True Closed Posterior Subtalar Dislocation Without Fracture or Associated Malalignment. Case Report and Literature Review

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ABSTRACT
Subtalar dislocation is a rare type of dislocation that is characterized based on the relationship of the calcaneus to the talus, with the medial and lateral forms being more prevalent and the posterior and anterior forms appearing only in isolated cases in the literature. We present the case of a patient with a closed posterior subtalar dislocation without an associated fracture, as documented clinically and radiologically. We also include a video of the technique for closed reduction under anesthesia, as well as a review of the existing literature on this rare type of dislocation.
Keywords: Dislocation; subtalar; posterior; closed reduction.
Level of Evidence: IV

Luxación periastragalina posterior genuina cerrada sin fractura ni mala alineación asociada. Reporte de un caso y revisión bibliográfica

RESUMEN
La luxación periastragalina es un tipo de luxación infrecuente. Se clasifica según la relación del calcáneo con respecto al astrágalo, y las más comunes son las formas medial y lateral; y hay casos aislados de las variantes posterior y anterior. Presentamos el caso de un paciente con una luxación periastragalina cerrada posterior sin fractura asociada, el video de la técnica para la reducción cerrada bajo anestesia y también una revisión bibliográfica de esta infrecuente variedad de luxación.
Palabras clave: Luxación; periastragalina; posterior; reducción cerrada.
Nivel de Evidencia: IV

INTRODUCTION

The talus represents the point of interconnection between the bones of the leg and the foot, thus constituting the hinge between both segments and the weight-bearing support during the different activities carried out by human beings. The bone surface of the talus is two-thirds covered with cartilage and does not represent the site of origin or insertion of any musculotendinous unit.[1] Because of its position, it is prone to traumatic forces that, depending on their intensity or direction, as well as the ankle and foot's position in respect to the ground, can induce fractures or dislocations.

Subtalar dislocation is a special type of injury because it involves simultaneous dislocation of the talocalcaneal and talonavicular joints while leaving the tibiotalar and calcaneocuboid joints intact.[2] In 1811, Judcy[3] and Dufaurest[4] made the first descriptions of this type of dislocation. They are classified according to the direction in which the calcaneus deviates in relation to the talus. In 1853, Broca[5] initially identified medial, lateral and posterior forms; later, in 1856, Malgaigne and Buerger[6] added a rare anterior variant. The prevalence of different forms of dislocations has fluctuated throughout time, but depending on the source, it is clear that the medial variant is the most prevalent (73-85%),[7] followed by lateral dislocation (17%).[8]

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In contrast, the posterior and anterior variants are the least frequent (1-2.5%)[9] and their description is limited to isolated published cases.

We present the case of a patient with a closed posterior subtalar dislocation without associated fracture, resulting from a traffic accident, and confirmed by clinical and radiological evaluation. We also share a video of the technique for its closed reduction under anesthesia and a literature review on this rare variety of dislocation.

CLINICAL CASE

A previously healthy 25-year-old man with adequate function who worked in construction arrived at the Emergency Department after being involved in a traffic accident three hours earlier while riding a motorbike and colliding with a car, resulting in direct trauma to his left foot and ankle.

During the physical examination, the patient was conscious (Glasgow scale 15/15), had adequate hemodynamic stability, pain, edema, a deformity of the foot's neck with bony prominence in the anterior region, and a laceration at that level as well as another on the lateral aspect of the ankle; no wounds or loss of skin integrity were found. Toe range of motion and sensitivity were normal, and capillary refill and palpable pedal pulse were adequate and symmetrical (Figure 1).

Figure 1. A. Anterior view of the ankle. **B.** Lateral aspect, deformity with equinus tendency caused by Achilles tendon contraction, loss of heel height caused by anterior talus dislocation, and marked anterior deformity. **C.** Dysmetria, external rotation, and an anterior ankle deformity are visible on the medial aspect due to the prominence of the talar head.

Anteroposterior and lateral ankle radiographs revealed loss of talar joint congruence with posterior talocalcaneal dislocation, talonavicular dislocation with preservation of tibiotalar and calcaneocuboid joint connections, and no talar neck fractures. As a complementary study, computed tomography revealed no non-obvious associated lesions (Figures 2 and 3).

Figure 2. A. Lateral radiograph of the ankle shows apparent "verticalization" of the talus to almost 90° and loss of the talocalcaneal and talonavicular joint relationships, while the tibiotalar and calcaneocuboid relationships remain intact. **B.** Anteroposterior radiograph of the ankle. Talar head overlapping the midfoot (anterior displacement), with no lateral/medial displacement of the midfoot or calcaneus (non-rotational).

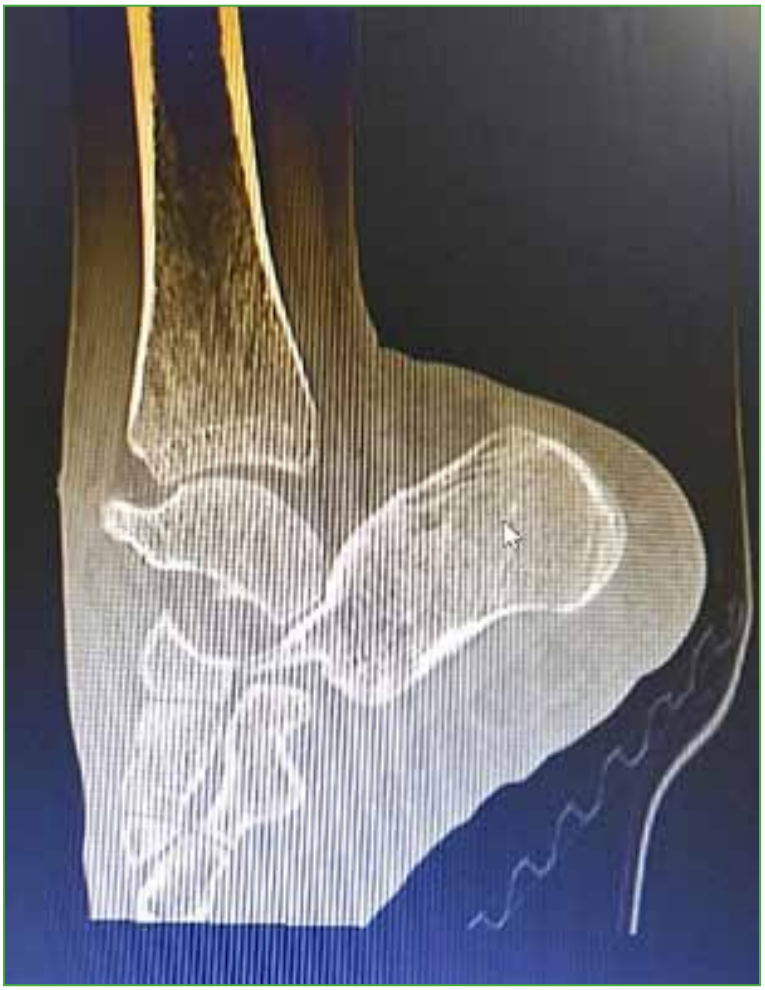

Figure 3. Computed tomography of the ankle, sagittal section. Empty talonavicular space with verticalized subtalar articular surface. The talus appears in the pseudo-zenith direction.

It was decided to attempt a closed reduction in the operating room. After informed consent was given, the patient was placed in the supine position under general anesthesia to achieve the greatest possible relaxation. The knee was brought into slight flexion to decrease the tension of the gastrocnemius/soleus complex. In plantar flexion, the rearfoot was tractioned and direct pressure was applied with the thumbs to the head of the talus at the anterior region of the ankle neck, followed by progressive dorsiflexion (Figure 4) until a non-audible snap was perceived and the deformity was corrected. Immediately, the passive range of motion of the tibiotalar/subtalar and talonavicular joints was assessed and found to be stable, with no cramping or locking (Video).

Figure 4. The reduction maneuver consists of knee flexion, traction in plantar flexion of the foot, and direct pressure on the talar head.

Reduction was verified by fluoroscopy and the limb was immobilized with a posterior ankle splint (Figure 5).

The patient remained under observation for 24 h to treat pain and to perform a CT scan in order to properly evaluate a congruent reduction, and rule out associated fractures, free bodies or previously undiagnosed lesions. Control imaging studies showed correction of the dislocation without talus fractures or occult fractures (Figure 6).

Figure 5. Immobilization with a plaster cast.

After this observation period, the patient was discharged with the splint. He was allowed to use crutches without unloading the limb, an articulated ankle brace was prescribed, and he was scheduled for an outpatient follow-up appointment. At his two-week outpatient evaluation, he had full ankle range of motion, adequate mobility and sensitivity in his toes, but he still lacked strength in plantar/dorsiflexion, as well as in the invertor and evertor muscles. The patient had already removed the splint and was wearing the ankle brace. He was instructed to start physiotherapy, and was scheduled for another outpatient consultation with a follow-up radiograph.

He was referred to the Physical Therapy Service for early rehabilitation, but did not return for follow-up, because the SARS-CoV-2 pandemic confinement had begun. After almost 18 months of trying to contact him, he did not attend the follow-up visit.

Figure 6. A. Computed tomography of the ankle, sagittal section. Talonavicular, subtalar, tibiotalar, and calcaneocuboid joints with congruent anatomical reduction. **B.** Computed tomography of the ankle, axial section. No free bodies are observed in the talonavicular or talocalcaneal joints.

DISCUSSION

Subtalar dislocation occurs when the talus loses articular contact with any of its surrounding osteoarticular components. As the foot's point of union with the rest of the lower appendicular skeleton, the talus participates in movement transmission, primarily flexion-extension via the tibiotalar hinge, but it is also responsible for the foot's pronation and supination movements in the subtalar joint, as it is articulated with the calcaneus. Similarly, it forms the talonavicular joint, which responds to changes in calcaneal position, eversion, and inversion, providing flexibility or stability to the midfoot via the transverse tarsal joint, as described by Elftman in 1960.[10] This central position exposes it to a range of high-energy loading forces, such as those found in traffic accidents, falls from great heights, and extreme sports, with the possibility of sustaining fractures, dislocations, or a combination of these. The posterior variety of subtalar dislocation is rare (1.7%).[11]

A literature review was carried out covering the last 70 years. The search included articles in English and Spanish, in databases such as PubMed, EMBASE and Cochrane, and yielded 10 articles (with an equal number of cases) that specifically refer to the posterior variety of subtalar dislocation.[9,12-20] However, when reading them in detail, we noticed that some of these cases were associated with other injuries: open injury,[13] open dislocation with fracture of the talar neck and cuboid,[14] fracture of the posterior malleolus and talus,[15] and a report on a follow-up of a previous case.[19] This left only seven cases of posterior subtalar injuries without associated injuries.

In this extensively illustrated article, we present the case of a patient with a "true" subtalar dislocation, defined as a closed posterior subtalar dislocation with no lateral or medial malalignment of the calcaneus or accompanying fracture. It is an infrequent condition (8 true cases in the last 7 decades); therefore, we believe it is important to publish this case to draw attention to a type of injury that, despite its rarity, requires a prompt diagnosis that is easily reached with an appropriate pair of both anteroposterior and lateral radiographs, where this type of "bi-articular" injury can be identified, since, unlike other dislocations in which only two articular surfaces lose their normal relationship, subtalar dislocations involve two joints, both the talonavicular and the talocalcaneal, and sometimes there are other associated injuries.

We believe that after the initial diagnosis, the procedure should be performed under general anesthesia to allow for a painless and atraumatic reduction maneuver under fluoroscopic control, followed by an evaluation of joint stability. Immobilization with a cast is required as part of joint protection, edema and pain management, as well as to limit weight bearing for 2 to 3 weeks. Post-procedure follow-up will include anteroposterior and lateral radiographs to confirm reduction, as well as a CT scan if a previous occult fracture is suspected, or to rule out an iatrogenic fracture or free bodies within the joint.

After completing the initial immobilization period, the patient should begin an early physical rehabilitation process with the use of an ankle brace that allows the patient to do reconditioning exercises without weight-bearing Regarding the period of weight-bearing restriction, Camarda et al.,[16] Jungbluth et al.,[17] Bali et al.,[18] and Gaba et al.[20] only allowed protected weight bearing in weeks 3 and 4 after reduction. Our patient started physical therapy in the third week, and after that, we lost contact with him.

Follow-up of these few patients lasted between 6 and 24 months,[18,20] and clinical outcomes were good, including pain-free return to work. Camarda et al. published the longest follow-up (58 months) at the end of which the patient had an *American Orthopaedic Foot and Ankle Society* scale score of 88.[16] This may indicate that, in the absence of associated injuries, the functional prognosis appears favorable.

The strengths of our presentation are the early diagnosis with only a couple of radiographs properly taken when the patient was admitted to the Emergency Department, an atraumatic reduction under general anesthesia, appropriate immobilization with weight-bearing restriction, and a postoperative control with imaging studies that confirmed a congruent "bi-articular" reduction without iatrogenic fractures or intra-articular free bodies.

The weakness of our article is the lack of a longer follow-up that would allow us to clinically and radiologically evaluate the outcome in this type of case.

CONCLUSIONS

Hindfoot dislocations can easily go unnoticed, some are frequent, such as tibiotalar or medial subtalar dislocations, but there are more unusual cases, such as the one presented here: pure posterior. In the event of a loss of normal joint relationships as a result of trauma, it is critical to obtain appropriate radiographic images in the Emergency Department and, if in doubt, to request complementary studies, such as a CT scan, which can provide additional information to confirm or rule out these or other occult injuries. Our report presents a rare case, but one that should not be overlooked, given the risk of serious future sequelae.

Conflict of interest: The authors declare no conflicts of interest.

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