

## Case Report

## Closed total talar dislocation without fracture in a rare college athlete case

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## ARTICLE INFO

## Keywords:

Talus  
Total talar dislocation  
Closed reduction  
Avascular necrosis

## ABSTRACT

Total talar dislocation without a fracture is an extremely rare injury. It is often the result of high-energy trauma, such as that incurred after a fall, or owing to motor or vehicular accidents. Talar dislocations have poor outcomes owing to the frequent complications of infection, avascular necrosis and osteoarthritis attributed to open dislocations.

We report herein a closed total talar dislocation without a fracture in a college athlete who was injured during sports activities. Specifically, a 20-year-old man was injured during a soccer game this led to a closed total talar dislocation. We performed closed reduction with image guidance subject to a popliteal sciatic nerve block, and placed a plaster cast below the knee. Radiographic studies after reduction revealed no associated fractures. After an eight week no-weight bearing period, we confirmed that there were no avascular necrosis signs on magnetic resonance images. Based on these findings, partial weight bearing was allowed. At 18 months post trauma, the athlete continues to play soccer despite the fact that he experiences a slight pain and limited range of motion. The blood supply to the talus is limited, and trauma, such as dislocation, can easily injure the blood supply, thus resulting in complications, such as avascular necrosis. The talus vascularity of the presented case was maintained by superior branches. We think that it is important to a) perform closed reduction early on, b) avoid any type of surgical operation that damages the limited talus blood supply, and c) allow weight bearing after the lack of avascular necrosis signs is confirmed. Although there is no standardized treatment, the talar dislocation treatment should be chosen to preserve the blood supply to the talus as much as possible.

## Background

Total talar dislocation is a rare injury often accompanied by other fractures such as malleoli or talus fractures. It is usually the result of high-energy trauma such as a fall. The outcome is poor because of complications such as infection and avascular necrosis (AVN) caused by the open dislocation [1].

Herein, we report the case of closed total talar dislocation without fracture resulting from a sport-related injury.

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## Case presentation

A 20-year-old man was injured during a soccer game when he landed on his left foot stepped on another player's foot, and landed in a supination. The patient had a deformity of the left foot and ankle joint and experienced walking difficulties, so he was brought to the Emergency Department of our hospital. Upon arrival, the physical examination revealed a medially shifted hindfoot and a supinated forefoot, and no open injury.

There was no sensory loss, and the capillary refill  $\leq 2$  s. X-rays and computed tomography (CT) (Fig. 1) revealed a left lateral total talar dislocation without fracture (Leitnar classification type 1b). At 2 h following the injury subject to a popliteal sciatic nerve block, we performed closed reduction with image guidance. X-rays and CT after reduction revealed no fracture (Fig. 2). Magnetic resonance imaging (MRI) after reduction revealed disruptions of the calcaneofibular ligament and superficial and deep layers of the deltoid ligament and bone bruise of the talar head, and the anterior talofibular ligament was attached to the Os subfibulare. A plaster cast below the knee was applied on the ankle in the neutral position for six weeks and weight bearing was avoided for eight weeks.

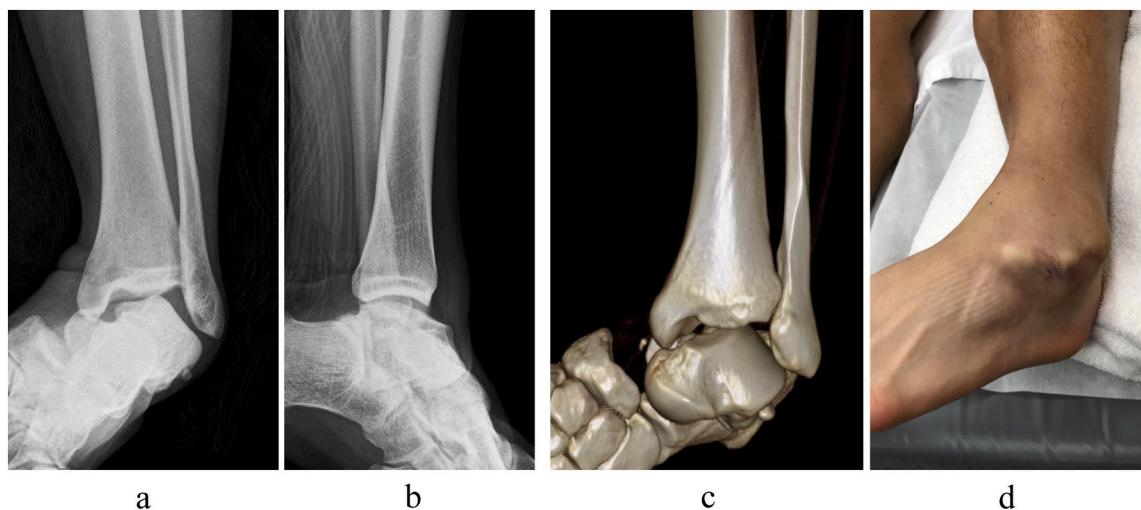
MRI conducted after eight weeks following trauma showed the repaired deltoid ligament and no signs of osteonecrosis, such as the depression of talar dome and talar head (Fig. 3). We allowed partial weight bearing after we confirmed that there were no signs of osteonecrosis on MRI. Weight bearing was increased every two weeks, and full-weight bearing was allowed at three months following the trauma. The patient started jogging at four months following the trauma and agility-based movements at five months following the trauma. At six months following trauma, there were no complications based on imaging study findings, such as AVN (Fig. 4). The athlete was then able to return to competitive sport activities.

At 18 months following the trauma, the AOFAS ankle and hindfoot score was 79 and ankle range of motion included a 15° dorsiflexion and a 30° plantarflexion. Although he still experiences slight pain and limited range of motion, he continues to play soccer.

## Discussion

Total talar dislocation is defined as the dislocation of the talus from the tibiotalar, talocalcaneal, and talonavicular joints, which accounts for only 3.4% of talar injuries [2]. It is often the result of high-energy trauma such as a fall or motor vehicular accident. In a systematic review of 86 cases of total talar dislocation, Weston et al. reported that 73 (85%) were open dislocations and 13 (15%) were closed [1]. The open dislocation outcomes are poor owing to the frequent complications of infection, AVN, and osteoarthritis. Closed total talar dislocations without fracture were reported in 8 (9%) of 86 cases. It is an extremely rare injury [1].

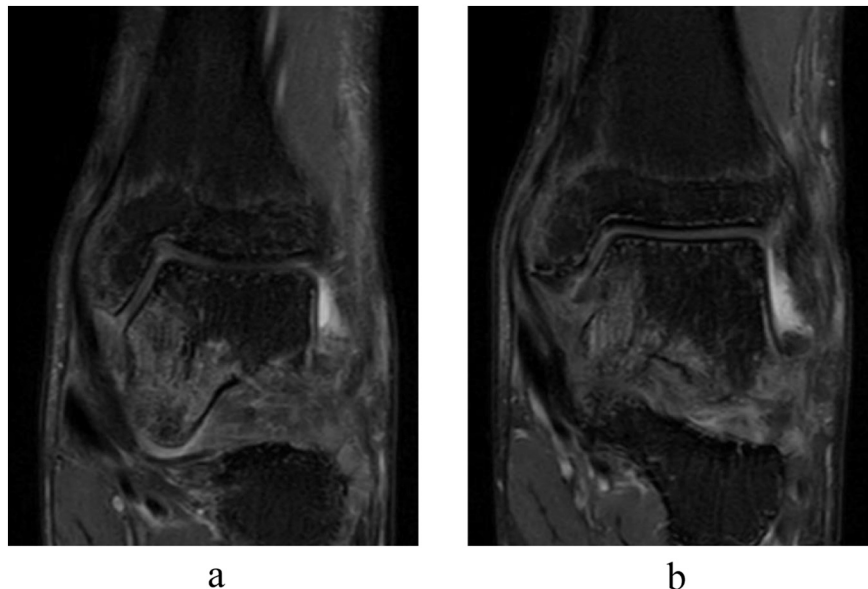
Approximately 60% of the surface of the talus is covered by articular cartilage. Thus, only a limited part of the surface is available to provide an adequate blood supply. The blood supply to the talus is attributed to three arteries: the anterior tibial, the posterior tibial, and the peroneal arteries. The delicate blood supply from the anastomosis of each branch can be easily disrupted by injury, such as talar dislocation, and can cause complications, such as AVN [3–5]. Initial fracture displacement, timing of reduction, and soft tissue handling can potentially affect the integrity of the talar blood supply. If one of the three major arteries is preserved, the blood supply to the talus is preserved and the possibility of osteonecrosis of the talus is reduced. The main blood supply to the talus is through the artery of the tarsal canal, which is a branch of the posterior tibial artery [6]. Hosny reported that the preservation of the deltoid or posterior process branches, which branch off the posterior tibial artery, may have helped avoid osteonecrosis [3]. Xarchas et al. reported that there is clinical and radiological (bone scan, MR angiogram) evidence that in cases of complete anterolateral dislocation of the talus, the vascularity of the bone is maintained by these superior branches via anterior soft tissue attachments [4]. In our case, the



**Fig. 1.** Initial X-rays in anteroposterior view (a), lateral view (b) and three-dimensional (3D) computed tomography (CT) (c) showed left total talar dislocation. Patient's foot (d) revealed a medially shifted hindfoot, a supinated forefoot, and no open injury.



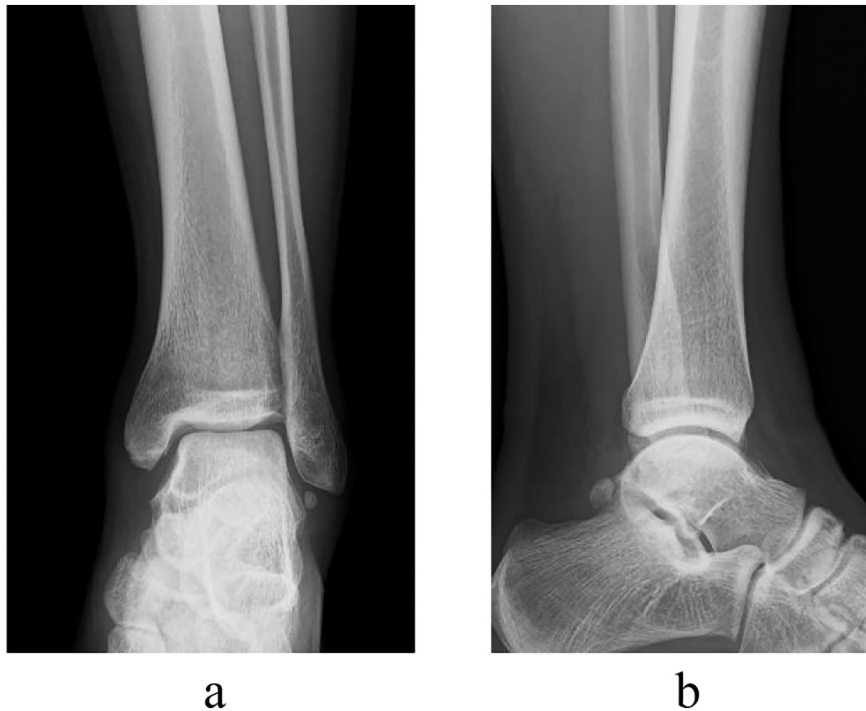
**Fig. 2.** X-rays after reduction in anteroposterior (a) and lateral views (b) revealed no fracture. Coronal, proton-density weighted magnetic resonance imaging (MRI) revealed disruption of superficial and deep layers of the deltoid ligament (c) and bone bruise of the talar head (d).



**Fig. 3.** Coronal proton-density weighted MRI after eight weeks post trauma (a, b) revealed the repair of the deltoid ligament and no signs of osteonecrosis, such as depression of the talar dome and head.

patient was a soccer player, and we considered repairing the deltoid ligament to ensure the stability of the talotibial joint. However, we chose a conservative treatment for the deltoid ligament to avoid damage to the limited feeding artery caused by the surgical operation. The talus vascularity might have been maintained by these superior branches through anterior soft tissue attachments, via the anterior tibiofibular ligament attached to Os subfibulare.

In the past, many authors recommended open reduction [4,7,8]. However, open reduction can have a negative influence on the blood supply of the talus after dislocation. Recently, early closed reduction was recommended to attempt closed talar dislocations to avoid injury to surrounding soft tissue and delicate blood supply network. Failure to achieve reduction may require open reduction. Yousef et al. reported that closed anterolateral total talar dislocation cases in the literature treated by closed reduction showed no AVN signs [8]. It is recommended to start weight bearing after confirming the revascularization of the talus and the absence of AVN signs [2]. The Hawkins' sign is an early predictive marker of revascularization that can be observed on X-rays and a reliable indicator to dismiss the occurrence of AVN [6,9]. MRI remains the most specific and sensitive imaging modality for the detection of early development of AVN. It is important to exclude AVN by imaging studies, especially MRI, at the start of weight bearing [6,8,10]. In our case, we performed closed reduction subject to a popliteal sciatic nerve block. After an eight week non-weight bearing period, we



**Fig. 4.** X-rays after six months following trauma in anteroposterior (a) and lateral views (b) revealed no AVN signs.

confirmed that there was no AVN sign in MRI. This allowed partial weight bearing. The factors that contributed to the successful outcome in our case were 1) protection of soft tissues and preservation of the blood supply to the talus by early closed reduction, 2) early rehabilitation, 3) avoidance of damage to the feeding artery caused by the surgical operation, and 4) onset of weight bearing after we confirmed the lack of AVN signs based on MRI.

The limitation associated with the study's findings is the possibility of occurrence of future complications such as AVN and osteoarthritis due to the short follow-up period.

### Conclusions

Owing to the limited blood supply of the talus and frequency of open injuries, talar dislocation leads to poor outcomes. We reported a college athlete's case of closed total talar dislocation without fracture who was treated with closed reduction and maintained good clinical and functional outcomes. Although there is no standardized treatment for these clinical cases, it is imperative to perform an appropriate treatment to preserve the blood supply of the talus.

It is important to perform early closed reduction and avoid any surgery, such as ligament repair, and to allow weight bearing after the lack of AVN signs is confirmed.

### Funding

None.

### Declaration of competing interest

The authors declare that there are no relevant conflicts of interest.

### Acknowledgements

The authors would like to thank Enago ([www.enago.jp](http://www.enago.jp)) for the English language review.

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