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Use of Focused Shock Waves in an Acute Talar Head Fracture

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Abstract

Talar fractures are rare and can be difficult to manage. Even in the absence of complications, the treatment of this type of injury can be prolonged and uncomfortable for the patient. Focused shock waves have been shown to be effective in the treatment of delayed unions and non-unions. In this case report, we share our experience with the use of focused shock waves in an acute talus fracture in a patient with risk factors for healing.

Keywords: Talus, Talar fractures, Shock waves, Bone marrow edema

Introduction

Talar fractures represent only 0.85% of all body fractures [1]. Fractures localized in the talar head are even rarer and have been associated with high complication rates [1, 2]. About two-thirds of the talus is covered with cartilage limiting the periosteal blood supply. Another peculiarity is the absence of tendinous insertions. The anatomical characteristics of this bone can frequently lead to complications of its fractures such as avascular necrosis and non-unions [3, 4]. Even in the absence of complications, the treatment of this type of injury can be prolonged and uncomfortable for the patient. Focused shock waves have been shown to be effective in the treatment of delayed unions and non-unions due to their ability to generate upregulation and expression of various pro-angiogenic and pro-osteogenic growth factors, stimulating bone healing [5]. Although in most studies focused waves have been used in cases of fracture healing failure, their use has also been proposed in acute injuries [6]. In this case report, we share our experience with the use of focused shock waves in a talus head fracture in a patient with risk factors for healing.

Case Report

A 52-year-old female patient, with a history of epilepsy and chronic arterial hypertension, both under treatment, height 153 cm and weight 85 kg (body mass index of 36.3), severe asthma with use of oral and inhaled corticosteroid therapy, hypovitaminosis D in supplementation, and no smoking habit, was received in consultation.

On April 01, 2024, she slipped on a wet surface, complaining pain on the medial aspect of the left ankle, and limitations in axial load. Inspection revealed edema and diffuse ecchymosis on the anterior and medial aspects of the ankle.

Initial ankle radiographs did not demonstrate any acute traumatic injury. Given the persistence of symptoms, it was decided to evaluate the area with magnetic resonance imaging (MRI) on April 17, 2024. MRI demonstrated extensive bone edema of the talus, with the presence of a trabecular subchondral fracture at the level of the talar head (Fig. 1).

Taking into consideration the patient's underlying pathologies: Grade II obesity according to the World Health Organization criteria, therapy with systemic corticosteroid and hypovitaminosis under treatment; extracorporeal focused shock waves application was decided to accelerate the healing process and reduce bone marrow edema.

A BTL 6000 piezoelectric device was used. Five sessions were carried out with a weekly interval, 3000 impacts per session, with an energy density flux of 0.31 mJ/mm2 (70% level of energy in BTL devices) with a frequency of 10 Hz.

The following therapeutic measures were added: ambulation with total unload with the use of two Canadian canes and rehabilitation to maintain joint range of motion, proprioception exercises, and strengthening of extrinsic and intrinsic muscles, also without load.

A follow-up MRI was performed on June 03, 2024, which demonstrated complete resorption of the bone edema and total healing of the talar trabecular fracture (Fig. 2).

Discussion

Fractures of the talar head, including osteochondral fractures are rare, they account for 2.6–10% of all talus fractures [4]. The natural history of talar head fractures is largely unknown, as only case reports are published in the literature [4]. The literature on talar head fractures is limited [2]. Orthopedic treatment of talus fractures is prolonged over time: The non-displaced fractures of the head and body can be treated by casting the foot and ankle in a neutral position for 6 weeks.

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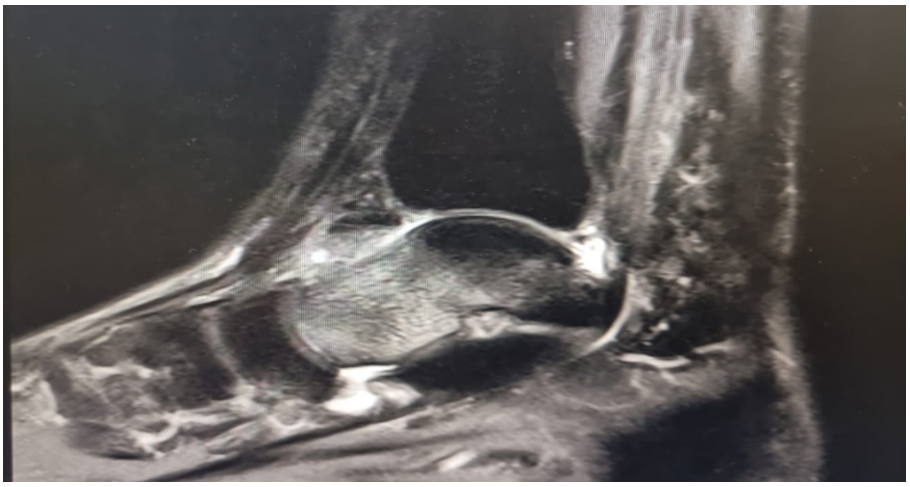

Figure 1: Subchondral fracture at the level of the talar head and extensive bone edema of the talus.

Partial weight bearing is required for approximately 8–10 weeks until radiographic proof of union of the fracture is obtained [7].

The talus is 60–70% covered in articular cartilage and has no muscular attachments [8]. The head of the talus is completely covered by cartilage.

The blood supply of the talus has a tenuous, unique, and delicate pattern, with several vessels contributing, but all of them are of low caliber; the predominantly cartilaginous surface greatly limits the available regions for perforating perfusion [4].

The rate of non-union is highly variable, with rates ranging from 3% to 20% [9, 10, 11]. Talus non-union or malunion are poorly tolerated, given the bone's multiple joint articulations, and its role as the cornerstone of weight transfer between the tibial and foot [4].

The patient in the case presented had risk factors for developing complications [12].

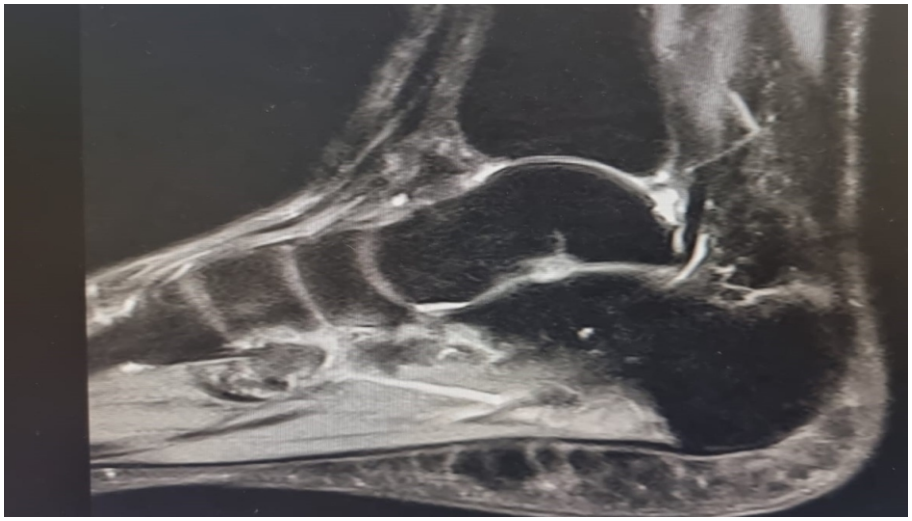

Figure 2: Resonance image after the application of focused shock waves.

She was obese, under corticosteroid therapy, and suffered hypovitaminosis D in supplementation at the time of initial consultation.

There is a large literature on the relationship between obesity and bone. The increasing body weight causes an increase in bone mineral density (BMD), both due to a mechanical effect and due to the greater amount of estrogen present in adipose tissue [13]. However, despite an apparent strengthening of the bone evidenced by increased BMD, the risk of fracture is greater. The increased risk of fracture in obese subjects is due to various factors [13]. These factors can be divided into metabolic alterations and increased risk of falls. The rate of fracture union is also compromised [13].

The effect of corticosteroids in terms of decreasing bone matrix density is well known [14]. Hypovitaminosis D predisposes to the occurrence of fractures [15, 16].

Wang et al. demonstrated that shockwaves generate upregulation and expression of various pro-angiogenic and pro-osteogenic growth factors, stimulating bone healing [5, 17]. This same author proposed the acute use of focused waves in acute high-energy fractures with a high risk of non-union in a randomized controlled trial [6]. At 12 months, the rate of non-union was 11% for the study group versus 20% for the control group [6].

Considering the characteristics of the patient and the injury and in light of Wang's experience, we decided to use shock waves in this case of talus fracture.

Conclusion

The use of focused shock waves in the present clinical case allowed, in our opinion, to accelerate the time and ensure the total healing of the talar fracture in a patient with risk factors for delay or non-union. It was possible to maintain a rehabilitation process throughout the treatment period, unlike the usual orthopedic procedure.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflicts of Interest: Nil. **Source of Support:** None.

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