Closed subtalar dislocation with non-displaced fractures of talus and navicular: a case report and review of the literature

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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 mediolateral 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).

**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
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   | 1980 | 20              | A. Closed reduction (19 patients)   | A. Excellent results 14, good 2, fair 2, poor 1                        |
| J Trauma               |      |                 | B. Open reduction (1 patient)       | B. Poor result 1 patient                                               |
| Ganel A et al          | 1981 | 3               | A. Closed reduction (2 patients)    | A & B. Good results                                                   |
| J Foot Surg            |      |                 | B. Open reduction (1 patient)       |                                                                        |
| Monson ST, Ryan JR. J Bone joint Surg (Am) | 1981 | 9               | Closed reduction                    | A. Medial dislocation; some loss of subtalar motion                    |
| DeLee JC, Curtis R. J Bone joint Surg (Am) | 1982 | 14              | Closed reduction (10 patients)      | B. Lateral dislocation; important disability                           |
| Merianos P et al       |      |                 | B. Open reduction (4 patients)      | A. Normal ROM (5 patients)                                             |
| Injury                 |      |                 |                                    |                                                                        |
| Zimmer Tj, Johnson KA. Clin Orthop Relat Res | 1989 | 11              | Closed reduction                    | A. Medical dislocation: varying degrees of disability                  |
| Ghrintz H et al        | 1989 | 12              |                                    | B. Lateral dislocations: serious disability                            |
| UgeskLaegger           |      |                 |                                    |                                                                        |
| Br J Sports Med        |      |                 |                                    |                                                                        |
| Merchan EC.            |      |                 |                                    |                                                                        |
| Injury                 |      |                 |                                    |                                                                        |
| Love JN et al          | 1995 | 2               | A. Closed reduction (1 patient)     | A. Good results (11 patients), fair results (6 patients)              |
| J Emerg Med            |      |                 | B. Open reduction + K-wires (6 patients) | B. Fair results (1 patient), poor result (5 patients)                 |
| Ruiz Valdivieso T et al | 1996 | 12              | A. Closed reduction (10 patients)   | A. Good results (6 patients), fair results (4 patients)               |
| Int Orthop             |      |                 | B. Open reduction (2 patients)      | B. Fair results (2 patients)                                           |
| Jarde O et al          | 1996 | 35              | A. Closed reduction (21 patients)   | A. Excellent results (11 patients), Good results (10 patients)         |
| Rev Chir Orthop Reparatrice Appar Mat |      |                 | B. Open reduction (14 patients)     | B. Good results (3 patients), fair (9 patients), poor (2 patients)     |
| Bohay DR, Manoli A. Foot Ankle Int | 1996 | 4               | Closed reduction                    | Minimal disability and subtalar joint stiffness                        |
| Kinik H et al          | 1999 | 1               | Closed reduction                    | Symptomless                                                            |
| Int Orthop             |      |                 |                                    |                                                                        |
| Tabbw W et al          | 2000 | 1               | Closed reduction + K-wire           | Good result                                                            |
| Rev Chir Orthop Reparatrice Appar Mat |      |                 |                                    |                                                                        |
| Kanda T et al          | 2001 | 1               | Open reduction                      | Good result                                                            |
| Foot Ankle Int         |      |                 |                                    |                                                                        |
| Perugia D et al        | 2002 | 45              | Closed reduction                    | Good results                                                           |
| Int Orthop             |      |                 |                                    | Mean AOFAS score: 71 (fair results)                                    |
| Bibbo C et al          | 2003 | 19              | Closed reduction                    | A. Medial dislocation: excellent results (10 patients)                |
| Foot Ankle Int         |      |                 |                                    | B. Lateral dislocation: fair results (2 patients)                     |
| Garofalo et al         | 2004 | 12              | Closed reduction                    | Pain free and stable. Moderate loss of subtalar motion                |
| J Foot Ankle Surg      |      |                 |                                    |                                                                        |
| Hadji M et al          | 2004 | 1               | Closed reduction                    |                                                                        |
| Rev Chir Orthop Reparatrice Appar Mat |      |                 |                                    |                                                                        |
| Wagner R et al         | 2004 | 26              | A. Closed reduction (20 patients)   | A. Medial dislocations: Excellent results (10 patients), Good (7 patients), Fair (3 patients) |
| Injury                 |      |                 | B. Open reduction (6 patients)      | B. Lateral dislocations: Excellent results (1 patient), Good (4 patients), Poor (1 patient) |
| Chuo CY et al          | 2005 | 1               | Open reduction                      | Moderate loss of subtalar motion. Mild ankle soreness                  |
| Kaohsiung Med Sci      |      |                 |                                    |                                                                        |
| Cilli F                | 2006 | 1               | Closed reduction                    | Excellent result                                                       |
| Acta Orthop Traumatol Turc |      |                 |                                    |                                                                        |
| Jerome JT et al        | 2007 | 1               | Closed reduction                    | Good result                                                            |
| J Foot Ankle Surg      |      |                 |                                    |                                                                        |
| Simon LC et al         | 2008 | 22              | Closed reduction                    | Isolated dislocation: 50% excellent results                            |
| Sporwendt Sportschaden |      |                 |                                    | Dislocation with fracture: mainly good and fair results               |
| De Palma L et al       | 2008 | 30              | Closed reduction                    | A. Medial dislocations: Excellent results (7 patients), good (11 patients), fair (3 patients) |
| Arch Orthop Trauma Surg |      |                 |                                    | B. Lateral dislocations: Good results (3 patients), fair (3 patients), poor (3 patients) |
that 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 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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