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Complete Plantar Dislocation of Navicular Bone - A Rare Case with a Long Term Follow Up

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Abstract: ***A traumatic plantar dislocation of navicular is a rareinjury. In this article we report a case of an open plantar navicular dislocation with associated complex midfoot injury in a 25 year old male. The injury was managed with open reduction and stabilization with Kirschner - wires. Wire removal was performed at 8weeks. The patient was followed up to 8 years. At the end of the follow up he had mild mid foot pain with no other complaints. Effective and immediate management of this patient resulted in a satisfactory outcome.***

Keywords: Navicular bone, dislocation, Midfoot, arthrodesis

1. Introduction

Very few cases of traumatic plantar dislocation of navicular bone associatedwith complex midfoot injury have been reported in literature. [(1).] The regional anatomy and ligamentous architecture confer stability to the mid - foot [(2 - 6).] Intact navicular dislocation is a part of a complex disruption involving structures in the adjacent column ([(6).]

The dislocation of navicular can be associated with many bony and soft tissue injury patterns, including communited intra articular fracture of calcaneum and associated calcaneo - cuboid joint subluxation, fracture and subluxation of calcaneo cuboid joint, fracture dislocation of calcaneo cuboid joint with fractures of third and fourth metatarsals and a combination of fractures of the intermediate cuneiform, the second through fourth metatarsals and the cuboid [(4 - 11).]

In this article we report a case of a 25 year old man with a traumatic open complete plantar navicular dislocation of right foot with associated complex mid foot injury.

2. Case Report

A 25 year old man, Asian Indian in origin sustained direct trauma to right foot due to a heavy disc like object. It fell straight on the dorsal aspect of his foot while he was working in a factory. The patient was brought to our emergency room. He was haemodynamically stable with isolated complaint of injury to the right foot. Physical examination revealed two open 5x8 cm and 4x4cm wounds present over the dorsal aspect of foot and ankle region. Fortunately the dorsalis pedis artery was intact and pulsating. Tendones were found to be intact grossly (Fig.1). The foot had normal sensations all over and normal capiilary refill. After securing an IV line, appropriate analgesics were given for patient comfort. Single dose Cefazoling 2gm IV along with single dose Amikacin 500 mg was also administered. An AP and lateral X rays of the foot were taken which showed Talo navicular dislocation, disruption of the naviculo cuneiform joints with plantarly dislocated navicular bone. Disruption of the 1st, tarsometatarsal joints, medial and intermediate cunieform subluxation with increased 1st and 2nd metatasrsal space were also noted (Fig 2).

Figure 1

Figure 2

The patient was taken to the operating room. Thorough irrigation and debridement of the wounds was carried out under spinal anaesthesia. All the tendons were found to be intact along with a viable and pulsating dorsalis pedis artery. However the dorsal talonavicular capsuloligamentous structure was torn. The soft tissue was retracted to visualise the naviculo - cuneiform / tanonavicular joints and were subsequently reduced with application of longitudinal traction under direct vision. Once the joints were reduced, they were fixed using multiple 2.5 mm sized K - wires. Stay sutures were applied. The patient was put on a short leg Cramerwire splint. The post – operative radiographs showed adequate alignment of the joints.

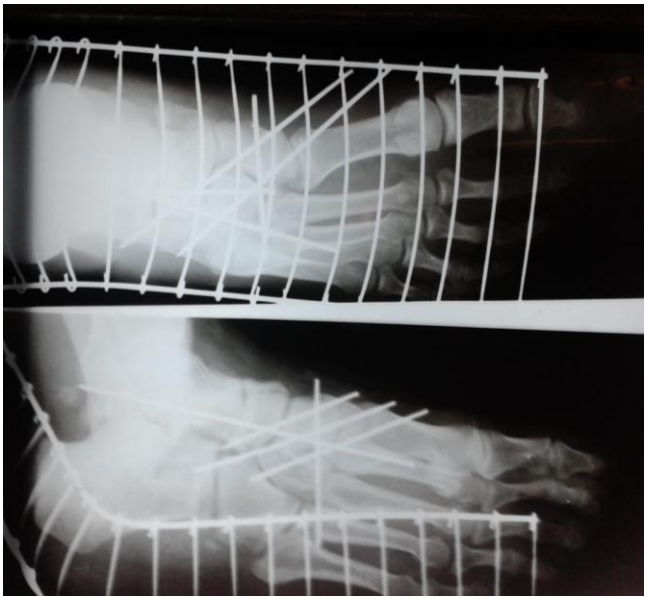
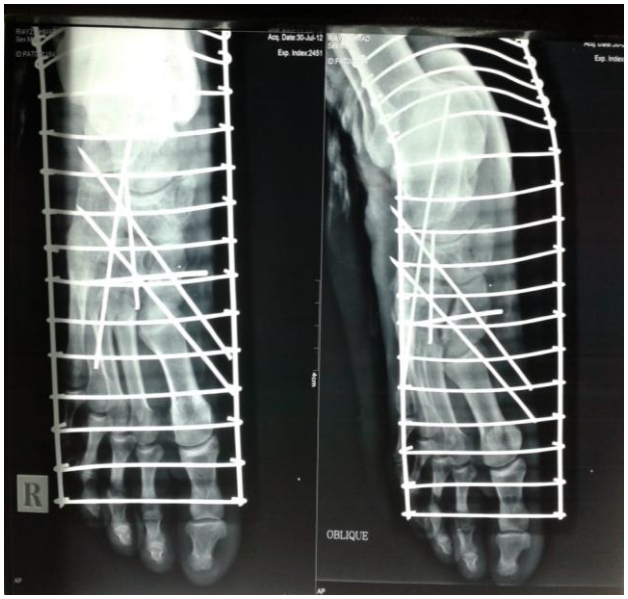


Figure 3



Patient was taken to the operating room within 24 hours for second look debridement. A back slab splint was applied and the limb was kept elevated for 48 hours. Sutures were removed after 14 days. Then after a well molded short leg cast was applied. The patient was made to ambulate with non weight bearing on the affected side. Cast was removed along with the k - wires after 8 weeks from the index procedure. A new cast was applied and kept for a period of 1 month. Patient was asked to ambulate with weight bearing as tolerated. A Custom made AFO was also prescribed and kept for a period of 3 months. The patient was followed yearly for a period of 4 years and then once in 2 years. After 8 years of follow up patient was complaining of mild discomfort over the dorsum of foot. On examination the patient was fully ambulatory with normal range of motion at the ankle joint and subtalar joint. The scars had healed.

There was midfoot stiffness. There was deep tenderness present over the dorsum of foot. The medial and lateral arches of the foot were maintained. (fig 5)

Figure 5

A radiograph of the foot AP and Lateral views showed arthrodesed mid foot joints with features of talonavicular arthritis with normal calcaneal pitch and no mid foot sag (Fig 6). Patient was prescribed oral analgesics for a short period and had no further complaints.

Figure 6

3. Discussion

The navicolocuneiform joints play a vital role in the dissipation of loading stresses on the mid foot but provide minimal motion. The plantar and dorsal ligaments are strong structures which stabilise these joints, predisposing the navicular to a fracture than a dislocation. The stability of foot is dependent on both the medial and lateral longitudinal columns which is considered impossible to injure one without disruption of the other [6]. Several patterns of lateral column disruptions have been documented involving navicular dislocation with associated calcaneo cuboid joint injuries. [5, 6, 10]

Our case happens to be a unique one where the navicular has dislocated plantarward with an intact lateralcolumn, contrary to a usual dorsal dislocation with involvement of both columns. We could only find a single case report with some of the features which we are reporting in our case study [1].

Several mechanisms have been proposed accounting for mid foot tarsal dislocations. In an acute trauma setting, the navicular displaces dorsally as a result of forefoot plantar flexion and axial loading [4], A severe abduction / pronation injury leading to a mid tarsal dislocation followed by a spontaneous reduction can force the navicular to dislocate medially [6] . This dislocation of naviculocuneiform joint and concurrent "nutcracker" injury to lateral column can produce an associated disruption of the calcaneo cuboid joint [6]. Depending on the direction of deforming force, the forefoot can dislocate supreolaterally if the force is plantar or inferolaterally if the force is dorsal, the remaining soft tissue attachments help determining the position of navicular. In our case the force was axially directed by a discoid heavy metal object over the stationary mid foot dorsally which could explain the unusual plantar of dislocation.

Majority of the surgeons agree that navicular dislocations are best treated with open reduction [4, 6]. The goal of surgical intervention is to establish a stable plantigrade foot and to minimise pain. The current literature supports using either wires or screws to maintain reduction of mid foot injuries. Wires can be used for both talonavicular and naviculocuneiform fixation. Screws can be placed across the naviculocuneiform joints. The talonavicular joint and the cuboid - metatarsal joints provide most of the motion in the mid foot and should not be readily fused ([5]. Stabilization of both columns is considered necessary to avoid complication such as subluxation and mid foot deformity. In our case the lateralcolumn was found intact and stable hence bicolumnar stabilization was not considered necessary.

Midfoot fractures that are recognised and treated early have generally favourable outcomes [5 - 11]. Chronic pain and subsequent deformity maybe present often. Perhaps the most frequent reported complication of navicular dislocation is avascular necrosis (AVN) which is thought to occur in 25 % of the cases [12]. AVN is a well - recognised complication of hind foot and mid foot trauma. In the tarsal navicular, blood supply to central third watershed region is marginal. Small branches of posterior tibial and dorsalis pedis artery that supply the medial and lateral areas are readily injured. Not surprisingly, the risk for AVN is high when the dislocated bone is severely displaced [6]. In some circumstances, the shared blood supply of the posterior tibialis maybe the only remaining osseous supply. The tendon and its soft tissue attachments should therefore be carefully monitored during dissection and reduction. [6]. In most cases, AVN of the foot manifests clinically within the first 10 months of injury. [13] AVN can result in Charcot like collapse of medial column, leading to progressive plantar midfoot deformities ([4]. in our case we did not observer AVN which could possibly have been due to a better and cautious surgical approach preserving the vessels, the second possibility lies with the fact that the navicular had displaced plantarly sparing the dorsal vascularity of the navicular.

Damage to the articular surface at the time of injury and residual articular displacement, instability and joint subluxation after injury are considered risk factors for development of post traumatic arthritis in the foot and ankle [14]. Reports suggest that the severity of damage to the articular surface is directly proportional to the degree of arthritis. Such damage may not be initially visible, especially in axial impaction injuries, but latent damage of articular surface can occur. [15] This could have been probably the reason for the arthrodesed midfoot with an arthodesed naviculocuneiform joint in our case. This possibly resulted in favourable outcome in our patient considering the fact that fusion of mid foot and naviculocuneiform joints is used as treatment for painful arthritis of foot. ([16, 17]

It is important to assess the injury on a case to case basis with a deep rooted knowledge of foot and ankle anatomy and mechanics, and the surgeon must be able to identify and anticipate and take appropriate decisions accordingly. Counselling of patients is also mandatory for acute and delayed complications in such settings. Early intervention and restoration of anatomy is the key for a good outcome as was in our case.

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