

# Non-traumatic isolated medial cuneiform fracture: A unique mechanism of a rare injury

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**Gabriella Paisan, Steven Magister, Andrew Bridgforth and Seth Yarboro**

## Abstract

We report a case of a 23-year-old woman who sustained a stress fracture to the medial cuneiform. Isolated medial cuneiform fractures are extremely rare with less than 10 cases reported in the literature. The patient initially presented to an urgent care facility complaining of right midfoot pain that occurred while running. Radiographs obtained at the time showed no acute abnormality and the patient was told to resume normal activities. Several weeks later, she presented to urgent care again after exercising, this time unable to bear weight and with swelling and ecchymoses of the right foot. Plain radiographs were again normal, but a high suspicion for injury remained, so a magnetic resonance imaging of the foot was obtained. The advanced imaging showed an acute, non-displaced fracture of the medial cuneiform. Because the fracture was discovered soon after the injury and was non-displaced, she was treated conservatively and at 6-month follow up had returned to all pre-injury activities with no complaints. These rare fractures are often missed at initial presentation because they are usually not evident on plain radiographs. Unless more advanced imaging is obtained to rule out a fracture, a delay of diagnosis can occur resulting in additional morbidity for the patient.

**Level of clinical evidence:** Level 5

## Keywords

Midfoot, runner, sports, stress fracture, tarsal bone

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## Introduction

Isolated fractures of the cuneiforms are extremely rare, accounting for only 1.7% of all midfoot fractures.<sup>1</sup> When cuneiform fractures do occur, they are often in conjunction with other injuries, such as fractures to the adjacent cuneiforms, or are a part of a greater injury complex, such as Lisfranc fracture dislocations. Per our review of the literature, only eight cases of isolated medial cuneiform fracture have been reported (Table 1). Five of these cases resulted from high-energy trauma or a direct blow to the dorsal midfoot.<sup>1–4</sup> The other three cases were a result of excessive foot eversion, hyper-plantarflexion, and falling with the foot in a plantar flexed and inverted position.<sup>1,3,5</sup> Here, we present the case of an isolated medial cuneiform stress fracture that occurred in an active 23-year-old woman. To our knowledge, only one other medial cuneiform stress fracture is reported in the literature.<sup>6</sup>

## Case report

A 23-year-old woman and recreational runner with no significant past medical history initially presented to an urgent care clinic with pain in the right foot associated with running. Several weeks prior to the injury, the patient described a consistently dull pain along the dorsal and medial aspects of her midfoot. Plain radiographs taken at that time were normal. Given her history of extensive running, the pain was attributed to a “midfoot sprain,” and the patient continued with full activities with only minor discomfort.

University of Virginia School of Medicine, Charlottesville, VA, USA

### Corresponding Author:

Seth Yarboro, University of Virginia School of Medicine, Suite 330, 400 Ray C Hunt Drive, Charlottesville, VA 22903, USA.  
Email: sry2j@virginia.edu



**Table 1.** Table summarizing the previously reported cases of isolated medial cuneiform fractures.

Author	Year	Patient profile	Injury mechanism	Treatment	Outcome
Guler et al. <sup>1</sup>	2011	32-year-old male	Direct trauma	ORIF	Full recovery
		21-year-old male	Hyper-plantarflexion	Casting	Full recovery
Alemdar et al. <sup>2</sup>	2013	62-year-old male	Direct trauma	Rest followed by ORIF w/bone autograft due to non-union	Non-union <sup>a</sup>
Olson et al. <sup>3</sup>	2000	39-year-old male	Direct trauma	Casting	Full recovery
		27-year-old male	Eversion	Casting	Full recovery
Patterson et al. <sup>4</sup>	1993	21-year-old male	Direct trauma	ORIF	Full recovery
Akan et al. <sup>5</sup>	2013	30-year-old female	Inversion, plantarflexion	ORIF	Full recovery
Khan et al. <sup>6</sup>	1993	41-year-old male	Stress fracture	Rest	Full recovery
Taylor and Heidenreich <sup>7</sup>	2008	26-year-old male	Direct trauma	Casting	Full recovery

ORIF: open reduction internal fixation.

<sup>a</sup>No data reported for follow up following ORIF w/autograft for non-union.



**Figure 1.** (a–c) Right foot plain films (lateral, DP, and oblique) showing no acute fractures or joint spacing abnormalities.

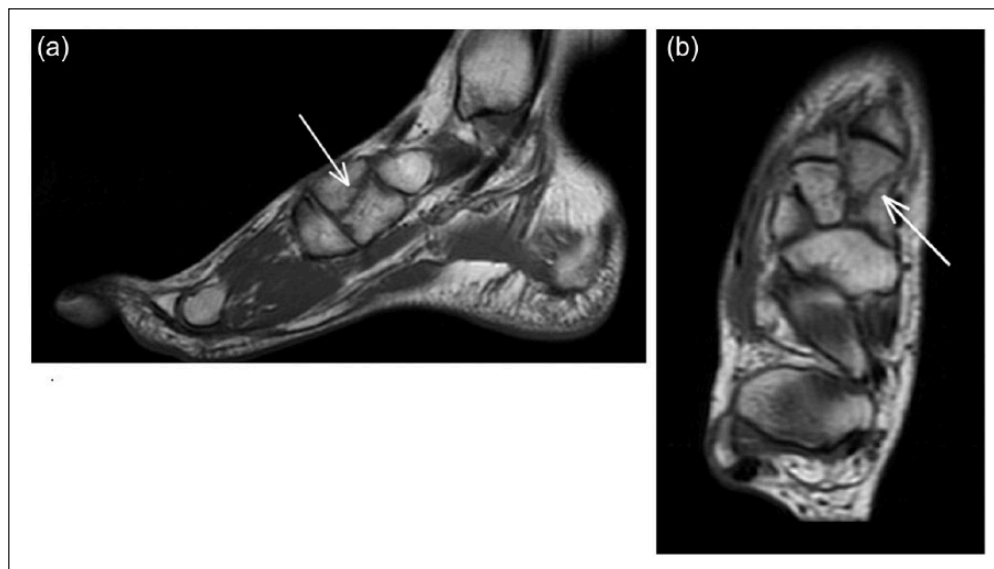
Several weeks later, after playing a recreational soccer game, the patient was walking off the field and suddenly felt a crack with associated severe pain in her right foot. The patient was unable to bear weight following the injury, and again presented to an urgent care clinic for evaluation. On exam, there was significant midfoot swelling and ecchymosis along the plantar foot. Significant tenderness was appreciated over the dorsal medial midfoot; however, the midfoot joint complex was stable.

Given the apparent acute-on-chronic nature of this event, and focal tenderness over the medial midfoot on exam combined with an inability to bear weight, x-ray imaging was obtained which showed no obvious acute fractures or significant joint space disruption (Figure 1). A high degree of suspicion remained for an occult stress fracture and advanced imaging was obtained. Magnetic resonance imaging (MRI) showed an isolated fracture of the medial cuneiform (Figure 2). Given the non-displaced nature of the fracture, closed treatment

was initiated and consisted of 4 weeks of non-weight-bearing in a short leg cast followed by another 4 weeks of progressive weight-bearing in a walking boot. No concerns were noted at progressive follow-up visits, and at 6 months post injury, the patient has returned to full activity with no associated pain.

## Discussion

The most common mechanism of isolated medial cuneiform fracture is a direct blow to the midfoot or an axial or rotational force applied to the midfoot. The injury in this case is likely the result of a stress reaction in the medial cuneiform that progressed with continued weight-bearing and activity. This case is unique in that it represents a midfoot stress fracture involving the medial cuneiform rather than the much more commonly injured navicular bone. Only one other case of medial cuneiform stress fracture in an athlete is reported in the literature.<sup>6</sup> Although still relatively uncommon,



**Figure 2.** (a, b) Right foot T1-weighted MRI, lateral and axial planes, showing a non-displaced oblique fracture line in the medial cuneiform. Arrow denotes the fracture line.

navicular stress fractures have been found to be the most common stress fracture of the lower extremity in track athletes, and they are generally associated with compressive push-off forces like sprinting and jumping.<sup>8</sup>

Diagnosis of cuneiform fractures can be very difficult, as they are not always visible on plain films due to the intricate overlapping articulations of the midfoot. Thus, identification may require more advanced imaging such as CT or MRI. As such, these fractures may be missed in the acute setting, resulting in a delay in treatment. Therefore, in the setting of injury to the midfoot with inability to bear weight, a diagnosis of “midfoot sprain” should be met with a high degree of skepticism until further imaging can be obtained to rule out an occult stress fracture.

Most cases of non-displaced medial cuneiform fracture can be treated conservatively with immobilization with a short leg cast for a period of approximately 6 weeks. There are only two cases reported in the literature of non-union of a non-displaced medial cuneiform fracture.<sup>2,9</sup> For the treatment of displaced fractures, internal fixation is recommended in order to preserve the function of the joint spaces.<sup>7</sup>

We believe this case report highlights a rare injury with a challenging diagnosis. A high index of suspicion should be maintained when evaluating a patient with an acute midfoot injury. As was the case here, advanced imaging may be needed when plain radiographs do not adequately characterize the injury. Despite the slight delay in diagnosis seen in this case, the injury was correctly identified and properly treated without any additional morbidity or long-term sequelae.

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#### Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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