

## C A S E R E P O R T

# Talus dislocation and pereinon malleolar fracture after high-energy trauma: a case report

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**Abstract.** Talus dislocation is a rare injury and it is usually the consequence of high energy traumas, despite the anatomical features of the talus which predispose to its dissociation (absence of muscle insertions with over 60% of the surface covered by cartilage). It may be associated with malleolar fractures. Standard treatment of closed talar dislocation is a controversial issue. The most common early complications is avascular necrosis. Authors report a case of a complete talar dislocation associated to displaced lateral malleolar fracture in a 18-years-old male following a high energy trauma treated by closed reduction and fixation of the malleolar fracture.

**Key words:** talus, fibula, dislocation, fracture, trauma

## Introduction

Complete talus dislocation is usually the consequence of high energy traumas; it may be associated with malleolar fractures.

It has been demonstrated that the force necessary to dislocate the talus has to exceed the body weight by five times, thus often causing concomitant lesions of the bone, ligamentous and skin components and resulting in difficult wounds healing due to poor coverage of the soft tissues (1).

In 1811 Dufarest and Judey first described a subtalar dislocation, a rare condition characterized by the loss of contact of the talus with calcaneus and navicular bone. This type of lesion represents 1% -2% of all dislocations and 1% of traumatic foot injuries and it mainly interests middle-aged male subjects (2).

Fabricus instead first described a complete dislocation of the talus in 1680 and treated it by talectomy (3).

Ideally, a valid classification system should allow the identification of a certain type of lesion indicating the causal mechanism and any associated ligamentous/bone damage.

One of the most used system classified this lesion according to the direction in which it occurs (4):

- medial (80-85% of cases -trauma in plantar flexion and inversion of the foot and in external rotation of the talus)
- lateral (15-20% of cases - trauma in eversion of the foot and in internal rotation of the talus)
- posterior (2.5%) or anterior (<1%) (following forced plantar flexion of the foot and subsequent traction in the rear /front direction of the talus).

Lietner described lateral and medial total talar dislocations as sequelae of either forceful supination or pronation respectively (5). On the other hand, Pinzur and Meyer described a pure posterior dislocation as a result of forceful dorsiflexion associated with posterior thrust to the foot (6).

The dislocation is defined as pure in the absence of associated fractures; the presence of peritalar fractures may negatively affect prognosis and increases the risk of developing post-traumatic osteoarthritis (7-9).

In case of high-energy trauma involving the foot and ankle with suspicion of talar dislocation is necessary:

- to inspect the skin surface in order to exclude exposure areas, soft tissue impairment and/or neurovascular deficit
- to perform initially 3 projections X-rays ( antero-posterior, lateral and oblique) in order to define the direction of the dislocation and the possible presence of associated fractures
- to perform subsequently a CT scan, which better studies the lesion and it allows the identification of associated fractures and intra-articular bone fragments (10).

Authors report a case of a 18 years old man with a talus antero-lateral dislocation associated to lateral malleolar fracture following an high energy trauma (motorcycle accident).

### Case report

A young man (FZZ, 18 years old), following a car accident (motorcycle versus car), suffered of an isolated trauma to the right lower limb with undefined dynamic. In the emergency room, local physical examination showed:

- swelling and deformity of the anatomical profile of the right ankle (Figure 1)
- fixed plantar flexion of the foot and supination of the forefoot
- absence of peripheral vascular/nervous impairment
- tight skin but intact.

X-rays demonstrated a complete antero-lateral dislocation of the talus with rotation of the talus of almost 90° around its horizontal axis and fracture Weber type A of the fibular malleolus that was displaced postero-medially below the Achilles tendon (Figure 2). The patient, in order to avoid soft tissue compromise, avascular necrosis, and the onset of peripheral vascular deficiency underwent surgery without performing a diagnostic CT scan.

Under spinal anesthesia he was subjected to:

- closed reduction of the talar dislocation and fixation with a 2 mm K wire (Figure 3)
- postero-medial incision to remove the fragment of the dislocated lateral malleolus (Figure 4)
- osteosynthesis with a Hau-ban cerclage of the fibula by lateral incision (Figure 5)



**Figure 1.** Clinical image of the right ankle at the arrival in the emergency room.

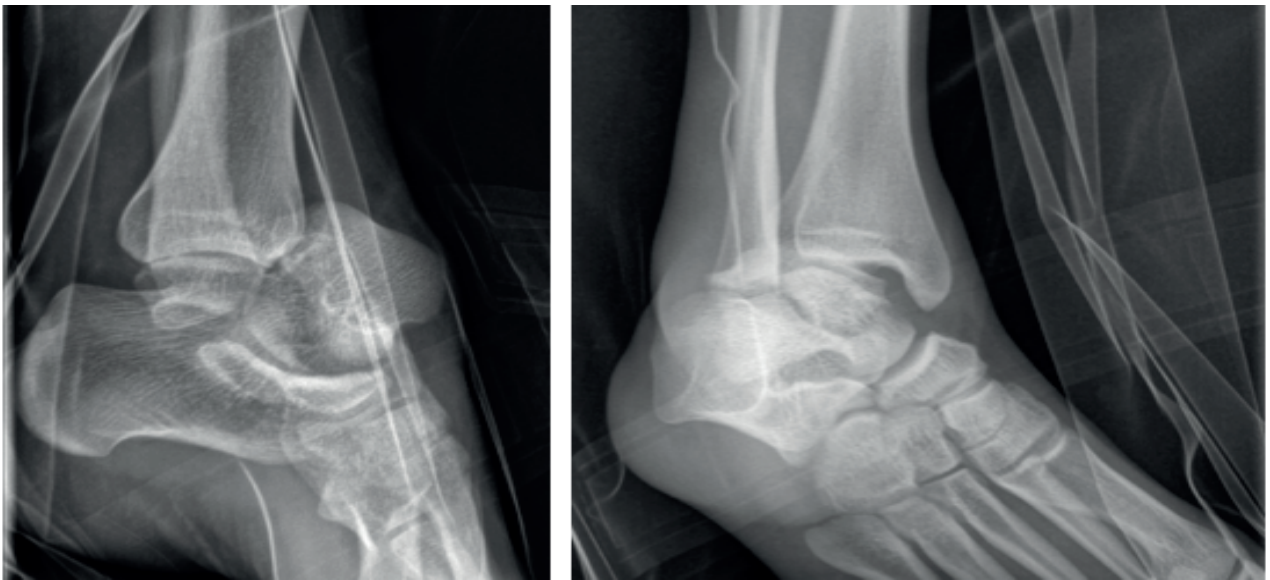
- final fluoroscopic check (Figure 6)
- immobilization in an ankle boot.

Thirty days after surgery a radiograph was performed and the K wire placed for temporary arthrodesis was removed. Ten days later partial load was granted (30% of body weight) with the use of not articulated Walker brace and of two crutches. The total load has been progressively reached over a further 40 days in which passive and active physiotherapy has been associated, in order to recover the full range of motion (ROM).

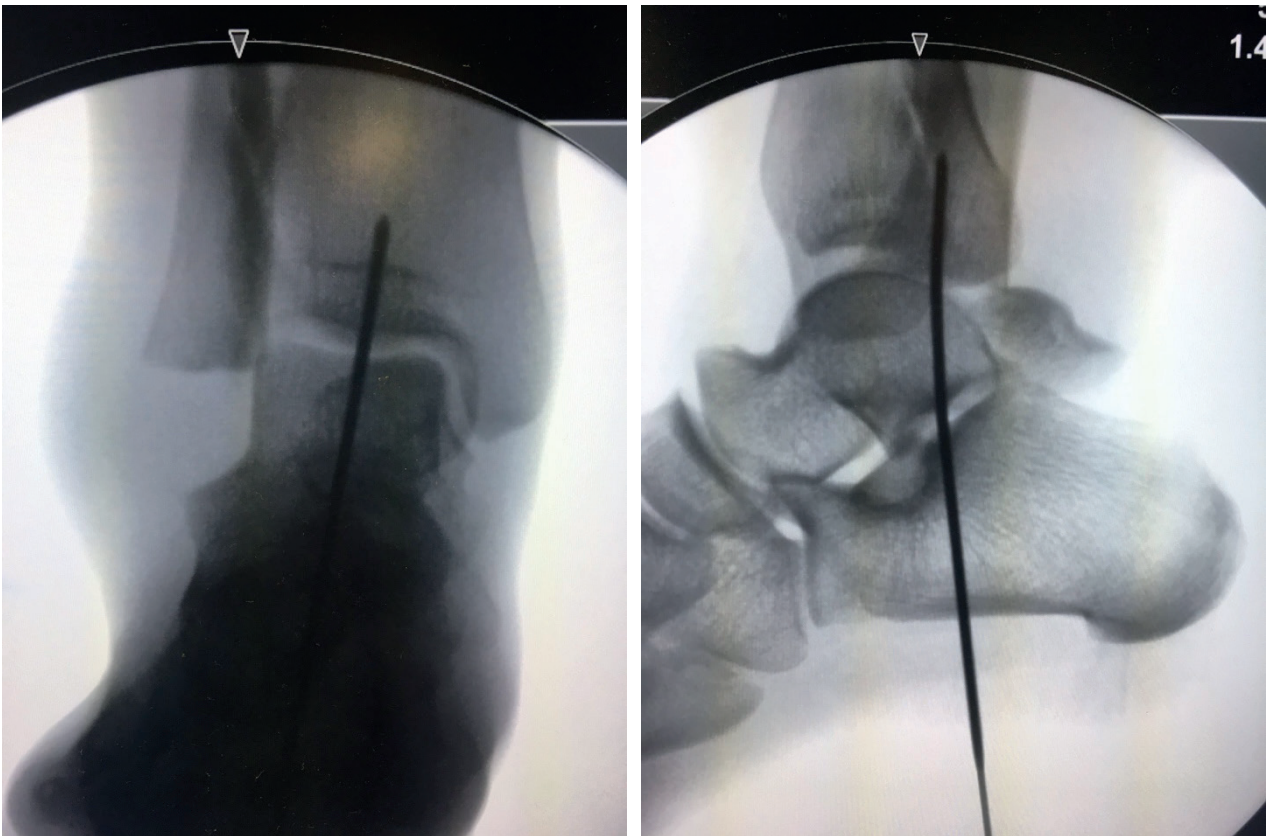
Eleven months after the trauma, the patient reached in daily activities a functional level similar to those prior the accident. He described limitations with moderate pain in running and jumping (score of 4 out of 10 on the numerical VAS).

According to the American Orthopaedic Foot and Ankle Society Score (AOFAS Score) (11,12), patient had a score of 90 out of a total of 100 that corresponds to a satisfactory outcome.

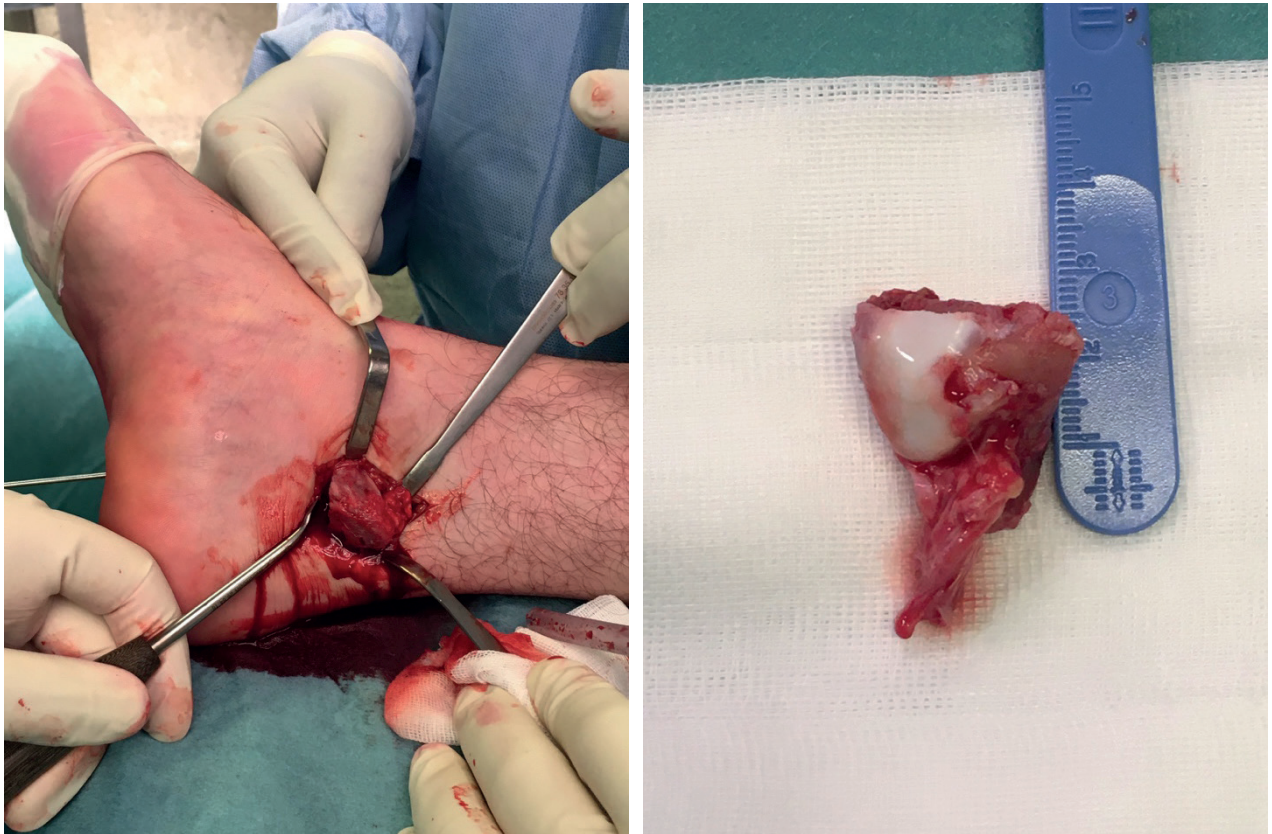
It was also measured the ROM of the tibio-talar and subtalar joints through the use of a protractor and the result is almost similar to that of the contralateral



**Figure 2.** X-rays with talus dislocation associated with fibular fracture.



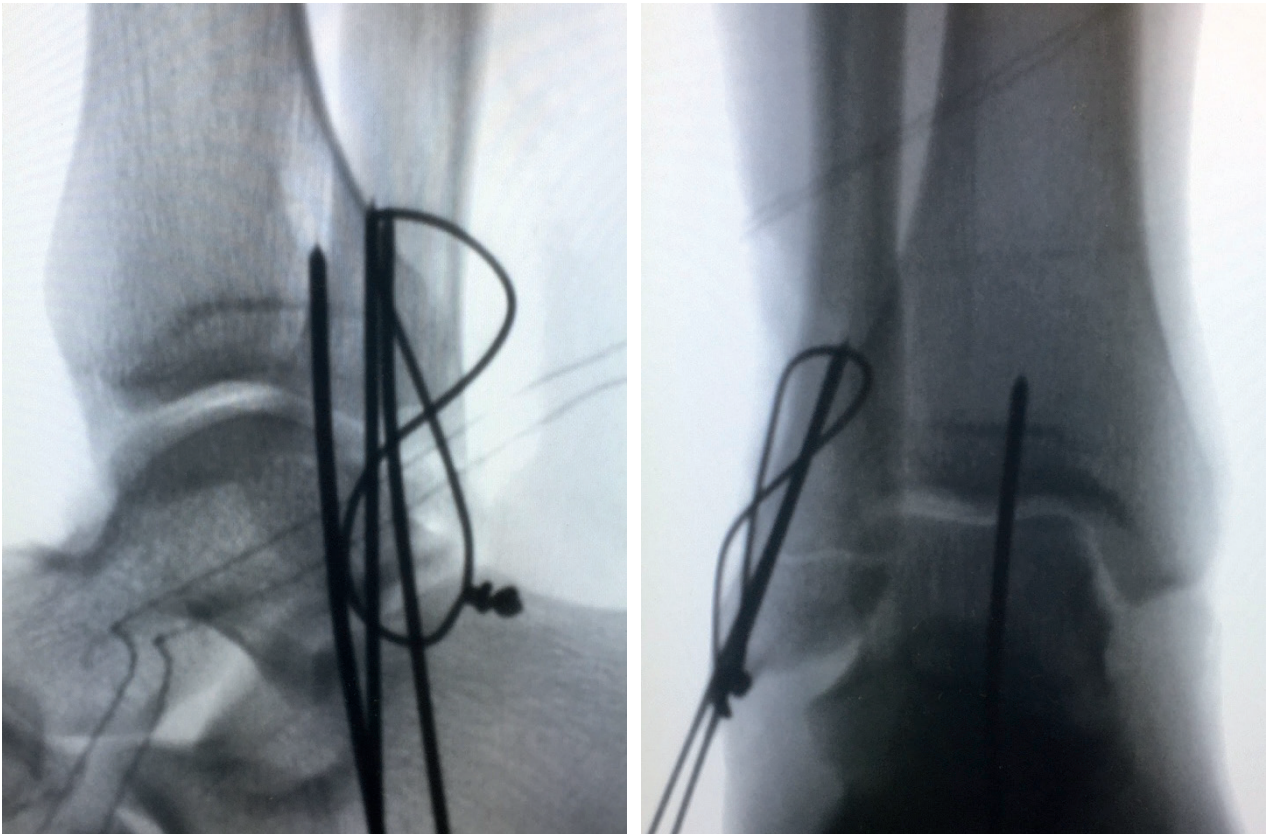
**Figure 3.** Fluoroscopic intra-operative images after closed talus reduction; the lateral malleolar fragment is displaced postero-medially (arrows).



**Figure 4.** Postero-medial approach to identify and excise the distal lateral malleolar fragment.



**Figure 5.** Fixation after repositioning of the lateral malleolus with two K-wires and Hau-ban cerclage.



**Figure 6.** Intraoperative fluoroscopic final check.

ankle: 15° of dorsiflexion, 50° of plantar flexion with a deficit of 10° on the traumatized side, 50° of supination, 30° of pronation (Figure 7).

X-rays performed at that time did not show signs of osteopenia or osteoarthritis (Figure 8).

## Discussion

Total dislocation of the talus is the consequence of a particularly violent trauma that causes a massive rupture of the capsular and ligamentous structures around this bone (13). This is a rare injury, despite the anatomical features of the talus predispose to its dissociation; the astragalus is in fact the only bone of the lower limb without muscle insertions with over 60% of the surface covered by cartilage (14).

The mechanism at the base of the dislocation is an excessive supination or pronation associated or not to plantar flexion, which provide an antero-lateral or

postero-medial luxation. Supination represents the most common mechanism; pronation instead is frequently associated with fracture of the fibular malleolus (13,14).

The initial treatment is prompt reduction, and this can be achieved by closed or open maneuvers. There is a deference of opinion regarding the best treatment for closed talar dislocations.

More authors reported good results after closed reduction. In those cases of anterolateral total talar dislocation, under spinal or general anesthesia, manual longitudinal traction of the foot was done in addition to counter traction of the leg with the knee in flexion to relax Achilles tendon and posterior leg muscles (15-19).

Because of all capsular and ligamentous attachments of the talus are ruptured and dependence of vascularization on these ligaments, avascular necrosis is predictable. In these cases, surgery may further worsen blood supply.



Figure 7. Full ROM at final follow-up.



Figure 8. X-rays at final follow-up.

For this reason closed reduction has become the preferred way of treatment of closed anterolateral tibiotalar dislocation.

If avascular necrosis appears following open or closed reduction, it is recommended to avoid early weight-bearing during the course of treatment until the appearance of radiographic signs of revascularization of the talus (17).

To achieve better outcomes, reducing the likelihood of developing avascular necrosis and osteoarthritis, joint stiffness and instability, the treatment must include: timeliness in surgery, early mobilization with progressive load (respecting the consolidation of any

associated fractures) and a rehabilitation aimed at recovery of the complete ROM.

In conclusion this case report confirms all these assumptions.

The reduction was closed and performed after 2 hours from accessing in the emergency room. Avascular necrosis was not encountered.

Furthermore, stable fixation of the lateral malleolus guaranteed an immediate physiotherapy with early mobilization.

**Conflict of Interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, eq-

uity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

**Statement of Informed Consent:** Informed consent from the patient to published the case (included images, case history and data) was obtained.

**Author Contributions:** CB and RB contributed to the study conception. Material preparation and data collection were performed by CB. FP and AP are the senior surgeons supervising the writing of the article. HYS assessed the scientific contents and the writing. All authors read and approved the final manuscript.

## References

- Maciej S. Trattamento delle fratture malleolari. *Capsula eBurnea* 2010; 5: 343-4.
- DeLee JC, Curtis R. Subtalar dislocation of the foot. *J Bone Joint Surg Am* 1982 Mar; 64(3): 433-7. PMID: 7061560.
- Kompanje EJO. Painful sexual intercourse caused by a disproportionately long penis: an historical note on a remarkable treatment devised by Guilielmus Fabricius Hildanus (1560-1634). *Arch Sex Behav* 2006 Oct; 35(5): 603-5. PMID: 17031589 DOI: 10.1007/s10508-006-9057-z.
- Marotte JH, Lord G, Samuel P, Moati JC. Les Luxations sous- astragaliennes externes. A propos de 4 cas. *Chirurgie* 1979; 105(5): 389-92. PMID: 535490.
- Leitner B. The mechanism of total dislocation of the talus. *J Bone Joint Surg Am* 1955 Jan; 37A(1): 89-95. PMID: 13233273.
- Pinzur MS, Meyer PR Jr. Complete posterior dislocation of the talus. Case report and discussion. *Clin Orthop Relat Res* 1978 Mar-Apr;(131): 205-9. PMID: 657624.
- Camarda L, Abruzzese A, La Battuta A, Lentini R, D'Arenzo M. Results of closed subtalar dislocations. *Musculoskeletal Surg* 2016 Apr; 100(1): 63-9. PMID: 26254192 DOI: 10.1007/s12306-015-0380-1.
- Jungbluth P, Wild M, Hakimi M, et al. Isolated subtalar dislocation. *J Bone Joint Surg Am* 2010 Apr; 92(4): 890-4. PMID: 20360512 DOI: 10.2106/jbjs.i.00490.
- Prada-Canizares A, Aunon-Martin I, Vila y Rico J, Pretell-Mazzini J. Subtalar dislocation: management and prognosis for an uncommon orthopaedic condition. *Int Orthop* 2016 May; 40(5): 999-1007. PMID: 26208589 DOI: 10.1007/s00264-015-2910-8.
- Melenevsky Y, Mackey RA, Brad Abrahams R, Thomson NB. Talar fractures and dislocations: A radiologist's guide to timely diagnosis and classification. *Radiographics* 2015 May-Jun; 35(3): 765-79. PMID: 25969933 DOI: 10.1148/rg.2015140156.
- Kitaoka HB, Alexander IJ, Adelaar RS, Nunley JA, Myerson MS, Sanders M. Clinical Rating Systems for the Ankle-Hindfoot, Midfoot, Hallux, and Lesser Toes. *Foot Ankle Int.* 1994 Jul; 15(7): 349-53. PMID: 7951968 DOI: 10.1177/107110079401500701.
- Leigheb M, Janicka P, Andorno S, Marcuzzi A, Magnani C, Grassi F. Italian translation, cultural adaptation and validation of the 'American orthopaedic foot and ankle society's AOFAS ankle Hindfoot scale'. *Acta Biomedica* 2016; 87: 38-45. PMID: 27163894.
- Sharifi SR, Ebrahimzadeh MH, Ahmadzadeh-Chabok H, Khajeh-Mozaffari J. Closed total talus dislocation without fracture: A case report. *Cases J* 2009; 2: 1-4. PMID: 20062649 PMID: 2803929 DOI:10.1186/1757-1626-2-9132.
- Basile G, Pagano R, Caminiti D, Mus L. Total dislocation of talus. *GIOT* 2011; 37: 248-51.
- Xarchas KC, Psillakis IG, Kazakos KJ et al. Total dislocation of the talus without a fracture. Open or closed treatment? Report of two cases and review of the literature. *Open Orthop J* 2009 Jul 3;3:52-5. doi: 10.2174/1874325000903010052.
- Taymaz A, Gunal I. Complete dislocation of the talus unaccompanied by fracture. *J Foot Ankle Surg* 2005 Mar-Apr; 44(2): 156-8. PMID: 15768366 DOI: 10.1053/j.jfas.2005.01.008.
- Johnson B, Rouholamin N, Patel A. Total dislocation of the talus. *Eur J Orthop Surg Traumatol* 2012 Dec; 22(8): 633-7. PMID: 27526063 DOI: 10.1007/s00590-011-0881-z.
- Schiffer G, Jubel A, Elsner A, Andermahr J. Complete talar dislocation without late osteonecrosis: clinical case and anatomic study. *J Foot Ankle Surg* 2007 Mar-Apr; 46(2):120-3. PMID: 17331872 DOI: 10.1053/j.jfas.2006.11.004.
- Segal D, Wasilewski S. Total dislocation of the talus. Case report. *J Bone Joint Surg Am* 1980; 62(8): 1370-2. PMID: 7440616.

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