Tibialis Anterior Tendon Rupture: A Case Report

James Uh, DPM Cameron Barr, MD

INTRODUCTION

Closed rupture of the tibialis anterior tendon is a rare injury. Bruning first described it in 1905 and there have been fewer than 120 cases reported in literature since (1). The rupture can be a result of a direct, closed trauma without ankle motion. However, it is more commonly associated with forced ankle plantarflexion against resistance (1). It has also been established that a normal tendon rarely ruptures. Conditions that increase the likelihood of rupture are systemic lupus erythematosus, hyperparathyroidism, and psoriasis (2). Other factors may contribute to tibialis anterior tendon ruptures including metabolic disorders such as diabetes mellitus, gout, rheumatoid arthritis, or after local injections or chronic use of corticosteroids (1). The typical patient is a male older than the age of 45 years with a complaint of slapping of the foot during gait or frequent tripping.

The tibialis anterior muscle is one of the strongest dorsiflexors at the ankle joint. It provides up to 80% of the dorsiflexory power (3). Extensor hallucis longus, extensor digitorum longus, and peroneus tertius provide the rest of the dorsiflexory force. The mechanism of rupture is supination at the ankle joint and an abrupt plantarflexion against resistance (2).

Rupture of the tibialis anterior tendon can be subtle, thus a careful physical examination must be performed. Patients diagnosed with rupture of this tendon often-present weeks to years following the injury due to a relatively mild degree of pain (3). On physical examination there is mild pain to palpation at the insertion of the tendon. A tender bulbous mass is encountered, most commonly at the level of the ankle joint (3). The tendon is usually not palpable from the point distal to its insertion. Another clue in diagnosing a rupture is to have the patient dorsiflex and invert the ankle. This would cause the tendon to become visible (in a rupture the tendon is no longer visible), or palpable in the patient with closed rupture of the tendon. Extensor substitution occurs in patients with tibialis anterior tendon ruptures, in which the extensor digitorum longus, extensor hallucis longus, and if present peroneus tertius compensate for the loss of tibialis anterior tendon function during active dorsiflexion of the ankle (1).

In this case report we present a rare case of an isolated tibialis anterior tendon rupture in a 70-year-old female, detailing a unique surgical treatment involving the Pulvertaft weave technique. This patient had a predisposing factor that may have contributed to her rupture, which was the use of local corticosteroids. However, she had no history of acute trauma to the area of her tibialis anterior tendon or any other systemic factors that could have been attributed to her tibialis anterior tendon rupture.

CASE REPORT

A 70-year-old female presented to our clinic with complaint of vague pain and weakness of 1 month duration that was localized to the anterior aspect of her right ankle. She denied any history of trauma to the area. However, she did recall that while walking normally that she felt a discomfort that was present to the anterior aspect of her ankle that presented as a popping type of sensation. Per the patient's report, she felt discomfort even before this popping sensation. Prior to this visit she had seen a different podiatric physician, who injected her with some sort of unknown steroid in the region of her anterior ankle prior to this popping sensation. However, following the injection she did not notice any improvement in her pain and was continuing to have difficulties in her daily activities. Her past medical history was significant for fibromyalgia, hypothyroidism, and hypertension.

At the time of presentation, it was noted that her right tibialis anterior tendon was not actively firing during gait analysis compared to her contralateral unaffected side. On seated examination, with active dorsiflexion there was noted to be a palpable void at the tibialis anterior near its insertion. During manual muscle testing there was recruitment of her extensor halluces longus tendon on the injured side with dorsiflexion. Compared to her uninjured side, the right foot was noted to have less inversion. Light touch sensation was intact throughout her bilateral feet. She had brisk capillary refill time to her toes bilaterally. Subsequent magnetic resonance imaging (MRI) revealed a complete tear of the patient's tibialis anterior tendon at its insertion with 3-4 centimeters of retraction (Figure 1).

A discussion with the patient was had regarding treatment options for her pathology. The patient opted for surgical intervention given that she had been dealing with this for quite some time. Given the extent of the patient's rupture as seen on MRI, an end-to-end repair was



Figure 1. Magnetic resonance image demonstrating rupture of the tibialis anterior tendon.



Figure 3. Intraoperative view following excision of scar tissue from the tibialis anterior tendon ends.

determined not to be feasible. Thus the decision was made to use a semitendinosus allograft.

The patient was brought back to the operating room suite where the anesthesiologist administered a regional nerve block. Intravenous antibiotics were given for perioperative prophylaxis. An SCD was placed on the contralateral limb for deep vein thrombosis prophylaxis. The patient was induced under general anesthesia. A wellpadded thigh tourniquet was placed high on the right thigh. The right lower extremity was then prepped and draped in the usual sterile fashion. A time-out was called and all those present confirmed operative site, patient name, and procedure to be performed. An Esmarch bandage was used to exsanguinate the limb and the tourniquet was insufflated



Figure 2. Intraoperative view showing chronic scar tissue formation.

to 250 mm Hg.

A 12-cm incision was made along the anterior aspect of the ankle coursing over the dorsomedial aspect of the foot. This was positioned approximately 1 cm lateral to the course of the tibialis anterior, so as to try to minimize skin tension during the repair. After sharply coming through skin, blunt dissection was made down to the tendon sheath and extensor retinaculum. Care was taken to protect and retract the traversing branch of the superficial peroneal nerve. The tibialis anterior tendon sheath was then sharply incised. The extensor retinaculum was incised and marked for later repair. There was found to be a chronic rupture of the tibialis anterior just proximal to its insertion with retraction up above the level of the extensor retinaculum. There was extensive scar tissue that appeared almost tendon-like traversing from the distal stump all the way to the proximal stump at the level of the ankle (Figure 2). Just proximal and distal to this, was more normal appearing tendon. This scar tissue was excised with a knife. This measured approximately 6 cm in length. After removing this, there was more clear representation of the tendon stumps (Figure 3). There was no feasibility of end-to-end repair.

Dissection was carried down to the medial cuneiform. A Beath pin was then driven from dorsal to plantar through the medial cuneiform. Appropriate positioning and trajectory was confirmed under fluoroscopy. A semitendinosus allograft was then sized. A 6 mm drill hole was made over the Beath pin. A whipstitch was placed through one end of the semitendinosus allograft and then it was brought up and through the created drill hole through the medial cuneiform. One end of the allograft was brought up to the proximal



Figure 4. Intraoperative view demonstrating semitendinosus allograft tenodesised with the distal aspect of tibialis anterior tendon under tension utilizing the Pulvertaft weave technique.

tendon stump. The more distal aspect of the allograft was then tied back onto itself, so that the tendon was secured in and around the medial cuneiform. FiberWire (2-0) was used to secure the tendon to itself. For added stability, a 5 x 15 mm tenodesis screw was placed through the drill hole. It had excellent purchase and compression against the graft.

With the distal aspect of the allograft secured, it was then tensioned. With the ankle held in approximately 10 degrees of dorsiflexion, the allograft was brought through the proximal stump of residual tendon using a Pulvertaft weave (Figure 4). With the tendon appropriately tensioned and the ankle held in 10 degrees of dorsiflexion, the tendon weave was secured with #2 FiberWire suture. This achieved an excellent restoration of the tibialis anterior tension. The repair was tested and found to be secure. The residual distal stump of the tibialis anterior was then sewed into the allograft. The wound was copiously irrigated.

Meticulous closure was performed, so as to minimize tension on the anterior soft tissue. The extensor retinaculum was closed over the tendon graft with 0 Vicryl suture. Great care was taken to close this layer to prevent bow stringing and tension. The remaining tibialis anterior tendon sheath was then closed in a similar fashion using 0 Vicryl suture. This recreated necessary restraint for the tendon. The subcutaneous tissue was then reapproximated with 3-0 Vicryl. The skin was closed with combination of 3-0 and 4-0 nylon in a horizontal mattress fashion. At the end of the case, the ankle rested in approximately 10 degrees of dorsiflexion. There was no excessive tension on the anterior skin. Sterile dressings consisting of Xeroform, 4 x 4s, Webril, and a well-padded short-leg splint was applied. Care was taken to splint the ankle resting in approximately 10 degrees of dorsiflexion.

Following surgery the patient was kept strict nonweightbearing for 6 weeks, followed by an additional 6 weeks of walking in a boot. At the patient's 11 weeks postoperative visit, she was fully ambulatory in a CAM boot with no pain. On physical examination, she was able to actively dorsiflex her ankle with firing of the tibialis anterior graft. At her 6 month postoperative visit she was fully ambulatory in regular shoes. She relayed some mild residual weakness but it was improved from her preoperative visit. She had no significant pain to her right ankle. Manual muscle testing revealed 4/5 strength with dorsiflexion. There was no tenderness along the course of her tibialis anterior tendon.

DISCUSSION

Tibalis anterior tendon rupture is a rare injury, which may be the reason why the optimal treatment continues to remain a debate. It is generally accepted that surgical repair is warranted for the more active patients. While conservative treatment with casting and immobilization for patients with a more sedentary lifestyle have yielded satisfactory results. Markarian et al found no difference when comparing the results of 16 tibialis anterior tendon ruptures, in which 8 were treated surgically and 8 were treated conservatively (4). On the contrary, Ouzounian et al compared 12 tibialis anterior tendon ruptures, in which 7 were treated surgically and 5 conservatively and found that the group that was treated surgically had better functional outcomes than those treated conservatively (5). It is important to note however, that there was some bias between the 2 groups, in which age played a role in terms of who got what treatment. The younger patients were more likely to undergo surgical treatment whereas the older patients were more likely to be treated conservatively. Despite the shortcoming in these 2 studies, both authors recommended surgical treatment for highly active patients and conservative treatment for those patients with less functional demands. Acute trauma, degenerative changes, systemic disease such as diabetes or rheumatoid arthritis, and the use of local or systemic steroid therapy can lead to tibialis anterior tendon ruptures.

Clinical findings of tibialis anterior tendon rupture include weak dorsiflexion at the ankle and inversion at the subtalar joint. Complete drop foot is rare as extensor digitorum longus and extensor hallucis longus are recruited to help lift the foot. There will likely be a palpable defect along the tendon. A flat foot deformity may be seen as their antagonist, the peroneus longus tendon, overpowers the tibialis anterior tendon.

When deciding between surgical and conservative treatment, potential complications need to be considered.

Surgical intervention has been shown to result in few complications. Trout et al believed that surgical intervention for tibialis anterior tendon ruptures showed no disability following repair (3). Of the cases that were treated surgically only 4 (12.5%) experienced a complication. The complications included limited ankle joint range of motion and weakness of ankle dorsiflexion resulting in some limitations in activities. Conservative treatment complications include the risk of a partial foot drop and late sequelae such as heel cord contracture and flatfoot deformity with ankle arthrosis.

The location of a tibialis anterior tendon rupture can vary from close to its insertion to just proximal to the ankle. It also may not be possible to see the full length of tendon defect as seen in our case study where there was a 6 cm of tendon deficit that was not apparent on MRI, thus making direct repair difficult due to the amount of defect. There have been various surgical techniques described in the literature when there is a sizable shortening of tendon that include tendon lengthening, allograft, tendon transfer, or non-anatomical correction. Markarian et al described 8 different techniques for the surgical treatment of tibialis anterior tendon ruptures (4). This included 2 primary repairs, 1 primary extra-retinacular repair, 1 direct repair through a boney tunnel in the medial cuneiform, 2 modified Tohen procedures where extensor hallucis longus is Pulvertaft-weaved to tibialis anterior tendon, 1 Kelkian procedure where two-thirds of the extensor digitorum longus is Pulvertaft-weaved to the tibials anterior tendon, and 1 non-anatomical repair to the navicular.

Our case study showed that direct tendon repair utilizing an allograft tendon can be possible even after delayed diagnosis. Our goal was for the patient to be able to ambulate without any weakness secondary to drop foot, to eliminate any pain that the patient was having, and for her to be able to return to her normal daily activities. Tibialis anterior tendon ruptures are a rare injury and the treatment remains controversial. However, as a general guideline surgical intervention is warranted for younger active patients. While conservative treatment yields good outcome for older patients with a more sedentary lifestyles. Treatment should be catered to each individual and the patients' age, functional demand of the patient, condition of the tendon, size of defect, and cause of rupture must all be considered when choosing the appropriate treatment for patients with tibialis anterior tendon ruptures.

REFERENCES

- Neumayer F, Djembi YR, Gerin A, Masquelet AC. Closed rupture of the tibialis anterior tendon: a report of 2 cases. J Foot Ankle Surg 2009;48:457-61.
- 2. Anagnostakos K, Bachelier F, Furst OA, Kelm J. Rupture of the anterior tibial tendon: three clinical cases, anatomical study, and literature review. Foot Ankle Int 2006;27:330-9.
- Trout BM, Hosey G, Wertheimer SJ. Rupture of the tibialis anterior tendon. J Foot Ankle Surg 2000;39:54-8
- Markarian GG, Kelikian AS, Brage M, Trainor T, Dias L. Anterior tibialis tendon ruptures: an outcome analysis of operative versus nonoperative treatment. Foot Ankle Int 1998;19:792-802.
- 5. Ouzounian TJ, Anderson R. Anterior tibial tendon rupture. Foot Ankle Int 1995;16:406-10.

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