Acute Tibialis Posterior Tendon Rupture With Pronation-Type Ankle Fractures

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Abstract

Tibialis posterior tendon rupture in the setting of pronation-type ankle fractures can lead to long-term debility as a result of chronic tendon dysfunction. This rare injury pattern presents a diagnostic challenge because thorough preoperative examination of the function of the tendon is limited by pain, swelling, and inherent instability of the fracture. As such, a high index of suspicion is necessary in ankle fractures with radiographs showing a medial malleolar fracture with an associated suprasynovial fibula fracture. This report describes 3 cases of tibialis posterior tendon rupture associated with pronation-type ankle fractures treated acutely with open reduction and internal fixation and primary tendon repair. Additionally, common features of this injury pattern are discussed based on the current literature. In accordance with this report, the typical mechanism of injury is high energy and includes forced pronation, external rotation, and dorsiflexion of the ankle, which places maximal stress on the tibialis posterior tendon. Rupture most commonly occurs in a relatively hypovascular area of the tendon located at the posteromedial extent of the medial malleolus fracture. In the operative treatment of pronation-type ankle fractures, direct inspection of the tibialis posterior tendon allows for timely diagnosis and treatment of associated ruptures. [Orthopedics. 2016; 39(5):e970-e975.]

Recognition of tibialis posterior tendon ruptures in the setting of ankle fractures presents a diagnostic challenge. This rare injury may easily be overlooked in the acute setting because pain and swelling related to the fracture itself may limit clinical examination, and most reported ruptures are discovered intraoperatively.1-18 Lauge-Hansen pronation and external rotation ankle fractures with a forced dorsiflexion moment are the most commonly reported mechanisms of injury because this position places maximal stress on the tibialis posterior tendon.18 However, a direct medial blow also has been described.2,17 A high index of suspicion is needed to diagnose these injuries. Unrecognized and untreated ruptures may lead to long-term impairment and loss of function as a result of progressive, painful pes planovalgus deformity.10 This report describes 3 cases of ankle fractures associated with complete tibialis posterior tendon rupture recognized at the time of surgery.

Case Report

Patient 1

An otherwise healthy 29-year-old man had an isolated closed Lauge-Hansen pronation-abduction bimalleolar ankle fracture and tibiotalar dislocation as the result of a motorcycle collision. He underwent urgent closed reduction and splint immobilization at an outside hospital (Figure 1). Four days after the in-
jury, he presented to the authors’ institution for evaluation. On examination, the patient’s skin was intact, with a positive wrinkle sign, indicating that the soft tissues were amenable to operative treatment. The patient had intact flexion and extension of the toes. The foot was warm to the touch, and brisk capillary refill was present, with intact sensation to light touch in all toes.

Surgery was performed 6 days after the injury. The patient underwent open reduction and internal fixation of the fibula with a 6-hole, 3.5-mm plate and 5 cortical screws measuring 3.5 mm (VariAx; Stryker, Kalamazoo, Michigan). The most distal hole was left open for potential syndesmotic fixation. The medial malleolus was then approached through a posteromedial incision. During dissection, disruption of the flexor retinaculum was appreciated. Further inspection showed a complete rupture of the tibialis posterior tendon at the level of the fracture, with proximal retraction of 5 cm. Inspection of the tendon edges showed a clean cut without fraying, indicating a sharp transection as the most probable mechanism of disruption. After reduction and fixation of the medial malleolus with 2 cannulated screws measuring 4.0 mm, the tibialis posterior tendon was repaired primarily with 2-0 Fiberwire suture (Arthrex, Naples, Florida) with the Krackow technique. Because of the tension on the repair, this was reinforced with a running Bunnell suture with an additional 2-0 Fiberwire suture, to make a 4-stranded repair (Figure 2A). A Chaput fragment was discovered intraoperatively and was reduced. Fixation was performed with a single 4.0-mm cannulated screw. Syndesmotic stability was assessed fluoroscopically with external rotation and lateral translation stress testing with the ankle in a mortise view. Instability was documented, and the syndesmosis was reduced and fixed with a 4.0-mm cannulated screw. Fluoroscopic evaluation confirmed proper reduction and fixation of the ankle (Figure 2B). A well-padded trilaminar splint was applied in plantar flexion and inversion to protect the tibialis posterior tendon repair.

At the most recent 10-month follow-up, the patient had returned to full activity and...
showed excellent strength in plantar flexion and ankle inversion.

**Patient 2**

A 65-year-old man with poorly controlled type II diabetes mellitus, peripheral neuropathy, peripheral vascular disease, and hepatitis C with cirrhosis fell off of a 6-ft-tall ladder and had an open Lauge-Hansen pronation and abduction ankle fracture with tibiotalar dislocation (Figure 3). Examination showed a 10-cm anteromedially based transverse open wound with contamination. Dorsiflexion and plantar flexion of the toes remained intact, sensation was globally diminished distal to the ankle, and posterior tibial and dorsalis pedis artery pulses were palpable and equal bilaterally. The patient underwent urgent reduction and splinting. After initial stabilization, irrigation and debridement were performed on the day of injury.

After debridement and irrigation of the medial wound with 6 L of normal saline mixed with bacitracin, given the lack of contamination within the wound, the decision was made to proceed with definitive fixation. The medial malleolus was approached through the traumatic wound, and during reduction of the medial malleolus, complete rupture of the tibialis posterior tendon was identified, with sharp, transversely lacerated edges at the level of the fracture. After fixation of the fracture with 2 cannulated screws measuring 4.0 mm (Synthes, West Chester, Pennsylvania), the tendon edges were coapted with 2-0 Fiberwire suture with the Krackow technique and reinforced with a 2-0 Vicryl running epitendinous suture (Ethicon, Somerville, New Jersey) (Figure 4A). The fibula was approached via a posterolateral incision to maintain a safe distance from the traumatic wound. Significant comminution was appreciated, with multiple bony fragments completely devoid of soft tissue attachment. These pieces were used temporarily to template the reduction and were subsequently discarded. Fixation was achieved with a bridge plating technique with a 2.7-mm distal fibula locking plate (Synthes). Syndesmotic stability was assessed fluoroscopically with manual external rotation and lateral translation stress testing with the ankle in a mortise view, and it was documented to be unstable. The patient underwent manual reduction and fixation with a fully threaded 3.5-mm cortical screw through the plate. Proper alignment was confirmed fluoroscopically (Figure 4B), and all wounds were closed primarily without tension. A trilaminar splint was applied with plantar flexion and inversion to protect the tendon repair and the medial skin. Necrotizing fasciitis developed approximately 2 weeks postoperatively and ultimately necessitated below-the-knee amputation. The wound subsequently healed, and the patient was ambulating with a prosthesis at 6 months.

**Patient 3**

An otherwise healthy 15-year-old boy who was near skeletal maturity was tackled...
while playing high school football. By the patient’s description, the ankle was forced into pronation, external rotation, and dorsiflexion, at which point he felt a pop and immediate onset of severe pain and inability to bear weight. He was evaluated at the authors’ institution the next day. Physical examination showed ankle tenderness medially and laterally. The skin was intact, with a positive wrinkle sign. The patient had limited ankle dorsiflexion and plantar flexion as a result of discomfort, with good range of motion of the toes. Sensation to light touch was diminished along the dorsum of the foot but otherwise was normal. Strong pulses were palpated at the dorsalis pedis and tibial arteries, with brisk capillary refill in all toes. Radiographs showed a closed Lauge-Hansen pronation and external rotation bimalleolar ankle fracture that was subsequently immobilized in a well-padded trilaminar splint (Figure 5).

Operative fixation was performed 5 days after injury. The patient underwent open reduction and internal fixation of the fibula with a 4-hole, 3.5-mm semitubular plate and cortical screws (Biomet, Warsaw, Indiana). During the approach to the medial malleolus, the tibialis posterior tendon was completely ruptured at the level of the medial malleolus fracture, with longitudinal intratendinous tearing proximally. After fracture fixation, the tendon edges were coapted with a 2-0 Fiberwire Kessler-type core suture augmented by a gift-box stitch (Figure 6A). Syndesmotic stability was assessed fluoroscopically with manual external rotation and lateral translation stress testing with the ankle in a mortise view, and it was found to be unstable. The patient underwent manual reduction and internal fixation with a suture-button implant (TightRope; Arthrex) (Figure 6B). A trilaminar splint was applied in plantar flexion and inversion to protect the tendon repair. At 8 months postoperatively, the patient had excellent strength in plantar flexion and ankle inversion. He returned to football without limitations at the beginning of the next football season.

**DISCUSSION**

This report describes 3 patients who had ankle fractures with acute traumatic rupture of the tibialis posterior tendon. Each patient had a pronation-type injury that resulted in a typical medial malleolus fracture with a suprasynodesmotic fibula fracture and associated syndes-
motric widening. All patients underwent acute open reduction and internal fixation. Intraoperatively, complete disruption of the tibialis posterior tendon was encountered at the level of the fracture site. The 2 patients who had a high-energy mechanism of injury had sharp lacerations, with fresh tendon edges. This finding was most consistent with a sharp laceration, most likely against the fracture edge, with the tendon already maximally tensioned. The patient who had a lower-energy athletic mechanism of injury had additional longitudinal tearing of the tendon, consistent with shredding of the tendon against the fracture edge, with progressive elongation of the tendon to ultimate failure. In all cases, primary repair was performed.

Each patient’s immediate postoperative management plan included 4 weeks of non-weight bearing on the operative extremity. For the first 2 weeks, the patient was kept in the splint that was placed in the operating room. At the initial postoperative visit, this splint was replaced with a cast that was worn for an additional 2 weeks. Four weeks after surgery, the patient was allowed to progress to weight bearing as tolerated in a boot, and outpatient physical therapy was prescribed. No orthotics were used.

This type of injury is rare, with only 23 previously reported cases over the last 35 years.1-3,9,11-18 In concert with the current findings, the most common mechanism of injury includes forced pronation, external rotation, and dorsiflexion of the ankle, which places maximal stress on the tibialis posterior tendon. However, direct trauma to the tendon medially also may occur.2,17 Most cases involve a high-energy mechanism of injury, such as a motor vehicle collision or a fall from height.1,10,11-18 However, lower-energy athletic injuries also have been described.11,12 Rupture frequently occurs in a relatively hypovascular segment of the tendon, corresponding approximately to the level of the fracture site postoperatively, which may indicate that the tendon lacerates against it.18

These injuries present a diagnostic challenge because physical examination is often limited by patient discomfort and swelling. An irreducible ankle mortise may signal potential tendon interposition and injury, even without medial malleolar fracture11; however, this may not be present and was not the case in this series. Compared with the remainder of the injury, tibialis posterior tendon rupture may have a more subtle presentation and thus may be overlooked. A high index of suspicion is required to ensure prompt diagnosis and treatment, particularly in pronation-variant ankle fractures. Failure to appreciate tibialis posterior tendon injury may lead to progressive, painful pes planovalgus deformity that ultimately may necessitate reconstruction. Thus, direct examination of the tibialis posterior tendon at the level of the fracture site is advisable in these injuries when a medial approach is made. When the radiographic pattern of the injury does not prompt a medial incision, the diagnosis is more challenging. Persistent pain, inability to invert the foot, and rapidly progressive flat foot after injury19 may alert an astute clinician to a potential tibialis posterior injury. Although the authors do not advocate routine use of these modalities, ultrasound or magnetic resonance imaging can be used to evaluate the integrity of the tibialis posterior tendon in highly suspicious cases.

Once the diagnosis has been made, primary repair should be performed when possible. However, if the tendon quality is not adequate, patients should be advised that progressive flat foot with associated pain may develop over time and may require reconstruction. In either case, long-term follow-up is needed to determine whether the tendon becomes progressively dysfunctional.

**CONCLUSION**

Acute tibialis posterior tendon rupture in the setting of ankle fracture poses a diagnostic challenge because the bony injury distracts from thorough evaluation of tendon integrity preoperatively. Although this concomitant injury appears to be rare, the true incidence is unknown, and expeditious diagnosis and treatment is essential. Most reported cases have been diagnosed intraoperatively by direct inspection. Failure to appreciate these injuries in the acute setting may result in progressive, painful pes planovalgus deformity, associated impairment, and the need for additional reconstructive procedures. The authors recommend a high level of suspicion and direct intraoperative inspection of the tibialis posterior tendon in all pronation-type injuries.

**REFERENCES**


