

Spontaneous Rupture of the Anterior Tibial Tendon in a Diabetic Patient: Results of Operative Treatment

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Spontaneous rupture of the tibialis anterior tendon is infrequently seen as a clinical entity. In this report, we describe the case of a diabetic neuropathic patient that underwent successful surgical repair of a spontaneously ruptured tibialis anterior tendon with no other factors that would render the tendon susceptible to injury or rupture. Level of Clinical Evidence: 4. (The Journal of Foot & Ankle Surgery 47(5):463–467, 2008)

Key Words: diabetic neuropathy, spontaneous ruptures, tibialis anterior tendon

Spontaneous rupture of the tibialis anterior tendon is a rare clinical entity that is usually associated with predisposing disease that makes the tendon susceptible to structural failure (1, 2). Anzel (3) reported that 10 out of 1014 tendon injuries of the foot and ankle involved ruptures of the tibialis anterior tendon. Injury to this tendon can occur as a result of several different mechanisms, both acute and chronic. Repetitive microtrauma with resultant chronic degeneration secondary to the presence of a dorsal pedal or anterior talotibial exostosis, and repetitive friction and pressure due to the distal margin of the inferior ankle retinaculum have been reported as potential causes of tibialis anterior tendon rupture (4, 5). Lesions involving the L₄ nerve root secondary to poliomyelitis or other spinal cord conditions have also been reported in association with tibialis anterior tendon rupture, due to chronic traction strain related to dropfoot deformation (3). Patten and Pun (6) reported the spontaneous rupture of the tibialis anterior tendon secondary to deposition of gouty tophi within the tendon sheath, whereas others have pointed to the metabolic role that

certain systemic diseases, such as lupus erythematosus and rheumatoid arthritis, play in the development of spontaneous tendon ruptures (7). Spontaneous tendon ruptures, particularly those localized to the flexor tendons, have also been reported to be prevalent in the neuropathic diabetic population (8). Akturk et al (9) described Achilles tendon thickening and associated pathology, including rupture, in patients with type 2 diabetes mellitus. Ouzounian and Anderson (10) reported the prevalence of acute and chronic tibialis anterior tendon ruptures in the general population, and noted that only 3 (25%) of the 12 patients with tibialis anterior tendon ruptures could not associate the pathology with an acute traumatic event. Meyn (11) described a case of surgical repair following chronic rupture of the tibialis anterior tendon in a 69-year-old man with spondylolisthesis whose tendon ruptured during a physical examination. Omari et al (5) described spontaneous ruptures of the tibialis anterior in terms of a collective process that involves a culmination of the pathological influences of tendinosis, intrasubstance tear, and partial and then complete rupture. Still, the most common mechanism of injury remains acute trauma, typically due to forced plantarflexion of the foot and ankle (12). In this report, we describe the case of a diabetic patient that underwent surgical repair of a spontaneously ruptured tibialis anterior tendon. Although the patient was diabetic and neuropathic, she displayed no other local or systemic factors that could be attributed with predisposing the tendon to rupture, and she had no history of acute trauma localized to the tibialis anterior tendon.

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Case Report

A 61-year-old female, with an 18-year history of insulin-dependent diabetes mellitus that was medically managed

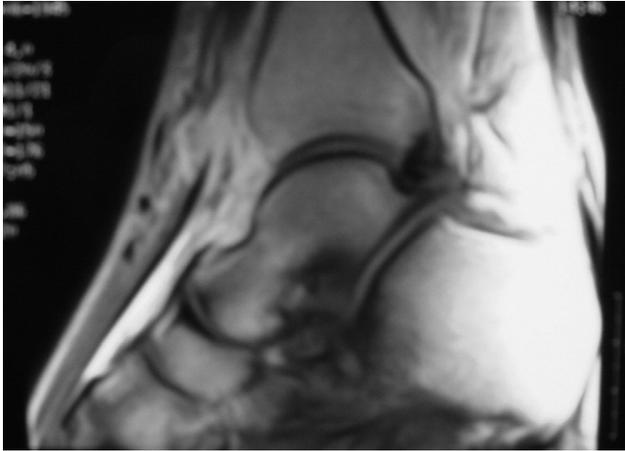


FIGURE 1 Preoperative magnetic resonance image showing ruptured tibialis anterior tendon.

with insulin, presented to an outside clinic with an inability to dorsiflex her right foot, in association with vague pain localized to the anterior ankle and hindfoot. Her past medical history also included hypertension, heart disease, and osteoarthritis affecting primarily her knees. Her right lower extremity symptoms began after taking a normal step, and she associated the onset with the sense of a mild pop localized to the dorsum of the right foot. She was initially treated with a removable below-the-knee immobilizing splint and treatment measures that included analgesics, modification of activities, and physical therapy. After several weeks without a satisfactory response to these measures, she was referred to the senior author (L.A.D.) for surgical consultation of suspected rupture of the tibialis anterior tendon at or near its insertion. At the time of presentation to the surgeon, manual muscle strength testing using the Medical Research Council scale (13), revealed tibialis anterior strength graded as 2 out of 5, indicative of an inability to simultaneously dorsiflex and invert the foot against the resistance of gravity. Further physical examination demonstrated a relatively well-preserved gait due to extensor substitution using the long extensors to the toes, difficulty in heel walking and when attempting to invert her ankle against manual resistance, as well as an inability to dorsiflex the foot with the toes flexed. The patient denied any previous acute injury to the foot and/or ankle, and she related denied rheumatological disease of any sort. She also displayed diminished touch-pressure sensorium as noted by the absence of appreciation of the 10-gram monofilament esthesiometer in the plantar pulps of her toes, bilaterally. The patient had noticed increasing flattening of the foot and a sensation of her foot slapping the floor upon ambulating over the past few weeks. Subsequent magnetic resonance image (MRI) scans revealed complete rupture of the tibialis anterior tendon, which had retracted proximally from the level of its cuneiform insertion to the tibiotalar joint where



FIGURE 2 Intraoperative view demonstrating the diseased tibialis anterior tendon and the rupture (medial view, right lower extremity).



FIGURE 3 Intraoperative view demonstrating the diseased tibialis anterior tendon and the terminal bulb of the rupture (lateral view, right lower extremity).

there was fusiform thickening of the substance of the tendon with a gap deficit measuring approximately 1 cm (Figure 1). Radiographic findings were significant for mild arthrosis of the midfoot, loss of the plantar arch as viewed on lateral view, and a decrease in Meary's angle indicative of a flattened foot. Noninvasive arterial vascular studies were performed on the right lower extremity, and these showed satisfactory perfusion to the involved foot. Furthermore, diagnostic ultrasonic images were significant for a hypo-echoic area indicative of an accumulation of tissue fluid in the distal segment of the ruptured tibialis anterior tendon just proximal to its insertion. Treatment options were reviewed with the patient, and an emphasis was placed on functional considerations related to the progressive nature of the condition. When presented with the choice of continuing conservative measures

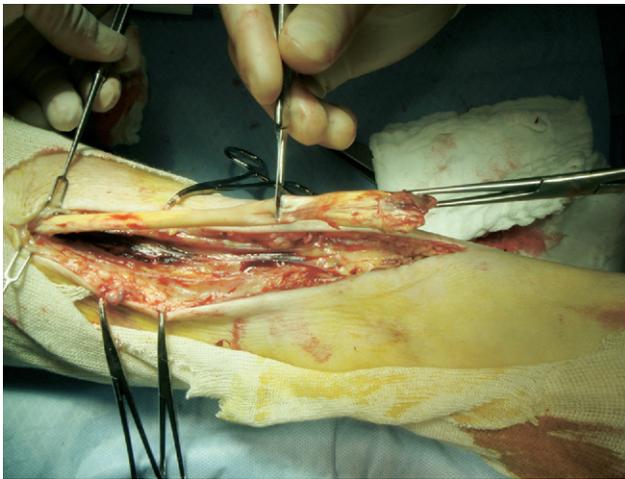


FIGURE 4 Intraoperative view demonstrating the rupture and sectioning at the proximal extent of the diseased tendon (lateral view, right lower extremity).



FIGURE 5 Intraoperative view demonstrating the specimen diseased portion of the tibialis anterior tendon sectioned and procured for pathological examination.

versus primary repair of the tibialis anterior tendon, the patient chose surgical intervention.

Thereafter, the patient was prepared and taken to the operating room for primary repair of the tibialis anterior tendon with the use of tissue mend. The procedure was performed with the use of general anesthesia and the patient in the supine position on the operating table, and a well-padded pneumatic tourniquet was applied about the ipsilateral thigh. Attention was then directed to the anterior aspect of the right foot where an incision was made over the course of the tibialis anterior tendon. The dissection was deepened through subcutaneous tissues, neurovascular structures retracted or cauterized and hematoma evacuated. Disruption of the tibialis anterior tendon was identified just proximal to its cuneiform insertion (Figures

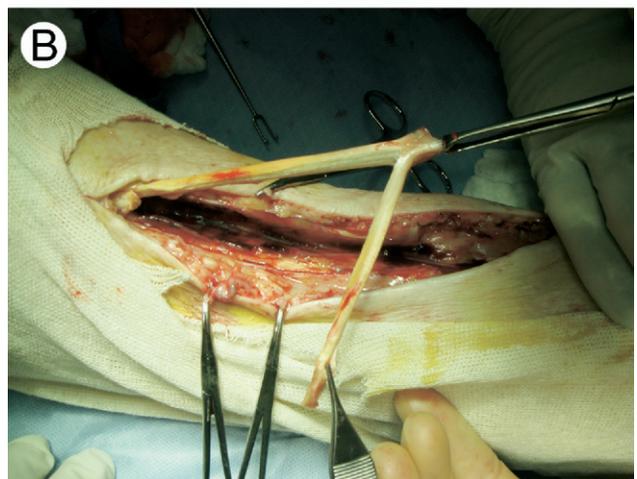
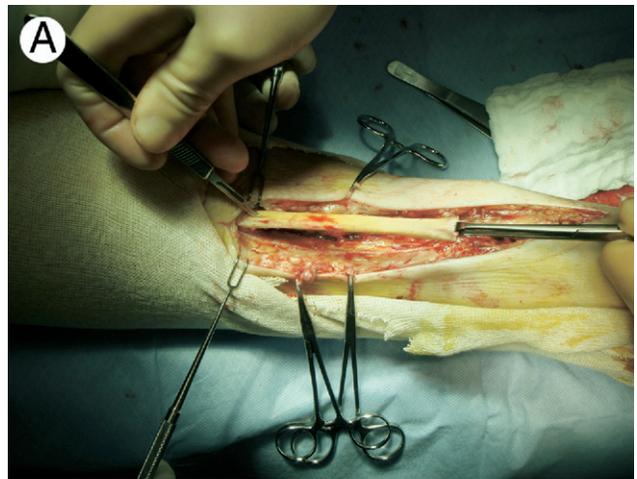


FIGURE 6 Intraoperative view demonstrating the proximal tendon split into medial and lateral halves (lateral view, right lower extremity). (A) Initiating the split proximally. (B) Extending the split distally.

2 and 3). Necrotic, nonviable tendon was identified distally and excised, after which the tendon was followed proximally and subsequently debrided, leaving a 5-cm gap between the remaining viable healthy tendon ends (Figure 4). The grossly necrotic segment of tendon was submitted for pathological inspection (Figure 5), and the subsequent pathology report ultimately confirmed an approximately 5-cm segment of necrotic tendon. Upon further intraoperative consideration, the decision was made to excise the remaining distal segment of degenerated tendon. The proximal tendon was then split into anterior and posterior halves (Figure 6), and reflected distally and secured into the navicular under physiologic tension and anchored with a soft tissue-to-bone anchor (Mitek Mini G2 suture anchor, Mitek Surgical Products, Westwood, MA) under fluoroscopic image intensification guidance (Figure 7). The split and anchored tibialis anterior tendon was then reinforced, from its navicular insertion to a level proximal to the tibiotalar joint, by means of wrapping the reconstructed portion of the

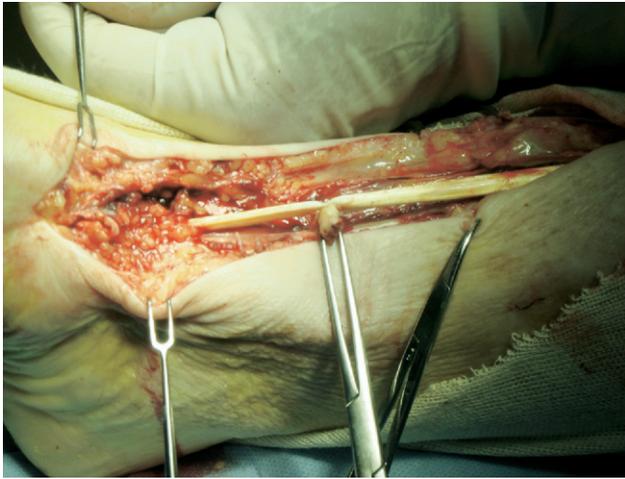


FIGURE 7 Intraoperative view demonstrating the split tibialis anterior tendon under physiologic tension (medial view, right lower extremity).



FIGURE 8 Intraoperative view demonstrating the split tibialis anterior tendon under physiologic tension wrapped with tissue mend (medial view, right lower extremity).

tendon with a xenogeneic collagen matrix procured from fetal bovine dermis, namely TissueMend (manufactured by TEI Biosciences, Inc., Boston, MA, and sold by Stryker Corporation, Kalamazoo, MI) (Figure 8). The wound was closed in layers, and the patient was placed in a bivalved cast and dispensed crutches for avoidance of weight bearing on the right lower extremity during ambulation. Her entire postoperative course progressed without incident. At 6 weeks postoperative, the patient was dispensed a pneumatic walker and allowed to resume weight bearing on the right lower extremity, and sent to physical therapy for active and passive range of motion, flexibility, and proprioception exercises. After 6 months of follow-up, the patient demonstrated nearly full strength, graded 4 out of 5, in the reinserted tibialis anterior tendon, with restoration of heel-walking ability (Figures 9 and 10).



FIGURE 9 Six-months postoperative clinical view demonstrating satisfactory dorsiflexion of the right ankle. (A) Lateral view. (B) Frontal view.

Discussion

Injuries to the tibialis anterior tendon are clinical rarities; however, they can lead to significant deformity as well as loss of function. Their inconspicuous nature, often related to an ability to walk by means of extensor substitution, may lead to missed diagnoses, and improper management. Conservative treatments including ankle-foot orthoses, bracing, and modification of activity and shoe gear, are all viable options in an elderly or inactive patient population. Review of the biomedical literature suggests that conservative care will ultimately lead to long-term problems with ambulatory function and pain. When faced with a clinical presentation that includes the inability to stand on uneven surfaces, foot slap and foot drop, and frequent ankle sprains, a clinical suspicion of spontaneous rupture of the tibialis anterior tendon, especially in the diabetic population, is warranted. In the



FIGURE 10 Six-months postoperative clinical view demonstrating satisfactory plantarflexion of the right ankle. (A) Lateral view. (B) Frontal view.

neuropathic diabetic patient, a dysfunctional or ruptured tibialis anterior tendon will predictably lead to further morbidity. The inability of the forefoot to clear the ground during the swing phase of gait, increased medial forefoot plantar pressures, an inability to evert the foot, and eventual attenuation of the posterior tibial tendon, are all likely sequela of an absent, ruptured, or dysfunctional tibialis anterior tendon. Restoration of the function of tibialis anterior may resolve these pathologies and restore normal function to the foot and reduce biomechanical complications, and this may be particularly important in diabetic patients. The purpose of this paper was to document the clinical presentation, diagnostic work-up, diagnosis, and subsequent surgical repair of a spontaneously ruptured tibialis anterior tendon in a diabetic patient.

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