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Complete Cuboid Dislocation With Associated Lisfranc Injury: A Case Report and Review of the Literature

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ABSTRACT

Cuboid dislocations are rare midfoot injuries that usually occur in the setting of high-energy trauma. Diagnosis can be challenging and optimal treatment remains unknown. This case report and review aims to summarize the recent literature on this topic.

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Cuboid dislocations are exceedingly rare injuries seen in isolation or associated with other midfoot trauma such as Lisfranc injuries. They are often a result of high-energy or crush injuries. With only case reports cited in the literature, the optimal surgical treatment of pancuboid dislocation is unclear (1–12). Various methods of fixation with respect to the calcaneus, lateral cuneiform, tarsal navicular, and fourth and fifth metatarsals must be considered. In this article, we report a case of surgical fixation of a cuboid dislocation in the setting of an associated Lisfranc fracture dislocation to both increase awareness of this rare injury and report a surgical technique for reduction and stabilization.

Case Report

A 47-year-old healthy female was taken to a local emergency department after a motor vehicle collision in which she was a restrained driver. She sustained an isolated crush injury to the right foot with immediate pain and swelling throughout her midfoot. Physical examination demonstrated a diffusely swollen midfoot with intact skin and significant dorsal and plantar ecchymosis. Sensation was intact to light touch throughout the foot, and vascular examination demonstrated palpable dorsalis pedis and posterior tibial pulses. Initial standard 3-view plain-film imaging of the foot demonstrated subtle diastasis between the first and second tarsometatarsal (TMT) joints

consistent with a Lisfranc injury, fracture at the base of the second and third metatarsal bases, and a possible fracture of the cuboid seen on the anteroposterior view (Figs. 1–3). Overall, the radiographic appearance of the injury was relatively benign. Subsequent computed tomography (CT) scanning delineated further injury including a plantar-medial migration of the cuboid and fracture of the anterior calcaneal process (Figs. 4–6). Although subluxation of the cuboid was appreciated on the CT, intraoperatively the cuboid was found to be nearly 100% displaced into the plantar midfoot (Fig. 7).

After consultation, the patient underwent surgical fixation 7 days postinjury. The first and second TMT joints underwent open reduction and internal fixation using a bridge-plate technique via a dorsomedial approach to address the Lisfranc injury with concomitant intercuneiform instability noted intraoperatively and addressed with an intercuneiform screw. Subsequently, a dorsolateral longitudinal incision centered over the cuboid was performed to allow exposure to (1) the calcaneocuboid joint, (2) the fourth and fifth TMT articulations, and (3) the lateral cuneiform–cuboid articulation. The extensor digitorum brevis was split in line with its fibers. As seen on the preoperative CT scan, the cuboid was not only fractured but also dislocated plantar medially into the foot, with loss of articulation with its surrounding tarsal and metatarsals (Fig. 7). The cuboid was elevated from the plantar foot using a Freer elevator with manual longitudinal distraction placed on the forefoot. Once reduced, the respective anatomic pericuboid articulations were restored, and provisional fixation was achieved by placing multiple 0.062-inch Kirschner wires, because there was a tendency for the cuboid to sublux plantarly. Given little motion between the cuneiform and cuboid compared with increased physiologic motion at the calcaneocuboid and TMT joints, stabilization was achieved by open reduction and internal fixation of the cuboid to the lateral cuneiform (Fig. 8). The

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Fig. 1. Anteroposterior radiograph of right foot: initial injury.



Fig. 2. Oblique radiograph of right foot: initial injury.

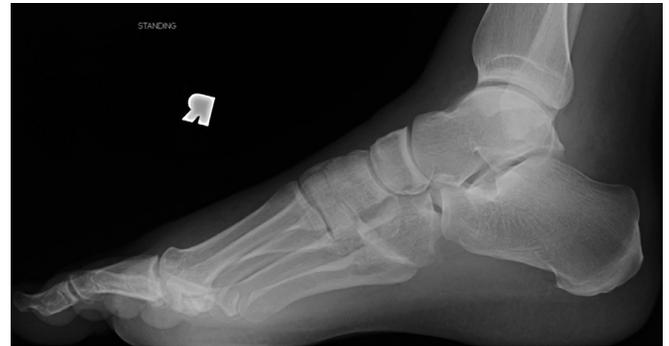


Fig. 3. Lateral radiograph of right foot: initial injury.



Fig. 4. Axial computed tomography of right foot: initial injury.

grossly unstable fourth and fifth TMT joints were reduced and stabilized with percutaneous Kirschner wires, with the joints anatomically reduced by direct visualization.

Postoperatively, the patient was non-weightbearing in a splint and transitioned to a protective boot at her 2-week postoperative visit. At the 6-week postoperative visit, pins were removed, new radiographs were taken, and she was progressed to touchdown weightbearing (Figs. 9–11). A routine CT scan obtained 3 months after surgery demonstrated adequate healing with maintained alignment, and she was advanced to full weightbearing. The internal bridge plate construct at the first and second TMT joints was removed 5 months after her original procedure, but the lateral cuboid and medial intercuneiform hardware was retained. At final follow-up, 10 months after the injury, the patient had made a near-complete recovery with full return to regular exercise and wearing high-heeled shoes.



Fig. 5. Sagittal computed tomography of right foot: initial injury.

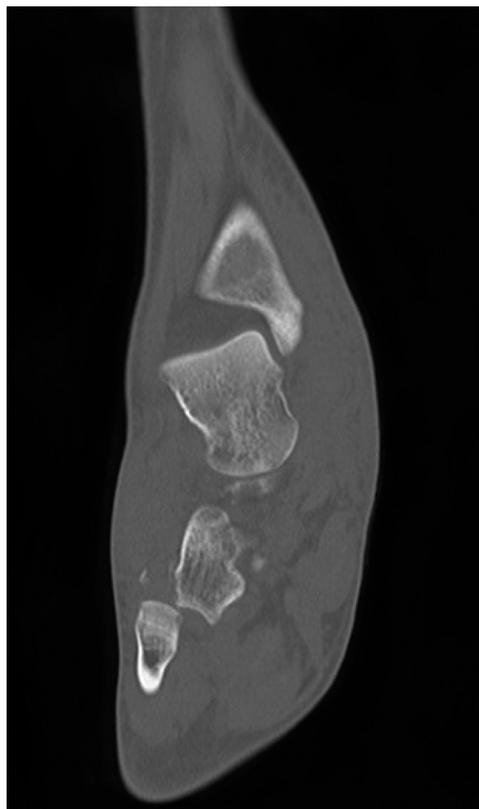


Fig. 6. Coronal computed tomography of right foot: initial injury.

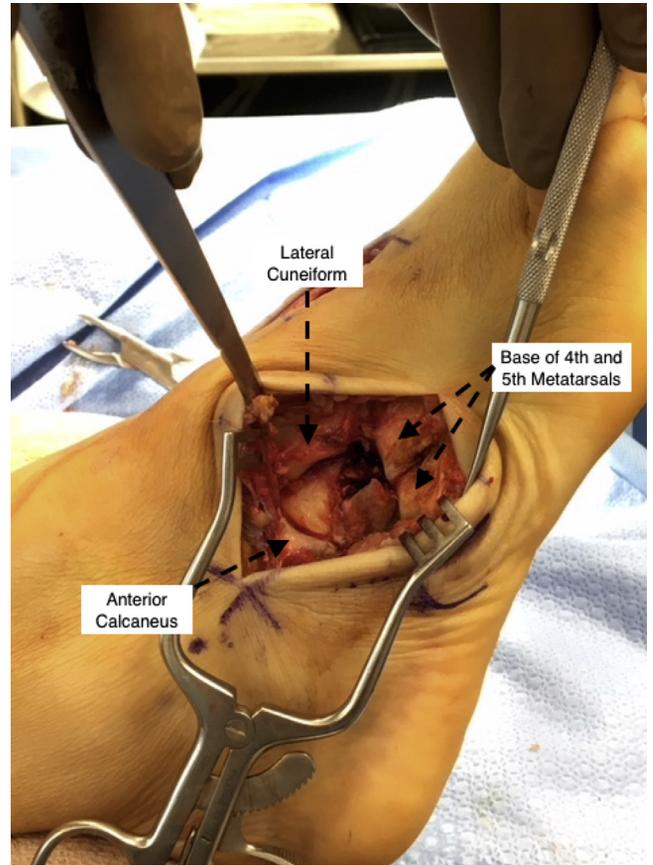


Fig. 7. Intraoperative cuboid fracture dislocation.

Discussion

Given the cuboid's strong surrounding ligamentous attachments and saddle-shaped articulations, dislocation and fracture dislocations of the cuboid are rare traumatic midfoot injuries described infrequently in the literature (1–12). Commonly, they occur in association with medial midfoot trauma involving multiple tarsal bones and articulations such as Lisfranc injuries, as seen in this case (7,9). Isolated cuboid dislocations are often missed in the initial evaluation owing to their subtle radiographic appearance, leading to delayed diagnosis, especially in cases that are not evaluated with advanced axial imaging, such as CT (6–8,10). If swelling permits, a palpable gap over the lateral midfoot may be present on physical examination. Acute isolated cuboid dislocations are rarely managed with closed reduction, with only 1 case reported in the literature (1). There is a high likelihood of irreducibility, especially when tendons are interposed (commonly the peroneus longus), as described by Dobbs et al (7,12). More commonly, cuboid dislocations are recognized in the setting of fracture dislocations and other lateral midfoot fractures necessitating open reduction with fixation.

The mechanism of cuboid dislocation was proposed by Drummond and Hastings (6) as a dorsolateral force associated with fore-foot inversion or eversion causing a plantar-medial dislocation. Given the rarity of this injury, however, the exact mechanism is unknown, nor has it been biomechanically tested in the literature (6). These injuries are typically associated with higher-energy foot trauma (9). Anatomically, osseous articulations of the cuboid with surrounding tarsals and metatarsals, ligaments, and tendons all confer significant inherent stability to the cuboid (12). The cuboid articulates with both the TMT joints (Lisfranc joints) and midtarsal joints

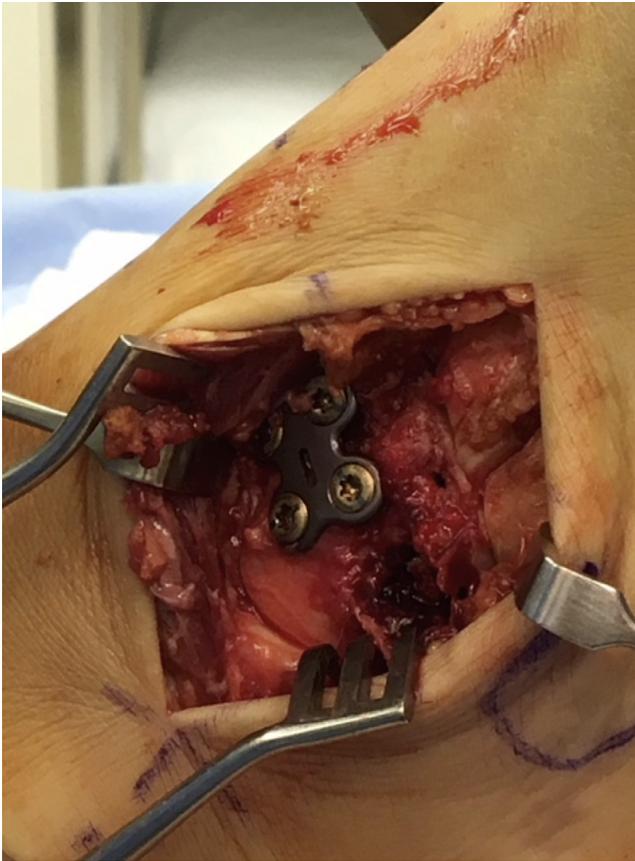


Fig. 8. Intraoperative cuboid open reduction internal fixation; note restoration of the pericuboid articulations.



Fig. 10. Oblique radiograph of right foot: 6 weeks after surgery.



Fig. 9. Anteroposterior radiograph of right foot: 6 weeks after surgery.



Fig. 11. Lateral radiograph of right foot: 6 weeks after surgery.

(Chopart joints) and is the only bone to do so (9,13). Strong dorsal and plantar ligamentous attachments including the plantar fascia anchor the cuboid proximally, medially, and distally to the calcaneus, lateral cuneiform and navicular, and fourth and fifth metatarsal bases, respectively (7,12,13). The tendons of the peroneus tertius, peroneus brevis, peroneus longus, tibialis posterior, and flexor digitorum brevis all add further stability to the cuboid (7,12–14). The cuboid is the keystone to stability of the lateral column of the foot as well as the lateral border of the transverse arch of the midfoot and must be restored in cases of dislocation (3,9,12,13).

The optimal method of open surgical treatment remains unknown because of the paucity of reported cases and absence of comparative studies in the literature. Some authors prefer rigid internal fixation

with plates and screws, whereas others have used temporary percutaneous pin fixation after open reduction to minimize joint damage and stiffness (6,8–10). In this case, external dorsally directed pressure from the plantar aspect of the foot and longitudinal traction in combination with instrument levering was sufficient to relocate the dislocated cuboid, but some authors have described applying a small external fixator to gain longitudinal length and aid reduction (9). Additionally, it is unclear whether primary arthrodesis of the calcaneocuboid joint may be indicated in dislocations with significant proximal comminution. However, it is generally accepted that preserving the relative flexibility of the lateral midfoot remains an important consideration, hence the use of temporary percutaneous fixation of the fourth and fifth TMT joints (6,8–10).

In conclusion, cuboid dislocations may be seen in isolation or in the setting of other midfoot injury. They can often be overlooked on initial plain radiographs of the injured foot, leading to a delay in diagnosis and treatment and considerable morbidity. There is currently no consensus in the literature regarding the optimum type of fixation (rigid internal or temporary percutaneous) of cuboid dislocation and fracture dislocations. Further biomechanical and clinical outcome studies are needed to determine how to maximize functional outcomes after these significant midfoot injuries.

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