Case Report

Isolated dorsal dislocation of the tarsal naviculum

Kaziz Hamdi, Ben Ghozlen Hazem, Zitoun Yadh, Abid Faouzi

Abstract

Isolated dislocation of the tarsal naviculum is an unusual injury, scarcely reported in the literature. The naviculum is surrounded by the rigid bony and ligamentous support hence fracture dislocation is more common than isolated dislocation. The mechanism and treatment options remain unclear. In this case report, we describe a 31 year old man who sustained an isolated dorsal dislocation of the left tarsal naviculum, without fracture, when he was involved in a motor vehicle collision. The reported mechanism of the dislocation is a hyper plantar flexion force applied to the midfoot, resulting in a transient disruption of the ligamentous support of the naviculum bone, with dorsal displacement of the bone. The patient was treated with open reduction and Krischner-wire fixation of the navicular after the failure of closed reduction. The wires were removed after 6 weeks postoperatively. Physiotherapy for stiffness and midfoot pain was recommended for 2 months. At 6 months postoperatively, limping, midfoot pain and weakness were reported, no X-ray abnormalities were found. The patient returned to his obvious activities with a normal range of motion.

Key words: Dorsal dislocation, fixation, navicular bone, surgery
MeSH terms: Tarsus, tarsal joints, dislocations, foot joints, foot bones

Introduction

Isolated dislocation of the tarsal naviculum is scarcely reported in the literature.[1] Some few similar injuries have been described previously, whereas, they were often associated with fractures in the navicular bone or in the other midfoot bones.[2] The rarity of isolated dislocation in tarsal naviculum is explained by the rigid bony support around it in the midfoot and hindfoot, moreover, the presence of sturdy ligamentous attachments. The treatment of such entity is until now controversial.[2] Several options have been described based on reduction and stabilization.

Case Report

A 31 year old male driver, who sustained injury in a motor vehicle accident, presented with complain of pain and deformity of his left ankle and foot. He had hyper plantar flexion on his foot at the time of trauma.The clinical examination revealed an obvious deformity and swelling on dorsomedial aspect of his left midfoot [Figure 1]. Neither neurovascular complications nor skin injuries were found. X-ray findings showed pure isolated dorsal dislocation of the tarsal naviculum without fractures [Figure 2]. The diagnosis was confirmed by tomography scan [Figure 3]. The closed reduction under anesthesia was attempted, naviculum was not reducible. Hence, both open reduction and cuneio-naviculo-talar stabilization were achieved with Krischner-wires (K-wires) [Figure 4]. The limb was put in a plaster, shortleg splint.

Anatomical reduction of the naviculum was achieved [Figure 5]. After surgery, the patient was made no weight bearing on the left lower extremity. At 6 weeks postoperatively, the wires were removed, the radiographs confirmed that naviculum and midfoot are reduced in anatomical position. The patient was given a removable, short leg boot and instructed to remain nonweight bearing on the operated foot. Physiotherapy for swelling of the midfoot was recommended. Partial weight bearing was started at the beginning of the 3rd month postoperatively and progressed gradually total weight bearing at the end of the 3rd month. At 6 months postoperatively, the patient is ambulating in his regular shoes and has returned to his previous activities. The eversion was 20^0 and inversion was 30°. X-ray showed an anatomical reduction without abnormalities of the midfoot [Figure 6]. The functional outcome of such entity is satisfied with normal values of motion [Figure 7].

Department of Orthopedics and Traumatology, Tahar Sfar University Hospital, Mahdia, Tunisia

Address for correspondence: Dr. Kaziz Hamdi, Department of Orthopedics and Traumatology, Tahar Sfar University Hospital, Mahdia, Tunisia.
E-mail: hamdi.kaziz@yahoo.fr

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Figure 1: Photograph of medial and dorsal clinical aspects of the left foot immediately after the injury showing swelling on dorsomedial aspect of foot

Figure 2: Anteroposterior and lateral X-ray of the left foot anteroposterior and lateral views showing a dislocation of the navicular bone

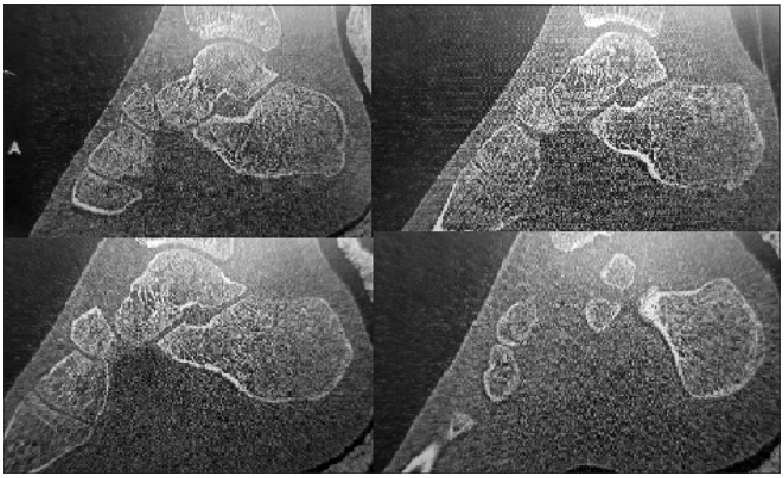

Figure 3: Sagittal computed tomography views of the foot revealing the isolated dorsal dislocation of the navicular bone

Discussion

Isolated tarsal navicular dislocations are rare.[1,2] Reviewing the literature, only 15 cases have been reported since1924.[1-4] Usually, associated midfoot fractures, dislocations, or soft tissue damage were found simultaneously to navicular dislocation.[4] The rarity of this dislocation is explained by the strong dorsal and volar ligamentous attachments and the rigid bony support surrounding the navicular.[4-8] Several mechanisms of tarsal navicular dislocation have been reported.[4,5] However, they are complex and not well understood.[2,4] No specific mechanism is established for the isolated dorsal dislocation.[4] The most reported one is a plantar flexion/compressive injury.[4,5,9,10] The position of the foot and the direction of the force at injury will determine the direction of the dislocation. Main and Jowett[11] had considered that longitudinal forces transmitted along the metatarsal rays would compress the navicular, produce dorsal dislocation; this theory was based on radiographic appearances.[11] Whereas, this implies rupture of the dorsal ligaments, which could fail only in tension produced by plantar flexion. Knowledge of this mechanism is useful when performing.[7] This makes it likely that his left foot was pressing on the brake pedal and in a plantar flexed position at impact. Associated fractures of the cuboid and calcaneus may occur when there are a hyper plantar flexion and inversion force applied to the midfoot and the location of the bifurcate ligament.[4,6]

The mechanism of a navicular dislocation has been described as being similar to a perilunate dislocation of the hand.[4,6] Some authors think that tarsal navicular dislocation cannot occur without bony or ligamentous damage to the lateral column of the foot because this injury inevitably involves both columns.[4,6] As a result, stabilization of both medial and lateral columns is recommended to have a good outcome even in cases when the dislocation seems to be isolated.[4,5] The stability of the foot is ensured by the rigidity of both of these columns, and each supports the other.[4] according to this concept, it is impossible to sustain an isolated

Figure 4: Peroperative photograph showing the dislocated navicular bone after the dorsal incision toward the talo navicular joint

Figure 5: Postoperative X-ray of foot anteroposterior and oblique views showing reduction and fixation of the navicular bone with K-wires. The talonaviculocuneiform fixation

Figure 6: X-ray of the left foot anteroposterior and oblique views at last followup showing outcome without abnormalities in both talo-navicular and cuneo-navicular joints

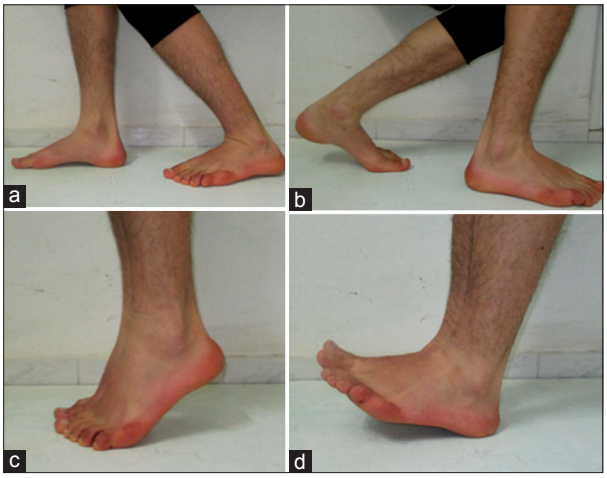

Figure 7: Clinical photographs showing the functional outcome at the last follow up; (a and b) left foot on lateral and medial views. (c and d) Plantar and dorsal flexion of the foot

dislocation at any level in either of the two bony columns, without disruption of the bony or ligamentous anatomy of the adjacent column; however, internal fixation of the lateral column with K-wires was not necessary. This allowed the injured ligaments to heal with the lateral column reduced in an anatomic position. The appropriate treatment of this injury should consist on anatomical reduction and K-wire fixation across the naviculocuneiform and talonavicular joints, supplemented with spanning external fixation, which provides stabilization of both longitudinal columns of the foot. Percutaneous K-wire fixation of the lateral column should also be added if the injury to the lateral column is severe enough and not reducible with external fixation alone. Open reduction is recommended.[4,6,10,11] closed reduction alone has been shown to lead to recurrent dislocation and osteoarthritis.[10] Some complications may occur after complete navicular dislocation, but they are not well known. Avascular necrosis of the navicular bone is the most described complication, it is estimated at nearly (25%) from all reported cases.[4,6,7] The blood supply to the navicular bone is by the small branches of the dorsalis pedis and posterior tibial arteries. After dislocation, the blood supply to the navicular is ensured by the posterior tibialis tendon.[4] If the attachment of this tendon to the navicular bone is disrupted, avascular necrosis is likely to develop. Other complications have been reported like residual subluxation of the naviculum, flatfoot deformity, posttraumatic arthritis.[5,6] At both talonavicular and naviculocuneiform joints, stiffness of the foot and soft tissue compromise.[4,8,11] concerning K-wire fixation, it is recommended to remain in place for 6 months to reduce the rate of future subluxation of the naviculum after removal of the K-wires.[12] The stabilization of the medial column leads to ligamentous repair. However; we think that stabilization of the lateral column may reduce the midfoot pain and swelling revealed in our case. External fixation of the lateral column seems to be an alternative to solve these problems.

To conclude the present rare case report, despite the restricted followup data, adds to the limited amount of information available on these injuries and presents a viable treatment option according to the injury pattern and stability of the midfoot.

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