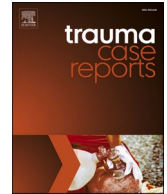




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## Case Report

# Dorsomedial fracture dislocation of the tarsal navicular: A rare orthopaedic injury

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## ABSTRACT

Dorsomedial fracture dislocations of the tarsal navicular are extremely rare injuries which commonly occur secondary to high energy, complex multidirectional forces involving an abduction force to a pronated and plantar-flexed foot. A 44-year-old female presented in the emergency room following a motor vehicle accident with a dorsomedial fracture dislocation of her navicular. Management required acute fusion of the talonavicular joint. There are few reports in the literature discussing the treating, outcomes, and complications of these injuries. Our report represents one method of treating these rare injuries with a favorable outcome.

## Introduction

Isolated dislocations of the tarsal navicular are extremely rare injuries due to the extensive ligamentous attachments providing support to the midfoot. These injuries are typically associated with fractures of the navicular itself, other tarsal bones, or disruptions of the medial or lateral column [1–4]. Usually, these injuries are due to high energy, complex multidirectional forces involving an abduction force to a pronated and plantar-flexed foot [3–5]. This case report presents our management of a dorsomedial fracture dislocation of the navicular with associated fractures of the medial, intermediate, and lateral cuneiforms.

## Case report

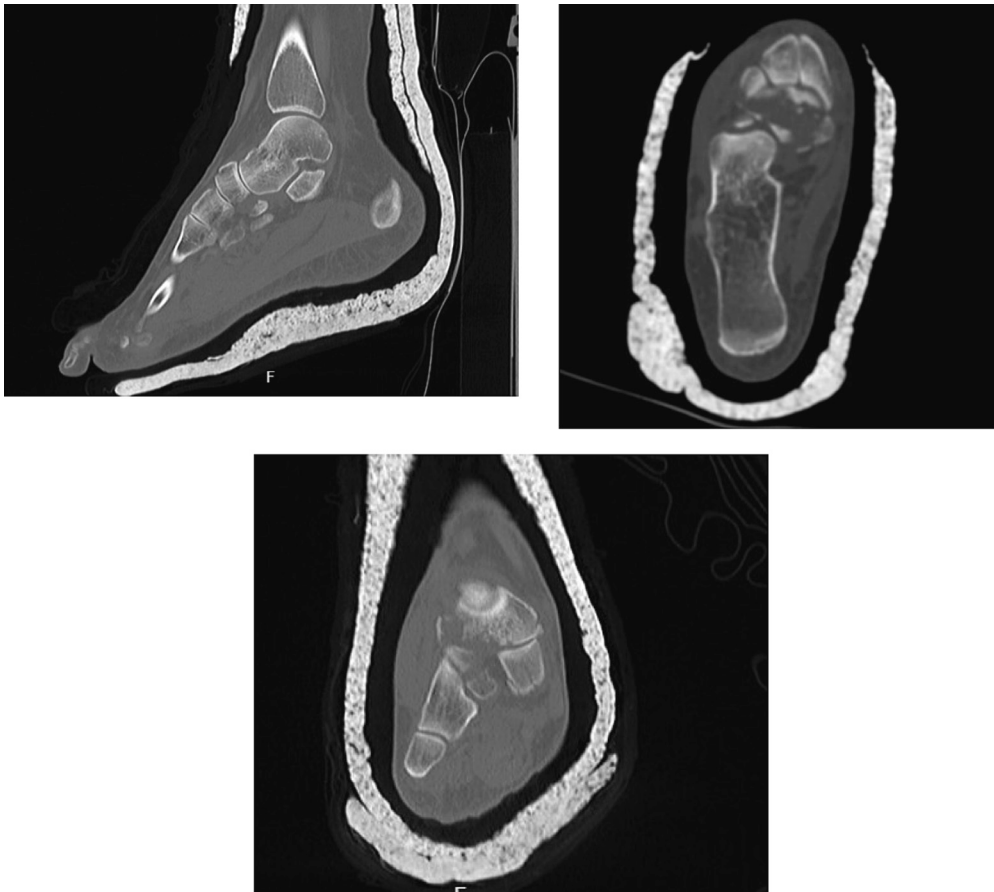
A 44-year-old female presented to the emergency room following a motor vehicle accident. She reported significant pain in the bilateral feet, left shoulder, and back. Clinical exam revealed the patient had significant tenderness to palpation to the right foot with a palpable dorsomedial prominence. She also had tenderness to palpation about the thoracic spine, left clavicle, and left foot. Radiographs of the right foot demonstrated a right dorsomedial fracture dislocation of the talo-navicular joint (Fig. 1). Patient also had a left clavicle fracture, left cuboid fracture, and left great toe fracture. Conscious sedation and closed reduction of the navicular was attempted in the emergency department with persistent dorsal dislocation of the navicular as seen on fluoroscopy images (Fig. 1). A CT was obtained which demonstrated fracture dislocation of the navicular with associated dorsal and plantar fractures. In addition, CT scan demonstrated fractures of the medial, intermediate, and lateral cuneiforms (Fig. 2). Due to the dislocated talonavicular joint, the plan was for operative management with talonavicular arthrodesis the following day. A longitudinal incision was placed midway between the anterior tibial tendon and posterior tibial tendon overlying the talonavicular joint medially. The talonavicular joint capsule was found to be torn from the dorsal aspect of the talar neck. Portions of the capsule were still attached to the navicular, and

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**Fig. 1.** Initial X-ray images demonstrating dorsomedial fracture dislocation of tarsal navicular as well as fluoroscopy images demonstrating continued dorsal subluxation of the tarsal navicular following attempted closed reduction.



**Fig. 2.** CT images demonstrating continued subluxation of tarsal navicular as well as associated plantar and dorsal fractures of the navicular as well as fractures of the medial, intermediate, and lateral cuneiforms.

these were left intact. There was also capsular disruption of the medial aspect of the navicular cuneiform joint. Comminuted fracture fragments were identified through the plantar aspect of the navicular, with one fragment consisting of the posterior tibial tendon insertion. Due to plantar comminution, it was decided to fuse the talonavicular. The talonavicular joint was prepped in the standard fashion. The talonavicular joint was reduced, and provisionally pinned with k wires. Once anatomic position was confirmed, 3.5 mm headless compression screws were placed using guide pins (Fig. 3). Satisfactory compression was noted across the joint. The wound was then closed, and the patient was kept non-weight bearing in a posterior slab splint for 6 weeks post-operatively. At 6 weeks follow up, the patient was doing well with continued but improving pain and compression screws in adequate alignment with subtle signs of healing (Fig. 4). Incision appeared to be healing well and the patient was transitioned to weight bearing as tolerated in a boot, with instructions to wean from the boot as pain tolerated over the next 6 weeks. At 6 months follow up, the radiographs demonstrated bridging bone, but the patient continued to have mild pain (Fig. 5). A repeat CT was ordered to assess for bony fusion. CT was obtained at 10 months and showed adequate fusion, >90 % (Fig. 6). Patient transitioned to shoe wear at this time with significant improvement in her pain.

## Discussion

Isolated navicular dislocations and fracture dislocations are extremely rare injuries with only a few reports in the literature. The rarity of this injury is secondary to the robust ligamentous and bony support surrounding the navicular [1–3,6,7]. Dislocations of the navicular are most often accompanied by fractures of other midfoot bones or the navicular itself secondary to its attachments much like in our reported case. The mechanism of injury is not completely understood but is most likely due to a complex multidirectional force involving a high energy abduction force on a pronated and plantar flexed foot [3,6,7]. Management of these injuries involves closed versus open reduction with internal or external fixation with K-wires, plates, screws, staples, or external fixators [1–10].

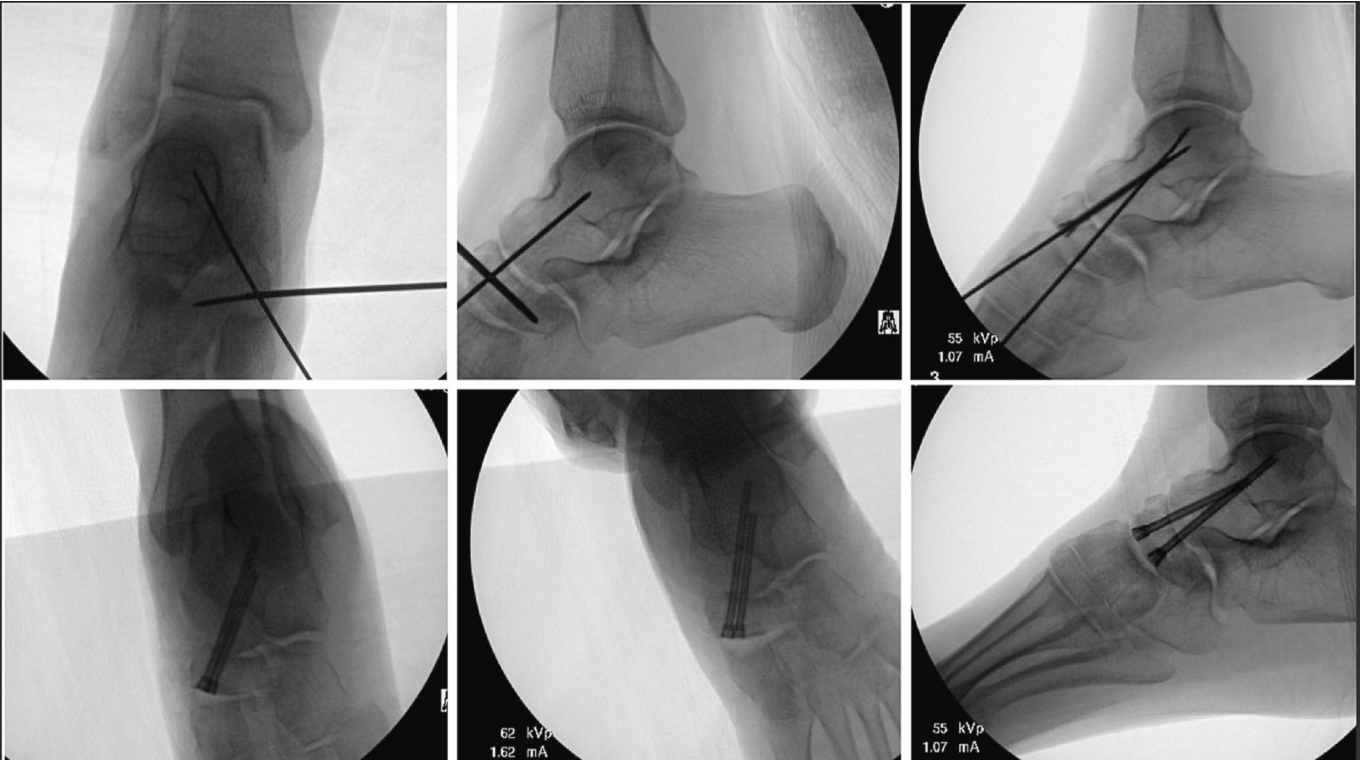


Fig. 3. Intraoperative fluoroscopy images demonstrating adequate reduction and fixation with two 3.5 mm headless compression screws.



**Fig. 4.** 6-Week postoperative films in appropriate alignment with subtle early osseous bridging.

Although not all complications are known for these injuries due to the injury rarity, there are documented complications described in the literature. These complications include the following: risk for avascular necrosis of the navicular, posterior tibial tendon dysfunction, flatfoot deformities, residual navicular subluxation, pain, stiffness secondary to posttraumatic arthritis, and wound complications [1–3,5]. The navicular bone has a tenuous blood supply. The bone obtains its blood supply from small branches from the dorsalis pedis and posterior tibial arteries. Following injury, these are disrupted, and the navicular bone receives blood supply primarily from the posterior tibialis tendon [2]. Thus, the navicular bone is at significant risks of avascular necrosis following this type of injury and close monitoring is warranted [3,5,8,11]. The navicular bone is also at high risk of residual subluxation or delayed subluxation [8]. Therefore, it is suggested that open reduction with K-wire fixation needs supplemented with the addition of internal fixation in the form of plates versus external fixation [8]. The K wires as well as external fixators typically need to remain for a minimum of 6 months to reduce the possibility of delayed subluxation after removal [8,11]. This may be cumbersome for the patient and potentiates the possibility of complication in the form of fixation failure, pin infection, and wound complications secondary to pin migration or external fixator placement.

There is no definitive evidence suggesting one fixation method over another in the literature. Although there are multiple techniques to address these injuries without fusion, many may still require delayed fusion procedures to obtain and maintain joint stability if these methods fail. Since our patient had undergone multiple failed closed reductions, had significant comminution, and preferred one definitive procedure, we elected to manage our patient with primary talonavicular joint arthrodesis utilizing headless compression screws as this would ensure adequate reduction, compression, and maintenance of midfoot stability. Ultimately, our patient went on to a satisfactory outcome following a primary fusion with minimal pain and adequate fusion, >90 %, as seen on CT imaging approximately 10 months following surgery.

In conclusion, fracture-dislocations of the tarsal navicular bone are rare injuries with differing approaches for addressing these injuries in the literature. This report demonstrates a successful outcome with a single surgery in the form of primary fusion for a dorsomedial fracture-dislocation of the tarsal navicular.



Fig. 5. 6-Month postoperative films in appropriate alignment with evidence of osseous bridging and fusion.

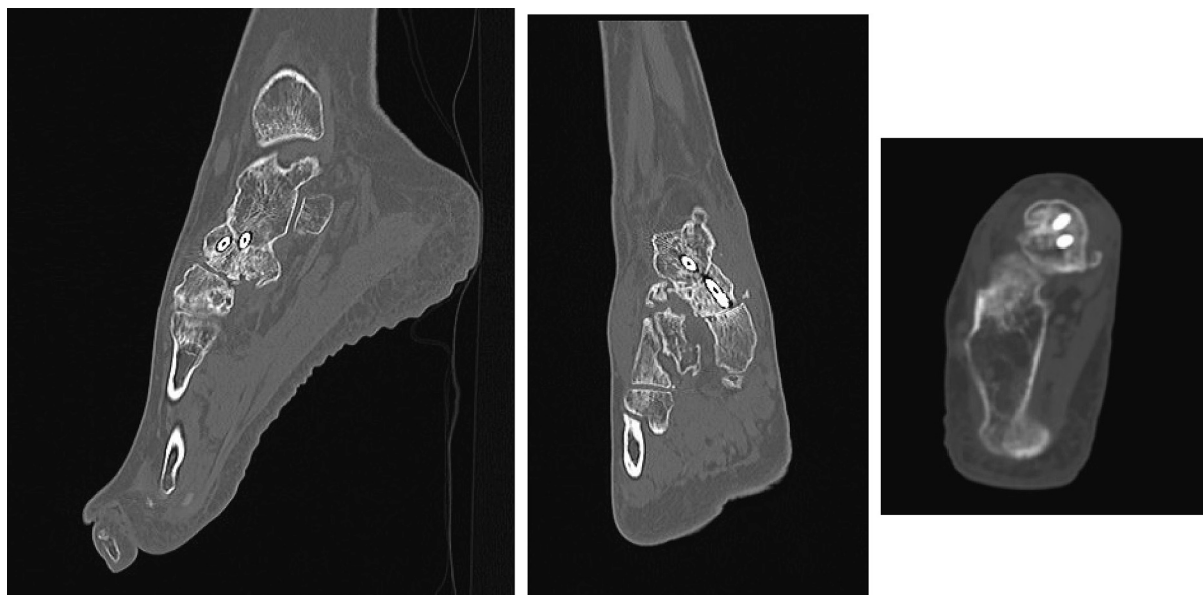


Fig. 6. 10-Month CT imaging demonstrating adequate fusion, >90 %, of the talonavicular joint.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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