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Reconstructive

Anterolateral Thigh and Vascularized-tensor Fascia Lata Flaps for Long-gap Achilles Tendon Reconstruction

Kengkart Winaikosol, MD
Palakorn Surakunprapha, MD

Summary: We demonstrated our surgical technique of 8-cm segmental loss Achilles tendon reconstruction and repair of posterior heel skin and soft tissue defects with composite anterolateral thigh and 4-layer folding vascularized-tensor fasciae latae flaps of a 15-year-old adolescent boy's post-traumatic injury and infection after primary repair. This technique highlights the ease of harvesting the flap, short operative time, and facilitation of the strong and sustainable motion of the Achilles tendon after reconstruction. *(Plast Reconstr Surg Glob Open 2021;9:e3631; doi: 10.1097/GOX.0000000000003631; Published online 10 June 2021.)*

INTRODUCTION

Laceration of the Achilles tendon is common when there is a trauma around the ankle. Unfortunately, some injuries lead to segmental loss of the tendon, making direct repair impossible. The Achilles tendon is the strongest tendon in the human body,[1] which makes the reconstruction of the posterior heel defects composing of a segmental loss of the Achilles tendon, overlying skin, and soft tissue challenging. In such cases, the reconstruction aims are to (1) reconstruct the tendon in a way that will allow it to withstand the mechanical and shear forces required to do normal functions (such as standing on tiptoes), (2) provide vascularized soft tissue that will address the contour defect, protect the tendon reconstruction, and allow smooth tendon glide, and (3) provide durable skin that will allow for the patient to wear shoes.[2]

Short segmental defects are amenable to repair using the end-to-end technique and V-Y lengthening with or without tendon transfer.[3] If there is a defect gap > 4 cm, reconstruction can be performed using a gastrocnemius fascial turndown flap, flexor hallucis longus or tendon transfer, hamstring tendon autograft,[4] or Achilles tendon allograft.[5,6] We present our reconstruction method of the long-gap Achilles tendon and posterior heel defect with composite anterolateral thigh (ALT) and vascularized tensor fasciae latae (TFL) flaps in a patient with an 8-cm segmental loss of Achilles tendon and overlying skin and soft tissue. This study was reviewed and approved by the Khon Kaen University Ethics Committee for Human Research (HE621412).

CASE REPORT

A 15-year-old adolescent boy was referred from a private hospital after 1 month following a motor vehicle accident. Since the initial presentation, he had an open wound at the posterior heel and a laceration of the Achilles tendon. Immediately after the accident, the surgical repairs of Achilles tendon and skin were performed by an orthopedic surgeon. However, approximately 10 days later, most of the skin and Achilles tendon necrosed, and the surgical site became infected.

The operation was performed again, and after debridement, there was a skin defect of about 13 × 6 cm with an Achilles tendon defect of 8 cm in length and most of its width (Fig. 1). Simultaneous reconstruction of the Achilles tendon and skin was performed with a composite flap. An ALT with attached vascularized TFL was harvested after a preoperative Doppler ultrasound examination. The main cutaneous perforator was located in the middle portion of a line between the anterior superior iliac spine and lateral edge of the patella. The perforator that supplied the TFL was located 10 cm superiorly to the cutaneous perforator. The skin paddle was designed to be slightly larger than the soft tissue defect and a portion of the TFL, including both muscle and the fascial component measuring 15 × 12 cm. After confirmation of the perforator, the section of the TFL, still attached to the branches, was raised from the perforators, and the composite ALT was elevated (Fig. 2). The TFL was rolled up from posterior portion to anterior part for 4-layer folding to recreate the missing segment of the Achilles tendon and sutured to both proximal and distal ends of the Achilles tendon with Krackow-type stitch for the

From the Plastic & Reconstructive Unit, Department of Surgery, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand.
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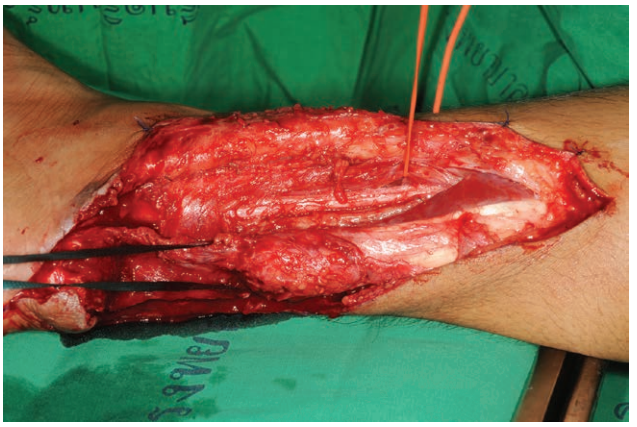

Fig. 1. Posterior heel skin defect with 8 cm of Achilles tendon defect.

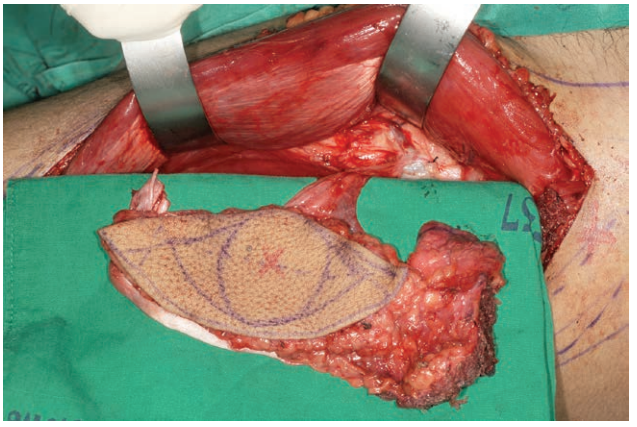

Fig. 2. Complete flap harvesting of chimeric ALT and TFL flap. The 2 different perforators supplied to skin and TFL were preserved.

appropriate tension of the ankle (Fig. 3). End-to-side arterial anastomosis and end-to-end venous anastomosis of the recipient vessels (posterior tibial artery and its vena comitans) were performed under a microscope. The skin paddle was then sutured in place, and the donor site was closed over a suction drain. The overall duration of this operation was approximately 6 hours and 20 minutes. Postoperative immobilization was maintained using a protective cast for 6 weeks with the ankle at 30 degrees of plantar flexion. Only passive movement was allowed for the next three weeks. Afterward, the patient was trained to perform active ankle stretching and engaged in a part-time, full weight-bearing program. By week 12, the patient was engaged in a full-time weight-bearing program and could walk without a cane or walker. The patient could walk normally and stand on tiptoes at 6 months after surgery (Fig. 4).

DISCUSSION

The Achilles tendon is the strongest tendon in the human body. Reconstructive surgery to treat these tendon defects is especially challenging.[1] In defects smaller than 5 cm, local soft tissue, such as V-Y advancement with transfer flexor hallucis longus, peroneus brevis, flexor digitorum longus, or a gastrocnemius fascial turndown flap, can be used for reconstruction, which yield satisfactory functional results.[7,8] For long-gap Achilles tendon defects without overlying skin defects, some authors have proposed Achilles tendon allograft[3,6] or autograft,[9] hamstring tendon autograft,[4] distant tissue such as tensor fasciae latae,[10–15] or skin-aponeurosis-bone composite tissue from the groin region.[16]

In post-traumatic injuries that involve defects in both the Achilles tendon and overlying skin, both strong tissues for Achilles tendon reconstruction and well-vascularized

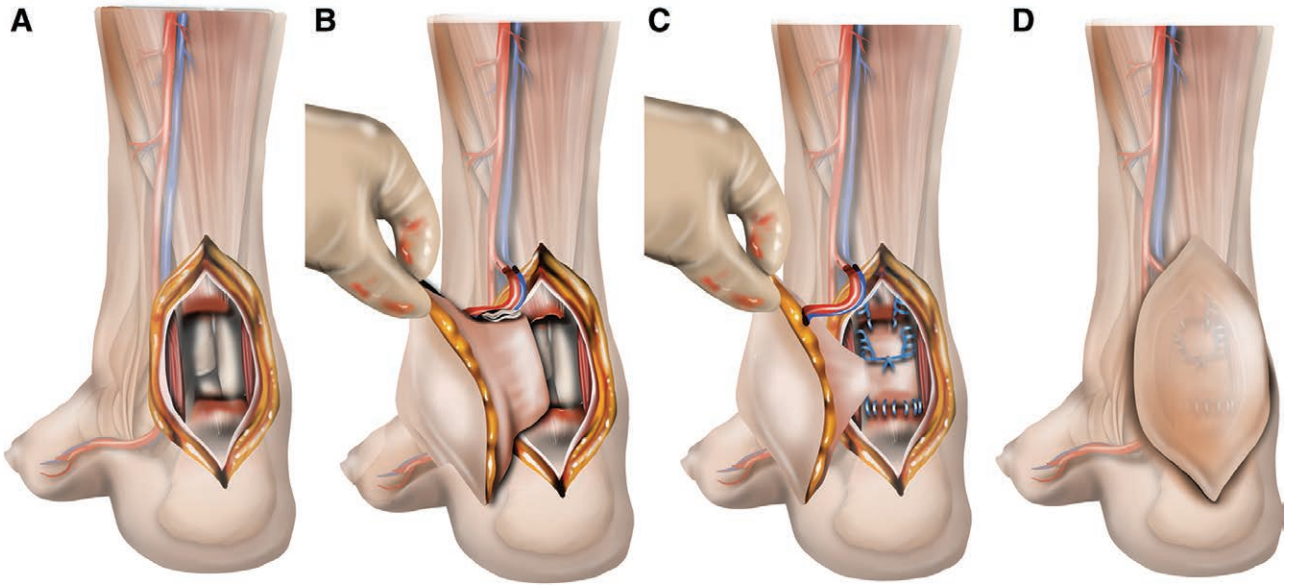

Fig. 3. Repair procedure. A, Posterior heel soft tissue defect with 8-cm segmental loss of Achilles tendon. B-C, Four layers of TFL to recreate the missing segment of the Achilles tendon and sutured to the proximal and distal ends of the Achilles tendon with Krackow-type stitch. D, The ALT flap was sutured to cover the posterior heel.

Fig. 4. Six months after surgery, the patient was able to stand on his toes.

tissue to promote healing and combat infection are required. The TFL flap is the most suitable tissue for Achilles tendon reconstruction. Nevertheless, it has some limitations, such as its short vascular pedicle, difficulty in flap setting when combined with composite skin and soft tissue, and the thick layer of subcutaneous tissue, making it difficult to wear shoes or require a secondary procedure to debulk the flap.

The ALT flap offers versatile reconstructive capabilities. Most of the perforators derived from the descending branch of the lateral circumflex femoral artery. The major type of perforator is musculocutaneous.[17–19] The ALT flap is a versatile flap with a long vascular pedicle (8–16 cm),[20] large vessel diameter (the diameter of the artery is 1.98 mm, and the vena comitans is 2.22 mm).[18] The ALT flap can be harvested at a thickness of just 5 mm with supra-fascial dissection[20,21] and the procedure can be performed using a 2-team approach.

We present a case of reconstruction of a posterior heel defect and segmental loss of the Achilles tendon with an ALT, using a vascularized-tensor fasciae latae flap, which yielded good postreconstructive results. The keys to flap harvesting are (1) preserving the vascular branch that supplied the fascia lata and (2) harvesting the flap in a supra-fascial fashion for thin skin and soft tissue. The effectiveness of this procedure was demonstrated by the fact that it resulted in good tendon healing and other clinical outcomes without the use of tendon transfers for reinforcement. The advantages of our technique are that it is easy to harvest the flap, requires short operative time, and provides strong power to the Achilles tendon after reconstruction.

CONCLUSION

The reconstruction of a composite defect of the long-gap Achilles tendon and overlying skin using the free ALT and vascularized TFL flaps resulted in favorable patient-reported outcomes, and there were no postoperative complications in our case study.

Kengkart Winaikosol, MD
Department of Surgery
Faculty of Medicine Khon Kaen University
123 Mittraparp Highway Muang District Khon Kaen 40002
Thailand
E-mail: kengkawi@kku.ac.th

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