Clinical Case Report

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Medial malleolar stress fracture resulting from repetitive stress caused by lateral ankle instability

A case report

Hong Seop Lee, MD[a], Young Koo Lee, MD, PhD[b], Hak Soo Kim, MD[b], Dhong Won Lee, MD[c], Sung Hun Won, MD[d], Ki Jin Jung, MD[e], Chang Hyun Kim, MD[e], Woo Jong Kim, MD[e,*]

Abstract

Rationale: Stress fractures are most commonly sustained in the lower extremities owing to the repetitive weight-bearing forces. They are overuse injuries that are seen often in athletes, but rare in the general population, so early diagnosis and proper treatment are important to enable athletes to return to activity. This is a rare example of successful treatment of a medial malleolar stress fracture with lateral ankle instability.

Patient concerns: A 16-year-old athlete presented with acute-onset left ankle pain. He was a baseball pitcher who had previously sprained left ankle while training. Subsequently, the ankle pain worsened, and he had tenderness on the medial aspect of his left ankle. The symptoms were mild at rest, but increased upon walking and training. Three years previously, he had sprained his ankle several times during baseball training.

Diagnosis: Plain standing radiographs of the left ankle showed a vertical fracture line in the medial malleolus. Computed tomography also showed the vertical fracture in the medial malleolus. Magnetic resonance imaging revealed mild bone marrow edema in the medial malleolar area and total rupture of the anterior talofibular ligament.

Interventions: Surgery was performed under general anesthesia, and we checked the instability of his ankle using a C-arm image intensifier, and the varus talar tilt angle was increased (10.3°). The medial malleolus stress fracture was fixed using tension bend wiring, and an arthroscopic modified Broström procedure was done.

Outcomes: Two months postoperatively, the patient started walking, and raised-heel squatting. The medial malleolar fracture was completely united at the 3 months postoperatively on plain radiography, and return to full activity was achieved by 3 months postoperatively. Then the hardware was removed 1-year after operation and both the anterior drawer and external rotation stress tests were negative.

Lessons: Medial malleolar stress fractures are rare, so they can be overlooked. With these fractures, plain radiographs are frequently normal initially because the medial malleolus consists mainly of cancellous bone. Physicians require a high level of suspicion when taking the patient's history and doing the physical examination. Because most occur in athletes, early diagnosis and proper treatment are important for patients' subsequent athletic performance.

Abbreviations: CT = computed tomography, MRI = magnetic resonance imaging.

Keywords: ankle instability, medial malleolus, stress fracture

1. Introduction

Stress fractures are overuse injuries that are often seen in athletes and are very rare in the general population.[1–4] They most often involve the lower extremities owing to the repetitive weight-bearing forces imparted on the bony anatomy, and specific anatomic sites are related to individual sports.[4] The most common site for stress fractures in the lower extremity is the

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[a] Department of Foot and Ankle Surgery, Nowon Eulji Medical Center, Eulji University, 68, Hangeulbiseok-ro, Nowon-gu, Seoul, [b] Department of Orthopaedic Surgery, Soonchunhyang University Hospital Bucheon, Jomaru-ro, Wonmi-gu, Bucheon, [c] Department of Orthopaedic Surgery, Konkuk University Medical Center, Neungdong-ro, Gwangjin-gu, [d] Department of Orthopaedic Surgery, Soonchunhyang University Hospital Seoul, 59, Daesagwan-ro, Yongsan-gu, Seoul, [e] Department of Orthopaedic Surgery, Soonchunhyang University Hospital Cheonan, 31, Suncheonhyang 6-gil, Dongam-gu, Cheonan, Korea.

[*] Correspondence: Woo Jong Kim, Department of Orthopaedic Surgery, Soonchunhyang University Hospital Cheonan, 31, Suncheonhyang 6-gil, Dongam-gu, Cheonan, Korea, 31151 (e-mail: kwj9383@hanmail.net).

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Figure 1. Preoperative plain anteroposterior (A), mortise (B), and lateral (C) radiographs of the left ankle showing a vertical fracture line in the medial malleolus.

distal third of the tibia; stress fractures of the medial malleolus are rare, accounting for 0.6% to 4.1% of all stress fractures.[5–7] Although they are uncommon, it is important that medial malleolar stress fractures be diagnosed and treated early to enable athletes to return to their sports quickly. Failure to assess and manage the fracture properly can result in complications such as fracture progression, delayed healing, nonunion, chronic pain, and delayed return to their athletic lives.[2,3]

In the limited number of reported cases, recovery tended to be faster with operative fixation than with conservative management, although outcomes varied markedly.[8]

We present a medial malleolar stress fracture in a skilled baseball pitcher. After initial successful operative management, including open reduction and internal fixation with an arthroscopic modified Broström procedure[9] to treat the lateral instability of his ankle, he returned to baseball quickly.

2. Case description

This case report was approved by the Institutional Review Board of Soonchunhyang University Hospital (IRB No. 2018-09-031), and the patient gave written informed consent for publication of this case report and accompanying images.

A 16-year-old baseball pitcher presented with chronic, vague-onset left ankle pain. He had sprained his left ankle while training 3 years earlier. Subsequently, he sprained his left ankle several times during training, and 1 month prior, he sprained his left ankle again. The ankle pain worsened, and the medial aspect of his left ankle was tender. The symptoms were mild at rest, but increased upon walking and training.

Initial clinical and radiologic examinations were done at anther clinic. There were no specific findings involving his left ankle other than medial tenderness. Analgesics were prescribed, and no other treatment was given at that time. However, his ankle pain worsened, and he visited our clinic. We could not obtain the original images from the initial examination, but the patient said that nothing unusual was seen. Examination in our clinic revealed focal tenderness on the medial aspect of his left ankle. Plain standing anteroposterior, mortise, and lateral radiographs of the left ankle showed a vertical fracture line in the medial malleolus with fused epiphyseal plate (Fig. 1), and a medial malleolar stress fracture was diagnosed. Considering his history of several ankle sprains during baseball training, we hypothesized that lateral instability of his left ankle led to the stress fracture due to sustained varus force on the medial malleolus. His ankle was too painful to check stability by taking varus and valgus talar tilt stress views. Therefore, we planned to check ankle stability under anesthesia. Computed tomography (CT) confirmed the vertical fracture seen on plain radiographs (Fig. 2). Magnetic resonance imaging (MRI) showed mild bone marrow edema in the medial malleolar area and total rupture of the anterior talofibular ligament (Fig. 3).

We planned open reduction and internal fixation of the medial malleolus with an arthroscopic modified Broström procedure to correct the ankle lateral instability.

Figure 2. Preoperative computed tomography (CT) shows a vertical fracture line in the medial malleolus. CT = computed tomography.

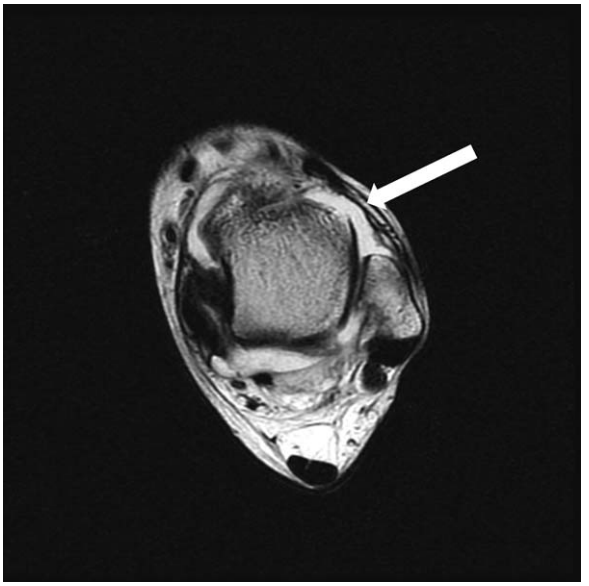

Figure 3. Magnetic resonance imaging (MRI) shows total rupture of the anterior talofibular ligament (arrow) on T2-weighted axial images. MRI = magnetic resonance imaging.

Surgery was performed under general anesthesia. Examination of left ankle stability using a C-arm image intensifier showed that the varus talar tilt angle was increased to 10.3° (Fig. 4). The medial malleolar fracture was fixed using tension bend wiring, and the arthroscopic modified Broström procedure was done (Figs. 5 and 6).

Two months postoperatively, he started weight-bearing walking and raised-heel squatting. Plain radiography at the 3-month follow-up showed complete union of the medial malleolar stress fracture, and gradual advancement to full activity can be achieved by 3 months postoperatively. Then the hardware was removed at 1-year after operation. During surgery, the anterior drawer and external rotation stress tests were negative. He returned to baseball.

Figure 4. Under general anesthesia, the varus talar tilt angle of the left ankle was checked using a C-arm image intensifier.

3. Discussion

Rettig et al[10] reported the first case series of stress fractures of the medial malleolus. They established 3 basic criteria for identifying medial malleolar stress fractures: tenderness over the medial malleolus and joint effusion; pain during activities before an acute episode; and a vertical line from the tibial plafond.

However, diagnosis of a medial malleolar stress fracture may be difficult because of the vague symptoms and insidious onset.[7]

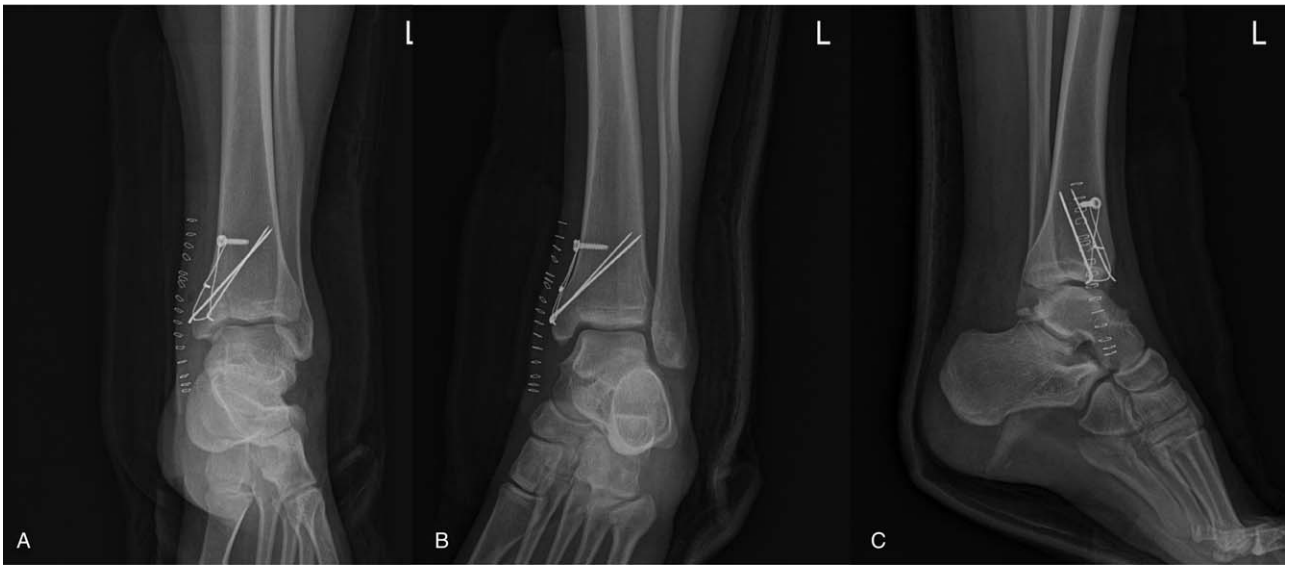

Figure 5. Postoperative plain anteroposterior (A), mortise (B), and lateral (C) radiographs of the left ankle.

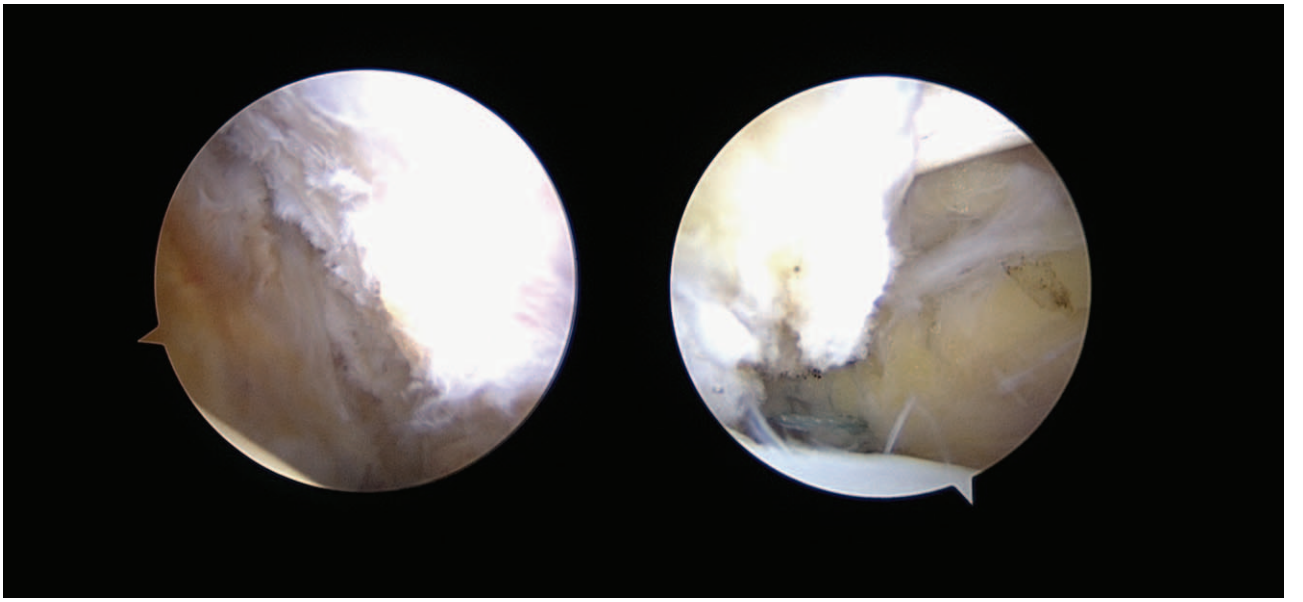

Figure 6. An arthroscopic modified Broström procedure was done.

Plain radiographs are frequently normal in the early phase because the medial malleolus consists mainly of cancellous bone. Additional imaging using CT, MRI, or nuclear bone scans is recommended. CT provides better bony detail for localizing the stress fracture.[1,3,7] Differential diagnosis of a medial malleolar stress fracture includes anterior medial impingement syndrome, intraosseous cyst formation in the medial malleolus due to osteochondritis dissecans in the tibial plafond at the junction of the medial malleolus, a nonunited medial malleolus fracture or ossicles, neoplasm, osteomyelitis, metabolic disease, internal derangement of the ankle, tendinitis of the posterior tibial tendon or flexor hallucis tendon, tarsal tunnel syndrome, external compartment syndrome, muscle strain or hernia, and periostitis.[6,7,11] In this case, we were told that there was no fracture line in the initial plain radiograph, although we could not confirm this directly.

Once the diagnosis is established, there is no standard protocol for nonoperative therapy. Many clinicians use 1 of 2 broad treatment regimens: one comprises strict nonweight bearing with crutches and a short leg cast or boot, and the other allows limited weight bearing with a boot and tape immobilization, combined with rest, ice, compression, and elevation. The duration of non- or partial weight-bearing activity ranges from 2 to 8 weeks. Additional methods include weight bearing as tolerated while curtailing or stopping training regimens and avoiding strenuous activity.[8] Surgical therapy is slightly more uniform. Open reduction and internal fixation can be achieved using cannulated or cancellous screws.[12,13] Irion et al[8] examined difference in clinical outcomes between nonoperative and operative treatment, concluding that, although both interventions led to successful healing and return to sports, early operative intervention had a greater likelihood of early healing, decreased symptoms, and return to sports.

In this case, the medial malleolar stress fracture was not diagnosed at the first clinic that the patient visited. The history of repeated ankle sprains and the 3 diagnostic criteria listed above led us to us focus on lateral instability and medial malleolar fracture. MRI showed total rupture of the anterior talofibular ligament with a vertical fracture line in the medial malleolus.

No published case report describes the relationship between medial malleolar stress fracture and lateral instability of the ankle, so we have no additional cases to support our hypothesis that lateral instability of the ankle accelerated the medial malleolar stress fracture. Nevertheless, our successful treatment of a medial malleolar stress fracture with lateral instability of the ankle is meaningful, and we believe that further study of the relationship between medial malleolar stress fracture and lateral instability of the ankle is needed.

4. Conclusion

Stress fractures of the medial malleolus are rare, and they can be misdiagnosed or overlooked. Therefore, physicians need to consider them when taking the patient's history and doing the physical examination. Because most of these fractures occur in athletes, early diagnosis and proper treatment are important. Based on the literature and this case, be believe that operative treatment, including correction of any lateral instability by an arthroscopic modified Broström procedure, has a better outcome and can enable the patient return to sports more quickly than non-operative treatment.

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Author contributions

Conceptualization: Hong Seop Lee, Woo Jong Kim.
Data curation: Hak Soo Kim.
Investigation: Hak Soo Kim.
Project administration: Woo Jong Kim.
Software: Dhong Won Lee, Chang Hyun Kim.
Supervision: Dhong Won Lee, Sung Hun Won, Ki Jin Jung, Chang Hyun Kim, Woo Jong Kim.
Visualization: Sung Hun Won.

Writing – original draft: Hak Soo Kim.
Writing – review & editing: Young Koo Lee, Woo Jong Kim.
Woo Jong Kim orcid: 0000-0002-4579-1008.

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