Double-Layer Reconstruction of the Achilles' Tendon Using a Modified Lindholm's Technique and Vascularized Fascia Lata

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Abstract

Loss of the Achilles' tendon with overlying soft tissue and skin defects remains a complex reconstructive challenge. Herein we present our experience using a free composite anterolateral thigh (ALT) flap with vascularized fascia lata and a modified Lindholm's technique to repair the Achilles' tendon. A 37-year-old man suffered from tertiary Achilles' tendon rupture. For reconstruction, the free composite ALT flap with vascularized fascia lata was used to wrap Achilles' tendon. A modified Lindholm's technique was used to cover overlying soft tissue defects. The patient was followed up for 12 months. No wound healing problems were reported, and the patient was able to walk and return to his daily ambulating activities without any support after 5 months postoperatively. This technique may be useful to achieve satisfactory outcomes in patients with ruptured Achilles' tendons following tertiary repair.

Keywords
- Achilles' tendon
- rupture
- anterolateral thigh flap
- fascia lata
- Lindholm's technique

Introduction

The Achilles' tendon is the most powerful tendon in the human body.[1] The highest incidence of Achilles' tendon rupture is observed in middle-aged populations during occasional sporting activities. The major sign of a ruptured Achilles' tendon is the absence of plantar flexion of the foot.[2] After successful treatment, Achilles' tendon ruptures may reoccur, which could lead to soft tissue defects.[3] Loss of the Achilles' tendon with overlying soft tissue and skin defects remains a complex reconstructive challenge. Free composite anterolateral thigh (ALT) flap with vascularized fascia lata is a well-described and common surgical treatment option.

Herein we report the repair of an Achilles' tendon, using a modified Lindholm's technique and a free composite ALT flap with vascularized fascia lata to repair the new tendon and cover overlying soft tissue defects.

Case Report

A 37-year-old male patient was referred for left Achilles' tendon rupture, wound dehiscence, and partial tissue necrosis. The patient was injured by participating in occasional sports, and he underwent Achilles' tendon repair twice within 3 months. Upon physical examination, there was no viable tendon structure, and wound dehiscence and soft tissue necrosis were present (►**Fig. 1**). After debridement, a skin defect measuring 12 × 6 cm and a 6-cm-long defect of the Achilles' tendon were observed. For tertiary repair, the Achilles' tendon was reconstructed using the gastrosoleus turn-down flap technique as a modified Lindholm's technique,[4] and was inserted into the calcaneal bone using an anchor suture. Next, a 16- × 8-cm composite ALT flap with a 7- × 9-cm strip of vascularized fascia lata was harvested from the right thigh. The fascia strip was wrapped around the repaired tendon (►**Fig. 2**) and sutured to the end of the soleus

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Fig. 1 Appearance of necrosis of Achilles' tendon and soft tissue defect.

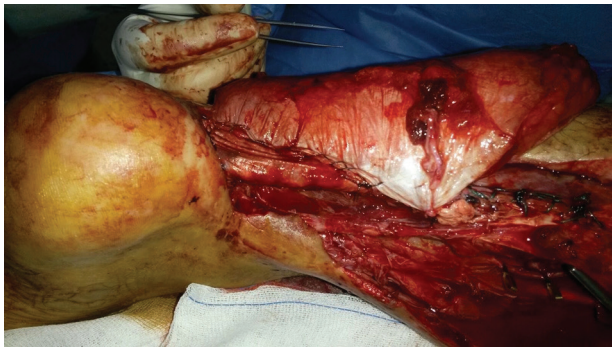

Fig. 3 Intraoperative view of the wrapping of newly reconstructed Achilles' tendon with fascia lata.

musculotendinous junction and to the soft tissue remnants around the insertion of the Achilles' tendon (►**Fig. 3**). End-to-end microvascular anastomoses were performed between the posterior tibialis vessels and the lateral circumflex femoral vessels. The flap donor site was closed with a skin graft. Wound healing was uneventful. The patient wore a protective splint for 6 weeks. Physical therapy began at 6 weeks postoperatively. Clinical outcomes were evaluated using the ankle-hindfoot scale score set forth by the American Orthopedic Foot and Ankle Society (AOFAS). The pre- and postoperative AOFAS ankle-hindfoot scale scores were 11 and 98, respectively. Visual analogue scales of pain decreased from 8 to 1. He was able to walk and return to his daily ambulating activities without any support after 5 months postoperatively. The patient was followed up for 12 months (►**Fig. 4**).

Discussion

Rupture of the Achilles' tendon is not uncommon, and after successful repair, wound dehiscence, infection, tendon exposure, and even re-rupture may be observed due to limited the vascularity of this region and thin, insufficient, and less mobile soft tissue.[5] Recurrent tendon rupture, segmental tendon loss, and overlying skin defects can render Achilles' tendon repair a complex surgical challenge. Requirements for tendon reconstruction include a thin layer of skin, a strong tendinous structure, and a reliable blood supply.[6] Conversely, soft tissue should be thick enough to protect the underlying structures and allow for smooth tendon gliding.[7] Reconstruction of the Achilles' tendon and overlying soft tissue requires that multidisciplinary care is successful both aesthetically and functionally; therefore, these surgeries should be done with both reconstructive and trauma surgeons on the team.[8]

Segmental tendon losses may require gastrosoleus turndown flaps and V-Y tendinous flaps.[2–4]

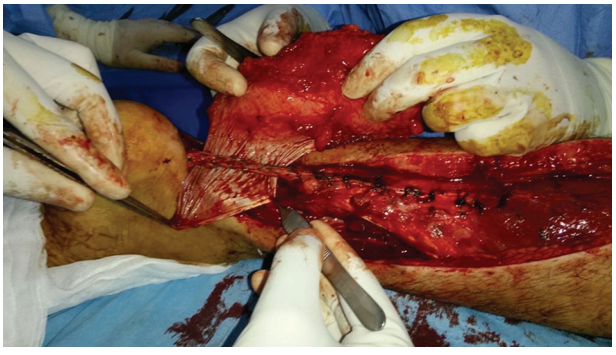

Fig. 2 A newly reconstructed Achilles' tendon with a modified Lindholm's technique.

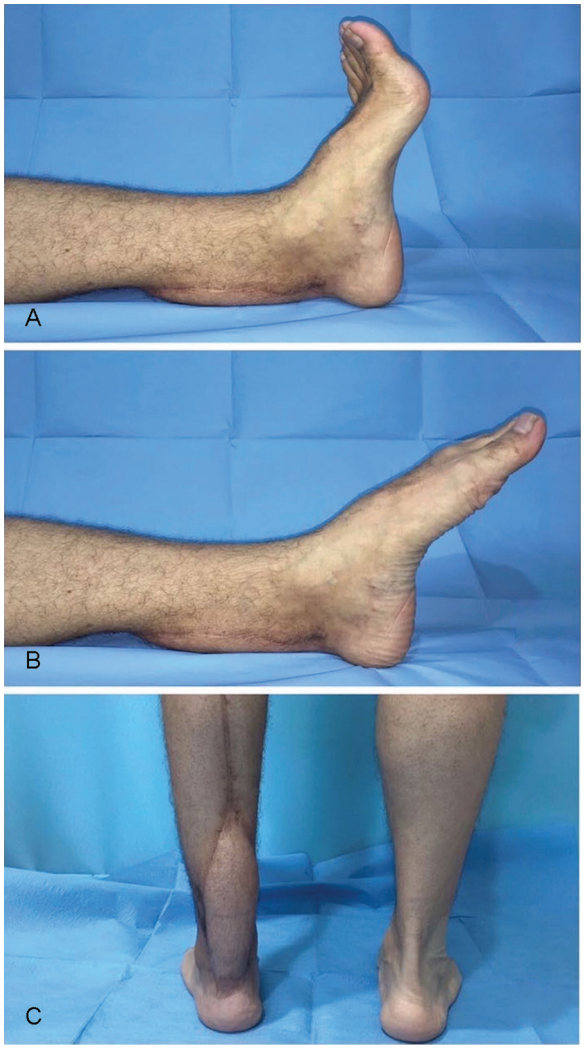

Fig. 4 Postoperative view at 12 months after operation. (**A**) Dorsal flexion; (**B**) plantar flexion; (**C**) standing position.

For a combined defect of the Achilles' tendon and overlying tissue, it is possible to achieve satisfactory results with microvascular tissue transfers, such as ALT or lateral arm flaps.[5–7,9,10]

Lee et al described the ALT flap as the best reconstructive option; this technique combines the simultaneous transfer of vascularized fascia and skin.[9]

Different from previous works,[5,9,10] we reconstructed a new double-layer Achilles' tendon, using a combination of a modified Lindholm's technique and vascularized fascia lata. First, the new tendon was created using the gastrosoleus turn-down flap technique as a modified Lindholm's technique, and the new tendon was inserted into the calcaneus using an anchor suture. A composite ALT free flap was then harvested for skin coverage and for wrapping the new tendon. Vascularized fascia lata was used to wrap the tendon to increase the strength and vascularization of the newly repaired tendon. As the free composite ALT flap is the best reconstructive option, it may also be possible to use this technique with various modifications during Achilles' tendon and overlying soft tissue reconstruction.

In conclusion, we achieved satisfactory results, using this modified technique for tertiary Achilles' tendon repair.

Note

This study was presented as a poster at the 38th Turkish National Plastic Surgery Congress on October 27–30, 2016 in Antalya, Turkey.

Conflict of Interest

None.

References

1 Krmpotic'-Nemanic' J. Anatomija. JUMENA; 1982:242–243
2 Cukelj F, Bandalovic A, Knezevic J, Pavic A, Pivalica B, Bakota B. Treatment of ruptured Achilles tendon: operative or non-operative procedure? Injury 2015;46(Suppl 6):S137–S142
3 Ahmad J, Jones K, Raikin SM. Treatment of chronic Achilles tendon ruptures with large defects. Foot Ankle Spec 2016;9(05):400–408
4 Demirel M, Turhan E, Dereboy F, Yazar T. Augmented repair of acute tendo Achilles ruptures with gastrosoleus turn down flap. Indian J Orthop 2011;45(01):45–52
5 Youn SK, Kim SW, Kim YH, Hwang KT. The composite anterolateral thigh flap for Achilles tendon and soft tissue defect reconstruction with tendon repair by fascia with double or triple folding technique. Microsurgery 2015;35(08):615–621
6 Michel G, Ho Quoc C, Assaf N, Delay E, Sinna R. [Dynamic reconstruction of Achilles tendon by free composite perforator flap with functional assessment] [in French] Ann Chir Plast Esthet 2015;60(01):78–83
7 Houtmeyers P, Opsomer D, Van Landuyt K, Monstrey S. Reconstruction of the Achilles tendon and overlying soft tissue by free composite anterolateral thigh flap with vascularized fascia lata. J Reconstr Microsurg 2012;28(03):205–209
8 Wurzer P, Eberl R, Kamolz LP, Parvizi D, Rappl T, Spendel S. Aesthetically and functionally satisfying reconstruction of an Achilles tendon and overlying skin defect in a 15 year old girl: a case report. Burns 2015;41(02):e1–e3
9 Lee JW, Yu JC, Shieh SJ, Liu C, Pai JJ. Reconstruction of the Achilles tendon and overlying soft tissue using antero-lateral thigh free flap. Br J Plast Surg 2000;53(07):574–577
10 Kuo YR, Kuo MH, Chou WC, Liu YT, Lutz BS, Jeng SF. One-stage reconstruction of soft tissue and Achilles tendon defects using a composite free anterolateral thigh flap with vascularized fascia lata: clinical experience and functional assessment. Ann Plast Surg 2003;50(02):149–155