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Isolated, nondisplaced medial cuneiform fractures: Report of two cases

by Koun Yamauchi MD[1*], Satoru Miyake MD[1], Chisato Kato MD[1], Takayuki Kato MD[1]

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Isolated, nondisplaced medial cuneiform fractures are difficult to diagnose using plain radiographs. Computed tomography (CT) or magnetic resonance imaging (MRI) are necessary to aid in diagnosis. This paper describes two patients with this fracture that were more difficult to suspect because the fractures occurred during running, which are extremely rare. Tenderness and swelling around the medial cuneiform was observed that led to suspicion of a fracture; this lead us to perform a CT scan or MRI for confirming the presence of the fracture. However, tenderness and swelling around the midfoot can be observed in a patient with a sprain without the fracture. Therefore, it is more important to note that isolated, nondisplaced medial cuneiform fracture can be induced by an indirect force such as that occurring while running.

Keywords isolated medial cuneiform fractures, non-displaced, during running, computed tomography, magnetic resonance imaging

Here, we describe two consecutive patients with isolated, nondisplaced medial cuneiform fractures that occurred during running. Cuneiform fractures generally occurs along with other fractures of the midfoot, such as Lisfranc dislocation fractures, whereas the occurrence of isolated medial cuneiform fracture is rare. A total of only seven published case reports have been reported in the literature [1-5]. Nevertheless, an isolated, non-displaced fracture of the medial cuneiform may be easily suspected when the midfoot has been bruised by a direct, intense force, such as the impact of a traffic accident. However, it may be more difficult to suspect the fracture when being caused by indirect and acute force. Only one case report clearly describes the mechanism of isolated, nondisplaced medial cuneiform fracture being caused by indirect and acute force that occurred during dancing [4]. Therefore, the occurrence of isolated medial cuneiform fracture during running is extremely rare.

Case Report #1

A 25-year-old woman visited a hospital after hearing a cracking sound and feeling pain in her right midfoot during short-distance running at full speed in a park. Clinicians at the hospital diagnosed her injury as a sprain because they found no indications of fracture. Two days later, she visited our hospital with tenderness and swelling around the midfoot. However, radiograph of the midfoot showed no indications of a fracture (Figure 1), and we diagnosed her injury as a sprain.

Five days later, she came for an examination; the tenderness and swelling around the midfoot persisted, although the spontaneous pain was gradually decreasing. We performed a computed tomography (CT) scan, which indicated an isolated, nondisplaced medial cuneiform fracture (Figure 2).

1 - Department of orthopedic surgery, Akita Hospital, Takara, Chiryu City, Aichi 472-0056, Japan.
*Corresponding author: Koun Yamauchi, koun_yamauchi@yahoo.co.jp

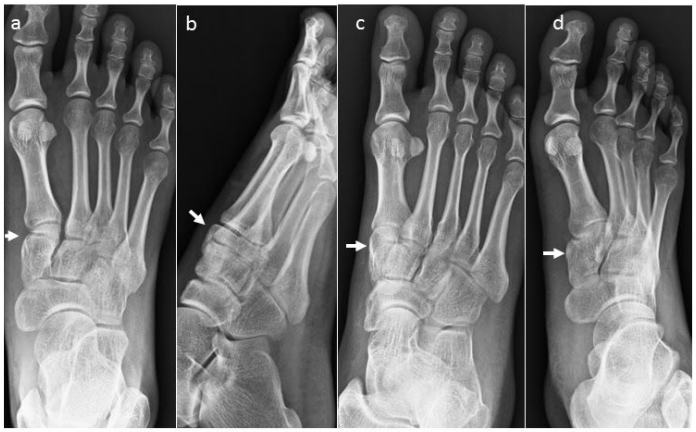

Figure 1 Plain radiographs of the foot in first case. White arrows show cuneiform bone. (a) anterior–posterior image; (b) lateral–medial image; (c) oblique, lateral–medial image; and (d) oblique, medial–lateral image.

Her treatment included non weight-bearing (NWB) activity for two weeks without any immobilization. An arch support was applied on her right foot. Partial weight-bearing (PWB) activity was allowed from the fourth week after the injury, full weight-bearing (FWB) activity was allowed from the sixth week after the injury, and she was treated in rehabilitation from the fourth week to three months after the injury. At two months after injury, her hallux range of motion (ROM) recovered to the level of the contralateral side hallux ROM; however, swelling around the midfoot persisted but disappeared at three months after injury. We conducted a self-score, self-administered foot evaluation questionnaire (SAFE-Q) at two and three months after the injury [6]. The following were the scores at two and three months after injury, respectively: Pain scores: 54.1 and 76.4; activities of daily living (ADL) scores: 65.9 and 91.0; social functioning scores: 0.4 and 82.5; shoe-related scores: 41.7 and 91.7; and general health scores: 60 and 90.0 (Full score for each subscale was 100 points).

Case Report #2

A 35-year-old woman presented at our hospital with tenderness and swelling around the midfoot. She had felt sharp pain in her right midfoot as she dashed up an acute slope. Radiographs taken during first examination showed no indication of a fracture (Figure 3), but CT scan showed an isolated, nondisplaced medial cuneiform fracture (Figure 4).

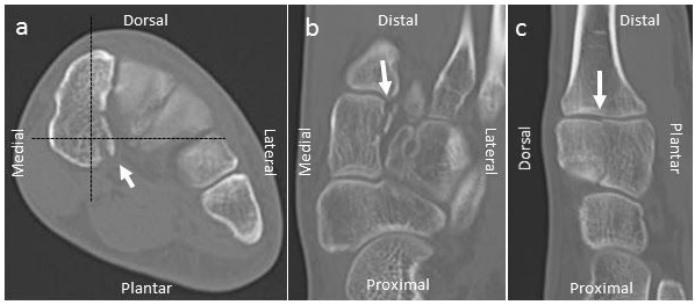

Figure 2 Computed tomography of the foot in the first patient. White arrows show fracture line. Dotted lines in axial image (a) show reference lines for coronal image (b) and sagittal image (c).

Figure 3 Plain radiographs of the foot in second patient. White arrows show cuneiform bone. (a) anterior–posterior image; (b) lateral–medial image; (c) oblique, lateral–medial image; and (d) oblique, medial–lateral image.

Furthermore, magnetic resonance imaging (MRI) showed an acute fracture of the medial cuneiform (Figure 5).

Her treatment included NWB activity for three weeks and immobilization with a soft-splint because of significant swelling. At three weeks after the injury, we started the same treatment strategy as that with the first patient. At two months after injury, her hallux ROM had recovered to the level of contralateral side hallux ROM, and swelling around the midfoot was no longer apparent. SAFE-Q scoring was conducted at 2, 3, and 8 months after injury. Following were the scores at 2, 3, and 8 months after injury, respectively: Pain scores: 76.7, 91.4, and 99.9; ADL scores: 75.0, 93.2, and 97.7; social functioning scores: 83.3, 82.4, and 100; shoe-related scores: 83.3, 58.3, and 91.7; and general health scores: 80, 90.0, and 100.

Figure 4 Computed tomography of the foot in the second patient. White arrows show fracture line. Dotted lines in axial image (a) show reference lines for coronal image (b) and sagittal image (c).

Figure 5 Magnetic resonance imaging (MRI) of the foot in the second patient. White arrows show fracture area in coronal images of T1-weighted image (a), T2-weighted image (b), and T2-weighted image with fat saturation sequence (c).

Discussion

Similar to earlier reports on diagnosis and treatment of an isolated, non-displaced medial cuneiform fracture [1-5], we were not able to diagnose the fracture in either of our patients based on the plain radiographs alone. All authors have reported that it was difficult to diagnose an isolated, non-displaced medial cuneiform fracture using plain radiographs and that CT and MRI were necessary to diagnose this fracture.

Observed tenderness and swelling around the medial cuneiform bone lead to suspicion of a fracture; this lead us to perform a CT scan or an MRI for confirming the presence of the fracture. An isolated, non-displaced fracture of the medial cuneiform may be easily suspected when the midfoot has been bruised by a direct, intense force, such as the impact of a traffic accident, whereas the stress fracture of this bone can be suspected when the feet of athletes are subjected to repetitive, physical loads.

However, when the midfoot is subjected to indirect and acute one-time force, such as dancing or running, clinicians may not perform a CT scan or MRI because they generally do not suspect the occurrence of a fracture, thereby diagnosing the tenderness and swelling around the midfoot as a sprain and/or bruise. Therefore, our suspicion of the isolated, nondisplaced medial cuneiform fracture is noteworthy even when the patient's midfoot has been subjected to indirect and acute one-time force during running. Although the bipartition of the medial cuneiform was not observed in both our patients, a clinician should suspect the presence of midfoot pain related to the bipartition of the medial cuneiform bone as a differential diagnosis. Steen et al [7] proposed that the bipartition of the medial cuneiform can be associated with midfoot pain following an acute injury.

As reported in the earlier reports, treatment for isolated, nondisplaced medial cuneiform fracture can be conservative [3, 5]. In both of our patients, CT scan taken at five weeks after injury exhibited bony union without complications, such as malunion or displacement. Although the patient's hallux ROM showed recovery two months after injury, SAFE-Q scores remained unfavorable. In particular, SAFE-Q scores of the first patient were worse, which could have resulted from persistent swelling around her midfoot. At three months after injury, the SAFE-Q scores were better in both patients, except the shoe-related scores of the second patient. We were not able to ascertain any causes for the low shoe-related scores in the second patient. At eight months after injury, the SAFE-Q scores were almost full scores in the second patient, while the SAFE-Q scores were not conducted in the first patient.

Interestingly, CT scan exhibited a similar fracture type in both patients: dorsal and plantar bone fragment with avulsion fracture of the lateral–distal–plantar cortex. Because the fractures in both patients included joint surfaces (navicular–cuneiform joint and cuneiform–metatarsal joint), bone fragment displacement was contraindicated.

Therefore, surgery using embedded screws may be an appropriate treatment option for fixation of dorsal and plantar bone fragments. Surgery, such as definitive fixation, is likely to maintain non-displacement until bony union is achieved. Definitive fixation is particularly appropriate for athletes because it enables early and successful recovery (because athletes are able to actively return to their respective sports sooner) compared to conservative treatment. We strongly suggest that more study is needed to assess the effect of surgical treatment options on recovery after isolated, nondisplaced medial cuneiform fracture.

Conclusion

Isolated medial cuneiform fracture can be induced by an indirect force while running and should be diagnosed by CT and MRI.

Acknowledgements

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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