CHAPTER **38**

CUBOID: The Misunderstood Bone

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INTRODUCTION

The cuboid is a poorly understood, and often neglected bone within the lateral column of the foot. When a patient presents with lateral column foot pain, pathology of the cuboid is usually at the end of the list of differential diagnoses. Sandwiched between the fourth and fifth metatarsal bases and the calcaneus, and flanked by the peroneal tendons, it is not surprising that one may overlook the cuboid when considering pathology of the painful lateral column. For the most part, injuries to the lateral column are ones of overuse or sports related. We will highlight cuboid syndrome and cuboid stress fractures as etiologies resulting in lateral column foot pain, as well as discuss some of the common differential diagnoses.

ANATOMY

The cuboid is a pyramid-shaped, short bone on the lateral aspect of the foot with 6 surfaces. It articulates anteriorly with the fourth and fifth metatarsal bases, medially with the lateral cuneiform and navicular, and posteriorly with the calcaneus. It ossifies between birth and 6 months of age, and has a variety of muscular and ligamentous attachments. The opponens and short flexor of the fifth digit, the oblique head of the adductor hallucis, the flexor hallucis brevis, and the tibialis posterior all attach to the cuboid in some way. There are dorsal and plantar cubometatarsal, cuneocuboid, cubonavicular, and calcaneocuboid ligaments. Additionally, the longitudinal plantar ligament and short plantar calcaneocuboid ligaments attach plantarly. There are also interosseous ligaments with the lateral cuneiform and the navicular. The peroneus longus tendon runs along a grove on the lateral aspect of the cuboid on its path to insertion at the base of the first metatarsal, and has attachments to the cuboid through its tendon sheath.

CUBOID SYNDROME

Cuboid syndrome or peroneal cuboid syndrome is considered a disruption or subluxation of the calcaneocuboid articulation of the midtarsal joint. It is most often caused by some form of overuse microtrauma that results in irritation of the joint capsule, surrounding ligaments and peroneus longus tendon.[1,2] It can also be a post-injury sequelae to a plantarflexion/inversion ankle sprain.[3]

Predisposing factors that can contribute to cuboid syndrome include overcorrected foot orthoses, worn out or improper athletic shoes for a specific sport, overpronated foot structure, rigid cavus foot type, uneven running surfaces, and inversion ankle sprains. The degree and direction of the force of the peroneus longus and position of the subtalar joint are thought to be possible biomechanical contributing factors in the development of this injury.

Cuboid syndrome can be a frequently misdiagnosed and mistreated foot injury. The symptoms can range from a dull ache in the area of the fifth metararsal/cuboid/calcaneus articulations, to more pronounced pain in this region radiating along the peroneus longus tendon as it courses plantarly under the foot. It can develop acutely or have a gradual onset and when more severe, can cause symptoms even when nonweight bearing. Because the disruption or subluxation of the calcaneo-cuboid joint is so minor, often standard radiographs and even computed tomography (CT) and magnetic resonance imaging (MRI) studies may be completely normal.

The differential diagnoses of cuboid syndrome include Jone's fracture of the fifth metatarsal base, cuboid fracture, os peroneum syndrome, traumatic or overuse injury of the peroneal tendons, tarsal coalition, anterior beak fracture of the calcaneus, and subluxing peroneals. In the absence of any of these pathologies, a high level of suspicion should be given towards the possible presence of cuboid syndrome.

Once the diagnosis of cuboid syndrome has been made, the initial management should consist of first addressing any predisposing factors including the use of inappropriate or worn out footwear, improperly prescribed foot orthoses, and other extrinsic causes that may be contributing to the development of this injury. Often by correcting these factors, symptoms can sometimes improve without significant intervention. The use of cuboid manipulation had been described as a possible primary treatement.[1,4,5] One should be skilled in this maneuver to avoid exacerbating the injury by utilizing poor technique. A valgus wedge paced on the lateral

shell of a prefabricated insole or custom orthotic will often unload the lateral column and peroneus longus tendon and allow any ligamentous or capsular injury to heal (Figure 1). In more severe cases immobilization for 2 to 4 weeks can be effective in allowing the injury to heal. Injectable corticosteroids should be avoided unless absolutely necessary due to the close proximity to the peroneus longus tendon. The diagnosis of cuboid syndrome should be considered in active people that present with lateral column pain with or without a history of trauma. Treatment with conservative methods is usually very successful once the proper diagnosis has been made.

CUBOID STRESS FRACTURES

A stress fracture is generally the result of chronic repetitive stress placed on a bone. The most common bones often predisposed to stress fractures include the internal metatarsal bones, the distal fibula and tibia, and the calcaneus. Isolated cuboid fractures and stress fractures are rare.[6]

Pain isolated to the cuboid bone with or without any significant swelling and in the absence of a specific traumatic episode should be worked up for the possibility of stress fracture. Plain radiographs are often normal, although over time the fracture may appear as a sclerotic line (Figure 2). A Tc99 tri-phasic bone scan is often the best diagnostic imaging study although thin-slice CT scan or MRI can also be used as well.

Very few cases have been reported in the literature regarding this injury, but treatment should be similar to other pedal stress fractures. This includes immobilization and activity modification until radiographic signs of healing are present. In a confirmed stress fracture that does not heal in 3 months, external bone stimulation may be considered.

OS PERONEUM

The os peroneum is an accessory ossicle/sesamoid found within the peroneus longus tendon as it courses past the calcaneocuboid joint. According to Sarrafian, it is always present in either a ossified, cartilaginous, or fibrocartilaginous stage. It is found ossified in approximately 20% of the population. When ossified, it is best viewed on the medial oblique view on radiographs.

Sobel and Pavlov et al described os peroneum syndrome as a spectrum of conditions that should be considered in the differential diagnoses when a patient presents with plantar lateral foot pain.[7] The described entities included an acute os peroneum fracture or a diastasis of a multipartite os peroneum, either of which may result in a discontinuity of the peroneus longus tendon; chronic os peroneum fracture or diastasis of a multipartite os peroneum with callus formation, either of which results in a stenosing peroneus longus tenosynovitis; attrition or partial rupture of the peroneus longus tendon, proximal or distal to the os peroneum; frank rupture of the peroneus longus tendon with discontinuity proximal or distal to the os peroneum; and/or the presence of a gigantic peroneal tubercle on the lateral aspect of the calcaneus, which entraps the peroneus longus tendon and/or the os peroneum during tendon excursion.

When pathologic, the patient with os peroneum syndrome likely presents with lateral column foot pain, especially with heel rise or ascending stairs. Resisted plantarflexion of the first ray causes tenderness of the peroneus longus as it courses around the cuboid. There may also be a sensation of walking on a stone within the lateral arch, or paresthesia along the sural nerve. When conservative measures have failed to relieve symptoms; i.e., taping, padding, orthotics, steroid injections, and casting, surgical excision of the ossicle is warranted.

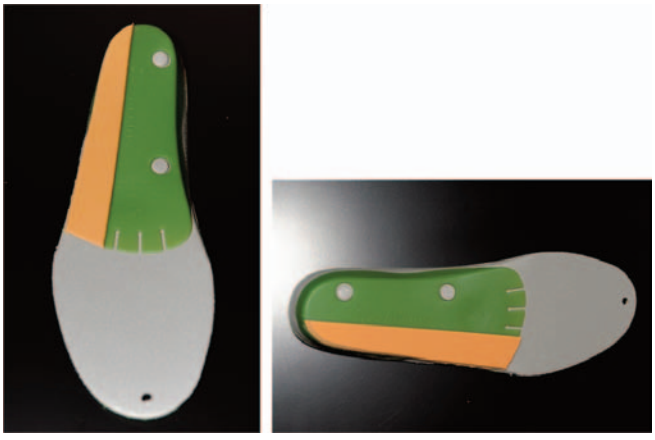

Figure 1. Valgus wedge.

Figure 2. Cuboid stress fracture.

The surgical technique is as follows: the incision is planned directly over the ossicle near the plantar-lateral edge of the cuboid. It should extend from the base of the fifth metatarsal to proximal to the calcaneal-cuboid joint (Figure 3). This incision provides adequate exposure and retraction of soft tissues to easily visualize the ossicle. Dissection is meticulously carried through skin and subcutaneous tissues down to the level of the deep fascia. The only real caution here is for the sural nerve, and if identified, it should be isolated and carefully retracted and protected (Figure 4). Once the deep fascia is identified, an incision is made within it, exposing the peroneal tendon sheaths. The peroneus longus tendon sheath is identified and incised (Figure 5). The ossicle is then identified within the peroneus longus tendon utilizing a medium bore needle (25 or 26 gauge) (Figure 6). After isolation of the ossicle, it is carefully excised taking care to preserve as much of the tendon as possible (Figures 7,8).

PERONEAL TENDONITIS

One of the most common causes of lateral ankle and foot pain is peroneal tendonitis. This is defined as acute inflammation within the tendon or tendon sheath caused by trauma or most likely overuse. Patients present with complaints of pain and swelling along the lateral aspect of the ankle and foot with point tenderness along the course of the peroneal tendons. They usually experience most discomfort while walking or running down slopes or uneven terrain, and there is usually marked wear on the outer surface of shoe gear. Peroneal tendonitis is found 80-85% of the time in patients with a cavovarus foot type. Conservative RICE (rest, ice, compression, and elevation) therapy works well to relieve the symptoms of peroneal tendonitis, and surgical intervention, unless rupture or degeneration has occurred, is rarely indicated.

Figure 3. Incision placement over ossicle from the base of the fifth metatarsal to proximal to calcaneal-cuboid joint.

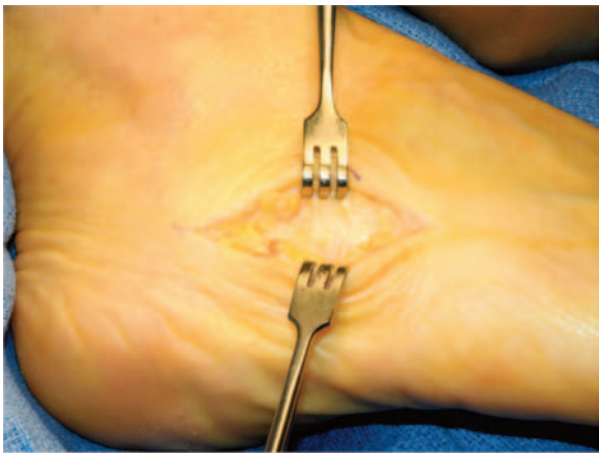

Figure 4. Exposure of deep fascia overlying peroneal tendons.

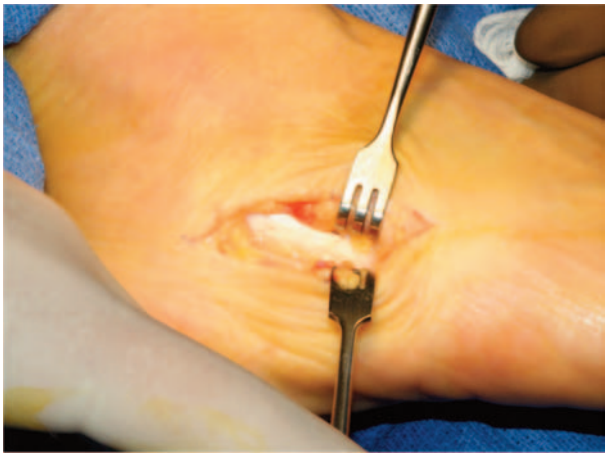

Figure 5. Incision into the peroneus longus tendon sheath, exposing tendon.

Figure 6. A 26 gauge needle is used to localize os peroneum within the peroneus longus tendon.

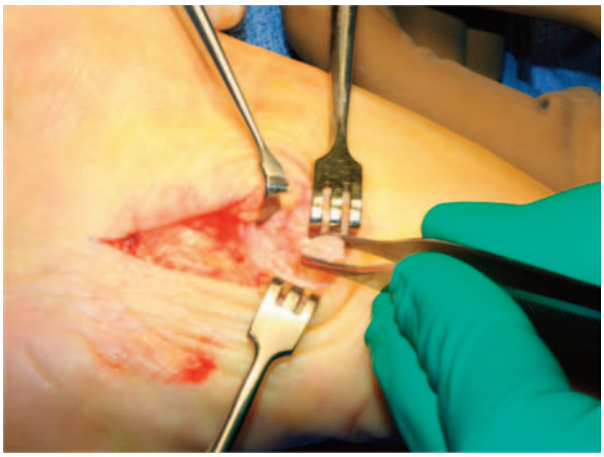

Figure 7. Careful dissection of the ossicle from the tendon. Care must be taken to preserve as much tendon as possible. Repair the tendon if necessary.

Figure 8. Preoperative radiograph of os peroneum excision (left). Postoperative radiograph of os peroneum excision (right).

FRACTURED ANTERIOR PROCESS OF THE CALCANEUS

Because of its proximity to the cuboid, fracture of the anterior process of the calcaneus must always be suspected when a patient presents with lateral column pain. Because so many lateral column injuries are the result of trauma, fracture of the calcaneus in this area is a likely differential diagnosis. This fracture is caused by stressed inversion, adduction, and plantarflexion, placing tension on the lateral half of the bifurcate ligament. An avulsion type injury as described is the most common occurrence, although compressive forces can also cause this injury. Examination will reveal point tenderness within the sinus tarsi, so this fracture must also be ruled out when sinus tarsi syndrome is suspected. The fracture is best viewed on the lateral radiograph. Because the fracture is extraarticular, if diagnosed early, full recovery can be achieved with immobilization in a below-knee cast for 4-6 weeks.

CONCLUSION

Although an often neglected bone, traumatic and overuse injury to the cuboid and surrounding structures needs to be considered in a patient presenting with lateral column pain, especially when the usual suspects have been ruled out. These injuries can often be subtle but still debilitating especially in the active and athletic population and prompt diagnosis and treatment can help limit the morbidly of these injuries.

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