Old nutcracker fracture of cuboid

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Abstract
Nutcracker fractures of the cuboid (compressed) are rare and often missed at an initial visit. We report a 21-year-old patient presented with a 9 months old cuboid fracture. He presented with a localized pain around his left foot. Radiograph revealed the shortening of the lateral column with old cuboid fracture. The lateral column of foot was reconstructed. The patient remained symptom-free and no radiographic evidence of recurrence was observed 1 year postsurgery.

Key words: Cuboid fracture, nutcracker fracture, old cuboid fracture, treatment

Introduction
Injuries of the cuboid are uncommon and often missed. There were several reports about fresh fracture of cuboid, but very few about the old fractures. Compressed fracture of the cuboid was named “nutcracker” fracture by Hermel and Gershon-Cohen. It results from forced plantar flexion and abduction, crushing the cuboid between the calcaneus and fourth and fifth metatarsals. Old nutcracker fracture of the cuboid with shortening of the lateral column changes the weightbearing position of the foot and results in a long term pain and/or instability. We report one such case treated by open reduction and internal fixation.

Case Report
A 21-year-old paper mill worker was overwhelmed by the paper reel and fell down. His left foot was crushed and developed dorsolateral swelling and pain. He went to a local hospital and the radiograph showed fractures of the cuboid, navicular, medial, and lateral cuneiforms. He was treated by plaster immobilization. He presented to us at 9 months with history of foot pain. On examination, there was deformity of the middle transverse arch. On palpation, there was tenderness and palpable bony bulge of dorsolateral aspect of foot. Active or passive movements of ankle increased the pain. The daily activities of his left foot were slightly restricted such as walking and running. Blood supply of the foot was normal.

Radiograph showed the compression and shortening of the cuboid. CT scan clearly showed the malunion of the cuboid, navicular, medial, and lateral cuneiforms [Figure 1]. His AOFAS midfoot score was 57/100.

Operative procedure
Surgery was performed under spinal anesthesia. The patient was placed in a supine position with a pillow under the ipsilateral buttock to avoid excessive external rotation of the foot and facilitate approach to the cuboid. A pneumatic tourniquet was used. A dorsolateral longitudinal incision was made over the cuboid at the lateral border of the extensor digitorum brevis muscle to the fourth metatarsal. The incision was proximal to the sural nerve. Calcaneocuboid and tarsometatarsal joints were exposed. It was found that the lateral wall of cuboid was bulging and there was instability of calcaneocuboid and tarsometatarsal joints. The joint surfaces were intact. The bulging bone was removed and the cuboid was sawn in half from the coronal plane. A distractor was required to restore the length of the lateral column and to help wedge shaped allogeneic bone grafting. The lateral wall of cuboid was extended 6 mm [Figure 2a and b]. Calcaneocuboid and tarsometatarsal joints were stable with positive action. “X”-shaped plate was placed over the cuboid dorsally and laterally which did not crossover any joints. After the plate was fixed by two compression screws, two locking screws were placed [Figure 2c]. Intraoperative and postoperative fluoroscopy...
Figure 1: Radiograph of the left foot (a) preoperative oblique X-ray showing compressed cuboid (b) preoperative anteroposterior X-ray showing unclear lateral column (c, d) preoperative CT scan showing that the lateral column was compressed

Figure 2: Intraoperative clinical photographs showing (a) intraoperative distraction. The cuboid was sawn in half from the coronal plane and then was distracted, (b) Intraoperative grafting. Allogeneic bone was grafted, (c) Intraoperative fixation of the plate. “X”-shaped plate was placed over the cuboid dorsally and laterally which did not crossover any joints showed that the plate position was good and the length of the screws was appropriate [Figure 3]. Then an incision between first and second metatarsals was made. Navicular and cuneiforms were exposed. The medial cuneiform was malunited; intercuneiform and naviculocuneiform joints had instability with osteophytosis, degeneration, and cartilage destruction. We fused the intercuneiform and naviculocuneiform joints by three fully threaded screws. Postoperative treatment was immobilization with prime cast for 6 weeks and nonweight bearing for 12 weeks. The implants were removed at about 1 year after union of the cuboid.

The followup was done at 3, 6, and 12 months. At the final followup walking and weight-bearing functions had been well-restored [Figure 4]. AOFAS midfoot score was 80/100.

DISCUSSION

Cuboid is the only bone structure supporting the lateral column from the midfoot. It is an important stabilizer of the lateral aspect of the foot. In addition, it is involved in the function of the fourth and fifth tarsometatarsal joints. Finally, it contributes to the activity of calcaneocuboid joint. Main and Jowett emphasized that the cuboid is involved in all intrinsic movements of the foot. The cuboid–metatarsal articulations provide for nearly all of the dorsal and plantar motion of the lateral column of the foot. Studies have shown that up to three times as much available motion at these two joints compared with the medial three tarsometatarsal joints.
Holbein, reviewed, that the operative indications can be displacement of joint surface of more than 1 mm or more than 3 mm shortening of the lateral column of the foot. Robert and John pointed that operative reconstruction should be done in all the cases of lateral column shortening or articular displacement. However, it is also advised that the fractures should be treated openly if there is more than 2 mm of joint surface disruption or any evidence of longitudinal compression. Shortening of the lateral column can lead to lateral instability and long term arthritic changes. The goals of operative management are first to restore the lateral column length and plantar support of the midfoot, second, to preserve the mobility of the tarsometatarsal joints, and last, to restore articular integrity to the calcaneocuboid.

In short, the cuboid is a significant structure of the lateral foot column as the “biomechanics stabilizer” and it plays an important role for normal activity and weight-bearing. Improper treatment will lead to defect of the foot function. For the old nutcracker fracture of cuboid, we recommend to reconstruct the length of the lateral column for the foot stability and function. However, further followup and study of more cases are needed to get long term and more conclusive results.

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