

## Corrective Osteotomy for Malunion of a Tillaux-Chaput Fracture: A Case Report

Katsuya Ito<sup>1\*</sup>, Yasuhito Tanaka<sup>2</sup>, Ryuhei Katsui<sup>3</sup> and Akira Taniguchi<sup>2</sup>

<sup>1</sup>Department of Orthopedic Surgery, Ishinkai Yao General Hospital, Osaka, Japan

<sup>2</sup>Department of Orthopedic Surgery, Nara Medical University, Nara, Japan

<sup>3</sup>Department of Orthopedic Surgery, Nishinara Central Hospital, Nara, Japan

\*Corresponding author: Katsuya Ito, M.D., Ph.D., Department of Orthopaedic Surgery, Ishinkai Yao General Hospital, Numa,Yao, Osaka, Japan, Tel:+81-72-948-2500; Fax:+81-72-948-7950; E-mail:[katutiyo@hcn.zaq.ne.jp](mailto:katutiyo@hcn.zaq.ne.jp)

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### Abstract

The frequency and significance of a Tillaux-Chaput (TC) fracture remains unclear, and there is no consensus on the treatment strategies for this type of fracture. We report on the first case of a severe TC fracture with malunion that extended into the joint, and it was successfully treated with corrective osteotomy.

**Keywords** Tillaux fracture; Malunion; Corrective osteotomy

### Introduction

An avulsion fracture of the anteroinferior tibiofibular ligament is termed as a Tillaux-Chaput (TC) fracture. It frequently accompanies a malleolar ankle fracture, but is often overlooked on plain radiography. Therefore, computed tomography (CT) is recommended for assessing malleolar ankle fractures. The frequency and significance of this type of fracture remain unclear, and no consensus has been reached on the treatment strategies for this condition. Herein, we report on the first case of a severe TC fracture with malunion that extended into the joint, which was successfully treated with corrective osteotomy.

### Case Presentation

A 35-year-old man sprained and injured his ankle during the delivery work. He was diagnosed with a medial malleolar ankle fracture at a local clinic and was treated with cast immobilization for 4 weeks. Five months post-injury, he returned to work. However, his ankle pain persisted; hence, he visited another clinic. Magnetic resonance imaging (MRI) revealed a fracture of the anterolateral aspect of the tibia. He was referred to our hospital with suspected pseudarthrosis 6 months after the initial injury. Swelling and tenderness were noted in the anterolateral aspect of the ankle and in the anterior aspect of the lateral malleolus. Limited range of motion and instability of the ankle were not observed. The medial malleolus on plain radiographs was slightly dislocated and fused. Although an osteosclerotic appearance was observed in the anterolateral aspect of the tibia, no apparent bone fragment was identified (Figure 1). On MRI films supplied by the patient, the TC fragment and tibia were not fused at the articular surface level, and the presence of an intervening scar or synovial fluid was suspected (Figure 2). CT scans showed a bone fragment extending into the articular surface in the anterolateral aspect of the tibia. Although the fragment was externally rotated and anteriorly projected, its central end had already been fused. Poor compatibility with both the talocrural and tibiofibular joints suggested malunion (Figure 3).



**Figure 1:** Preoperative plain radiographs of the ankle. The medial malleolus is slightly dislocated and fused, and there is no apparent bone fragment.

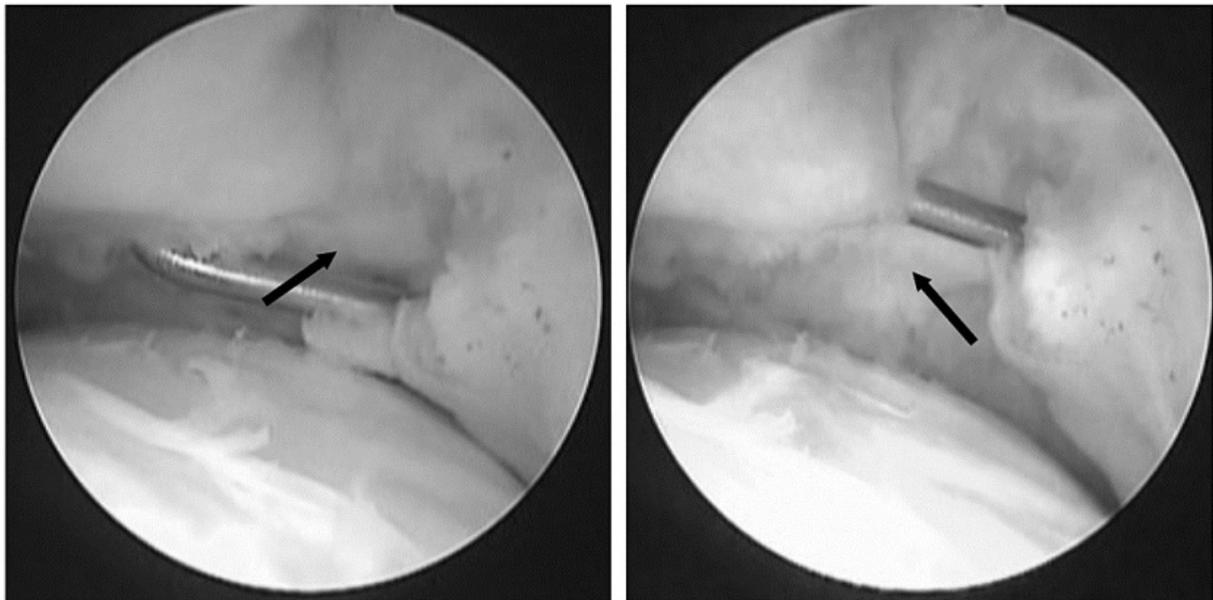
Conservative treatment was initially performed using a brace. However, since the pain persisted, surgery was performed. Ankle arthroscopy revealed proliferation of the synovial membrane, a septate-like scar at the fracture site, 2 mm step-off, 3 mm gap, and fibrillation of the cartilage surface (Figure 4). Osteotomy was performed at the original fracture site to resect the intervening scar and bone tissue. Cancellous bone was harvested from the iliac crest, and was implanted before compatibility with the articular surface was corrected; thereafter, the TC fragment was fixed with two screws.



**Figure 2:** Magnetic resonance imaging films supplied by the patient. The Tillaux-Chaput fragment is not fused at the articular surface level, and the presence of an intervening scar or synovial fluid is suspected (arrow).

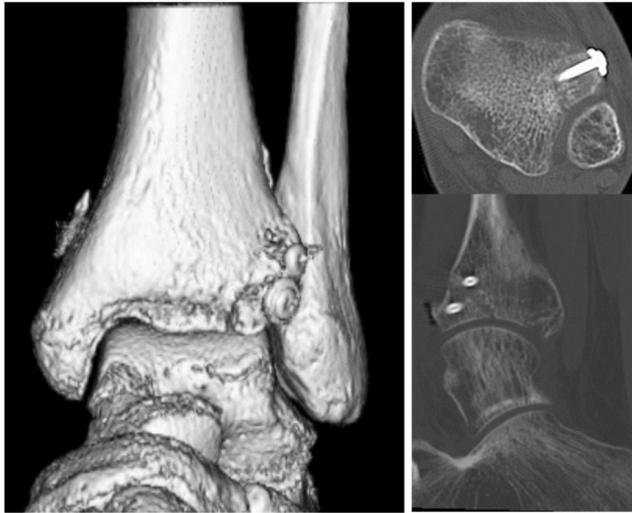


**Figure 3:** Computed tomography images showing a fracture of the anterolateral tibial plafond.



**Figure 4:** Ankle arthroscopy revealing a Tillaux-Chaput fragment (arrow), 2-mm step-off, 3-mm gap, and fibrillation of the cartilage surface.

After 4 weeks of cast immobilization, range of motion exercises and partial loading commenced. Full loading was permitted after 8 weeks when bone union was achieved (Figure 5). The patient was allowed to run after 3 months, and he returned to work after 4 months.



**Figure 5:** Computed tomography images at 2 months postoperatively.

One year postoperatively, the patient was able to work without pain and was satisfied with the surgery (Figure 6). The Japanese Society for Surgery of the Foot (JSSF) ankle/hindfoot scale score improved from 71 points preoperatively to 100 points postoperatively.



**Figure 6:** Radiographic images showing healed fractures at 12 months postoperatively.

## Discussion

To our knowledge, the present report is the first to describe corrective osteotomy for malunion of TC fractures. The TC fracture was first reported by Cooper in 1822 [1]. Tillaux [2] reproduced this fracture in an experiment using cadaveric specimens in 1848, and Chaput [3] reported on clinical cases in 1907. Subsequently, this type of fracture was termed as TC fracture. In young people, this fracture

appears to be morphologically similar to an epiphyseal injury; thus, it is different from adult cases, and it is specifically termed as juvenile Tillaux fracture. The frequency of TC fractures that accompany malleolar fractures in adults is approximately 12% [4]. An avulsion fracture is believed to be caused by the Chaput tubercle of the tibia when tension of the anteroinferior tibiofibular ligament occurs at the onset of an external rotation-type malleolar fracture. Cases without any other concurrent malleolar fracture of the ankle are rare, and this condition is termed as isolated Tillaux fracture [5].

Black et al. [6] reported that CT scans are useful for diagnosing this type of fracture, and if it is detected, a surgical plan may be altered to include internal fixation. In our case, the first doctor who examined the patient overlooked the TC fracture on plain radiographs. This also supports the importance of performing CT scans. In addition, we believe that the treatment for TC fractures needs to be considered in terms of ligament deficiency and also articular compatibility.

Kaya [7] reported that syndesmotic screws are important for stabilizing syndesmosis injuries. Yamaguchi et al. [8] showed that the syndesmotic fixation of Weber type C ankle fractures was not required when the rigid fixation of medial and lateral fractures was achieved. Nelson [9] reported that if the anteroinferior tibiofibular ligament is repaired (including avulsion fractures), the tibiofibular screws are not needed. We have also performed internal fixation of TC fragments or anteroinferior tibiofibular ligament repair when possible. We consider that syndesmotic fixation is necessary only if reconstruction of the stability of the syndesmosis is difficult.

TC fractures are sometimes intra-articular fractures, which require reduction. Marti et al. [5] reported that when TC fragments are dislocated by  $\geq 2$  mm, reduction and fixation are necessary. In the present case, since the greatly dislocated bone fragment was overlooked, the bone fragment was fused in a state of articular incompatibility, resulting in persistent pain. For an intra-articular TC fracture with dislocation, aggressive treatment (e.g., open reduction and internal fixation) appears to be important at the time of initial treatment [10,11].

## Conclusion

We demonstrated the first successful corrective osteotomy for malunion of a TC fracture. CT imaging appears to be essential for diagnosing this type of fracture. In addition, dislocated bone fragments extending into the joint require reduction and fixation at the time of initial treatment.

## Conflict of Interest

There is no conflict of interest to declare for any of the authors.

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