

Surgical treatment of nutcracker cuboid fracture: a case report

Alessio Carlisi, Matteo Vespi, Gianluca Manetti

UO Orthopedics and Traumatology, Ospedale dell'Alta Val d'Elsa, Poggibonsi (SI), Italy

SUMMARY

The nutcracker fracture is a rather unusual type of cuboid bone fracture caused by a compressive force which determines a multi-fragmentation of the fracture with consequent loss of the length of the lateral column of the foot and of the anatomy, which if not treated can cause instability and chronic pain. We present this case of a nutcracker fracture that was treated with only a bridge plate and relative screws, resulting in the restoration of length and anatomy with excellent clinical results.

Key words: nutcracker, cuboid, fracture, foot, trauma, hindfoot

Introduction

The cuboid is the only bone that supports the lateral column of the midfoot and is important to maintain polyarticular alignment of the tarsal bones (calcaneus, lateral cuneiform) and the fourth and fifth metatarsals ¹. Isolated cuboid fractures are rare due to the particular bone anatomy and protected position of the midfoot. A loss of length of the lateral column due to a cuboid fracture can result in abduction of the forefoot with a planus deformity, and is associated with compensatory hindfoot eversion and posterior tibial tendon insufficiency ².

In 1953 the term “nutcracker fracture” was coined to describe a cuboid fracture due to compression between the calcaneus proximally and the bases of the fourth and fifth metatarsals distally ³, resulting from forced and sudden plantar flexion of the hindfoot and midfoot against the forced abduction of the forefoot.

Case report

A 50-year-old man arrived at our emergency room following a motorcycle accident, presenting with bruising and pain localized on the lateral aspect of the left foot; pain was present at rest and exacerbated during eversion and inversion mobilisation of the ankle. An X-ray of the left foot showed a comminuted fracture, which was classified as a type 5 fracture in a classification proposed by Fenton; these are high-energy crushing injuries of the cuboid that may be accompanied by disruption of the mid-tarsal joint and loss of length of the lateral column alone or in combination with the medial column.

Ankle-foot CT was performed, better revealing a multi-fragmentary fracture of the cuboid with a decrease in the length of bone itself, a fracture of the III cuneiform

Received: May 9, 2024
Accepted: April 10, 2025

Correspondence

Alessio Carlisi
E-mail: alesmart90@live.it

How to cite this article: Carlisi A, Vespi M, Manetti G. Surgical treatment of nutcracker cuboid fracture: a case report. Lo Scalpello Journal 2025;39:21-23. <https://doi.org/10.36149/0390-5276-316>

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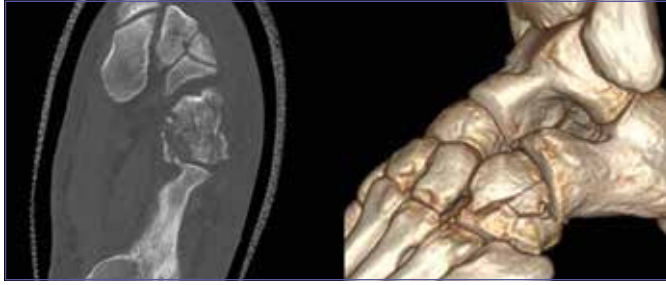


Figure 1. CT showing the fracture.

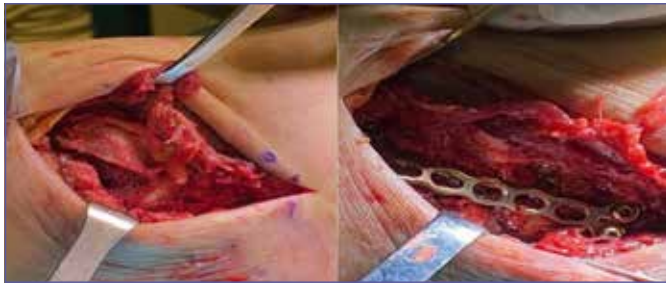


Figure 2. Restoration of the length and osteosynthesis with bridge plate.



Figure 3. X-ray after surgery.

and small bone avulsion at the base of the III and IV metatarsus (Fig. 1).

We decided to perform open reduction and internal fixation with use of bridge plating because the important comminution did not allow single-bone osteosynthesis. We approached this fracture through a dorsolateral approach to the cuboid, allowing assessment of articular capsule disruption. After adequate protection of the lateral dorsal cutaneous branch of the sural nerve, the length of lateral column was restored using a lamina spreader. No bone graft was used. Temporary reduction was achieved with Kirschner wires, and the bridge plate was then placed across the cuboid, from the calcaneus and into the base of the IV metatarsal (Fig. 2).



Figure 4. X-ray at 1 month.

After surgery an open cast was applied that was maintained for 2 weeks until wound healing was achieved and stitches removed; subsequently active and passive mobilization were allowed to restore range of motion (Fig. 3).

At 1 month an X-Ray control was performed, demonstrating initial fracture consolidation, and thus partial weight bearing (max 30% of body weight) was permitted (Fig. 4).

The patient complained of no pain at one month, with good recovery of range of motion.

At 2 months, good radiographic consolidation of the cuboid fracture and almost total recovery of the articular range of motion was found, with complete healing of the surgical wound and absence of paresthesia, especially in the dorsal side of the foot.

At 2 months, full weight bearing on the left foot was permitted with the aid of crutches.

At 6 months, the plate was removed.

Discussion

These fractures (type 5a) are mostly treated surgically except in cases where the length of the foot lateral column is

maintained². Various authors in review articles emphasize the importance of restoration of the length of the lateral column. Anatomical disorder of the bone articulations with tarsal bones of may lead to foot stiffness and painful arthritis. The cuboid is the only bone of the tarsus involved both in the Lisfranc complex and in Chopart's joint. Its position and anatomy support the rigid and the static lateral column and ensure that its length is maintained. The loss of length of the lateral column determines a planus deformity associated with compensatory hind-foot eversion and posterior tibial tendon insufficiency. Furthermore, alteration in the length of the cuboid can alter the sliding and functioning of the peroneus longus.

Surgery is recommended when there is articular displacement more than 1 mm and a shortening of lateral column by > 3 mm⁴. The main goal is to reduce the joint surface and restore the length of the lateral column and the principal treatment performed is the stabilization with a plate and screws only on the cuboid or using only screws, or as we did, a bridge plate.

Other possibilities of surgical management of cuboid fractures include: external fixators in the cases of a serious comminution and displacement of fracture fragments or in patients with vascular problems or poor skin quality.

Midtarsal primary arthrodesis is a surgical treatment that is recommended for serious crush injuries with extensive comminution, but presents the disadvantage of significant loss in lateral column motion and is mainly reserved for less active patients. In the case of failed internal fixation and persistent pain, secondary fusion may be a good treatment⁵.

Isolated injuries of the cuboid are extremely uncommon and malunion always results in restricted movement. Other complications described are related to surgery, such as infection of the surgical site and dehiscence of the surgical wound related to vascular problems. The most frequent complication, especially if the joint fragments are not reduced, is osteoarthritis. Most authors agree in maintaining the postoperative cast for at least 4 weeks¹⁻³.

In our patient, we measured the length of the contralateral cuboid, which was 33.2 mm; on the fractured side, CT showed

a length of 28.2 mm, accounting for a decrease of about 5 mm. After the operation, the length of the affected side was about 32.5 mm.

Thus, it is of utmost importance to restore the length of the lateral column and the cuboid anatomy to avoid instability of the foot and chronic pain.

Conflict of interest statement

The authors declare no conflict of interest.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contributions

All authors contributed equally to the work.

Ethical consideration

The research was conducted ethically, with all study procedures being performed in accordance with the requirements of the World Medical Association's Declaration of Helsinki

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