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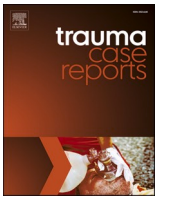

Case Report

High energy trans-cuboid Chopart dislocation: From closed reduction to secondary double arthrodesis

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ABSTRACT

Case report: Chopart joint fracture-dislocations are rare injuries. The purpose of this report is to present the management of a high energy trans-cuboid Chopart dislocation. This fracture-dislocation dislocation was treated with closed reduction, provisional fixation, and definitively with a combination of open reduction internal fixation (ORIF) and a lateral column external fixator. Due to persistent pain and Chopart joint collapse, the patient ultimately required a double arthrodesis.

Conclusion: While rare, Chopart joint fracture-dislocations are impactful injuries that require prompt diagnosis and specialized management. The description of this high energy trans-cuboid Chopart dislocation and the stepwise approach for its management may be useful for other surgeons who encounter similar injuries.

Introduction

Chopart fracture-dislocations are rare injuries. The purpose of this report was to describe the case of an individual with a high energy transcuboid Chopart dislocation. While it was initially closed reduced successfully, and had definitive fixation following provisional fixation, the patient ultimately required secondary double arthrodesis (talonavicular, subtalar). While there is some literature discussing these injuries there is a paucity of literature that thoroughly describes the technical management of these injuries (from emergency department temporization to eventual fixation/fusion). The description of this rare injury and the stepwise approach for its management may be useful for other surgeons in future.

Case

The patient was a 47-year-old female involved in a head-on motor vehicle crash (MVC). She sustained a right Chopart dislocation with severely comminuted cuboid fracture (Fig. 1A/B). She also had an ipsilateral anterior tibial plafond fracture (AO/OTA 43B2). She had intact distal sensation, motor function, palpable pulses, and no open wounds. Closed reduction was achieved (Fig. 1) by flexing the knee, initially applying a dorsiflexion manipulation force to the mid and forefoot, followed by longitudinal traction and a plantar flexion manipulative force. Residual instability remained at the talonavicular joint with attempted dorsiflexion of the ankle (Fig. 1D). Provisional fixation was performed the next day by placing three retrograde K-wires from the navicular to talus (Fig. 2A/B). Due to soft

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tissue swelling, definitive fixation could not be performed.

Three weeks later, soft tissues were deemed amenable to definitive fixation. A 5.5 mm transcalcaneal pin was placed in the calcaneal tuberosity. A 1.6 wire was placed through the 5th, 4th, and 3rd metatarsal bases on the oblique view, followed by a 4.0 schanz pin more distally in the same trajectory, after pre-drilling with a 2.5 mm drill. An anterior to posterior mid-tibia schanz pin was placed just medial to the crest.

The anterior tibial plafond fracture was addressed and then an anterolateral approach to the cuboid was performed. A carbon fiber rod was applied from the calcaneus to the lateral column pin and distraction was applied for better visualization. Many of the fragments, as demonstrated on preoperative CT scan, were displaced into the medial tissues (Fig. 3).

The distal cuboid articular fragments were elevated against the 4th and 5th metatarsal bases and held with wires. A lateral proximal cuboid fragment (calcaneal-cuboid articulation) was removed and protected on the back table. Through this void the displaced medial fragments were retrieved. These were reduced together on the back table and held with k-wires. These fragments were then replaced into the void and their fit to the anterior process was used to determine the reduction location. The previously removed far lateral fragment was then reduced to the anterior process. Provisionally these reductions were stabilized with wires. Montage calcium

Fig. 1. Injury radiographs (A, B) demonstrating comminuted cuboid fracture with anterior talonavicular joint dislocation. Post reduction radiographs demonstrating concentric reduction of the talonavicular joint with slight plantarflexion (C, E) but subluxation with dorsiflexion (D).

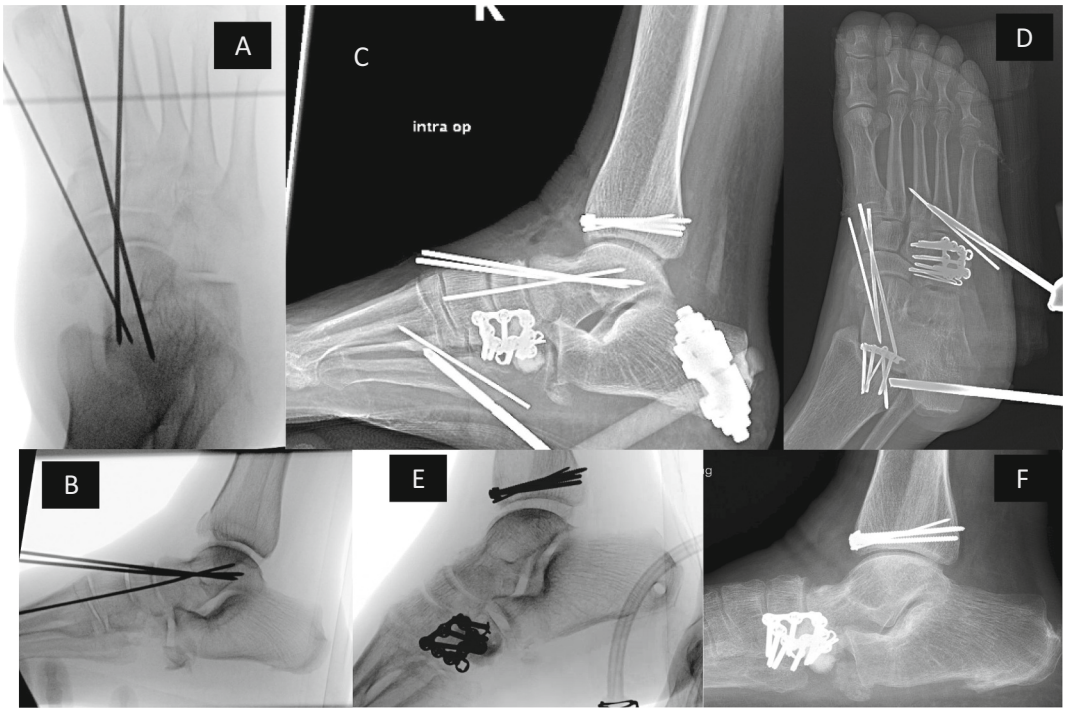

Fig. 2. Provisional fixation of talonavicular joint with k-wires (A, B). Definitive fixation with retained lateral column ex-fix (C, D). Stable intra-operative Chopart joint after removal of talonavicular wires and ex-fix (E) Susbequent Chopart joint collapse 6 months later (F).

Fig. 3. Post-reduction and provisional fixation axial (A, B) and sagittal (C, D) CT reformats demonstrating comminution of cuboid body with fragments significantly displaced medially and plantarly.

phosphate bone cement was used to fill the metaphyseal void.

A cuboid plate was applied in buttress mode and autocontoured with 2.4 mm cortex screws. Select holes were filled with locking screws given the poor bone quality. Lateral column portion of the ex-fix was adjusted to the appropriate amount of distraction and retained to prevent shortening/abduction (Fig. 2C/D) but other portions of ex-fix were removed. Previously placed buried talonavicular wires were retained.

At six weeks, the retained btalonavicular wires and lateral column external fixator were removed. The Chopart joints were deemed to be stable at that time (Fig. 2E). She remained non-weight bearing to the right lower extremity for a total of 12 weeks from the definitive fixation date, and then transitioned to full weight bearing. At six months, she reported right foot pain that limited significantly limited her ability to ambulate. Radiographs demonstrated collapse of the Chopart joint (Fig. 2F). After electing to initially trial conservative management for two months, the patient agreed to proceed with arthrodesis.

A dorsal approach to the talonavicular joint was performed. A small distractor was applied. The cartilage was removed using a high speed burr, irrigation, and curettes. The joint was realigned, compressed using a modified clamp, and held with provisional k-wires. The previous anterolateral incision was used to access the subtalar joint. The joint was distracted with lamina spreader and the cartilage was removed from the posterior facet and inferior articulation of the talus. Proximal tibia autograft and allograft was packed into the subtalar and talonavicular joints. Arthrodesis of the subtalar joint was performed with cannulated lag screws by design to generate compression, followed by position screws. Arthrodesis of the talonavicular joint was performed using a cannulated lag screw by design, followed by position screws. The calcaneal cuboid joint was then examined. This was well aligned and stable, so arthrodesis of this joint was not performed. At three weeks, patient was transitioned from splint to a tibial ankle foot orthosis and began ankle range of motion. She was non-weight bearing for 8 weeks and then transitioned to full weight bearing.

Postoperatively at one year (Fig. 4) she was doing well overall, ambulating independently, was predominantly pain-free besides occasional aches, and was looking for employment.

Discussion

Chopart joint dislocations are rare and typically these occur with concomittant tarsal fractures of the calcaneus, navicular, cuboid, or talus [1–5]. Main and Jowett proposed the original mechanisms for these fracture dislocations:

1. Forced adduction of the forefoot against the hindfoot leading to medial stress at the talonavicular joint or
2. Forced abduction of the forefoot leads to lateral compression at the lateral column with distraction medially [6].

In the case reported, not only did the talonavicular joint dislocation medially lead to the compression of the cuboid laterally, but the nature of the high energy head on MVC contributed an axial load and created severe cuboid comminution.

Rammelt and Missbach reported their experience with 128 Chopart injuries. Negative prognostic factors included a high injury severity score, work-related accidents, open and multiple fractures, purely ligamentous dislocations, staged surgery, delay of treatment of 4 weeks or greater, postoperative infection, and fusion (primary or secondary). Of all injuries, 9.4 % went onto to require secondary fusion. Of the 75 total injuries, 59 Chopart joint injuries had fractures involving the cuboid and 15 (20 %) of Chopart injuries had isolated cuboid fractures. They did not provide examples of radiographs for isolated trans-cuboid Chopart dislocations and they did not characterize the cuboid fractures, so it is unknown what percentage of these fractures were small avulsions, impactions, extraarticular, or nondisplaced. [5]

Williams et al. reported a medial talonavicular dislocation with associated minimally displaced cuboid body fracture in a 22-year-old female following a low energy inversion injury. This injury was closed reduced under general anesthesia and was found to be stable post reduction, so she was treated in cast. [7]

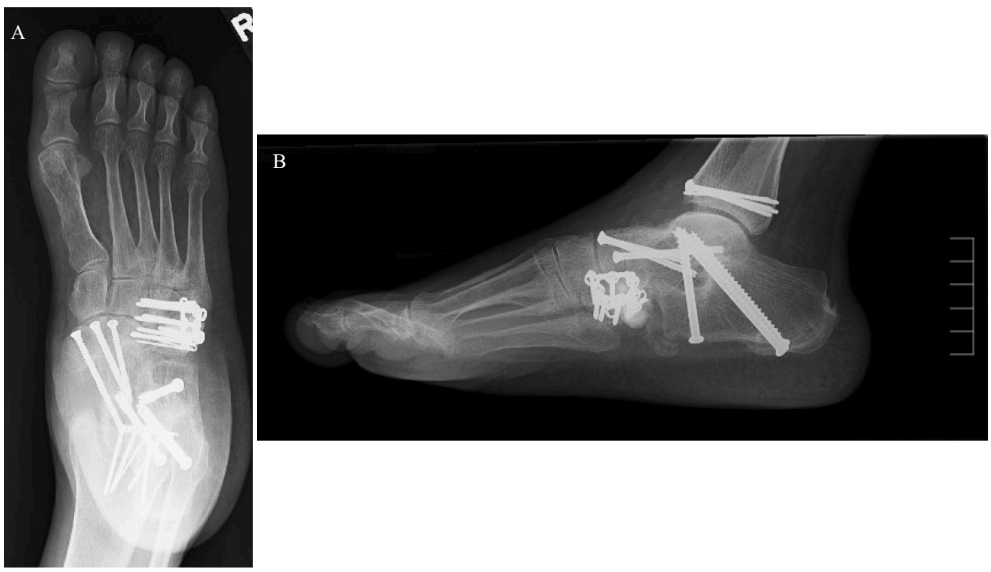

Fig. 4. One year follow-up radiographs from secondary arthrodesis of subtalar joint and talonavicular joint.

To our knowledge, no previously published reports have demonstrated a high energy isolated transcuboid Chopart dislocation. Furthermore, double arthrodesis is typically performed in the setting of adult acquired flatfoot deformity, but in the context of a Chopart fracture-dislocation, this double arthrodesis appears to be the first described. An argument could potentially be made for primary arthrodesis for this injury however Rammelt and Missbach demonstrated that patients with primary arthrodesis had equally poor outcomes as secondary arthrodesis. [5] Furthermore, this patient was only 47 years of age, had no evidence of preexisting arthritis, and the cuboid articular surface was reconstructable. As outlined by Rammelt and Schepers primary arthrodesis should be reserved for severe and nonreconstructable destruction of the articular surface due to the essential nature of the Chopart joint for global foot function [8].

In conclusion, this case report adds to the existing small body of literature as it details the step-by-step sequence of treatment for a rare high-energy isolated transcuboid Chopart dislocation from initial closed reduction to eventual secondary double arthrodesis.

CRediT authorship contribution statement

Patrick Wise: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Augustine Saiz:** Writing – review & editing, Supervision. **Gillian Soles:** Writing – review & editing, Supervision. **Ellen Fitzpatrick:** Writing – review & editing, Supervision. **Mark Lee:** Writing – review & editing, Supervision, Conceptualization. **Sean T. Campbell:** Writing – review & editing, Writing – original draft, Supervision, Investigation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could influence the work reported in this case report. This article/research was not funded by a grant or other outside sources.

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