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Osteonecrosis of distal tibia in open dislocation fractures of the ankle

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ABSTRACT

Introduction: Open ankle dislocation fractures are one of the most severe injuries of the ankle. Development of posttraumatic arthrosis is well known. However, there are just a few case reports describing evidence of posttraumatic osteonecrosis (PON) of distal tibia. The pathophysiological mechanism remains unclear and the question of morphologic or personal risk factors cannot be answered. The goal of this study was to evaluate the morphologic characteristics of open dislocated ankle fractures in correlation with the development of PON to facilitate early identification of patients with higher risk of posttraumatic osteonecrosis.

Material and methods: In this study data from 28 patients with open dislocation fractures of the ankle between 1975 and 2006 found at our databases were evaluated retrospectively. For each patient we documented personal data, mechanism of injury, type of lateral malleolar fracture, severity of open fracture, degree of tibiotalar dislocation, presence of medial malleolar fracture, presence of deltoid ligament rupture, time until joint reduction and kind of surgical treatment. We also documented clinical complications and number of surgeries. Presence of PON was examined by radiographs, magnetic resonance imaging (MRI) or histological analysis.

Results: Within 12 out of 28 patients with open ankle dislocation fractures a PON of the distal tibia could be found. Nine out of 15 patients with high-energy trauma and 12 out of 19 patients with type C fibular fracture developed PON. 73% of male patients and 88% of the patients with type III soft tissue damage according to Gustillo developed PON. However, if patients suffered from type C fibular fracture, total talus dislocation and grade III soft tissue damage ("necrotic triad") PON was developed in 100% of cases. Other patient's characteristics like late joint reduction, postoperative infection or bimalleolar fracture showed no higher proportion of patients with PON.

Conclusion: In this study we were able to identify clinical manifestations and risk factors for the development of PON of the distal tibia. All indentified risk factors were associated with heavy fracture mechanisms leading most likely to a serious devascularisation of at least parts of the distal tibial epiphysis. With regard to presented results early identification of patients with higher risk of PON might be possible and maybe additional treatment options can be initialised to protect patients from this process.

Introduction

Open and dislocated ankle fractures count amongst the most severe injuries of the ankle. However, concerning injury-related complications published data are quite rare. Some cases of severe tibiotalar joint destruction after open dislocation fractures of the ankle have been reported [1]. Within the majority of these cases a posttraumatic osteonecrosis (PON) of the distal tibial epiphysis leading to a progressive collapse and a loss of joint function was described [2–6]. Most patients ended up with an ankle arthrodesis. Up to now the aetiology of the necrosis of the distal tibia in dislocated ankle fractures even after meticulous osteosynthesis remains unclear. Therefore evaluation of potential risk factors is requested, because early detection of the necrosis and subsequent therapeutic management seem to be important [6–8].

The aim of this study was to analyse retrospectively all documented open fracture dislocations of the ankle looking for specific risk factors and morphologic characteristics of these fractures for possible causative relation with the occurrence of PON.

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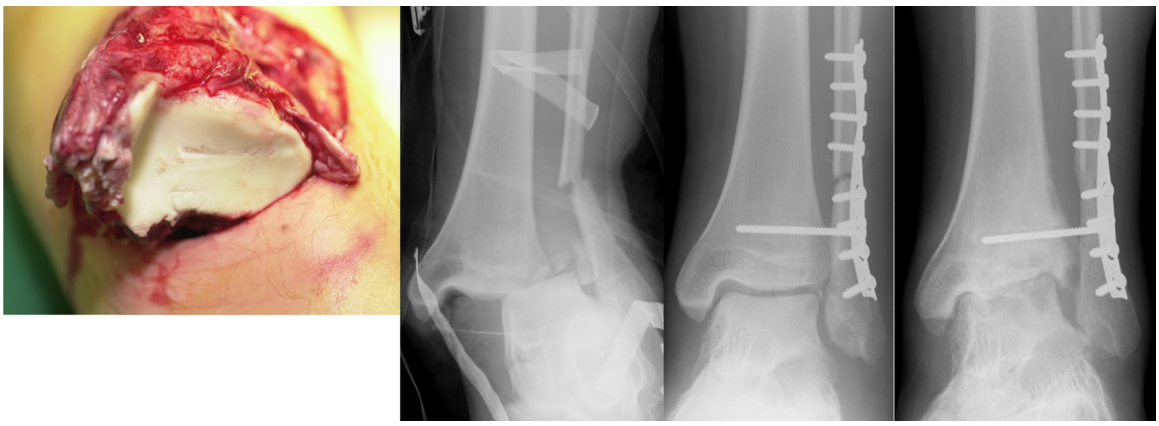

Fig. 1. (Case 21): WD, male, 28 years at the day of the accident, after the osteosynthesis and after 1 year.

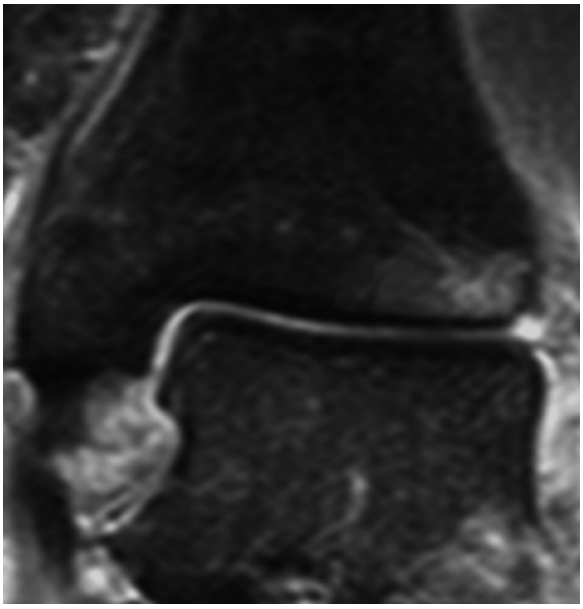

Fig. 2. (Case 21): MRI of the ankle with suspected PON of the lateral tibial epiphysis.

Introductory case report (case 13 Table 1)

A 28-year-old man suffered of a 3rd degree open malleolar fracture caused by a heavy fall of 5 m (Fig. 1). Twenty-four days after primary external fixation internal osteosynthesis followed with adequate retention of reposition. Magnetic resonance imaging (MRI) showed suspicion of PON of the lateral tibial epiphysis (Fig. 2). A drill biopsy out of the lateral tibial epiphysis confirmed the suspicion and presented a big area of PON (Fig. 3), surrounded by some still vital areas. Five months after osteosynthesis the patient still suffered of swelling and pain. The X-ray presented a slight lateral narrowing of the ankle joint. After 12 months the lateral tibial epiphysis was totally impacted in valgus position leading to a relative overlength of the fibula (Fig. 1).

Materials and methods

Twenty-eight patients with open dislocation fractures of the ankle between 1975 and 2006 found at our databases at the Kantonsspital Liestal, Switzerland were evaluated retrospectively. Closed ankle fractures and ankle fractures without joint dislocations were excluded from the study. Personal data, mechanism of injury as well as impact of injury (high or low) were noted. Types of

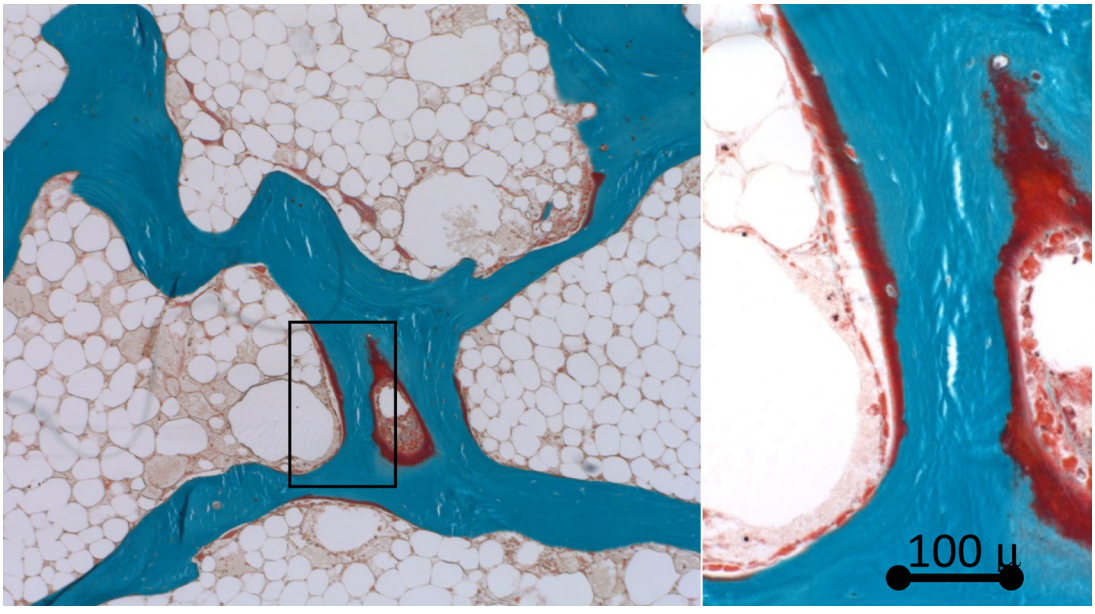

Fig. 3. (Case 21): drill biopsy out of the lateral tibial epiphysis. Area with total necrosis of the bone and marrow tissue.