

Medial Cuneiform Traumatic Fracture Dislocation: A Case Report and Literature Review

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Abstract

Introduction

The medial cuneiform articulates with the navicular and first metatarsal bone. Moreover, its significance comes from the attachment site for different ligaments. Isolated fracture dislocation of the medial cuneiform bone is rare.

Case Presentation

A 30 years old male, smoker, who works as a driver. He sustained a front collision, road traffic accident. Right foot swelling with a positive wrinkle sign had noticed. Right foot x-ray showed fracture and medial dislocation of the medial cuneiform.

Management and Outcome

Two trials of closed reduction were attempted in ER that were failed. Accordingly, the patient was admitted for analgesics, Ice packing and operative management after subsidence of the swelling after eight days from admission. Later on the same admission, closed reduction was achieved using Kapandji technique. Post-operatively, he was discharged with regular follow-up appointments at different time intervals. The patient showed marked improvement with regaining full range of motion and reported a generalized well-being.

Discussion

This case is considered a rare injury due to the fact that the majority of these cases are misdiagnosed at presentation. It is worth mentioning that even if detected early, the suboptimal treatment can result in chronic deformity that is challenging. In our patient, this was picked up early and treated surgically. Interestingly, with all the aforementioned findings, the case considered unique.

Introduction

Fracture dislocation involving the tarsometatarsal region is a common injury in foot trauma, usually characterized by traumatic disruption between the articulation of the bony and ligamentous structures.

Isolated fracture dislocation of the medial cuneiform bone is rare, especially medial dislocations [1]. However, most of the foot and ankle trauma literature have discussed tarsometatarsal injuries, however only few studies found to describe this entity.

Lisfranc's injury usually refers to an injury to midfoot at tarsometatarsal joint. The medial cuneiform is part from this joint and articulates with the navicular and first metatarsal. It is the largest of all the three cuneiform bones. Medial cuneiform is also a site of attachment for some ligaments, including peroneus longus and tibialis anterior muscles. Moreover, it plays a major role in the medial longitudinal arch of the foot. In general, dorsal ligaments are weaker than plantar ligaments but medial dislocation of the medial cuneiform is a very rare injury [2,3]. Therefore, we present a rare case of traumatic fracture and medially directed dislocation of the medial cuneiform with its successful way of management.

Case Report

A 30 years old male, smoker, who works as a driver, not known to have any medical illness before, brought to the emergency department by ambulance in which he sustained a front collision road traffic accident. He was the driver, unseat belted, and complaining of isolated right foot pain with inability to bear weight on it. A deformity in the foot noticed too.

Upon arrival, Advance Trauma Life Support protocol initiated, primary and secondary surveys were normal apart from the right foot swelling, positive wrinkle sign, deformity with medial skin tenting and severe tenderness (Figure 1). Moreover, the distal neurovascular exam was intact. Right foot plain radiography

showed fracture fracture and medial dislocation of the medial cuneiform (Figure 2). Then, two trials of closed reduction were attempted under proper analgesia in the emergency department, however, dislocated bones failed to be reduced most likely due to sever swelling.

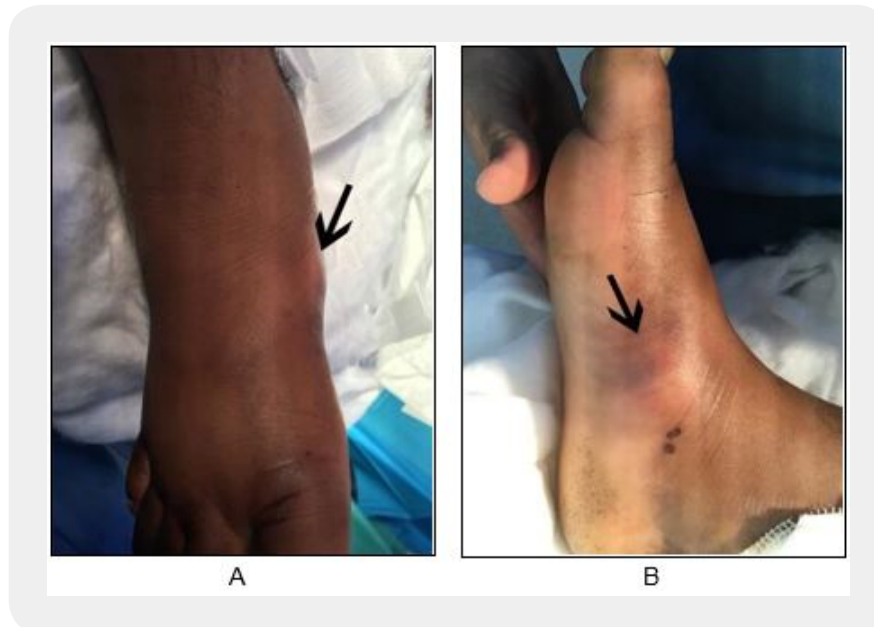


Figure 1 A&B: Right foot lateral and superior images showing medial foot swelling, skin tenting, and deformity (arrowed).

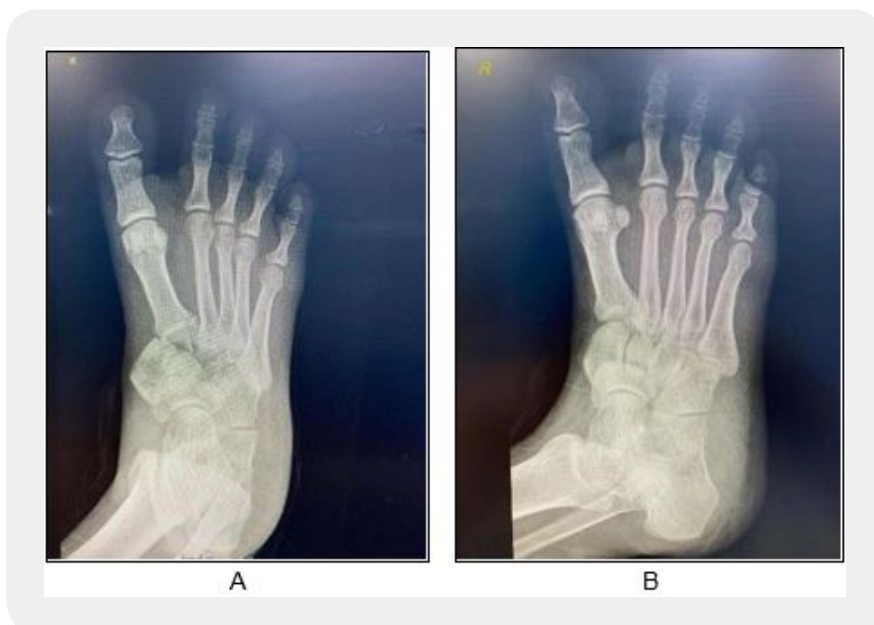


Figure 2: A (AP) and B (oblique) views of right foot showing fracture and medial dislocation of the medial cuneiform

Computed tomography scan was done to evaluate the articular surfaces and fracture geometry (Figure 3). CT scan showed anterior calcaneal process comminution, which indicate compression of cuboid over the anterior process of calcaneus during the trauma. Medial and middle cuneiform bones were dislocated medially out of their contact with proximal tarsal and distal metatarsal bones. Accordingly, the patient diagnosed with fracture dislocation of medial cuneiform of the right foot, admitted the surgical ward for analgesia, elevation, ice packing, and ultimately planned for operative management. Seven days after the trauma, the swelling decreased and skin wrinkles become visible.



Figure 3: (Description of the CT: sagittal and axial views comminuted fracture dislocation of medial cuneiform medially displaced medial cuneiform with lateral dislocation of the first tarsometatarsal joint).

On day eight and under spinal anesthesia, a trial of close reduction of the medial cuneiform done but again failed. Trail of closed reduction achieved using Kapandji technique [4]. Standard dorsolateral incision made over the mid foot, dissection done between tibialis anterior and extensor hallucis tendon. The midfoot joints are identified, there was distribution of naviculocuneiform and first, second and third tarsometatarsal joint, all these joints in the medial three rays disrupted and we decided to fix them with fusion, all disrupted joints were denuded from cartilage. Additional cannulated screws and k-wires are used to fix the second and third

rays bones. All the reconstruction built and fixed to the navicular bone. Then arthrodesis done using cannulated screws from medial to lateral cuneiform, followed by another screw from medial cuneiform to base of the second metatarsal bone. A plate applied from the navicular to the base of the first metatarsal bone. The lateral two rays were very stable and did not need fixation (Figure 4). A back slab was applied.



Figure 4: *Intraoperative medial image: showed right foot after reduction and K-wire fixation.*

Post-operatively, he kept in the hospital for two-day observation and then discharged with axillary crutches, non-weight bearing mobilization on the right lower limb and follow-up appointments.

On the first follow-up visit, wounds were clean and dry with no signs of infection. AP and Lateral plain radiograph views of the right foot done (Figure 5). Sutures were removed at around 3 weeks and cast was continued for 6 weeks. Immobilization with removable ankle immobilizer for another 6 weeks. Physiotherapy with range of motion and muscle strengthening of the ankle started at 6 weeks. Weight bearing initiated around 2 months after x-ray evidence of healing and progressed to full weight bearing at 3 months (Figure 6). At 6 months, he resumed full job activity and driving was allowed.

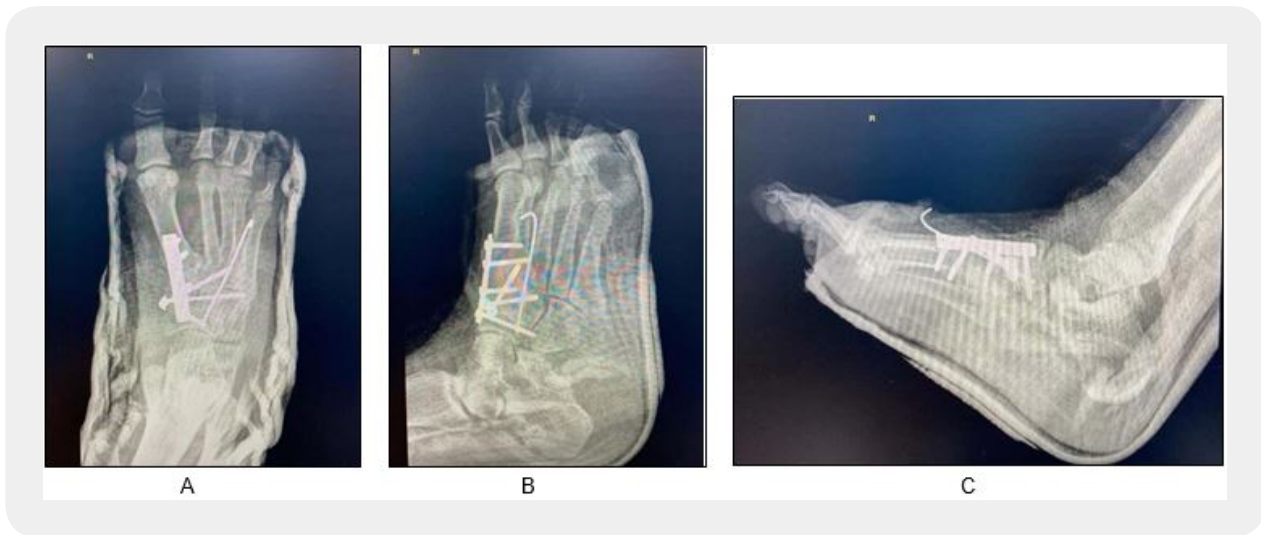


Figure 5: A, B & C Post-operative AP, oblique and lateral views x-rays of right foot with back slab showed reduced medial cuneiform dislocation and internal fixation



Figure 6: A, B & C 3 months Post-operative AP, oblique and lateral views x-rays of the right foot showing healed and fused tarso- metatarsal joint

Discussion

The cuneiforms are wedged in shape and articulate distally with first, second and third metatarsals respectively. Multiple ligaments achieve the stability of these bones including the thick plantar ligaments, tibialis posterior, tibialis anterior and peroneus longus tendon insertion, which collectively contribute in the formation of the transverse and medial longitudinal arch of the foot. However, in rare cases of excessive plantar flexion these ligaments can tear leading to dislocation of cuneiforms [1,5,6].

The majority of these cases are misdiagnosed at presentation using plain film radiographs only, so occult injuries can be missed. Thus considered as a rare injury. Suboptimal management of these injuries with a single Kirschner wire without taking into consideration the effect of deforming forces exerted by surrounding structures is common [7].

The exact mechanism of injury in our case was vague as it was a part of a road traffic accident. We believe that the cuneiform dislocation happened due to severe abduction of the foot with cuboid compressing over anterior process of the calcaneus. This resulted in disruption of the medial arch and plantar ligament that allows the cuneiform to dislocate. In literature, most cuneiform dislocations are described as direct trauma to the dorsomedial side of the injured foot with maximum plantar flexion during the accident. This can lead to ligament disruption in addition to the pull of tibialis anterior tendon, with severe capsuloligamentous complex injury, which can contribute to the fracture-dislocation of the medial cuneiform [1,6].

The swelling usually prevents the close reduction and earlier operative management in these cases, although trial of close reduction at the emergency room can be done to decrease the deformity and skin tenting in order to avoid long-term complications. However, tibialis anterior tendon might be engaged and can obstruct the close reduction, therefore necessitates exploration and open reduction [1,8].

Medial dislocation of the medial cuneiform was not described well in both Rockwood and Green (1984) and Helal and Wilson (1988), due to its rare incidence, and usually it is a part of more complex Lisfranc's injury [7]. In these injuries, Magnetic Resonance Imaging (MRI) usually is not indicated unless plain radiograph imaging is normal and ligaments injury is highly suspected [2].

Arthrodesis was done in our case due to the high failure rate and unsatisfactory result from reduction and fixation alone, development of painful degenerative joint arthritis was the most common cause of failure, and does not have significant functional impairment [6,9].

In addition, in severe foot trauma, high index of suspicion of compartment syndrome is crucial, so observation and serial examination is important step of the management of these injuries [1]. Less commonly, collapse of the medial arch can be a result of avascular necrosis of the dislocated bone when it loses its anatomical connections [6,10].

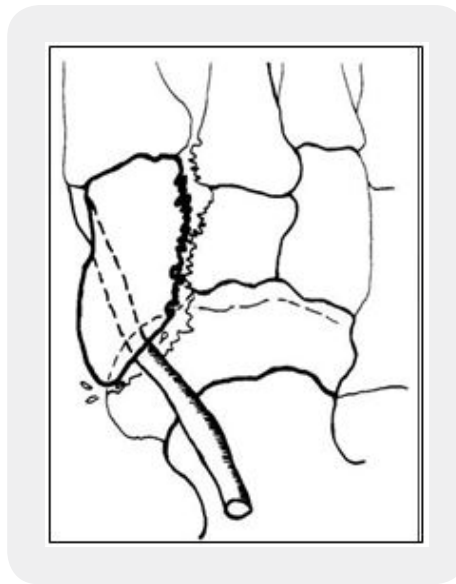


Figure 7: illustration of tibialis anterior tendon entrapment between navicular and the medial cuneiform [8].

Conclusion

Fracture and medial dislocation of the medial cuneiform bone is a rare entity of Lisfranc's injury that represent a diagnostic challenge, which can be missed by routine plain radiograph, precluding a high index of suspicion and three dimensional computed tomography can aid in diagnosis of these injuries. Careful assessment is very crucial and each ray of the foot should be examined and reconstructed alone to reach strong fixation and mechanically aligned foot.

Disclosure Statement

The authors have no conflicts of interest or any financial disclosures to make.

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