

Not all ankle injuries are ankle sprains - Case of an isolated cuboid stress fracture

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Abstract

A 22-year old lady, had a twisting injury to her left ankle followed by pain on prolonged weight bearing and walking. Magnetic resonance imaging with computed tomography correlation was done which showed an isolated cuboid stress fracture. Isolated cuboid stress fractures are very rare and are usually misdiagnosed as ankle sprains.

Introduction

Stress fractures of the foot are commonly seen in athletes but are mainly seen at the calcaneum, navicular and the metatarsals.¹ Isolated cuboid stress fractures are rarely seen and diagnosed.² We report a case of an isolated cuboid stress fracture in a physically active 22-year old lady.

Case Report

A 22-year old female student came with complaints of persistent pain and swelling on the left ankle and foot for 2 months. She had a twisting inversion injury of her ankle followed by a fall, following which she was not able to bear weight immediately and had swelling. She went to a local hospital where X-rays were taken and major fractures were ruled out. She was advised NSAID's, crepe bandage and rest. She continued with her daily activities and did not take rest as advised. Four weeks following the injury she consulted a local orthopaedician who advised her rest and NSAID's, which was again not followed by her.

After 6 weeks she presented to our hospital with complaints of persisting pain and swelling in her left ankle and foot. Her past history and family history were not remarkable. She was walking with a limping gait but could walk unaided. On examination, there was no abnormality in alignment of the lower extremities. No deformities were noted in the lower extremities. There was pain on single leg weight bearing with mild tenderness and swelling noted on the lateral side of foot and ankle. Plain radiographic

studies showed no definitive abnormalities. On magnetic resonance imaging (MRI), a T1 weighted image showed continuous hypointense signals at the infero-lateral aspect of the cuboid bone and Fat suppressed T2-weighted image showed hyperintense signals. This was correlated with computed tomography (CT scan). There were no other additional findings. Thus an isolated cuboid stress fracture was diagnosed. The patient was advised to discontinue prolonged physical activity and was immobilized for 3 weeks (Figures 1 and 2).

We obtained written informed consent from the patient to publish this case report.

Discussion and Conclusions

Iwamoto and Takeda³ studied 196 cases of stress fractures (125 fractures in males and 71 in female) and noticed the most common site was the tibial shaft (44.4%) and followed by the foot (15%) and metatarsals (9.7%) and the tarsal (1%).

The study by Posinkovic and Pavlovic⁴ detailed 113 stress fractures in soldiers of which majority were in the metatarsals and only 1 of 113 was in the cuboid bone. The study by Pester and Smith⁵ revealed only one cuboid fracture among 1338 fractures of the foot and the lower leg in soldiers. In a similar study, Yale⁶ reported no cuboid fractures among 3657 fatigue fractures of the distal lower extremities in military recruits. In contrast, cuboid stress fractures are not rare among children. Oestreich and Bhojwani⁷ through his studies came to a conclusion that tarsal stress fractures in children are not rare by detecting 188 stress fractures of the cuboid in 527 children. Greaney *et al.*⁸ studied 250 military recruits with lower extremity fractures and detected 11 cases of cuboid stress fractures. Thus incidence varies based on various studies and many cases usually go undetected.

Literature from various studies shows 7 such case reports of cuboid stress fractures^{1,9-14} in athletes (Table 1). All fractures occurred in young athletes aged between late teens and their early twenties. All of them recovered by conservative treatment. In most cases, it took more than 3 weeks to diagnose the case showing the limited awareness of the condition. The cases were diagnosed by MRI or bone scintigraphy. In our case, the patient was not an athlete.

The mechanism of fracture is still under hypothesis. Linder *et al.*¹⁵ in his studies showed that cuboid fractures are associated with inversion ankle sprains and should be noted when there is localized lateral foot pain or pain on forefoot mobilization. John *et al.*¹⁶ stated that the most likely mechanism

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nism of fracture of the cuboid bone is the forced plantar flexion of the foot leading to the compression of the cuboid between the calcaneum and fourth and fifth metatarsals. Therefore repeated plantarflexion may lead to the fracture. This mechanism was explained earlier by Hermel and Gershon-Cohen,¹⁷ known as the *Nut in the Nutcracker* which corresponds to the compression of the cuboid between the calcaneum and the metatarsals.

Another hypothesis as stated by Chen *et al.*¹⁰ was that the peroneal tendon passes through the peroneal groove of the cuboid bone and it is the supporting point of the peroneal tendon. Thus repetitive pull by the peroneal tendon on the cuboid bone through the groove is responsible for the stress fracture on the foot. Another hypothesis was by Goldman¹⁸ who stated that malalignment of the foot *i.e.* a pronated or cavus foot leads to a stress fracture of the cuboid bone. A pronated foot leads to the wedging of the cuboid between the calcaneum and the metatarsals due to marked forefoot abduction, thus leading to a stress fracture. Similarly, a cavus foot with increased weight bearing on the lateral column will lead to stress fracture.

In the current case, the most likely cause was excessive plantar flexion when she fell leading to the crushing injury on the cuboid bone and continuous plantar flexion on the foot while walking without rest has led to the stress fracture of the cuboid bone. Since there are very few case reports on stress fractures of cuboid bone and minimal research on its etiology, the mechanism of injury of cuboid bone still needs to be identified. More clinical studies or case reports in the future could give more information on the mechanisms of injury.

Table 1. Reported cases of cuboid stress fractures.

	Age and gender	Time from symptom onset to diagnosis	Diagnostic method	Treatment
Mahler <i>et al.</i> (1993) ¹	20 y/Female	1 week	Bone scintigraphy	Non weight bearing
Beaman <i>et al.</i> (1993) ⁹	22 y/Male	2 week	Bone scintigraphy	Plaster cast
	20 y/Female	1 week	Bone scintigraphy	
Chen (1993) ¹⁰	27 y/Female	1 week	Computed tomography	Rest
Matsumoto <i>et al.</i> (1996) ¹¹	16 y/Male	4 weeks	Magnetic resonance imaging	Brace
Battaglia <i>et al.</i> (2002) ¹²	20 y/Male	3 weeks	Bone scintigraphy	Plaster cast
Kawahara <i>et al.</i> (2010) ¹³	17 y/Female	1 month	Magnetic resonance imaging	Splint
Hagino <i>et al.</i> (2014) ¹⁴	17 y/Male	1 month	Magnetic resonance imaging	Brace
Present study	22 y/Female	6 weeks	Magnetic resonance imaging	Plaster cast



Figure 1. T1 weighted image showing continuous hypointense signals at the infero-lateral aspect of the cuboid bone.



Figure 2. Fat suppressed T2-weighted image showing hyperintense signals at the infero-lateral aspect of the cuboid bone.

Isolated cuboid stress fractures are rarely diagnosed and are usually missed out due to misdiagnosis of an ankle sprain. We thus report a rare case of an isolated cuboid stress fracture in a 22-year old physically active young woman. In cases of persistent pain on the lateral side of the foot with no radiographic findings, cuboid stress fracture should be suspected and investigations such as MRI or CT scan needs to be considered to confirm the diagnosis.

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