DISPLACED FRACTURES OF THE CUBOID

BRUCE J. SANGEORZAN, MARC F. SWIONTKOWSKI

From the University of Washington, Seattle

We report four cases of fracture of the cuboid treated by open reduction, bone grafting where necessary and internal fixation. We recommend this treatment where there is appreciable displacement of one or more of the articular surfaces. The preliminary results were better than those previously reported for conservative treatment or for later midtarsal fusion.

Injuries of the cuboid are uncommon; the most frequent, are avulsion fractures. More rarely, dislocation (Drummond and Hastings 1969) or indirect compression fractures are seen (DeLee 1986). Because of its shape and ligament attachments, fractures of the cuboid are usually associated with other midfoot injuries. Functionally, the cuboid is involved in all the intrinsic movements of the midfoot and hindfoot (Main and Jowett 1975). We could find only one report of cuboid fractures, and this was in Chopart-type injuries (Hermel and Gershon-Cohen 1953).

We have reviewed four isolated displaced fractures of the cuboid, all treated by open reduction and internal fixation. Three required bone grafts to fill a corticocancellous defect.

CASE REPORTS

Case 1. A 28-year-old male pedestrian was struck by a motor vehicle and sustained a traumatic right above-knee amputation, a left anterior cruciate injury, and fractures of the pelvis, spine, sacrum, and left cuboid.

After stabilisation of the life-threatening injuries, the cuboid fracture was treated surgically.

At operation, the distal articular surface was found to be driven into the body of the cuboid. When this was restored to its proper position, a large corticocancellous defect required filling with iliac crest graft, oriented so that cortical bone replaced the lateral wall of the cuboid. The graft was held with a lag screw and a Kirschner wire.
was used to stabilise the distal articular surface. At 14 months the patient was taking his entire weight with no symptoms and had full painless movement. Radiographs showed some narrowing of associated joint spaces.

Case 2. A 22-year-old woman sustained left acetabular and patellar fractures, and a right-sided cuboid fracture in a motor vehicle accident. Five days after the injury, she had an open reduction of the cuboid fracture.

At operation, the dorsal ligaments of the metatarsocuboid joint were intact, but the bone was split through the centre of the calcaneocuboid joint (Fig. 1a). Some comminuted fragments were removed and the bone was reduced and fixed with two 4.0 mm cancellous screws (Fig. 1b). At 15 months, the patient was walking normally on this foot and had full painless range of midtarsal movement.

lateral corticocancellous defect was filled with iliac bone graft and a small plate was used as a buttress (Fig. 2c).

DISCUSSION

The cuboid articulates with the calcaneus, the lateral cuneiform, the fourth and fifth metatarsals and sometimes with the navicular, having complex ligamentous attachments. This arrangement makes isolated injury uncommon, but dictates that malunion is likely to result in restricted movement. In addition, this complex anatomical relationship appears to make the cuboid susceptible to indirect injury from forced abduction of the forefoot, or a force directed laterally on a fixed forefoot (Main and Jowett 1975; Hillegas 1976). The cuboid is best evaluated radiographically by an oblique view (DeLee 1986).

Case 3. A 49-year-old man fell and sustained a split in the long axis of the cuboid, with some crushing and comminution at the calcaneocuboid joint. At operation, loose fragments were removed, and the depressed dorsal surface was elevated and packed with cancellous grafts. The fracture was fixed with two screws; the unstable metatarsocuboid joint being held with a percutaneous pin for six weeks. The patient returned to work on a farm at six months and has no complaints after one year.

Case 4. A 19-year-old man jumped from a third floor window. He felt his foot 'pop' as it was 'forced outward'. He had sustained a crush injury of the cuboid (Fig. 2a). At operation, using a longitudinal incision between extensor digitorum brevis and the peroneal tendons, reduction was performed by placing Kirschner wires into the subchondral bone of the proximal and distal fragments and using a laminar spreader (Fig. 2b). The large

Fig. 2a  Fig. 2b  Fig. 2c

Case 4. Figure 2a – The oblique radiograph shows compression of the cuboid with 8 mm shortening of the lateral border of the foot. Figure 2b – Kirschner wires were placed into the subchondral bone of the proximal and distal articular surfaces and a laminar spreader used to disimpact the fragments. Figure 2c – Reduction was maintained with 3.5 mm screws placed through a 2.5 mm plate acting as a buttress, and the defect was filled with iliac crest graft. The oblique orientation of the radiograph gives the false appearance that the plate had crossed the calcaneocuboid joint.

The treatment of displaced fractures is controversial. Hermel and Gerson-Cohen (1953) suggest that comminution requires primary midtarsal fusion and that early arthrodesis may decrease the period of morbidity. They consider that this fusion should not give rise to an appreciable disturbance in gait since "the lateral aspect of the foot is primarily rigid and static". By contrast, Hillegas (1976) emphasised that the cuboid articulates with five other bones and is an important stabiliser of the lateral aspect of the foot. He also stressed that malunion was likely to lead to discomfort and difficulty in shoe fitting and advocated accurate reduction and internal fixation, citing the good results achieved by open reduction of a pure dislocation (Drummond and Hastings 1969; Hillegas 1976).

Main and Jowett (1975) report only fair to poor results in four patients treated conservatively; all four
required a triple arthrodesis later. They recommend open reduction with internal fixation. DeLee (1986) considered that residual displacement of the articular surfaces of the cuboid could result in persistent subluxation of the midtarsal joint, and recommended open reduction and grafting; he suggested that long-term degenerative changes were likely if reduction is not achieved.

Our findings in four cases support the concept that compression between the anterior calcaneus and the metatarsals is the usual mechanism of injury. In three of our cases, the proximal or distal articular surface was driven into the centre of the bone, and reduction revealed corticocancellous defects large enough to require bone grafting. Our early clinical and radiographic results are satisfactory.

Even where there is considerable comminution, the anatomy of the articular surface can be restored and maintained with structural iliac graft and internal fixation. We believe that less aggressive treatment or the use of early or late arthrodesis are likely to give less satisfactory results.

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REFERENCES


