

Case report

Closed subtalar dislocation with non-displaced fractures of talus and navicular: a case report and review of the literatureElias Fotiadis^{1*}, Christos Lyrtzis¹, Theodoros Svarnas¹, Miltos Koimtzis¹, Kiriaki Akritopoulou² and Byron Chalidis³Addresses: ¹Orthopaedic Department, General Hospital of Veria, Veria, 59100, Greece²Medical School, Aristotle University of Thessaloniki, Thessaloniki, 54124, Greece³Orthopaedic Department, Avenue Hospital, Melbourne, Australia

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This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.**Abstract**

Closed subtalar dislocations associated with talus and navicular fractures are rare injuries. We report on a case of a 43-year-old builder man with medial subtalar dislocation that was further complicated by minimally displaced talar and navicular fractures. Successful closed reduction under general anesthesia was followed by non-weight bearing and ankle immobilization with a below-knee cast for 6 weeks. At 3 years post-injury, the subtalar joint was stable, the foot and ankle mobility was in normal limits and the patient could still work as a builder. However, he complained for occasionally mild pain due to the development of post-traumatic arthritis in subtalar and ankle joints. Our search in literature revealed that conservative treatment of all the successfully reduced and minimally displaced subtalar fracture-dislocations has given superior results compared to surgical management. However, even in cases with no or slight fracture displacement, avascular necrosis of the talus or arthritis of the surrounding joints can compromise the final functional outcome.

Introduction

Subtalar dislocation is a rare ankle injury. Although it can occur in any direction, medial dislocation is the most common injury pattern [1]. The lesion is usually closed [2] as a result of a high-energy injury such as fall from a height or motor vehicle accident [1]. Associated fractures may be easily overlooked and lead to disruption of the normal bone articulation, arthritis or avascular necrosis of the talus [3].

We report a case of closed subtalar dislocation with concomitant and ipsilateral talus and navicular fractures. At 3 years postoperatively, the foot scored well in terms of stability and range of motion but post-traumatic arthritis compromised the final result. We also present our results from the review of English literature regarding the incidence and the main characteristics of the injury, as well as the outcome of the applied treatment options.

The Hospital's Scientific Research Board approved this study, which was conducted in accordance with the World Medical Association Declaration of Helsinki of 1975 as revised in 2000. The patient was informed about his participation in the study and gave informed consent.

Case presentation

A 43-year-old Greek male builder admitted to the Accident and Emergency Department of the Hospital due to fall from a height of about 2.5 m. The patient complained of severe right ankle pain and inability to bear any weight on his extremity. In clinical examination the ankle was substantially swollen and ecchymotic, while the talonavicular and medial subtalar joints were very tender and painful to palpation. However, no neurovascular or tendon disturbances were identified. Both oblique and anteroposterior radiographs showed medial displacement of the midfoot without any evidence of bone fracture. (Figures 1a and b).

Under general anesthesia, the subtalar dislocation was successfully reduced with manual pressure on the head of the talus and traction, plantar flexion and pronation of the forefoot. The knee was kept flexed throughout the relocation process for eliminating the tension of the soleus muscle. Afterwards, the quality of the reduction and the stability of the subtalar joint were evaluated under fluoroscopy. As no signs of anteroposterior or medio-lateral instability were recognized, the ankle was immobilized in a short leg non-weight-bearing cast for 6 weeks. A post-reduction compute tomography (CT) scan was also performed to confirm the anatomic reduction of the subtalar joint dislocation and reveal any potential fractures. The CT scan showed a nondisplaced fracture of the talus body, an osteochondral fracture of the head of the talus and a nondisplaced navicular fracture (Figure 2). Due to the benign character of all fractures, no surgical treatment was decided.

After cast removal, an intensive foot and ankle physiotherapy program was commenced for restoring the foot and ankle mobility and preventing stiffness. The patient was limited to partial weight bearing for another 2 weeks and after that time he progressed to weight bearing as tolerated.

At 3 year follow up examination, the patient performed well in terms of foot and ankle range of motion. No signs of instability were identified. The good clinical result was also illustrated from the AOFAS [4], ankle hind foot scale, as a total score of 90 out of 100 points was achieved. Although, the patient returned to his prior to injury occupation, he complained occasionally for mild pain. The latter was attributed to the development of sclerotic changes in the body of the talus and post-traumatic osteoarthritis in subtalar and ankle joints (Figure 3).



Figure 1. Anteroposterior (a) and oblique (b) foot radiographs illustrate medial subtalar dislocation of the right foot.

Discussion

Closed subtalar dislocations may be associated with concomitant intra-articular fractures of the osseous elements of foot and ankle [2]. Combined injuries can prolong the immobilization period as well as the

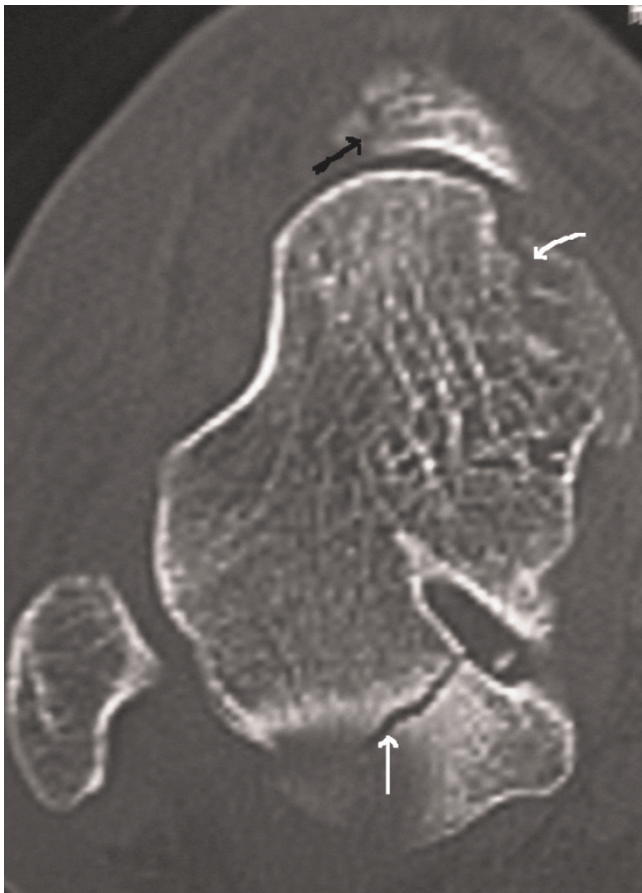


Figure 2. CT scan of the right foot showing two osteochondral fractures of the talus (white arrows) and an undisplaced navicular fracture (black arrow).



Figure 3 Lateral radiograph of the ankle 3 years post-injury. Sclerosis of the body of the talus and degenerative changes in ankle and subtalar joints are evident.

incidence and magnitude of complications, such as arthritis of the subtalar joint or avascular necrosis of the body of talus [3].

Our search in English literature revealed 26 published studies with 328 patients suffering from closed subtalar dislocations (Table 1). In the majority of cases (86%), the lesions were treated conservatively with a below-knee cast and non-weight bearing for at least 3-6 weeks. The described results were generally good to excellent despite some residual pain or stiffness in subtalar and ankle joints [5-9]. Heppenstall et al [10] reported excellent functional results in 14 out of 19 patients after closed reduction of subtalar dislocation. However, 16 of 20 patients had significant restriction of subtalar motion and 6 of 20 patients had roentgenographic evidence of arthritis, after an average of 4.2 years follow-up period. Jarde et al [11] noticed good to excellent results in 24 of 35 cases with the same injury type. At the same study, 3 patients developed talar necrosis in a mean period of 1 year.

Pure dislocations seem to have a more favorable prognosis compared to combined injuries and associated fractures [12,13]. In addition, open reduction and surgical fixation of the lesion was largely related to a poor result [14]. Merchan [15], described less favorable results in almost half of the 23 patients with closed subtalar dislocation. Interestingly, 6 out of 23 patients that were treated with open reduction and K-wires fixation had fair or poor final outcome. On the other hand, Kanda et al [16] and Chuo et al [17] reported good results and only mild ankle soreness after open reduction of the dislocation. Finally, Ganel et al [18] and Love et al [19] found that conservative and surgical treatment of closed subtalar dislocations were equal in terms of ankle and foot function.

According to the published studies, there is no general agreement regarding the proper immobilization period after successful reduction of the subtalar dislocation. DeLee and Curtis [20], found that in isolated cases without concomitant fractures, 3 weeks of immobilization

Table 1. Published cases of closed subtalar dislocations

Study	Year	Number of cases	Treatment	Result
Heppenstall RB et al <i>J Trauma</i>	1980	20	A. Closed reduction (19 patients) B. Open reduction (1 patient)	A. Excellent results 14, good 2, fair 2, poor 1 B. Poor result 1 patient
Ganel A et al <i>J Foot Surg</i>	1981	3	A. Closed reduction (2 patients) B. Open reduction (1 patient) Closed reduction	A & B. Good results
Monson ST, Ryan JR. <i>J Bone Joint Surg (Am)</i>	1981	9	Closed reduction	A. Medial dislocation: some loss of subtalar motion B. Lateral dislocation: important disability
DeLee JC, Curtis R. <i>J Bone Joint Surg (Am)</i>	1982	14	A. Closed reduction (10 patients) B. Open reduction (4 patients) Closed reduction	A. Normal ROM (5 patients) B. 50% loss of normal subtalar motion (9 patients)
Merianos P et al <i>Injury</i>	1988	21	Closed reduction	A. Medial dislocations: varying degrees of disability B. Lateral dislocations: serious disability Instability (mild- moderate): 63% of patients Restriction activity: 13% of patients
Zimmer TJ, Johnson KA. <i>Clin Orthop Relat Res</i>	1989	11	Closed reduction	Dislocations without fracture: good results Dislocations with fracture: less favourable prognosis
Ghirntz H et al <i>Ugeskr Laeger</i>	1989	12	Closed reduction	Good result
Bak K, Koch JS. <i>Br J Sports Med</i>	1991	1	Closed reduction	
Merchan EC. <i>Injury</i>	1992	23	A. Closed reduction (17 patients) B. Open reduction + K-wires (6 patients)	A. Good results (11 patients), fair results (6 patients) B. Fair results (1 patient), poor result (5 patients) A & B. Mild decreased range of motion
Love JN et al <i>J Emerg Med</i>	1995	2	A. Closed reduction (1 patient) B. Open reduction (1 patient)	
Ruiz Valdivieso T et al <i>Int Orthop</i>	1996	12	A. Closed reduction (10 patients) B. Open reduction (2 patients)	A. Good results (6 patients), fair results (4 patients) B. Fair results (2 patients)
Jarde O et al <i>Rev Chir Orthop Reparatrice Appar Mot</i>	1996	35	A. Closed reduction (21 patients) B. Open reduction (14 patients) Closed reduction	A. Excellent results (11 patients), Good results (10 patients) B. Good results (3 patients), fair (9 patients), poor (2 patients) Minimal disability and subtalar joint stiffness Symptomless
Bohay DR, Manoli A. <i>Foot Ankle Int</i>	1996	4	Closed reduction	
Kinik H et al <i>Int Orthop</i>	1999	1	Closed reduction	
Tabib W et al <i>Rev Chir Orthop Reparatrice Appar Mot</i>	2000	1	Closed reduction + K-wire	Good result
Kanda T et al <i>Foot Ankle Int</i>	2001	1	Open reduction	Good result
Perugia D et al <i>Int Orthop</i>	2002	45	Closed reduction	Good results
Bibbo C et al <i>Foot Ankle Int</i>	2003	19	Closed reduction	Mean AOFAS score: 71 (fair results)
Garofalo et al <i>J Foot Ankle Surg</i>	2004	12	Closed reduction	A. Medial dislocation: excellent results (10 patients) B. Lateral dislocation: fair results (2 patients) Pain free and stable. Moderate loss of subtalar motion
Hadji M et al <i>Rev Chir Orthop Reparatrice Appar Mot</i>	2004	1	Closed reduction	
Wagner R et al <i>Injury</i>	2004	26	A. Closed reduction (20 patients) B. Open reduction (6 patients) Open reduction	A. Medial dislocations: Excellent results (10 patients), Good (7 patients), Fair (3 patients) B. Lateral dislocations: Excellent results (1 patient), Good (4 patients), Poor (1 patient) Moderate loss of subtalar motion. Mild ankle soreness
Chuo CY et al <i>Kaohsiung Med Sci</i>	2005	1	Closed reduction	Excellent result
Cilli F <i>Acta Orthop Traumatol Turc</i>	2006	1	Closed reduction	Good result
Jerome JT et al <i>J Foot Ankle Surg</i>	2007	1	Closed reduction	Isolated dislocation: 50% excellent results
Simon LC et al <i>Sportverletz Sportschaden</i>	2008	22	Closed reduction	Dislocation with fracture: mainly good and fair results
De Palma L et al <i>Arch Orthop Trauma Surg</i>	2008	30	Closed reduction	A. Medial dislocations: Excellent results (7 patients), good (11 patients), fair (3 patients) B. Lateral dislocations: Good results (3 patients), fair (3 patients), poor (3 patients)

could offer adequate joint stability and almost normal ROM. On the contrary, there was a decrease of 50% in subtalar motion when a concomitant foot or ankle fracture existed and the immobilization period prolonged to more than 6 weeks. Similarly, Bohay and Manoli [21], stated that the factors resulting in a poor outcome after a subtalar dislocation were open lesions, bone fractures and prolonged immobilization. However, Zimmer and Johnson [22] advocated that subtalar instability (symptomatic) could occur in younger patients (average age 26 years) that treated with shorter periods of immobilization. Specifically, mild to moderate instability was developed in 62.5% of cases after a mean immobilization period of 4.4 weeks (range 3-9 weeks). Despite the diversity of the available clinical results, it seems that ankle immobilization should not be less than 6-8 weeks in case of associated undisplaced talus or navicular fractures [23].

The direction of dislocation seems to play also a significant role in the final functional outcome. Medial subtalar dislocations usually have shown good results when treated conservatively, while lateral dislocations have been associated with important disability [24-28]. However, Perugia et al [29] reported no significant difference in the AOFAS score between medial and lateral subtalar dislocations in a series of 45 patients. The authors pointed out that if pure low-energy subtalar dislocations were promptly reduced and immobilized for 4 weeks, a favorable outcome should be anticipated.

In the current case report, we emphasize that even careful scrutinize of the initial radiographs could not be always adequate for identifying any associated fractures. In this case, the clinical result may be complicated by stiffness and painful deformity. Therefore, we advocate further examination with CT scan after reduction of the dislocation. However, and despite the meticulous evaluation of the injured area, the current treatment methods cannot preclude the possibility of avascular necrosis of the talus and post-traumatic arthritis. These findings, which were also evident in our case, underline the severity of the injury and the magnitude of damage in both bone and soft tissue structures.

In conclusion, additional radiologic examination may be of clear benefit in all the subtalar dislocations. Conservative treatment remains the optimal treatment choice for the all the dislocation types without concomitant displaced fractures. However, the long-term performance of the foot is unpredictable due to the risks of avascular necrosis of the talus and degenerative arthritis.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying

images. A copy of the written consent is available for review by the journal's Editor-in-Chief.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

EF was a major contributor in writing the manuscript. BC was a major contributor in writing and in editing the manuscript. CL analyzed and interpreted the patient data regarding the injury. TS collected the bibliography of this injury. MK and KA were responsible for X-ray, CT examination and follow up of the patient.

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