Case 9296

Sonographic diagnosis of an apophyseal injury of the fifth metatarsal
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Imaging Technique: Conventional radiography
Case Type: Clinical Cases
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Patient: 13 years, male

Clinical History:

A 13-year-old boy, an elite footballer, presented with localised pain on the lateral aspect of the left foot. The pain worsened with weight-bearing/running and excluded prompt return to sports activity. The medical history revealed that the patient sustained an inversion injury of the foot one week prior to admission.

Imaging Findings:

Physical examination revealed swelling and tenderness on palpation over the proximal 5th metatarsal, restriction in the range of motion and mild warmth. He was initially treated for an ankle sprain and was treated with cast immobilisation and weight-bearing restriction, to be applied for three weeks. The patient removed the cast and ceased the weight-bearing restriction and despite continuous pain participated in the team’s vigorous training. An ultrasound examination demonstrated fragmentation of the apophysis of the 5th metatarsal bone (Fig. 1). Plain radiographs verified an avulsion fracture at the proximal 5th metatarsal bone (Fig. 2). The clinical history, the overuse activity despite symptoms, together with the imaging findings established the diagnosis of an acute traction apophysitis-fracture. The patient was treated with immobilisation in a cast with strict weight-bearing restriction for 6 weeks. He was allowed to return to full sport activities four weeks post cast removal.

Discussion:

Skeletally immature patients present with different types of injury than those seen in adults. The repetitive forces applied to the immature skeleton may lead to overuse injuries and stress fractures that are unique for the pediatric athlete [1-4]. Apophyses or traction epiphyses are found at the insertion site of muscles and tendons and play a role in bone development. They consist of columns of growth cartilage that unite tendon with bone [1-4]. Due to the fact that skeletal muscles and tendons are more resistant to stress than the apophyseal growth plate, repetitive microtrauma or macrotrauma may result in apophyseal avulsions and if left untreated to chronic traction apophysitis [1, 3-4]. The complex ligamentous and tendinous structures (dorsal, plantar cuboideometatarsal, intermetatarsal, capsular ligaments, the peroneus brevis tendon and the lateral band of the plantar aponeurosis) that provide stability to the lateral Lisfranc joint play a significant role in traction injuries at the fifth metatarsal base [5, 6]. However, avulsion fractures and apophysitis are a clinical diagnosis and not a radiological one. The delayed maturation of the secondary growth centre should not be confused with traction apophysitis or avulsion fracture in the absence of clinical symptoms [3-7]. The normal 5th metatarsal apophysis (as with many other ossification centres in the developing skeleton) may be fragmented. The differentiation of this normal variant from an acute avulsion injury is
based on the clinical history-findings and physical examination. The morphology of the fragmented apophysis may also provide additional diagnostic information. Os vesalianum, a normal variant, should also be differentiated from acute or chronic avulsion injuries. The radiographic appearance of this ossicle as well as the lack of symptoms aids in the correct diagnosis [3-7].

Our patient sustained an inversion injury that was presumed to be an ankle sprain. The identical mechanism of injury (inversion and plantar flexion) as in ankle sprains and the same treatment protocols applied in both conditions could be an explanation of the low incidence of acute apophyseal injuries in the medical literature [3-7]. What makes our case unique is the fact that, to the best of our knowledge, this is the first report of the sonographic evaluation of this acute apophyseal injury. In routine sports imaging, ultrasound of the small joints has gained enough attention in recent years because it can detect and assess traumatic injuries with accuracy comparable to or even better than MRI [8].

**Differential Diagnosis List:** Apophyseal avulsion fracture of the fifth metatarsal, Normal fragmented apophysis, Os vesalianum

**Final Diagnosis:** Apophyseal avulsion fracture of the fifth metatarsal

**References:**


Description: The transverse (a),(b) and the longitudinal (c),(d) sonographic images in the area of the fifth metatarsal base demonstrate the fractured apophysis. Origin:
Figure 2

**Description:** The oblique radiograph (a) and the magnification view (b), show the avulsion injury and the fragmentation of the apophysis. Note the soft tissue oedema in a (asterisk) and the malalignment of the apophyseal fragments. **Origin:**