

## Combined Midfoot Dislocation Involving the Naviculocuneiform and Calcaneocuboid Joints: A Case Report

Ibrahim S. Alayed

Department of Orthopedic Surgery, Al Noor Specialist Hospital, Makkah, Saudi Arabia

Corresponding Author: Ibrahim S. Alayed, E-Mail: Ibrahim.alayed@hotmail.com

### ABSTRACT

**Background:** Midfoot injuries such as dislocation of the naviculocuneiform and calcaneocuboid joints are very rare. They mostly result from high energy crushing trauma, which leads to dislocation of the midfoot in a plantar direction.

**Objective:** To study the outcome of open reduction and internal fixation with K-wires in naviculocuneiform and calcaneocuboid joint dislocations.

**Patients and methods:** Our case report of a 27 years old male who sustained an isolated left foot injury after a road traffic accident, radiographs showed a dislocation of the naviculocuneiform joint and fracture-dislocation of the calcaneocuboid joint. This uncommon injury pattern required open reduction and internal fixation with K-wires.

**Results:** K-wires were removed after 12 weeks. At the 12 months follow up, he achieved a complete range of motion of the left foot and ankle with good functional outcomes and with no complications. The goal in such dislocations is to achieve a stable congruent joint with gradual rehabilitation to reach a good functional outcome.

**Conclusion:** Closed dislocations involving the naviculocuneiform and calcaneocuboid joints are very rare, and they occur following a high energy trauma in the majority of cases. The goal of treatment in such injuries is to achieve a stable congruent joint with gradual rehabilitation to maximize the functional outcomes.

**Keywords:** Calcaneocuboid, Naviculocuneiform, Midfoot injury, Chopart, Midtarsal Dislocation.

### INTRODUCTION

Midfoot injuries are rare and it accounts about 5% of all foot injuries. Among these, fracture-dislocation of Chopart and Lisfranc joints is the most common <sup>(1)</sup>. Combined dislocations of the calcaneocuboid and talonavicular joints or isolated dislocations of the calcaneocuboid, talonavicular, or naviculocuneiform joints are very rare <sup>(2)</sup>. These injuries mostly occur in motor vehicle accidents <sup>(3)</sup>. However, cases with low energy mechanism have been reported in the literature. This case report presents the initial assessment, diagnosis, management and post-operative follow up of a patient with a dislocation involving the calcaneocuboid, naviculocuneiform joints, with the presence of a calcaneal fracture with extension to the calcaneocuboid joint articulation, which is an uncommon injury. Therefore, this study aimed to find the efficacy of the used fixation and treatment methods.

**Ethical approval:** Patient signed an informed written consent for acceptance of the operation and for publication of this case report.

### CASE REPORT

A 27 years old male patient, involved in a high speed road traffic accident, frontal impaction, brought

to our Emergency Department by an ambulance. ATLS protocol activated in the Emergency Department and primary survey were done and is unremarkable.

Secondary survey revealed that there was an isolated left foot injury with bony prominence and tenderness over the midfoot and restricted range of motion, there was no open wounds over the left foot and no sign of compartment syndrome and the neurovascular status was intact. Trauma series imaging and pan computed tomography were done and it was unremarkable. The patient was evaluated in the emergency room by the trauma and surgical subspecialties and was cleared as an isolated left foot injury. The radiographs of the left foot and ankle were done in the form of anteroposterior, lateral, and an oblique views for the left foot (Fig. 1). Radiographs revealed a naviculocuneiform joint dislocation and a fracture of the calcaneus with extension to the calcaneocuboid joint, with a calcaneocuboid joint dislocation. Closed reduction under sedation of the midfoot dislocations was attempted but it was unsuccessful. So we put the patient on a below knee posterior splint and we booked him for open reduction and internal fixation.

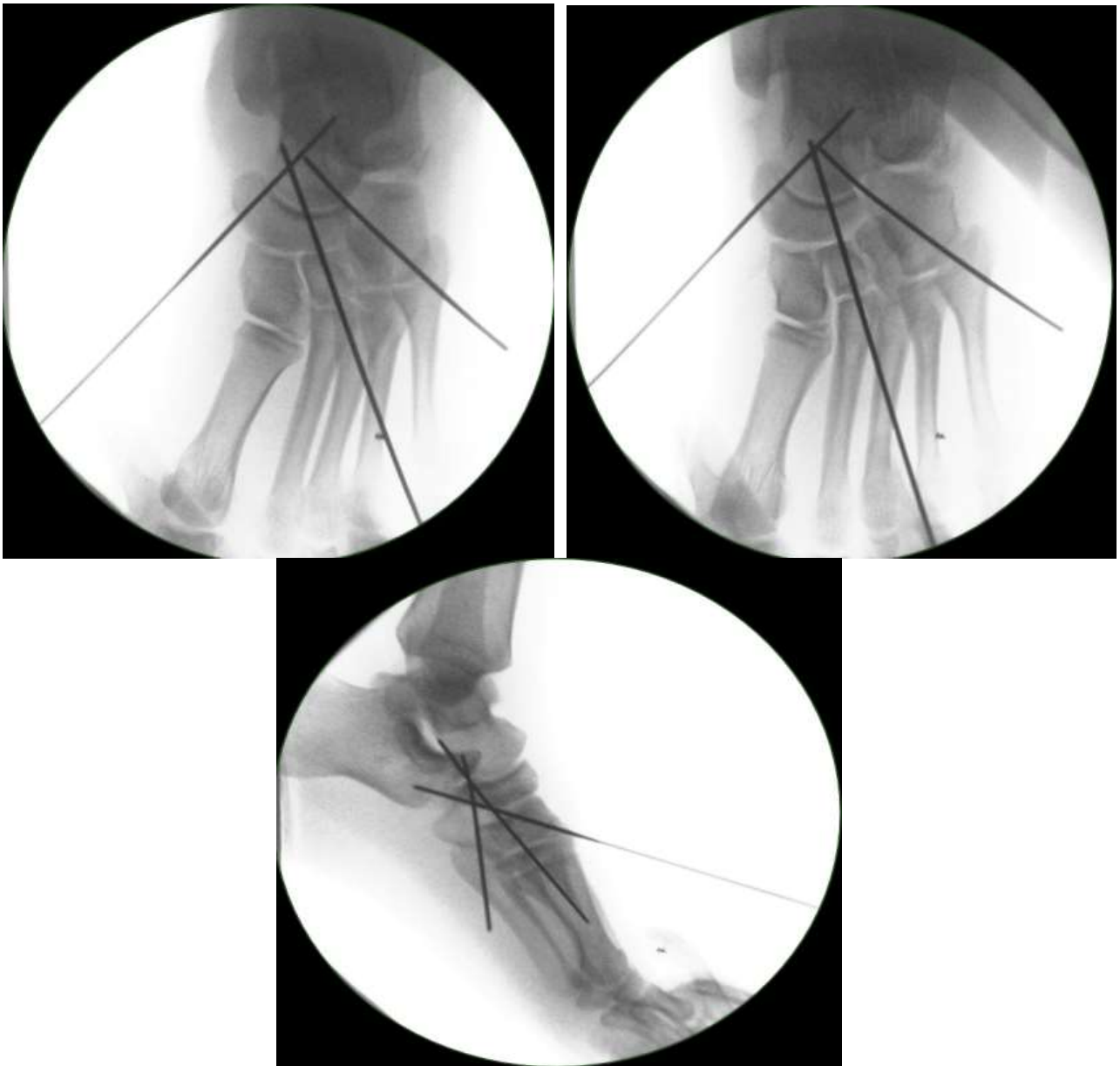


This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY-SA) license (<http://creativecommons.org/licenses/by/4.0/>)



**Figure (1):** The initial anteroposterior, Oblique and lateral radiographs of the left foot, showing naviculocuneiform and calcaneocuboid dislocations with fracture of the calcaneus with extension to the calcaneocuboid joint.

Open reduction and internal fixation with 2 mm K-wires were used; the calcaneocuboid and naviculocuneiform joints were approached with two small incisions (1 inch in length) over the dorsomedial and dorsolateral surface of the midfoot. The soft tissue entrapped between the two joints was removed, there was a disruption of joints capsule. We then used axial traction in line with the first metatarsal with midfoot adduction to reduce the navicular bone. Reduction was successful and the joint was congruent under an image intensifier. Then, a medial K-wire was introduced from the navicular ending at the talus, a middle K-wire was introduced from the middle cuneiform passing to the navicular and ending at the calcaneus. Finally, a lateral K-wire was used from the cuboid to the talus. Reduction and fixation was confirmed with the help of an image intensifier (Fig. 2). Postoperatively the patient was placed in a below knee posterior splint and was discharged from the hospital after completion of care with a strict non weight bearing on the left lower extremity.



**Figure (2):** The final intra-operative radiographs of the left foot, Anteroposterior, oblique, and lateral views showing stabilization of the naviculocuneiform and calcaneocuboid joint dislocations with three Kirschner wires.

First visit was two weeks postoperatively; sutures were removed and below knee cast was applied. The cast and K-wires were removed at 12 week post operatively and the patient started gradual weight bearing as tolerated. Follow up for one year postoperatively revealed that the patient had a complete range of motion of the midfoot with no restrictions but complained of mild pain after long periods of walking. His American Orthopaedic Foot and Ankle Society (AOFAS) midfoot score was 90 (Fig. 3).



**Figure (3):** The anteroposterior and oblique radiographs of the left foot at one year follow up.

## DISCUSSION

Combined calcaneocuboid and talonavicular joint dislocations or isolated dislocations of calcaneocuboid, talonavicular or naviculocuneiform joints are very uncommon<sup>(2)</sup>. The reason behind these injuries being uncommon is due to the strong ligamentous attachments located on the dorsal and plantar side, combined with a strong bony support around the navicular and cuboid bones<sup>(4)</sup>. The largest case series regarding midtarsal injuries was done by **Main and Jowett**<sup>(5)</sup>, they reported a total of 71 cases. Their classification was done according to the displacement and the direction of deforming forces, and these include: crush injuries, medial, lateral, longitudinal and plantar forces. Out of these 71 cases, only 12 cases were due to lateral displacement of the forefoot, and among these 12 cases, only 4 were due to fracture-dislocations and had a non-operative management. The rest of the injuries were undisplaced. Out of these 4 cases, two of them were managed at later stage with triple arthrodesis. They described in their cases a subluxation of the talonavicular joint combined with crushing and comminution of the lateral column of the midfoot (articulation of the calcaneocuboid joint) that was due to lateral displacement of the forefoot<sup>(5)</sup>. The difference in our case is that the injury consisted of a naviculocuneiform dislocation on the

medial side and calcaneocuboid fracture-dislocation on the lateral column.

According to several reports, dislocation of the navicular bone is associated with significant disruption of the midtarsal ligamentous support, as well as disruption of both the medial and lateral columns<sup>(4, 5, 6)</sup>. With this widespread disruption, the mode of injury should be high leading to these injury patterns. This is consistent with almost all published data related to calcaneocuboid and navicular dislocations, road traffic accidents, fall from height and significant crush injuries are among the described modes of injury<sup>(1, 2, 4)</sup>.

The complex injury pattern in our case, which resulted in a complete dislocation of the three cuneiforms, navicular and calcaneocuboid articulation is due to a plantar-abduction directed force through the naviculocuneiform and calcaneocuboid joints, which is very uncommon due to the substantial ligamentous support around the midfoot<sup>(4)</sup>.

Our case also differs in that the calcaneus fracture had an extension to the calcaneocuboid junction but the cuboid is intact. As described by **Main and Jowett**<sup>(5)</sup> in their lateral dislocation group, a cuboid body fracture is present, which is caused by compression from both metatarsals and the calcaneus; also known as "nutcracker fracture". Two cases about

naviculocuneiform and calcaneocuboid dislocations were reported by **Cheng *et al.*** <sup>(1)</sup>; one of these two cases had a fracture of the anterior process of the calcaneus. Hyperabduction of the forefoot, leading to compression of the calcaneocuboid joint at the time of injury is believed to be the mechanism of injury for a fracture of the anterior process of the calcaneus.

The key to any joint dislocation is anatomic reduction and stable fixation (if needed) to avoid post-traumatic arthritis and to obtain good performance results. Various treatment options for naviculocuneiform and calcaneocuboid joint dislocations have been described including closed reduction under fluoroscopy and posterior splint immobilization <sup>(2)</sup>, closed reduction and K-wires fixation or open reduction and internal fixation with K-wires or plates and screws <sup>(1)</sup>. A long single dorsal or two combined dorsomedial and dorsolateral incisions were recommended by **Richter *et al.*** <sup>(3)</sup> in the majority of open procedures in the midfoot and fixation with K-wires and screws. In our case, we used small incisions to approach the naviculocuneiform and calcaneocuboid joints and used three K-wires as the method of fixation with good functional outcome.

## CONCLUSION

Closed dislocations involving the naviculocuneiform and calcaneocuboid joints are very rare, and they occur following a high energy trauma in the majority of cases. The goal of treatment in such injuries is to

achieve a stable congruent joint with gradual rehabilitation to maximize the functional outcomes. Further reporting of these rare injuries is still needed to guide the best clinical and functional outcomes in the future.

## ACKNOWLEDGMENT

I would like to thank the patient for his cooperation and for his approval for making of this case report.

**Conflicts of interest:** There are no conflicts of interest.

## REFERENCES

1. **Cheng Y, Yang H, Sun Z *et al.* (2012):** A rare midfoot injury pattern: Navicular-cuneiform and calcaneal-cuboid fracture-dislocation. *J Int Med Res.*, 40: 824–31.
2. **Choudry Q, Akhtar S, Kumar R (2007):** Calcaneocuboid and naviculocuneiform dislocation: An unusual pattern of injury. *Foot Ankle Surg.*, 13: 48–50.
3. **Richter M, Wippermann B, Krettek C *et al.* (2001):** Fractures and fracture dislocations of the midfoot: Occurrence, causes and long-term results. *Foot Ankle Int.*, 22: 392–8.
4. **Dhillon M, Nagi O (1999):** Total dislocations of the navicular: Are they ever isolated injuries? *J Bone Joint Surg Br.*, 81: 881–5.
5. **Main B, Jowett R (1975):** Injuries of the midtarsal joint. *J Bone Joint Surg Br.*, 57: 89–97.
6. **Richter M, Thermann H, Huefner T *et al.* (2004):** Chopart joint fracture-dislocation: Initial opens reduction provides better outcome than closed reduction. *Foot Ankle Int.*, 25: 340–8.