

Composite Cutaneous Anterolateral Thigh Flap with Rolled Fascia Lata for Tibialis Anterior Tendon Reconstruction

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Background: Rupture of the tibialis anterior tendon (TAT) is a rare phenomenon with limited therapeutic options derived from sparse case reports. Without proper anchoring of the tibialis anterior, dorsiflexion and inversion of the foot become impaired, disrupting patient's gait. Reported techniques for repair fall into non-operative (ankle-foot orthosis) or operative (primary closure, tendon transfer, free gracilis) modalities, depending on patient factors, mechanism of injury, and extent of defect. In this report, we outline a novel method of tendon repair and soft tissue coverage for a large defect.

Methods: We present a unique case of traumatic TAT rupture with a failed primary closure yielding a large (>15 cm) defect. The patient presented with a defect spanning the entire anterior compartment of the leg, limiting options for coverage and functional restoration.

Results: The patient's large, chronic defect was successfully repaired via a composite cutaneous anterolateral thigh and a rolled fascia lata free flap. The patient had robust return to function and is able to dorsiflex and invert the foot and ambulate.

Conclusions: The use of this donor site offers a novel, advantageous option for TAT repair. It should be considered for patients with large defects that make other repair methods unfeasible. (*Plast Reconstr Surg Glob Open* 2020;8:e2959; doi: [10.1097/GOX.0000000000002959](https://doi.org/10.1097/GOX.0000000000002959); Published online 14 July 2020.)

INTRODUCTION

Although a relatively rare phenomenon, rupture of the tibialis anterior tendon (TAT) is detrimental to lower extremity form and function. The tibialis anterior is largely responsible for both foot dorsiflexion and inversion. Without proper anchoring of the strongest of the 3 ankle dorsiflexors, impairments such as steppage gait, drop foot, claw toes, and arch flattening begin to manifest.¹ Despite low occurrence, TAT rupture is the third most common lower extremity tendon rupture, after Achilles and patellar tendon rupture.²

Current understanding of the treatment options and outcomes for TAT repair primarily comes from case reports and small retrospective reviews. Definitive recommendations for treatment remain controversial, but the decision on treatment modality must take into account

patient factors, defect extent, reconstructive timing, and mechanism of injury. In this report, we outline a unique case in which a patient sustained a traumatic laceration to his leg, failed primary reconstructive efforts, and presented to our service with decimation of the anterior compartment form and function. With successful repair of the resultant large soft-tissue defect and total absence of the TAT via rolled anterolateral thigh (ALT) flap, we offer a novel method of reconstruction with concurrent appropriate coverage and robust return of dorsiflexion.

CASE

A 70-year-old patient presented to our tertiary wound care center with a significant traumatic laceration to his leg sustained while abroad 6 weeks before. Immediate repair to the TAT was attempted with primary closure; the site dehiscd and subsequently became infected. An outside hospital performed extensive incision, drainage, and debridement, yielding a 16 × 3 cm defect that was temporarily covered with a vacuum-assisted closure device. Of

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note, the patient's medical history included hypertension, hyperlipidemia, and previous tobacco use. Angiogram demonstrated normal anterior tibial and peroneal arteries but occlusion of the posterior tibial artery. Before definitive repair was attempted, the patient underwent 2 surgical debridements, yielding noninfected, nongranulated tissue. The necessary wound bed preparation left the patient with a 16×4 cm defect, absence of the soft tissues and tendons of the anterior compartment, an inability to dorsiflex the foot, and few options for combined coverage and tendon reconstruction (Fig. 1).

When the patient was deemed ready for a definitive closure, a free cutaneous ALT flap with additional fascia lata extending laterally to the tensor fascia lata was harvested (Fig. 2). After harvest and on ischemia time, we rolled in the fascia lata lateral to medial. We serially secured it in layers along the entire length using polydioxanone suture,

in a running locking fashion to create a 16-cm-long neotendon. Careful attention to avoid tension around the perforator was given (Fig. 3). During inset, the foot was put in maximal dorsiflexion (Fig. 4). A Krackow with 0 Prolene was used to secure the fascia lata into the distal and proximal ends of the TAT. Arterial microanastomosis was performed in the standard end-to-side fashion; 2



Fig. 1. The patient presented with a large defect that obliterated the anterior compartment of the leg. After necessary wound bed debridement, the patient was left with a wound spanning 16×4 cm.

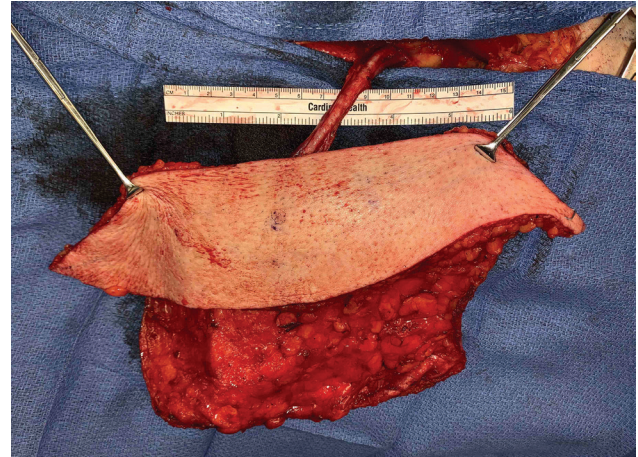


Fig. 2. A free anterolateral thigh flap with surrounding fascia lata was harvested for tandem wound coverage and neotendon creation.



Fig. 3. The fascia lata was rolled and serially secured with polydioxanone suture. Without disturbing the integrity of the perforators, a 16-cm long neotendon was formed in this fashion.

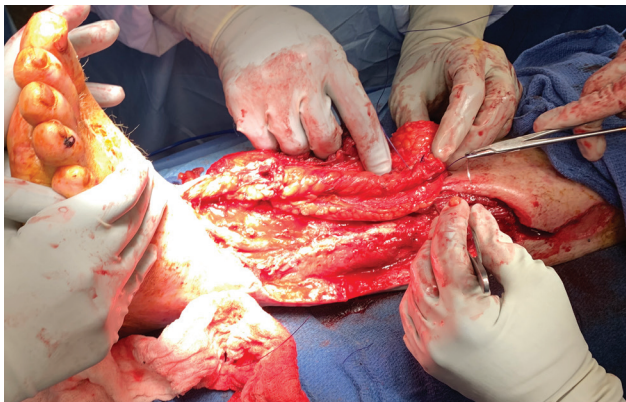


Fig. 4. Image showing the process of inseting the rolled fascia lata and anterolateral thigh flap.

veins were anastomosed using 2.5-mm couplers. A Cook Doppler was placed to ensure there was no compression on the vein during inset and dressing placement. The flap was inset with PDS, and the thigh was closed in layers after appropriate hemostasis.

As standard, the patient was transferred to the intensive care unit for rigorous flap monitoring every 1 hour. After discharge, an external fixator was placed for 1 month. An external fixator was used due to the size of the defect and the predicted significant soft-tissue swelling subsequent to repair. At the 8-month follow-up appointment, the patient demonstrated robust return of foot dorsiflexion and inversion, relatively normal gait, appropriately sized and skin-matched flap, and no long-term complications. (See Video 1 [online], which displays the patient's successful, robust dorsiflexion with the repaired TAT 8 months after reconstruction.) (See Video 2 [online], which demonstrates the patient's return to function, appropriate flap contour, and skin matching.)

DISCUSSION

Due to low incidence and heterogeneity of presentation, definitive treatment for TAT repair remains controversial. Nonoperative modalities, such as ankle-foot orthosis, have presented mixed results, with persistent deformities and incomplete return to functionality at best.¹ Surgical intervention is often required for defects that are either large or chronic, and some authors suggest that surgical methods are the only means of returning a patient to preinjury levels of function. Small defects in the acute setting have been successfully repaired via a primary closure, with acceptable outcomes.³ However, defects >4cm have been addressed with tendon grafting, whereas defects >10cm have been successfully treated with gracilis transfer.^{1,4,5} Although more commonly used for upper extremity tendon reconstruction, free functional muscle transfer could be considered. However, this method relies on adequate soft-tissue coverage and a local environment that allows for smooth tendon gliding.

In our patient's case, the defect measured 16 × 4cm, lacked all anterior compartment muscles, and had an excised TAT, requiring simultaneous coverage and reconstruction. Tendon transfer with free flap coverage was not an option based on the lack of points for anchoring the proper line of tension.⁶ Other free tissue transfer donor sites historically used in TAT repair, such as the gracilis flap, offer little tissue and do not provide a tendinous replacement. Other groups have commented on the utility of ALT flap for coverage in TAT repair combined with plate and screw reconstruction of the tendon.⁷ In our case, we noted an opportunity for simultaneous reconstruction and coverage via native tissue with hopes of avoiding the risks of hardware. As evidenced by function 8 months after operation, the combined coverage and TAT reconstruction with the ALT yields excellent dorsiflexion and inversion strength.

CONCLUSIONS

Although TAT rupture is relatively rare, disruption of this architecture has severe impact on patient form and function. Large defects pose an especially challenging reconstructive dilemma, and no consensus exists for the best means of repair. This case report shows a relatively straightforward and reproducible approach to large, chronic defects combined with TAT repair via the ALT and fascia lata. With remarkable long-term functional and aesthetic results, this approach can and should be replicated in similarly challenging scenarios.

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