

Case Report

Fracture dislocation of the ankle with posterior tibial tendon entrapment within the tibiofibular interosseous space: A case report

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ABSTRACT

In rare cases of ankle fracture dislocation, the posterior tibial muscle tendon (TP tendon) is incarcerated between the tibia and fibula, thereby impeding reduction. Here we describe a case that presented with such a condition, in which ankle reduction was achieved and surgical repair of the incarcerated TP was delayed.

The subject was a 30-year-old male who sustained a fracture dislocation of the left ankle (AO:44-C1.3) in a motorbike accident. After repairing the ankle dislocation, external fixation was performed and osteosynthesis was conducted 10 days after the injury. Plate fixation for the fibula fracture and tight rope fixation for the separation between the tibia and fibula were performed; however, internal fixation for the medial malleolus fracture was delayed because the skin on the medial side of the ankle was in poor condition. One month after the injury, osteosynthesis of the medial malleolus was performed, and the TP tendon was identified in the fracture site. After removing the incarcerated tendon, good reduction of the medial malleolus was achieved, and thus, internal fixation and wound closure could be performed. Re-examination revealed that the TP tendon had an abnormal course. After 3 months, upon re-exposing the entire length of the TP tendon, the TP tendon was incarcerated between the tibia and fibula. To date, although several cases have been reported regarding TP tendon incarceration caused by fracture dislocation of the ankle, no study has reported the anatomical repair of the ankle, regardless of tendon incarceration. In our case, rotational displacement of the medial malleolus fracture remained when the second surgery was completed; however, the presence of some type of incarcerated tissue was suspected. Because leaving the incarcerated TP tendon untreated can cause irreversible long-term complications, early anatomical repair is recommended.

Introduction

Our literature search to date revealed only seven cases of ankle fracture dislocation in which the posterior tibial muscle tendon (TP tendon) was incarcerated between the tibia and fibula; thus, the associated incidence is extremely rare. Furthermore, all recent studies included cases in which malreduction remained between the tibia and fibula, as well as the talocrural joint; therefore, a diagnosis was made by investigating the underlying cause. When tibial–fibula and talocrural joint malreduction is observed,

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Fig. 1. Radiograph at the time of injury. A Weber type C ankle fracture is observed. Closed reduction was not possible.

incarceration of the TP tendon between the tibia and fibula should be suspected. However, in our case, tibiofibular diastasis was resolved, and good reduction was achieved regardless of the incarceration. Hence, we present a case in which removal of an incarcerated TP tendon was delayed.

Case report

A 30-year-old male sustained a fall injury after colliding with a stationary car while riding a motorcycle at 40 km/h. When transporting to the hospital, although the subject had no problems with his general condition, marked swelling and deformation of the left ankle were observed. Skin tenting over the medial malleolus, which was caused by bone pressure, was observed; however, no problems with the circulation and sensation of the toes were detected. Radiography revealed a fracture dislocation of the left ankle (AO:44-C1.3), and although closed reduction was attempted under regional anesthesia in the emergency outpatient department, reduction was not achieved (Fig. 1). Upon brace fixation, internal fixation was scheduled for day 4 after the injury; however, because swelling persisted, pinning of the fibula and realignment via external fixation alone was performed. At this time, closed reduction was re-attempted under general anesthesia, but reduction of the medial malleolus bone fragments was not achieved (Fig. 2). We waited for soft tissue swelling to subside and then performed osteosynthesis on day 12 after the injury. Following plate fixation of the fibular fracture, tibiofibular instability persisted, and thus, fixation was performed via tight rope fixation (Fig. 3). Because the skin on the medial ankle had a poor condition, we decided to delay internal fixation for the medial malleolus fracture. At this time, incarceration of the TP tendon was not suspected.

On day 33 after the injury, the state of the skin improved, and internal fixation for the medial malleolus was performed; however, the TP tendon was identified in the fracture site. Upon removing the incarcerated tendon, the tendon tissue was observed to be attached to the navicular bone from the anterior tibia, which was considered highly likely to be the TP tendon. By removing the incarcerated tendon, the medial malleolus bone fragments were reduced (Figs. 4 and 5), and once the wound was closed, we decided to repeat additional imaging examination.

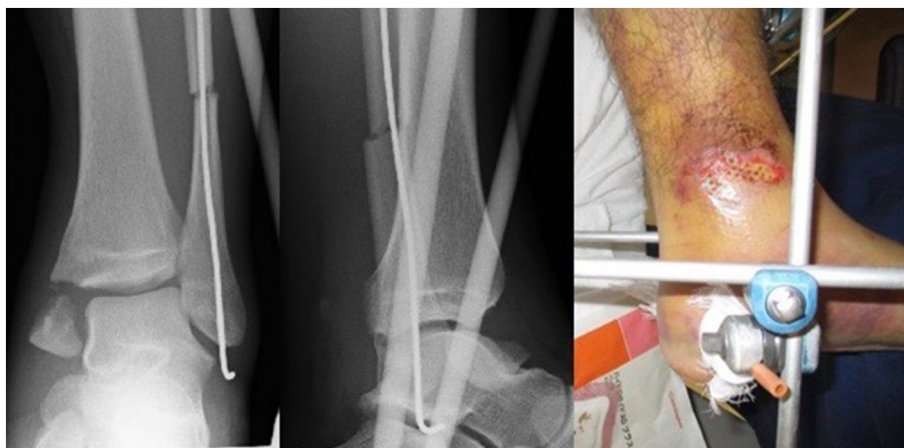


Fig. 2. Day 4 after the injury. Although closed reduction of the medial malleolus could not be achieved, open reduction was delayed because of the poor condition of the skin.

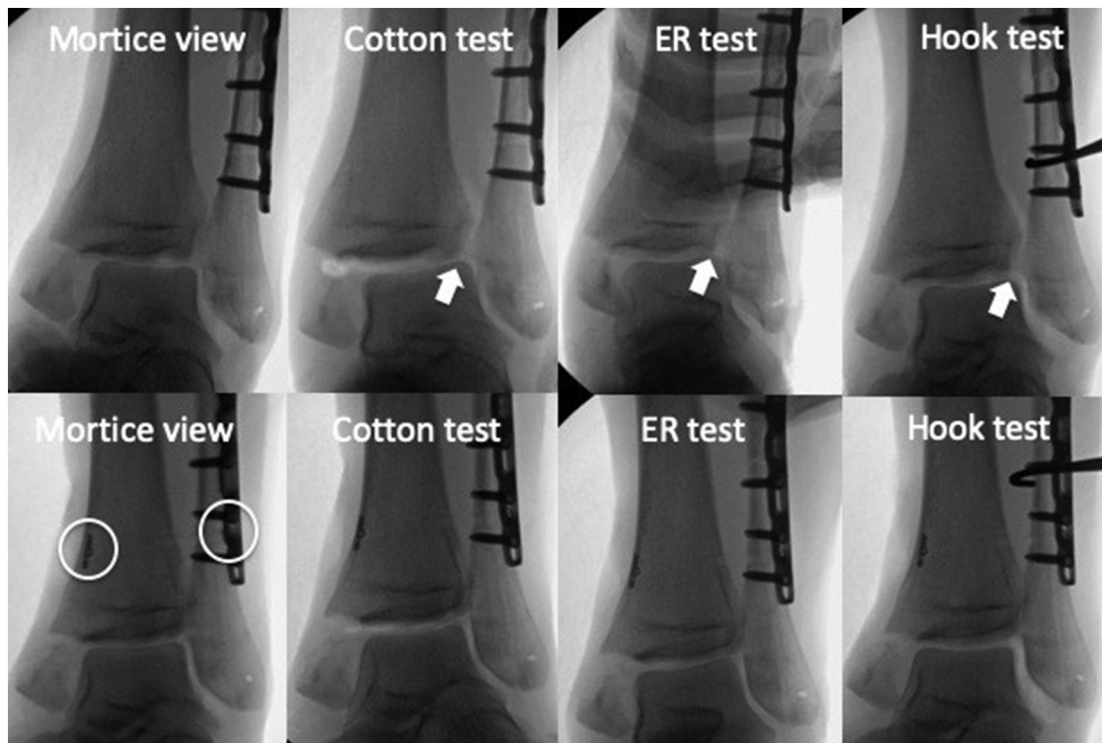


Fig. 3. Day 12 after the injury. Tibiofibular instability (indicated by arrows) did not improve with the internal fixation of the fibula; therefore, additional tibiofibular fixation (tight rope: indicated by circles) was performed.

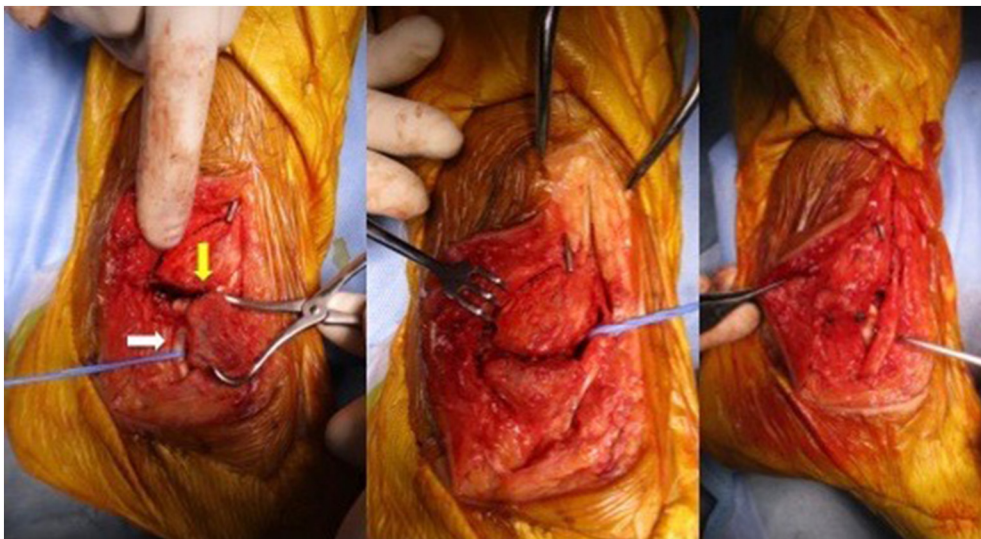


Fig. 4. Day 33 after the injury. The incarcerated tendon (white arrow) component in the fracture line (yellow arrow) was identified at the time of ORIF for the medial malleolus. The course of the TP tendon was considered to be abnormal.

Postoperatively, active ankle inversion was difficult, and echography, CT, and MRI revealed an abnormal tendon course. On day 86 after the injury, the entire length of the TP tendon was exposed. The TP tendon passed between the tibia and fibula from behind the tibia, emerging anterior to the tibia, passing medially to the ankle, and ending at the navicular bone (Fig. 6). The tendon components were completely dissected and restored to their normal anatomical position, whereas the plantaris muscle tendon were interlaced and reconstructed (Fig. 7). After surgery, ROM training was initiated 1 week after ankle fixation. Three months after the injury, the contractile ability of the TP tendon was restored. As a result, ankle inversion was possible, and the subject was able to walk with full weight bearing.

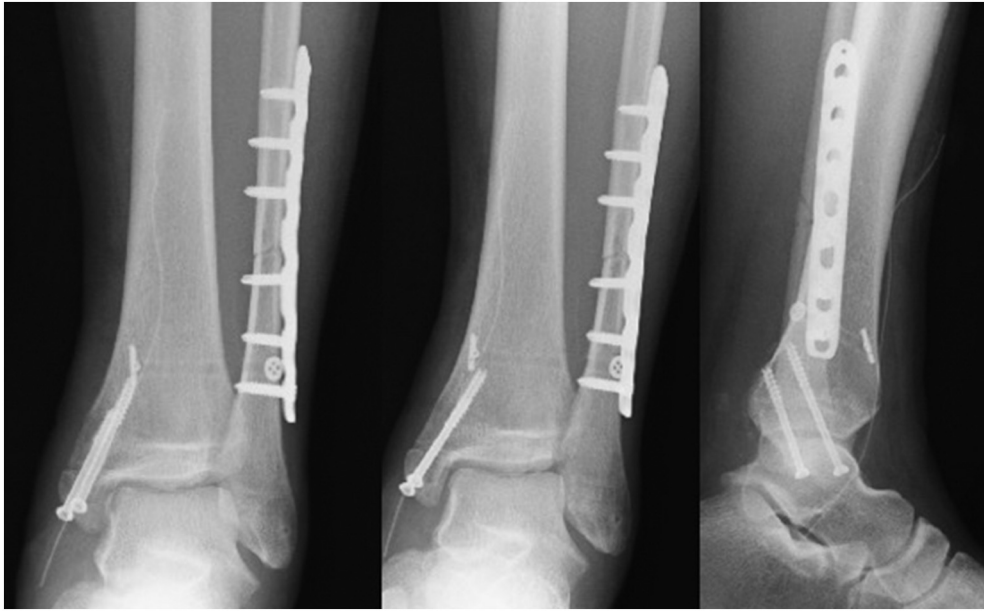


Fig. 5. Good reduction of the medial malleolus was achieved by removing the incarcerated TP tendon. The TP tendon was suspected of passing through the tibiofibular gap.

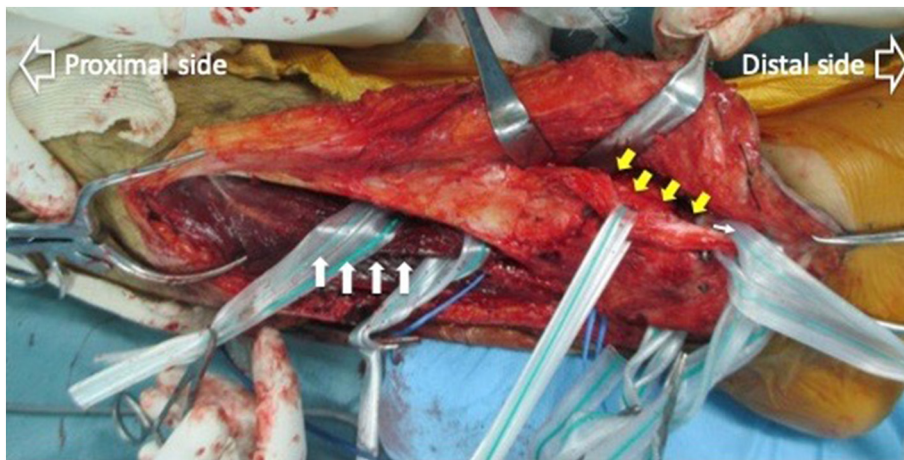


Fig. 6. Day 86 after the injury, the entire length of the TP tendon was exposed. The TP tendon ran posterior to the tibia (white arrows), passed through the tibiofibular gap, passed anterior to the tibia (yellow arrows), and then stopped at the navicular bone.

Discussion

The incidence of TP tendon incarceration between the tibia and fibula caused by fracture dislocation of the ankle is extremely rare. In 1936, Bohler reported the first case, after which similar cases were reported by Parrish in 1959 [1] and Walker in 1981 [2]. More recent reports include those by Anderson in 1996 [3] and Mehmet in 2010 [4], followed by case reports by Jean in 2015 [5] and James in 2016 [6]. Considering our extensive literature search, we believe that the current case is the eighth reported case.

In the four most recent cases, each patient sustained a fibular bone fracture higher than the articular surface and developed a valgus deformity. Fibular eversion was considered to have caused the widening of the tibiofibular gap and syndesmosis failure. Furthermore, anterolateral dislocation of the talus was observed. Closed reduction was considered difficult, and although open reduction and internal fixation were performed within 1 week, the incarcerated TP tendon between the tibia and fibula was a factor that impeded reduction in all four cases. Mehmet et al. reported that the incarcerated TP tendon was intraoperatively released, and good reduction was achieved [4]; however, in the other three cases, widening of the tibiofibular gap or subluxation of the talus persisted, and the incarcerated TP tendon was removed during the second or subsequent surgery. In addition, Jean et al. identified incarceration of the TP tendon within the tibiofibular gap using MRI [5]. Anderson et al. revealed that it took approximately 1 year for achieving a correct diagnosis and anatomical reduction, and irreversible damage remained in the affected limb [3].

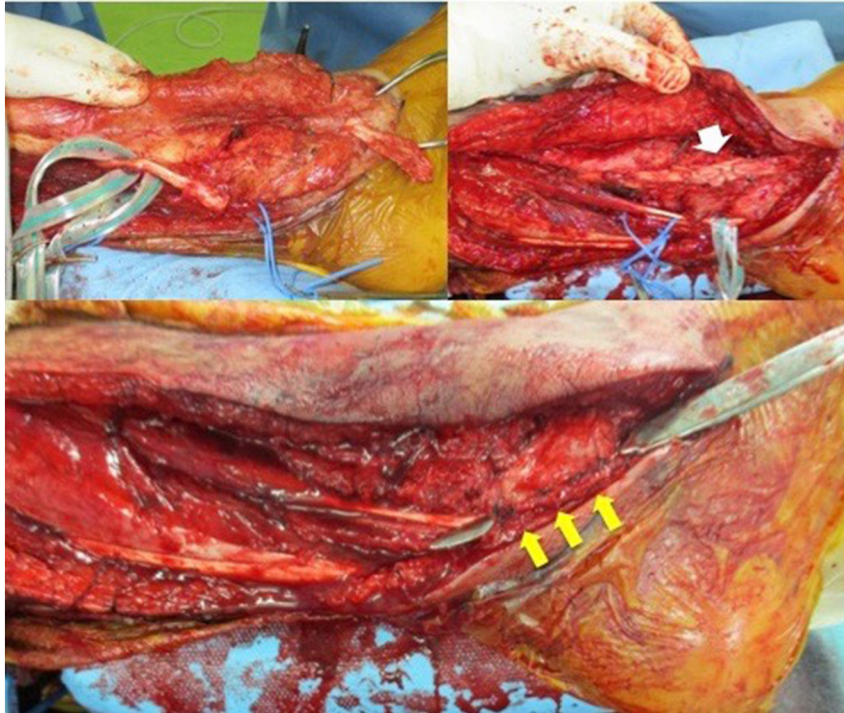


Fig. 7. After completely dissecting the TP tendon, it was returned to its anatomical course and re-sutured (white arrow). Upon suturing, the plantar muscle and tendon were interlaced. After that, flexor retinaculum was reconstructed (yellow arrows).

In our case, TP tendon incarceration within the tibiofibular gap was observed during the third surgery; however, one-stage removal was deemed difficult, and repeat surgery was scheduled for the following day. Moreover, postoperative radiography revealed that good reduction was achieved around the ankle and thus was an unprecedented case in which TP tendon incarceration did not inhibit reduction.

Because the TP tendon helps lift the plantar arch, it controls the movement of the mid and rear foot, which works in favor of gastrocnemius muscle output during gait. In addition, flatfoot progresses together with TP tendon dysfunction, and gastrocnemius dysfunction is considered to lead to an imbalance during gait [7]. In the four most recent cases, no patients developed general symptoms of TP tendon dysfunction; however, in the aforementioned report by Anderson, muscular imbalance and claw toe developed from an ischemic contracture in the deep posterior compartment. Moreover, the persistent talar dislocation and deformation of the articular surface may have led to arthritic changes [4].

TP tendon incarceration within the tibiofibular gap caused by fracture dislocation of the ankle has a low incidence and is occasionally overlooked as an unidentified factor that impedes ankle reduction. Over long term, TP tendon incarceration can lead to ischemic contracture of lower limbs and arthritic changes; hence, an accurate diagnosis during the early stages is important. With the development of a supporting diagnosis (e.g., image diagnosis), the number of case reports is increasing each year. Our report describes a case in which TP tendon incarceration did not impede ankle reduction.

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