



An Unusual Midfoot Fracture–Dislocation: Total Dorsal Dislocation of Midfoot at the Cunei–Navicular Joint Associated with Cuboid Fracture: A Case Report

Nadir Görülen Bir Orta Ayak Kırıklı–Çıkığı: Küneonaviküler Eklem Ayrışması ve Kuboid Kırığı ile Orta Ayağın Total Dorsal Çıkığı: Olgu Sunumu

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ABSTRACT

Midfoot fracture-dislocations including those involving the Chopart and Lisfranc joints can be very easy to misdiagnosed. Moreover, some rarely seen types of injuries of these region including; dorsal dislocation of the midfoot at the cunei-navicular and calcaneocuboid joints, isolated dorsal dislocation of the tarsal navicular, dorsal fracture-dislocation of the tarsal navicular and complete medial dislocation of the first cuneiform have been reported. There is a lack of obvious radiographic findings in up to 33% of such injuries and there may not be familiarity with such injuries by many treating physicians. CT scans are static imaging modalities and obtained without weight bearing. However, 3D CT scan may aid to better visualize complex fracture patterns. In this paper we report a case with a total dorsal dislocation of midfoot at the cunei-navicular joint associated with cuboid fracture diagnosed after performing a 3D CT.

Keywords: Cunei-navicular dislocation; lisfranc fracture dislocation; diagnosis; fixation; 3D CT.

ÖZET

Chopart ve Lisfranc eklemleri dahil, orta ayak eklemlerinde kırıklı çıkıkların teşhis edilemeyerek kaçırılması çok kolay olabilir. Ayrıca, bu bölgede nadiren görülen yaralanma türleri olarak; kunei-navikular ve kalkaneokuboid eklemlerde orta ayağın dorsal çıkığı, tarsal navikulanın izole dorsal çıkığı, tarsal navikulanın dorsal kırıklı-çıkığı ve medial küneiform kemiğin tam medial çıkığı bildirilmiştir. Bu tür yaralanmaların %33'e varan kısmında bariz radyografik bulgular bulunmayabilir ve bu tür yaralanmaları tedavi eden birçok hekim bu yaralanmalara aşina olmayabilir. BT taramaları statik görüntüleme yöntemleridir ve ağırlık taşımadan elde edilir. Bununla birlikte, 3D BT taraması, karmaşık kırık modellerini daha iyi değerlendirmede yardımcı olabilir. Bu yazıda, 3 boyutlu BT çekildikten sonra küboid kırığı ile beraber kunei-naviküler eklemde orta ayağın tam dorsal çıkığı olan bir olgu paylaştık.

Anahtar sözcükler: Cunei-navicular çıkık; fiksasyon; lisfranc kırıklı çıkığı; tanı; 3D BT.

Total dislocations of the midfoot at the cunei-navicular and calcaneocuboid joints are rare injuries, and few have been presented in the current literature.^[1-3] The mechanism of this injury is acute valgus and dorsiflexion stress. Isolated first and/or second ray dislocation at

the cunei-navicular joint is another rare midfoot fracture-dislocation pattern and typically occurs after a torsional compressive force applied to the first ray of a plantar-flexed foot.^[4-8] However, dislocation of the first and/or second ray at the cunei-navicular joint much more frequent than

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the previous one and treatment is consisted of open reduction and internal fixation of the dislocated joints. The signs of residual instability after an inappropriate fixation or can be subtle. Thus, it is essential to clearly define the extent of the injury preoperatively.^[7] A favorable surgical outcome is dependent on an accurate and stable reduction. We report an unusual case of a total dorsal dislocation of the medial and lateral column associated with cunei-navicular joint dislocation, cuboid fracture, base fracture of 2nd and 3rd metatarsals and medial cuneiform fracture, to our knowledge, which has not been reported. Patient was informed that data concerning the case would be submitted for publication, and informed consent was obtained for publication of radiological images, clinical images and other related clinical data.

Case Report

A 43-year-old man was admitted to our emergency department after a fall from a four meters height. Patient was unable to bear weight on the right foot and was brought to the emergency department within one hour of his fall. The initial clinical examination of his right foot revealed marked swelling, with deformity of the dorsal aspect of the midfoot and significant ecchymosis in this area. Neurovascular deficit or signs of compartment syndrome were not detected. There were no abrasions. Roentgenograms revealed a dorsal dislocation of the first and second ray at the cunei-navicular joint, cuboid fracture, and medial cuneiform fracture (Fig. 1). Any other associated injury was not detected on X-rays.

A closed reduction was performed immediately. However, satisfactory reduction could not be achieved. A 3-dimensional computerised tomography (3D CT) was suggested to assess

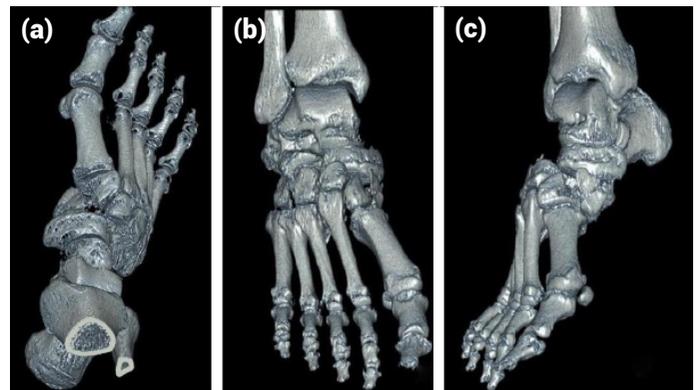


Figure 2. 3D CT scans revealed a total dorsal dislocation of the medial and lateral column at the cunei-navicular joint (a), cuboid fracture, base fracture of 2. and 3.th metatarsals (b), and medial cuneiform fracture (c).

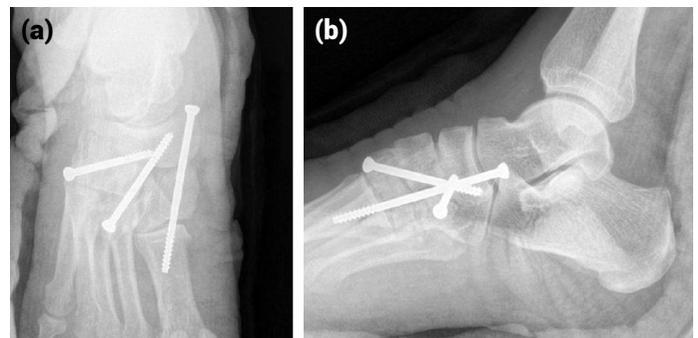


Figure 3. Initial postoperative AP (a) and lateral (b) radiographs showing anatomic reduction and fixation with screws.

the pathology thoroughly (Fig. 2). 3D CT scans revealed a total dorsal dislocation of the medial and lateral column at the cunei-navicular joint, cuboid fracture, base fracture of 2nd and 3rd metatarsals and medial cuneiform fracture. Open reduction and internal fixation were planned and performed at the 8th hour within the injury. The cunei-navicular joint was reduced through two incisions, which were placed in line



Figure 1. AP (a), lateral (b), and oblique (c) radiographs revealed a dorsal dislocation of the first and second ray at the cunei-navicular joint, cuboid fracture and medial cuneiform fracture.

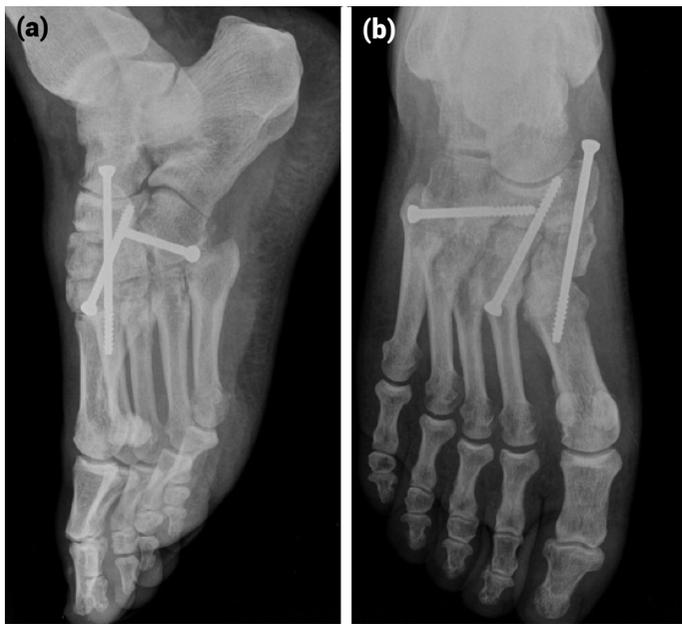


Figure 4. Postoperative 8- month follow-up AP (a) and lateral (b) radiographs show no loss of reduction.

with the first webspace and 4th metatars. The cunei-navicular fracture-dislocation was fixed with 2 Kirschner wires, one in retrograde and one in an antegrade position. Proper lateral column alignment was obtained after the reduction of the cuboid fracture. Cuboid fracture was fixed with one Kirschner wire. Joint congruence was considered satisfactory with no displacement on stability testing. All Kirschner wires were replaced with 4mm cannulated screws after proper drilling (Fig. 3). The foot was put in a spica cast and kept non-weight bearing for six weeks. The patient was able to bear full weight after three months. However, the patient had pain and tenderness after long-distance walking. At the 8th month follow-up, the patient returned to work and was pain-free during walking (Fig. 4).

Discussion

Fracture-dislocations of the midfoot around tarsal navicular bone are relatively rare injuries. Because there is high degree of congruity of the midfoot joints and there is a powerful dorsal and plantar ligamentous support, which explains that fractures or fracture-dislocations associated with other important foot injuries are more likely to occur than isolated fractures or fracture-dislocations.^[9] However, some rarely seen types of injuries of these regions, including dorsal dislocation of the midfoot at the cunei-navicular and calcaneocuboid joints,^[13] isolated dorsal dislocation of the tarsal navicular,^[10,11] dorsal fracture-dislocation of the tarsal navicular^[9] and complete medial dislocation of the first cuneiform,^[12] have been report-

ed. Incidence of tarsal navicular fracture–dislocations have been reported to be approximately 0.26% of all fractures.^[9] However, real incidence of other injuries is not known and reported previous studies are mostly case reports. To our knowledge, this is the first study reporting total dorsal dislocation of the midfoot at the cunei-navicular joint.

Midfoot fracture-dislocations, including those involving the Chopart and Lisfranc joints, can be very easy to be misdiagnosed. Because these are rare injuries, there is a lack of obvious radiographic findings in up to 33% of such injuries and there may not be familiarity with such injuries by many treating physicians.^[13] CT scans are static imaging modalities and obtained without weight bearing. Thus, they are not generally helpful in evaluating the stability.^[14] Thus, in present case, we used a 3D CT scan to better visualize fracture patterns. Real characteristics of injury was diagnosed after having a 3D CT scan.

Approximately one-third of Chopart and Lisfranc fracture-dislocations arises from low-energy trauma, such as sports injuries.^[13] Cunei-navicular joint dislocations are less common. Because the joint between the navicular and the medial cuneiform is exceptionally stable and considerable force is required to produce a dislocation because of minimal motion at this joint provided by strong ligamentous support.^[1, 7, 8] However, in present case, total dorsal dislocation of the medial and lateral column at the cunei-navicular joint associated with cuboid fracture occurred after a fall from four meters height on plantar-flexed foot. Position of the foot and the direction of the force during the injury determines the direction of the dislocation.^[11] Longitudinal forces transmitted along the metatarsal rays compresses the navicula and produce dorsal dislocation, which implies rupture of the dorsal ligaments, which could fail only in tension produced by plantar flexion. 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. It is impossible for a dislocation to occur without an associated fracture or ligament injury.^[9] Only a few studies reported similar cases with total dorsal dislocations of the midfoot at the cunei-navicular and calcaneocuboid joints.^[13] However, in our case, plantar forces disrupted the dorsal ligamentous structure, resulting in total dorsal midfoot dislocation at the naviculo-cuneiform joint associated with cuboid fracture without calcaneocuboid dislocation. This finding suggests that the probable mechanism of injury for that case maybe a fall on the hyper plantar flexed and inverted foot.

Nonsurgical treatment for midfoot fracture dislocations is reserved for nondisplaced and stable injuries only.^[4-6] Joint displacement through the tarsometatarsal joint complex with or without a stress examination is an indication for surgical intervention. Essential joints (the talonavicular, calcaneocuboid and the articulations between the cuboid and the fourth and fifth metatarsals) are those essential to midfoot function because of the motion required at those joints. Every attempt must be made to reconstruct and preserve essential joints. Nonessential joints (first, second, and third metatarsocuneiform joints; the intercuneiform joints; and the naviculocuneiform joint) have minimal to no for the motion. Nonessential joints may be fused, and permanent implants may be placed across these joints.^[14] Total dorsal dislocation of the midfoot is a very important injury as it causes disruption of both the medial and lateral columns of the foot. Early and prompt reduction–fixation is needed for satisfactory results.^[3] Closed reduction and/or fixation with K wires is not enough to provide stability.^[1,15,16] Closed reduction and/or fixation with K wires may result in early mid-tarsal joint subluxation and arthritis secondary to residual instability.^[1,16] In present case, fracture dislocation had occurred through nonessential joints. Reduction was achieved through two incisions after debridement of fracture-dislocation area. Satisfactory stability was provided by permanent screw fixation. After eight months of follow-up, patient returned to work and remained pain-free during walking.

Conclusion

Total dorsal dislocation of the midfoot is a rare and severe injury as it causes disruption of both the medial and lateral columns of the foot. To our knowledge, this is the first report of a total dorsal midfoot dislocation at the naviculo-cuneiform joint without calcaneocuboid joint dislocation. 3D CT scan was used to better visualize fracture patterns. Real characteristics of injury were diagnosed by 3D CT scan. Early, open reduction and permanent fixation with cannulated screws of this rare injury was successful in this case and appeared to be important.

Disclosures

Informed consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

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Conflict of Interest: None declared.

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