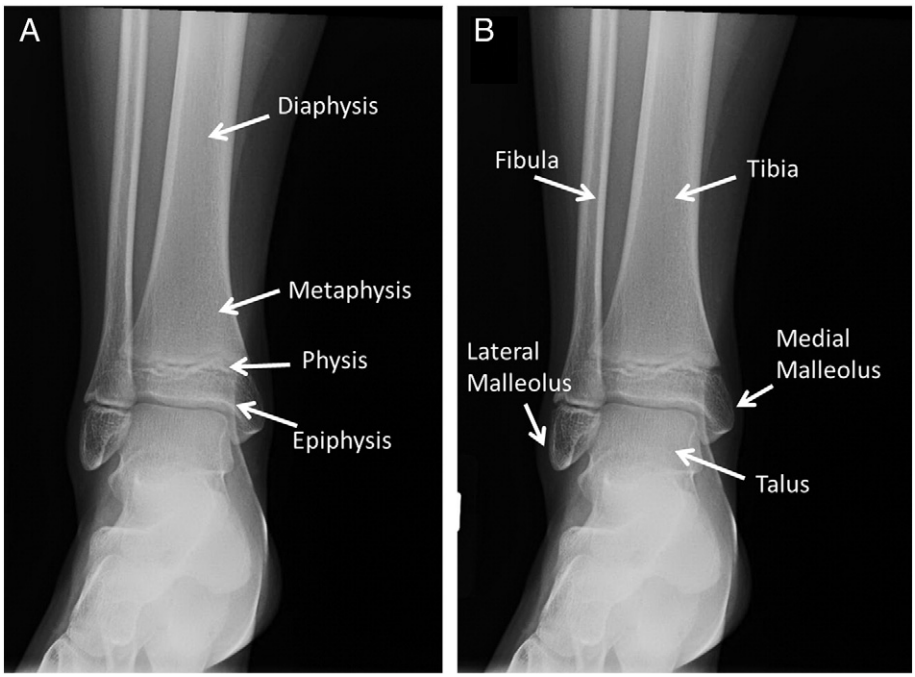

Figure 1. A, Normal ankle anatomy. B, Illustrated here are the 4 structural components of the long bone: the diaphysis, metaphysis, physis (growth plate), and epiphysis.

growth plate is of importance because unique patterns of injury occur in adolescence. It closes from the medial to the lateral aspects over an 18-month period between 12 and 15 years of age (Figure 2). Closure typically begins earlier in females compared to males with complete closure occurring by 20 years of age.[1,3,5-7]

Evaluation of Ankle Injuries

Evaluation of children with ankle injuries requires a detailed history, including mechanism of injury, and examination. Plain radiography is often necessary. When obtaining radiographs, anterior-posterior (AP), lateral, and mortise views should be obtained.[1,3] The mortise view allows for visualization of

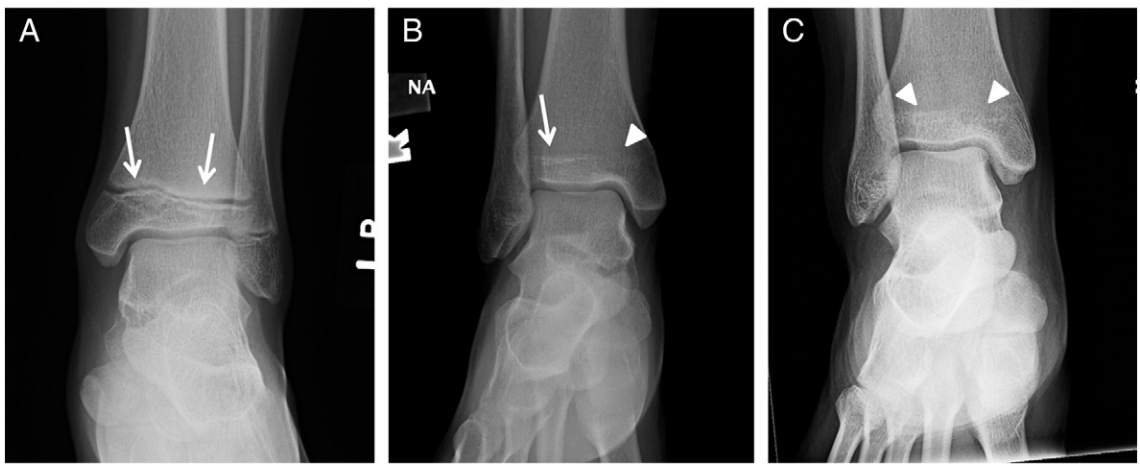

Figure 2. Transitional closure of the tibial physis occurs as the child reaches skeletal maturity. In young children, the physis is completely open (arrows) (A), followed by transitional closure as the medial physis closes (arrowhead) and the lateral physis remains open (arrow) (B), and resulting in complete closure of the physis by late teen years (arrowheads) (C).