

Tibialis Posterior Tendon Rupture Concomitant with Closed Bimalleolar Fracture

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Abstract

Case Report

Introduction: Tibialis posterior rupture is rarely associated with ankle fractures, usually misdiagnosed, and leads to flatfoot deformity if untreated. Primary repair has been reported in most cases, with better outcomes regarding late deformity correction. **Case Report:** 22-years old female surgically treated for bimalleolar fracture, with intra-operative diagnosis of irreparable tibialis posterior tendon rupture, submitted to tenodesis to the flexor digitorum longus.

Conclusion: Irreparable tibialis posterior rupture in acute fracture is a rare association with ankle fractures. Tenodesis to the flexor digitorum longus is a surgical option when primary repair is not possible.

Keywords: Diagnosis, Bimalleolar fracture, Tibialis posterior tendon dysfunction, Acute Tibialis posterior tendon repair.

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INTRODUCTION

Traumatic rupture of the Tibialis Posterior tendon (TPT) is rarely associated with a closed ankle fracture, with few cases reported in the literature (Cataldi *et al.*, 2020; Formica *et al.*, 2016; Giblin, 1980). Most injuries are a result of high-energy trauma, usually by pronation and external rotation of the ankle or, less frequently by direct trauma and forced dorsiflexion with inversion (Ceccarelli *et al.*, 2008; Formica *et al.*, 2016). Clinical examination is difficult due to the pain and limited mobility caused by the fracture, and the high prevalence and low threshold to surgical treatment of ankle fracture accounts for misdiagnosis before and during surgery (Mallick & Faleme, 2001; Wardell *et al.*, 2017).

Intraoperative direct repair in acute setting is usually feasible when both stumps can be identified near fracture site (Giblin, 1980; Talebi *et al.*, 2021). Untreated TPT rupture (TPTR) is a cause of acquired planovalgus deformity, and timely surgical treatment is mandatory to avoid such debilitating complication (Flores *et al.*, 2019; Wardell *et al.*, 2017).

This report presents a closed bimalleolar fracture with associated irreparable TPTR.

CASE REPORT

A 22-year-old female, without relevant prior diseases, as transferred to our institution following a motor-vehicle accident. At another hospital, a right bimalleolar ankle fracture was diagnosed, reduced and a posterior below knee slab was applied. Internal and external ecchymosis was present, no open wounds were identified, and neurovascular status of the foot was intact. Radiographs confirmed subluxated Lauge-Hansen Pronation-External Rotation type 3 fracture (figure 1), with a small medial tibial fragment observable, apparently in intra-articular position, without further injuries identified. Patient was admitted for further management and surgical treatment was performed after 72 hours.

Patient was positioned in supine position, and diagnostic arthroscopy was performed, showing no cartilage injuries or loose bone fragments. Furthermore, open reduction and internal fixation (ORIF) with a locked plate of the peroneus was performed uneventfully. When performing open reduction of the internal malleolus, a significant haematoma was identified posteriorly, and distal tendinous fibers were seen distally, revealing the tendinous injury.

Further surgical exploration revealed the distal tendinous stump of the TPT (figure 2), about 5cm in length, identified 2 cm above the fracture site, its main portion inserted into the navicular. No suturable proximal tendinous stump was identified after exploring the paratenon and deep posterior compartment. Screw fixation of the medial malleolus was finalized and tenodesis to the flexor digitorum longus was performed

with end-to-lateral 2-0 prolene suturing wire, with adequate tensioning of the TPT stump. After surgery, a new bellow knee slab was applied, with slight supination and flexion.

Patient was voluntarily discharged after 2 days and missed subsequent follow-up appointments.



Figure 1: Oblique (A), Anteroposterior (B) and Lateral (C) pre-operative radiographs with slab applied. Small bone fragment highlighted (yellow circle)

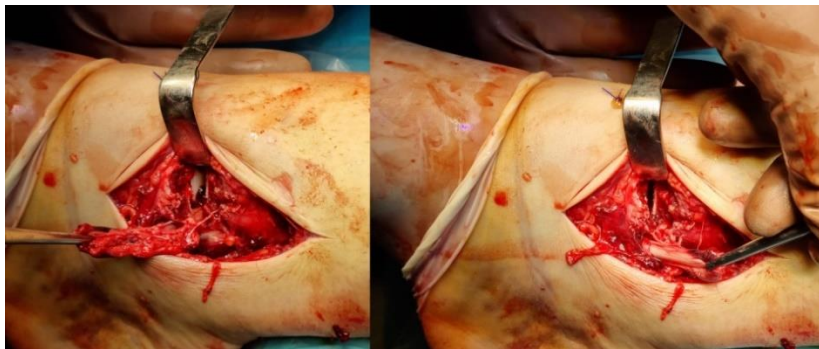


Figure 2: Intraoperative identification (A) and tensioning (B) of distal TPT stump

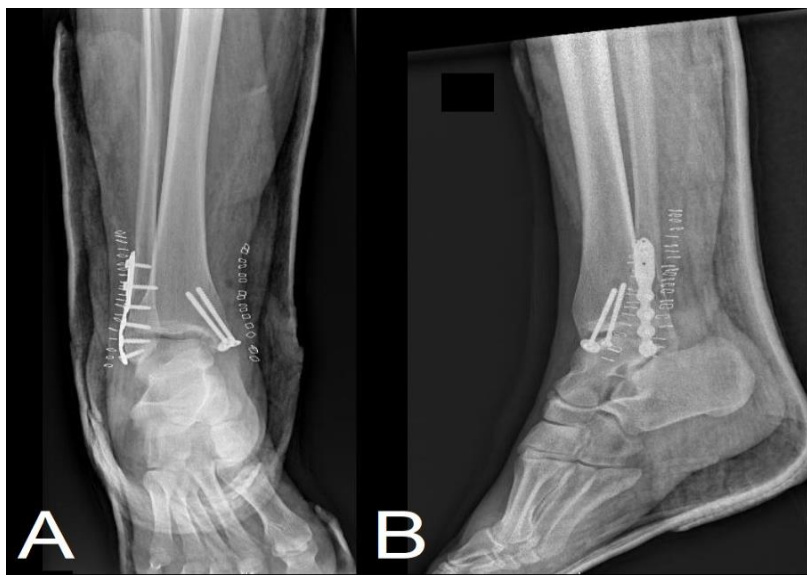


Figure 3: Anteroposterior (A) and Lateral (B) post-operative radiographs

DISCUSSION

The TPT is the most anterior tendon on the medial aspect of the ankle, lying posterior to the medial malleolus in a fibro-osseous tunnel. The posterior tibial muscle arises from the posterior aspect of the interosseous membrane and the surface of the proximal tibia and fibula and descends within the deep posterior compartment of the leg between the flexor digitorum longus and the flexor hallucis longus. The myotendinous junction appears in the distal third of the leg, and the tendon circumvents the medial malleolus posteriorly at about 80° angle. It passes inferior to the calcaneonavicular ligament and inserts distally in the tubercle of the navicular bone, with plantar expansions to the medial and plantar talo-navicular joint capsule (Flores *et al.*, 2019; Guelfi *et al.*, 2017). Other variable bony attachments have been identified to the cuneiforms, cuboid, calcaneus and plantar bases of the metatarsals (Willeger *et al.*, 2020). The TPT acts as the main inverter of the midfoot (through foot supination and adduction), contributes to ankle plantar flexion and is a primary dynamic stabilizer of the medial longitudinal arch. When incompetent, collapse of the medial longitudinal arch and pronation of the hindfoot during the last stage of gait occur, leading to flatfoot deformity (Flores *et al.*, 2019; Talebi *et al.*, 2021).

Most recognized TPT injuries occur spontaneously in a tendon with pre-existing chronic tendinopathy, usually associated with older age, diabetes, corticosteroid treatment, rheumatoid arthritis, connective tissue disease, obesity and hypertension, conditions that predispose to microvascular damage of the tendon (Ceccarelli *et al.*, 2008; West *et al.*, 2010).

TPTR in trauma setting are rarely due to laceration or direct trauma, because of the structures enveloping the tendon, but mostly associated with low-energy pronation-external rotation bimalleolar fractures. In such cases, the tendon is affected at the hypovascular midsubstance segment, although higher energy injuries may affect the myotendinous junction (Ceccarelli *et al.*, 2008). Rarer injury patterns, such as isolated medial malleolus or bimalleolar-equivalent fractures have also been described (Martinelli *et al.*, 2014; Wardell *et al.*, 2017; West *et al.*, 2010).

The following clinical indicators should raise suspicion for this injury: pronation-external rotation injury mechanism, direct trauma to the medial ankle, excessive soft tissue swelling, irreducible fracture or dislocation or avulsed tibial metaphyseal bone flakes in radiographs or CT scan. Irreducible fractures or dislocations may be caused by interposition of the ruptured TPT between bone fragments or in the tibiotalar joint, or even by the intact tendon, although deltoid ligament rupture is a much more common cause and can occur simultaneously. Distal tibial bone flakes usually correspond to disruption of the deltoid ligament

and may lead to misdiagnose. If available, ultrasonography is the reference standard imaging for studying tendon injuries and quality. MRI has also been used when planning re-operation or after missed injuries (Alamri *et al.*, 2020; Formica *et al.*, 2016; Wardell *et al.*, 2017; West *et al.*, 2010).

In almost all previous cases, primary end-to-end suture repair of a previously healthy TPT was feasible, with excellent result (Talebi *et al.*, 2021; Wardell *et al.*, 2017). If impossible, some authors have performed tenodesis to the flexor digitorum longus, or, in an unhealthy or extensively injured tendon, flexor digitorum longus transfer to the tibialis posterior tendon, with good outcomes (Wardell *et al.*, 2017). If undiagnosed, flatfoot deformity requires correction according to Bluman & Myerson classification, with worse functional outcomes (Bluman *et al.*, 2007; Wardell *et al.*, 2017).

CONCLUSION

TPTR is rarely associated with a closed malleolar fracture, but high clinical suspicion is necessary is for prompt diagnosis and correction to avoid further debilitating consequences. Higher quality studies are needed to access the best surgical technique in the acute setting to address irreparable TPTR and long-term outcomes of such injuries.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Abbreviations:

ORIF – Open Fixation and Internal Reduction
TPT – Tibialis Posterior Tendon
TPTR – Tibialis Posterior Tendon Rupture

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