

CASE REPORT

Avulsion Fracture of the Tibialis Anterior Tendon Associated with First Metatarsal Base Fracture: A Case Report and Literature Review

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Abstract

We present a unique case of a 59-year-old shipyard worker who sustained an avulsion fracture of the tibialis anterior tendon, concurrently with a comminuted fracture at the base of the first metatarsal. This is the first reported case highlighting this concomitant presentation, which underlines the possibility of avulsion fractures accompanying comminuted fractures. Importantly, such avulsion fractures could lead to skin tenting and potential necrosis, necessitating early identification and prompt intervention. The patient underwent successful surgical intervention and displayed good functional restoration 15 months postoperatively.

Level of evidence: IV

Keywords: Avulsion fracture, Comminuted fracture, First metatarsal base, Skin tenting, Tibialis anterior tendon

Introduction

Avulsion fracture of the tibialis anterior tendon from the base of the first metatarsal is a rare injury. While it has been reported that the tibialis anterior tendon could be ruptured at the musculotendinous junction,¹ the tendon itself,² or from its distal insertion,³ there has only been one previously reported case of isolated bony avulsion of the tibialis anterior tendon after a crush injury to the foot.⁴ We are presenting a case of avulsion fracture of the tibialis anterior tendon, associated with a comminuted fracture of the first metatarsal base, which serves to remind clinicians to be vigilant of concomitant diagnoses even when the cause seems apparent.

Case Presentation

A 59-year-old male shipyard worker sustained a left foot injury after jumping down from the ship to the dock. He had landed directly on his forefoot on an uneven surface. Immediately after the injury, he experienced pain and swelling in his left foot with inability to bear weight. He was first reviewed in the Emergency Department and diagnosed to have closed comminuted fracture of the first metatarsal base. Subsequently, he was placed into a posterior ankle

splint and put on non-weightbearing ambulation with crutches.

Five days later, he was reviewed in the outpatient Orthopaedic clinic and noted to have a shortened big toe with notable swelling and skin tenting on the dorsomedial aspect of the midfoot [Figure 1]. There was a loss of ankle dorsiflexion noted during clinical examination. He was admitted immediately to the hospital for elevation and icing to reduce swelling and close monitoring of the skin tenting. A closer review of the foot radiographs demonstrated comminuted fracture of first metatarsal base extending into the first tarsometatarsal joint [Figure 2].

Additionally, an avulsion fracture by tibialis anterior tendon was observed at the base of the first metatarsal on both the anteroposterior (AP) and oblique (OBL) views of the foot radiographs [Figure 2]. Computed tomography (CT) scan was performed for preoperative planning and it highlighted the high degree of comminution at the fracture site with the avulsed fracture fragment located dorsomedially [Figure 3]. CT scan did not demonstrate any Lisfranc joint pathology.

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Figure 1. Clinical pictures of the left foot on day 5 post injury during the Orthopaedic clinic review illustrating the swelling over medial border of the foot and redness with skin tenting at the dorsomedial midfoot



Figure 2. Radiographs of the foot demonstrating the comminuted fracture of the 1st metatarsal base extending into the 1st tarsometatarsal joint associated with shortening of the 1st metatarsal length. The bony avulsion fracture fragment of the tibialis anterior tendon is illustrated by the white arrow

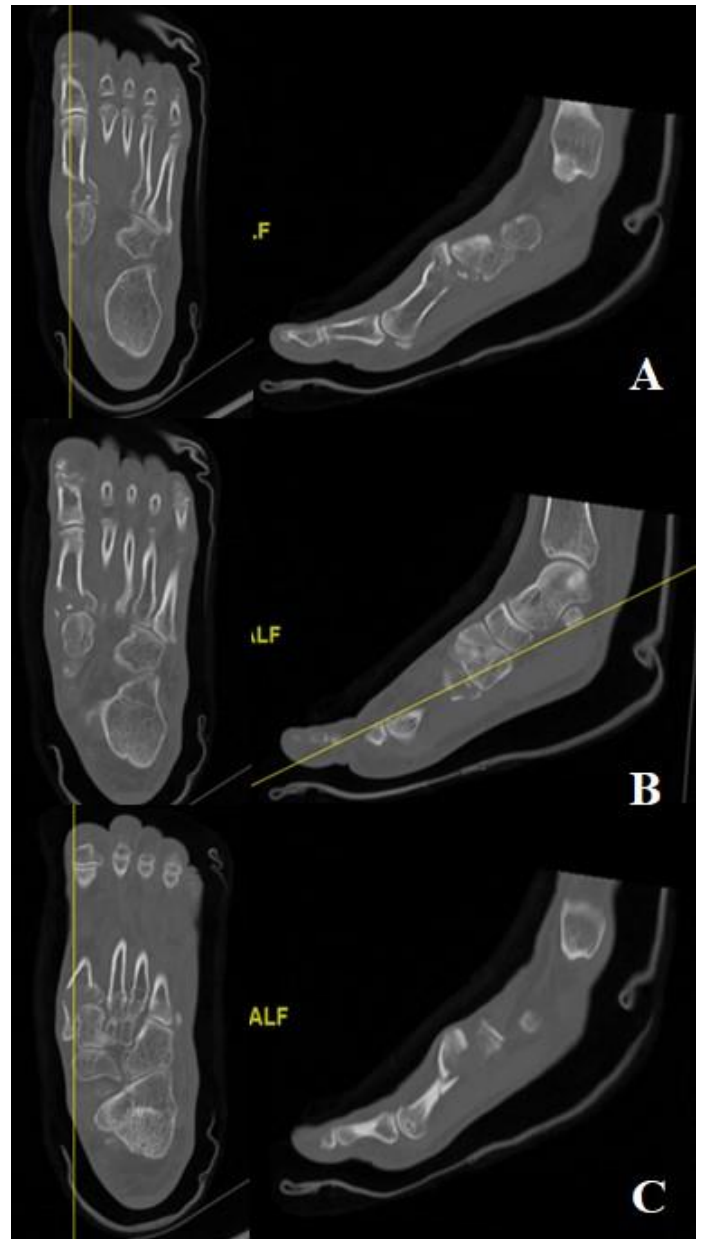


Figure 3. CT scan images of 3A to 3C showing the axial and its corresponding sagittal cuts of the 1st metatarsal base comminuted fracture with intraarticular extension. Image 3C depicts the avulsion fracture fragment on the dorsomedial aspect of the midfoot

After 4 days of elevation and icing, there was a noticeable improvement in swelling with skin wrinkling sign [Figure 4]. The patient underwent left foot first metatarsal base fracture suspensory fixation, fusion of the first tarsometatarsal joint with bone grafting from the ipsilateral calcaneus, and reconstruction of the avulsion fracture of tibialis anterior tendon via a medial incision away from the tented skin [Figure 5]. There was no Lisfranc joint instability noted intraoperatively. The decision for fusion was made due to the severely comminuted articular surface with

cancellous bone loss which was not reconstructable. Postoperatively, he was not allowed to weightbear for 4 weeks with a posterior ankle splint, and transitioned into a walking surgical boot (Aircast XP Walker, DJO, LLC, Vista, California) on partial weightbearing for 2 weeks once the wound had healed. After the first 6 weeks, the suspensory K wire was removed and he was allowed to weightbear as tolerated in the boot for another 6 weeks. Radiographs taken at 3 months showed good consolidation at the fusion site with strong ankle dorsiflexion (MRC grade 5) on clinical

examination. At this stage, he was allowed to transit to normal foot wear and resume progressive return to heavy impact activities. On his final review at 15 months postoperatively, the first tarsometatarsal joint had fused and the ankle dorsiflexion strength was preserved with a good functional restoration as evidenced by the ability to perform his daily activities such as walking, running and return to work in the shipyard without pain or weakness [Figure 6].



Figure 4. Clinical pictures of the resolution of left foot swelling with skin wrinkling and pinchable skin after elevation and icing for 4 days

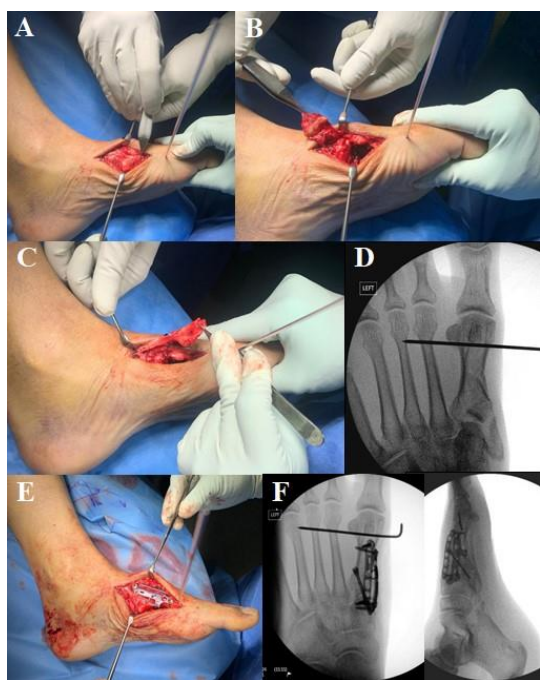


Figure 5. 5A-5D demonstrating clinical pictures of the bony avulsion fracture of the tibialis anterior tendon after suspensory K wire fixation to restore the length of the 1st metatarsal. 5E and 5F illustrates the fusion of the 1st tarsometatarsal joint with dual plating and compression screw augmented by the suspensory K wire fixation. The medial Lapidus plate was used to reduce the fracture fragments particularly the bony avulsion fragment of tibialis anterior reinforced with sutures to the plantar screw hole while the dorsal plate was applied to augment the construct for stability as seen in 5E and 5F

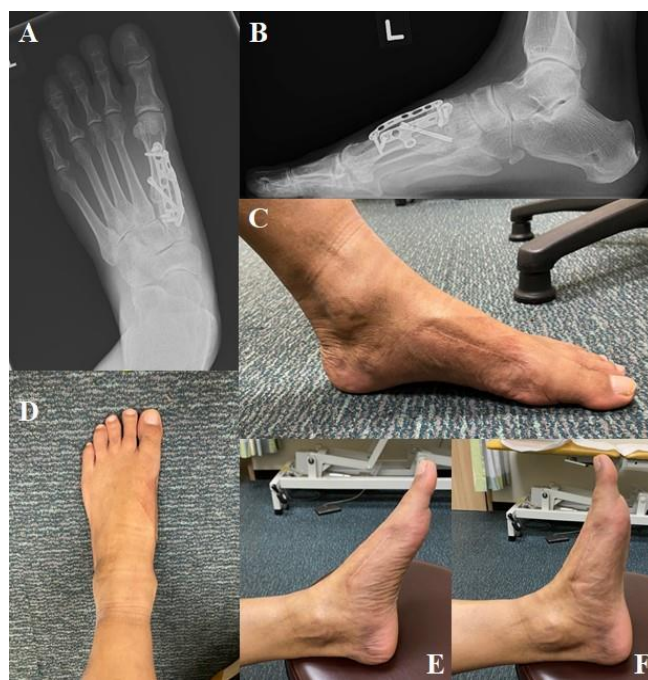


Figure 6. 6A and 6B are radiographs of the foot at 15 months postoperatively with complete union of the first tarsometatarsal joint. 6C to 6F are clinical pictures of the left foot at 15 months with good functional ability to dorsiflex the ankle

Discussion

This case is interesting for two reasons. Firstly, the diagnosis of tibialis anterior tendon rupture or tear is not difficult to make clinically due to a resultant foot drop. However, the concomitant diagnosis of bony avulsion fracture of the tibialis anterior tendon in a comminuted first metatarsal base fracture may be easily missed due to the swelling and pain from the fracture overshadowing the actual avulsion of the tibialis anterior tendon leading to inability to dorsiflex the ankle. Given that it is not a common injury, a delay in diagnosis and management can lead to poorer outcomes.^{5,6} In fact, this patient was referred to our service solely for the fracture of the first metatarsal base without identification of the avulsion fracture. Therefore, by having the knowledge that there could be a potential avulsion fracture of the tibialis anterior tendon in a first metatarsal fracture, one can be cognizant of this possible differential diagnosis when reviewing similar cases.

Secondly, this case also highlighted a notable similarity in the radiographic appearance of the bony avulsion fracture fragment consistent with Rajeev et al.⁴ An avulsion fracture of the tibialis anterior tendon starts at the plantar medial base of the first metatarsal, which would displace dorsomedially upon tendon contraction along the line of tibialis anterior tendon pull to dorsiflex the ankle. Although this bony fragment can be seen on AP radiograph of the foot, it is best visualized on the OBL view without any overlap of the cuneiforms due to the dorsomedial location [Figure 2]. Additionally, we also observed that the bony avulsion fragment at the dorsomedial aspect of the midfoot could lead to skin tenting due to the thin soft tissue envelope of the foot, emphasizing the need for prompt recognition and early

intervention to prevent skin necrosis [Figures 1 and 4]. This is in contrast to the avulsion fracture of the peroneus longus tendon which is from the lateral base of the first metatarsal.^{7,8} The resulting bony avulsion displaces towards the plantar lateral direction, making it unlikely to cause skin tenting.

Conclusion

In conclusion, this case report highlighted for the first time the concomitant presentation of an avulsion fracture of tibialis anterior tendon and comminuted fracture of the first metatarsal base, indicating that the avulsion fracture can occur in conjunction with a comminuted fracture. Furthermore, as such avulsion fractures can result potentially result in skin tenting and necrosis, it is of utmost importance that clinicians are cognizant about this potential complication and the need for early review.

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