

The Isolated Volkmann Fracture

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Abstract

Sprain injuries of the ankle are a very common injury in the trauma department. However, the clinical appearance and X-ray findings may not be congruent. Radiological signs of injury can be only subtly noticeable on films. In these cases, the clinical suspicion is crucial for establishing the diagnosis with appropriate further investigations, which, in turn, can yield surprising findings.

Keywords: *Isolated Volkman Fracture; Fracture of the Tibial Plafond; Ankle Sprains*

Introduction

Ankle sprains are very common injuries, accounting for 10% to 15% of all sports-related injuries [1]. In the general population, the incidence rate of ankle sprains is estimated to be 2.15 to 2,66 per 1000 person-years, which translates to approximately 0.215% per year [2,3]. Of course, in injury-prone sports, their share is 5 fold higher. They affect the casual or the professional athlete but are also very common as trivial injury in everyday life. The assessment follows a critical evaluation for the need of X-rays followed by possible recommendations for further investigations. The interpretation of X-rays requires a critical evaluation of the clinical findings. The accuracy of X-ray films in 2 planes is estimated at 85 to 98% [4,5]. Our case presented with a sprain injury and images that revealed only very subtle signs for a possible higher degree of injury.

Case Report

A 32-year-old female patient presented in a wheelchair in casualty. She missed a step on stairs, which made her foot falling down 2 steps. During this incident, her foot "twisted". Upon further inquiry, she described that it twisted in a forced supinated manner. Weight-bearing was not possible afterwards.

The physical examination of the ankle showed a rather diffuse soft tissue swelling over the distal fibula, extending into the anterior joint space. The anterior part of the joint was puffy and tense. There was no bony tenderness over the proximal or distal fibula. However, the patient experienced pain on anterior mobilization of the distal fibula and during Frick and Squeeze tests. The plantar flexion and dorsiflexion were indicated as painful at the beginning of her movements. She appeared neurovascularly intact



Figure 1: XR images of the right ankle in two planes.

X-rays of the ankle in two planes were conducted. At first glance, the images appeared unremarkable. However, the lateral view shows a short cortical irregularity that could have been misinterpreted as a vascular channel.



Figure 2

The subsequent CT scan revealed the true nature of the injury as an isolated non-displaced fracture in the dorsal tibial plafond. The talofibular joint remains congruent without dislocation of the fibula.

The patient received a “Moon walker” and forearm crutches. Immobilization without weight-bearing was determined to 3 weeks, followed by partial mobilization with passive physiotherapy until the 6th week, depending on the healing progress. Subsequently, gradual weight-bearing was introduced, leading to full weight-bearing over the next 4 weeks.

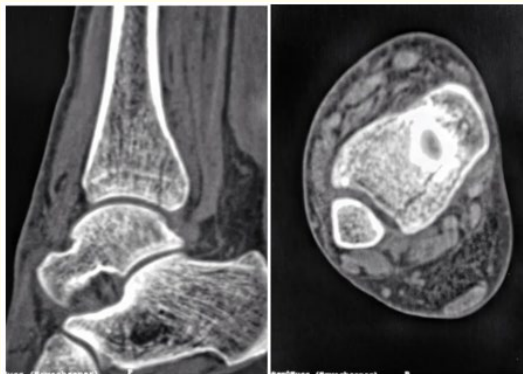


Figure 3: CT scan showing fracture extension into the dorsal tibial plafond.

Discussion

Isolated Volkmann fractures of the ankle are relatively rare and occur in less than 1% of cases [6]. They are more frequently observed in combination with other ankle fractures, particularly as part of Weber B or C fractures [7,8].

The mechanism involves an extensive plantarflexion followed by an axial impact of the talus against the posterolateral part of the malleolus. The taut state of the syndesmosis forces it to tear off the dorsal incisural angle at the distal tibia, including an articular component of varying extent. Generally, small and non-displaced fragments can be identified. Accompanying injuries include a tear of the anterior tibiofibular ligament or parts of the interosseous membrane or the posterior tibiofibular ligament. Usually, neither the fibula nor the medial structures of the ankle are affected.

The diagnosis can usually be made by radiographs. However, the number of missed fractures varies between 1% [9] to 9% [10] and entails many factors, e.g. the technical aspects, e.g. quality of images or imaging technique, but also the clinical quality of examining. Common reasons for missing ankle fractures include the inadequate physical examination, an unreliable patient history (e.g. altered mental status, intoxication), the misinterpretation of X-rays or truly occult fractures. But also the severity of trauma can lead to a lower detection rate. In high-energy or poly-trauma cases, the sensitivity of X-rays can be significantly lower, e.g. 87% for calcaneal fractures, 78% for talar fractures and 25 - 33% for midfoot fractures [11].

In our case, the clinical presentation and X-ray findings could not be reconciled. Swelling over the lateral malleolus is the leading symptom in sprains with ligament injuries or distal fibula fractures. A joint effusion without radiological correlation, however, required clinical experience in the interpretation of the images and the clinical signs. At that stage, it may be highlighted that some fractures can be undetectable on radiographs because they are simply undisplaced. These fractures are symptomatic and have the appropriate clinical findings and mechanism of injury, but they are not clearly evident on radiographs. Radiograph findings are falsely negative, because the method itself is insufficient to reveal the fracture. With a high clinical index of suspicion, further evaluation with additional imaging is typically required. The cortical irregularity had to be questioned, making the indication for CT logical. It turned out to be a fracture extension of the Volkman triangle, which was certainly surprising.

Without displacement, the treatment was conservative. MRI scans at a later stage could exclude an involvement of the syndesmosis ligaments. The integrity is important for the stability of the ankle and a relevant factor for OA [12,13]. Bony union of the tibial margin and healing of the ligaments can be expected within three to six weeks without weight-bearing but immobilization, followed by three weeks

of weight-bearing in a walking boot or cast. However, larger and displaced fragments usually require surgical stabilization. The prognosis can be expected to be favorable. Most patients show an excellent or good result [14].

Conclusion

This case illustrates the importance of a thorough clinical examination and appropriate interpretation of imaging in ankle injuries. The Volkmann fracture, which involves the posterior malleolus of the tibia, can be easily missed on plain radiographs [15]. CT imaging proved crucial in confirming the diagnosis in this case. The patient's mechanism of injury, involving forced supination, is consistent with the typical cause of Volkmann fractures [16]. Despite the lack of obvious displacement, the presence of pain and functional impairment warranted further investigation, leading to the correct diagnosis of this isolated Volkmann fracture.

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