Tibialis Posterior Tendon Entrapment Within Posterior Malleolar Fracture Fragment

Amanda Fantry, MD, Craig Lareau, MD, Bryan Vopat, MD, and Brad Blankenhorn, MD

Abstract

Management of posterior malleolus fractures continues to be controversial, with respect to both need for fixation and fixation methods. Fixation methods include an open posterior approach to the ankle as well as percutaneous reduction and fixation with or without arthroscopy for visualization of the articular surface. Plain radiographs are unreliable in identifying fracture pattern and intraoperative reduction, making arthroscopy a valuable adjunct to posterior malleolus fracture management.

In this article, we report a case of tibialis posterior tendon entrapment within a posterior malleolus fracture, as identified by arthroscopy and managed with open reduction. Tibialis posterior tendon entrapment within a posterior malleolus has not been previously reported.

Ankle arthroscopy for posterior malleolus fractures provides an opportunity to identify soft-tissue or tendinous entrapment, articular surface reduction, and articular cartilage injuries unlikely to be identified with fluoroscopy alone and should be considered in reduction and fixation of posterior malleolus fractures.

Irreducible ankle fracture-dislocation secondary to tibialis posterior tendon interposition is a rare but documented complication most commonly associated with Lauge-Hansen classification pronation–external rotation ankle fractures.[1-4] Entrapment of the tibialis posterior tendon has been documented in the syndesmosis (tibiotalar joint)[1,2,4] and within a medial malleolus fracture.[5] To our knowledge, however, there are no case reports of entrapment of the tibialis posterior tendon in a posterior malleolus fracture.

Ankle arthroscopy performed at time of fracture fixation is gaining in popularity because of its enhanced ability to document and treat intra-articular pathology associated with the initial injury.[6,7] In addition, percutaneous fixation of a posterior malleolar fragment with arthroscopic assessment of the articular surface reduction may be valuable, as evaluation of tibial plafond fracture reduction by plain radiographs and fluoroscopy has proved to have limitations.[8,9]

In this article, we present the case of a patient who underwent attempted arthroscopy-assisted reduction of the posterior malleolus with entrapment of the tibialis posterior tendon within the posterior malleolar fracture fragment. The tendon was irreducible with arthroscopic techniques, necessitating posteromedial incision and subsequent open reduction of the incarcerated structure. The patient provided written informed consent for print and electronic publication of this case report.

Case Report

A 67-year-old man slipped and fell on ice while jogging and subsequently presented to the emergency department with a closed bimalleolar ankle fracture-dislocation. Plain radiography (**Figure 1**) and computed tomography (CT) showed an oblique lateral malleolar fracture and a large posterior malleolar fracture. Further examination of the CT scan revealed entrapment of the tibialis posterior tendon within the posterior malleolar fracture (**Figure 2**).

Two days after injury, the patient was taken to the operating room for ankle arthroscopy with planned extrication of the entrapped tibialis posterior tendon and possible arthroscopy-assisted percutaneous fixation of the posterior malleolar fracture and open fixation of the distal fibula

Authors' Disclosure Statement: The authors report no actual or potential conflict of interest in relation to this article.

Figure 1. (A) Anteroposterior, (B) mortise, and (C) lateral plain radiographs show oblique lateral and posterior malleolar fracture with medial widening indicative of deltoid ligament injury and posterior subluxation of ankle.

Figure 2. (A) Axial and (B) sagittal computed tomography scans show large posterior malleolus and lateral malleolus fracture. (C) Closer examination reveals tibialis posterior tendon entrapped within posterior malleolus fragment (arrow).

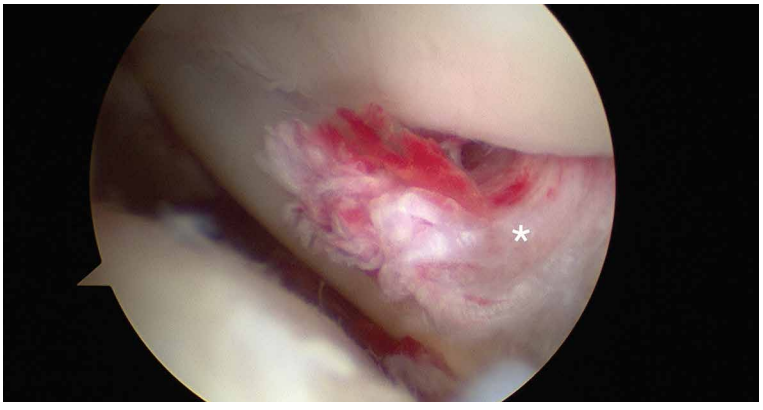

Figure 3. Arthroscopic image shows deep deltoid ligament (asterisk) tear consistent with widened medial clear space.

fracture. Diagnostic arthroscopy revealed a deltoid ligament injury (**Figure 3**) and a loose piece of articular cartilage (~1 cm in diameter), which was excised. No donor site for this cartilage fragment was identified with further arthroscopic evaluation. During arthroscopic examination, the tibialis posterior tendon was visualized within the joint, incarcerated within the posterior malleolar fracture (**Figure 4**). Attempts to release the tibialis posterior tendon from the fracture site using arthroscopic instruments and closed reduction techniques were unsuccessful, both with and without noninvasive skeletal traction applied to the ankle.

After multiple unsuccessful attempts to extract the tibialis posterior tendon arthroscopically, traction was removed, and a separate incision was made over the posteromedial aspect of the ankle. The tibialis posterior tendon was identified within the fracture site and was removed using an angled clamp (**Figure 5**). The fracture was reduced and held provisionally with a large tenaculum clamp. Two anterior-to-posterior, partially threaded

cannulated screws were placed for fixation after adequate fracture reduction was confirmed on fluoroscopy. As a medial incision was made to extract the tibialis posterior tendon, the joint could not retain arthroscopic fluid, and visualization of the posterior fracture fragment after tendon removal was difficult. Therefore, arthroscopy-assisted reduction could not be completed.

Next, the lateral malleolus was open-reduced, and fixation was achieved using a standard interfragmentary lag screw and a lateral neutralization plate technique (**Figure 6**). After surgery, the patient was immobilized in a posterior splint with side gussets. Two weeks later, the incisions were healing well, and the tibialis posterior tendon was functioning normally. The sutures were removed, the patient was transitioned to a controlled ankle movement (CAM) boot, and ankle and subtalar range-of-motion exercises were initiated. The patient remained non-weight-bearing for 6 weeks. Radiographs 6 weeks after surgery showed healing fractures with stable hardware (**Figure 7**). The patient demonstrated 5/5 strength of the tibialis posterior tendon without subluxation or dislocation. There was no tenderness to palpation over the fracture sites or tibialis posterior tendon. The patient began progressive weight-bearing in a CAM boot and physical therapy for range of motion and strengthening.

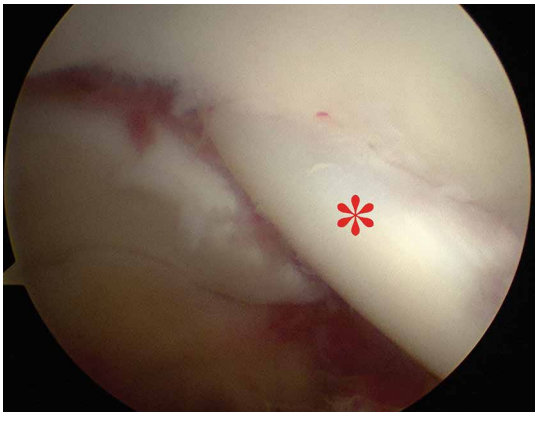

Figure 4. Arthroscopic image shows tibialis posterior tendon (asterisk) entrapped within posterior malleolus fragment and irreducible by arthroscopic techniques.

Figure 5. Tibialis posterior tendon visible through posteromedial incision that was required to facilitate tendon reduction. Further inspection revealed intact tendon. Tendon reduction allowed reduction and fixation of posterior malleolus fragment.

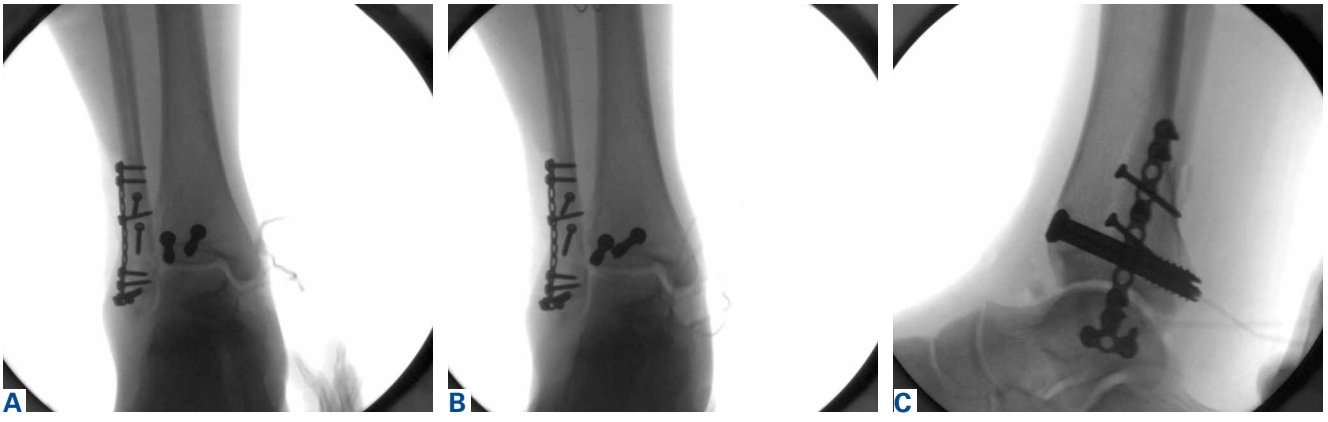

Figure 6. (A) Anteroposterior, (B) mortise, and (C) lateral radiographs taken intraoperatively demonstrate fixation of the lateral and posterior malleolus. The posterior malleolus was fixed with 2 partially threaded, anteroposteriorly directed cannulated screws and the lateral malleolus with 2 interfragmentary lag screws and a lateral neutralization plate.

Discussion

Tibialis posterior tendon injuries—including rupture, dislocation, and entrapment—are well-described complications of ankle injuries.[1,2,5,10] Most commonly, the tibialis posterior tendon has been reported to cause a mechanical block to reduction in lateral subtalar dislocations.[11-13] In addition, there are case reports of isolated traumatic dislocations of the tibialis posterior tendon without rupture, requiring operative stabilization and retinaculum repair with or without deepening of the posterior groove.[14,15]

Posterior malleolar ankle fractures remain controversial, with respect to both need for fixation and fixation methods. Although multiple investigators have advocated operative treatment for such fractures that exceed 25% to 33% of the anteroposterior dimension of the tibial plafond, there are no conclusive studies or evidence-based guidelines for treating these fractures.[16,17] Anatomical reduction and plating are important to restore articular congruity and increase syndesmotic stability; recent studies have demonstrated that fixation of posterior malleolar fractures provides more syndesmotic stability than trans-syndesmotic screws do.[18,19]

Indirect reduction of the posterior malleolar fragment after fibula fixation is often accepted as adequate. Whether indirect or direct reduction is attempted, close attention should be given to plain radiographs after attempted reduction, and consideration should be given to possible soft-tissue or bony interposition if malreduction is identified.[16,17] Plain radiographs are unreliable in assessing posterior malleolar fragment size as well as amount of comminution and impaction.[8,9] Therefore, an arthroscopy-assisted approach coupled with percutaneous fixation may provide more reliable fracture reduction over indirect fracture reduction with fibular fixation, with less dissection than a formal posterolateral approach with posterior plating.

Not all ankle fractures require CT. However, for posterior malleolus fractures thought to require fixation, preoperative CT may help in determining if percutaneous fixation with or without arthroscopic guidance is a feasible treatment option. Ideally, percutaneous reduction can obviate the need for a larger posterolateral incision and buttress plate and, with arthroscopic assistance, may be superior to indirect reduction with fluoroscopy.

In our patient's case, arthroscopic assistance facilitated diagnosis of an entrapped structure that would have been difficult to identify, particularly without preoperative CT. It may be difficult to identify imperfect reduction of the posterior malleolus on plain radiographs alone, and arthroscopy-assisted fixation enhances the surgeon's ability to consider reduction, view incarcerated structures within the joint, and treat articular injuries. We do not routinely use ankle arthroscopy as an adjunct to ankle fracture fixation, but judicious use in select cases can facilitate treatment of intra-articular injuries and facilitate visualization and reduction of posterior malleolar fracture fragments before percutaneous anterior-to-posterior cannulated screw fixation. If an open incision is required, as in the present case, visualization becomes difficult secondary to fluid extravasation. However, we think avoiding the morbidity associated with an open incision is worthwhile for fixation of posterior malleolus fractures.

Figure 7. Patient remained non-weight-bearing for 6 weeks after surgery. (A) Anteroposterior, (B) mortise, and (C) lateral radiographs at 6-week follow-up show well-healing fracture with no hardware complications. Patient then began weight-bearing and ankle range of motion.

Conclusion

Close inspection of both preoperative and intraoperative radiographs is required to ensure adequate reduction of a posterior malleolar fragment without soft-tissue or bony interposition in the reduction of ankle fractures. Although not previously reported, posterior tendon entrapment within the posterior malleolus fracture may occur and may require arthroscopic or open techniques to ensure adequate extrication of the tendon to allow for posterior malleolar fracture reduction and fixation. This case report highlights one indication for arthroscopy in the treatment of ankle fractures despite the fact that the tibialis posterior tendon was openly removed. Arthroscopic assistance in acute ankle injuries allows the surgeon to evaluate articular cartilage injuries and ensure there are no interposed structures while checking reduction of the posterior malleolar fracture fragment when present.

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Am J Orthop. 2016;45(3):E103-E107.

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