CHAPTER **34**

AUGMENTATION OF RUPTURED FOOT AND ANKLE TENDONS WITH GRAFT JACKET

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INTRODUCTION

A rupture of a foot and ankle tendon can be challenging to repair, especially in chronic injuries. In acute injuries the ruptured tendon ends are usually viable and not diseased, making the repair more straight forward. A good physical examination can indicate the diagnosis of a tendon rupture, though it can be aided by ultrasound and/or magnetic resonance imaging (MRI). In some instances the full extent of the rupture may not be known until the intraoperative period, especially in chronic ruptures.

The challenge in repairing a diseased tendon is attempting to improve the integrity and strength of the tendon. The repair of the tendon can be enhanced with the use of an autograft or allograft. The type of graft used may depend on the tendon being repaired and certain physiologic factors of the patient. The creation of a second surgical site in some patients may not be ideal. The development of new tissue substitutes can aid in the surgical repair of a ruptured tendon along with standard tendon advancement and suture techniques.

The type of graft being discussed in this article is Graft Jacket (Wright Medical Technology, Arlington, TN). Graft Jacket is an acellular tissue matrix that is processed from human dermis (Figure 1). The Graft Jacket scaffold is composed of collagen types I, III, IV, and VII, elastin, chondroitin sulfate, and proteoglycans. This biomechanic matrix provides a framework that supports repopulation and revascularization. Since the graft is acellular there is little inflammatory response upon its application. The tissue regeneration produces new subcutaneous tissue that has a quality similar to subdermal tissue. The grafts are packaged in a variety of configurations and range in thickness from 0.5 -2.0 mm and sizes from 2 x 4 cm to 5 x 10 cm. Graft Jacket has superior suture retention strength when compared with similar commercial types of grafts.

Graft Jacket is human tissue and does undergo numerous processing steps, laboratory testing, and careful donor screening to minimize the risks of disease transmission, though the graft can not be guaranteed to be free of all pathogens as with any processed donor tissue.

CASE PRESENTATIONS

The author has treated 4 tibialis anterior, 1 peroneus brevis, and 3 peroneus longus ruptures in the last 18 months. Two of the tibialis anterior, 1 peroneus brevis, and 1 peroneus longus tendon ruptures were augmented with Graft Jacket (Figure 2). The 4 ruptured tendons presented to the office from 2 weeks to 10 months following the rupture. All 4 patients underwent a MRI prior to surgical repair of the tendon.

Figure 1. A Graft Jacket Maximum Force that measures 4 x 7 cm and is 1.5 mm in thickness.

Figure 2. A 4-week-old rupture of the tibialis anterior tendon near the insertion site.

The first case is a 69-year-old man who presented with a 2 week history of progressive tibialis anterior tendonitis. He had been walking 2 miles a day and playing golf 2-3 times per week. He complained of pain and swelling, but what brought him to the office was the slapping of his foot against the ground while walking. His physical examination revealed dorsiflexion weakness at the level of the ankle and lower extremity edema. His MRI films did confirm a rupture of the tibialis anterior tendon near its insertion site.

The second case is a 54-year old man who ruptured his peroneus brevis tendon while exercising. He presented to the office 10 months following the injury to his ankle and foot because of pain and the inability to play golf comfortably. He had consulted with another physician near the time of injury and elected not to have the tendon repaired. His physical examination revealed pain and lateral ankle weakness with no edema. An MRI near the time of injury revealed a rupture of the peroneus brevis tendon along the lateral wall of the calcaneus.

The third case is a 64-year-old noninsulin dependent diabetic woman who presented to the office for evaluation of pain in her midfoot for 5 weeks. She noticed the pain in her midfoot when she turned over in the bed at night and she then tried to stretch her foot when getting out of bed and noticed that the pain became much more intense. She had been walking for exercise 3 miles a day until the time of her injury. Her physical examination revealed the inability to dorsiflex the foot at the ankle. She also had the presence of diabetic neuropathy and a normal vascular supply to both lower extremities. Her blood sugars routinely averaged near 100. The MRI of her foot and ankle revealed a rupture of the tibialis anterior tendon near its insertion site (Figures 3 and 4).

The fourth case is a 53-year-old woman who sprained her ankle 5 weeks prior to presenting to the office. She complained of pain and swelling in her ankle and foot that interfered with her daily routine. She indicated that she had a history of frequent ankle sprains, though none this severe. Her physical examination revealed pain and edema to the lateral aspect of the calcaneus. She also had instability of her lateral ankle joint. An MRI of her ankle and foot confirmed the diagnosis of a peroneus longus tendon rupture.

In all 4 cases the tendon was debrided and repaired to length with advancement techniques in 3 out of the 4 cases. The tibialis anterior and peroneal tendons were then augmented with varying lengths and thickness of Graft Jacket to strengthen the ruptured sites (Figure 5). In all of the cases the graft was sutured to the tendon with a 2-0 Fiberwire (Figure 6). All of the patients were casted in a nonweight-bearing cast for 6 weeks. Each patient progressed from partial to full weight bearing with an aircast walker in the repaired tibialis anterior tendon cases and an ankle brace in the repaired peroneal tendon cases. The patients with the repaired tibialis anterior tendon slept in an ankle brace for 6 weeks following removal of the cast. All patients were fitted with biomechanical orthotics post-operatively to provide medial arch stability in the tibialis anterior tendon repairs and control of rear foot motion in the peroneal tendon repairs.

Figure 3. A sagittal T2-weighted MRI image of a ruptured tibialis anterior tendon.

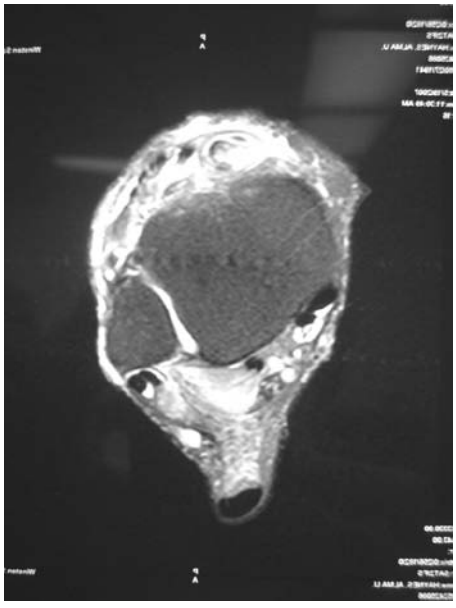

Figure 4. A transverse T2-weighted MRI image of a ruptured tibialis anterior tendon.

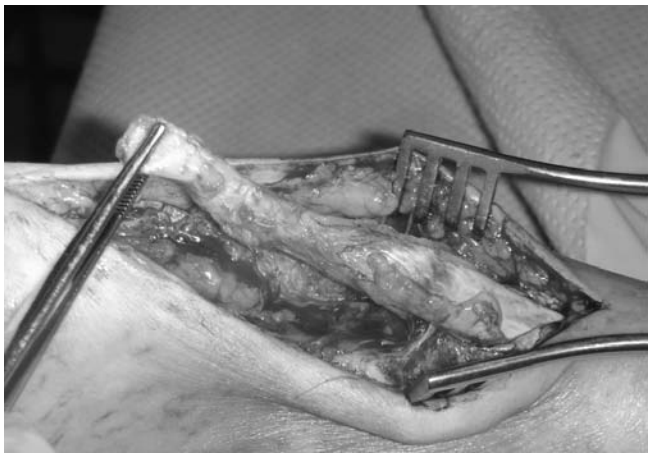

Figure 5. A 5-week-old rupture of the tibialis anterior tendon.

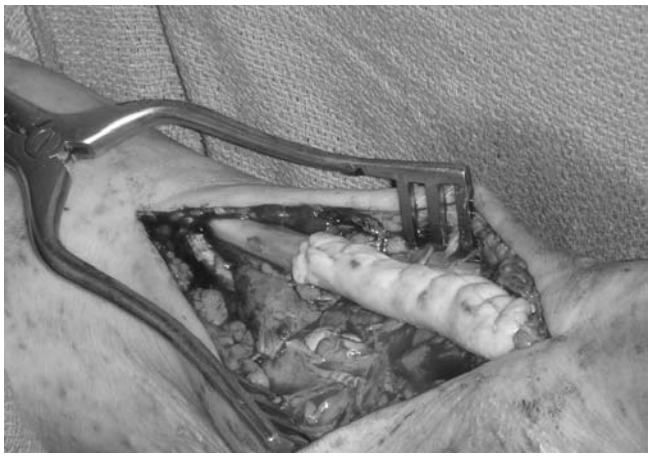

Figure 6. Surgical repair of the tibialis anterior tendon with Graft Jacket.

BIBLIOGRAPHY

Benzakein R, Wakim WA, DeLauro TM, Marcus R. Neglected rupture of the tibialis anterior tendon. *J Am Podiatr Med Assoc* 1988;78:529-32.

Cohen DA, Gordon DH. The long-term effects of an untreated tibialis anterior tendon rupture. *J Am Podiatr Med Assoc* 1999;89:149-52.

Hamilton GA, Ford LA. Longitudinal tear of the tibialis anterior tendon. *J Am Podiatr Med Assoc* 2005;95:390-3.

Jimenez AL, Mah C. Repair of chronic tendon ruptures. In Update 2006: The Proceedings of the Annual Meeting of the Podiatry Institute. Tucker (GA): Podiatry Institute; 2006. p. 4-6.

McGlamry MC. Augmentation of tendon repair in foot and ankle surgery. In Update 2006: The Proceedings of the Annual Meeting of the Podiatry Institute. Tucker (GA): The Podiatry Institute; 2006. p. 7-9.

Petersen W, Stein V, Tillmann B. Blood supply of the tibialis anterior tendon. *Arch Orthop Trauma Surg* 1999;119:371-5.

Rimoldi RL, Oberlander MA, Waldrop JI, Hunter SC. Acute rupture of the tibialis anterior tendon: a case report. *Foot Ankle* 1991;12:176-7.

Trout BM, Hosey G, Wertheimer SJ. Rupture of the tibialis anterior tendon. *J Foot Ankle Surg* 2000;39:54-8.

Wright Medical Technology for Graft Jacket. Package Insert.