

# Achilles Tendon Allograft with Bone Block for Achilles Tendon Reconstruction: 8-Year Follow-Up

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## Introduction & Purpose

Achilles tendon ruptures are difficult injuries to treat, especially neglected ruptures or those that have previously been treated and failed. Chronic Achilles tendon ruptures are defined as those with a time period of 4 to 6 weeks between injury and surgical management. (1) Patients with neglected Achilles tendon ruptures may recall a specific injury without prodromal symptoms such as pain or swelling, thus delaying diagnosis. Various surgical reconstruction methods have been introduced depending on the defect gap and the state of the remaining tendon, but a more difficult surgery and a longer recovery time than those for an acute ruptures are the challenges to the surgeon and patient, respectively. (2)

Neglected or misdiagnosed Achilles tendon ruptures are reported to occur 25% of the time and are considered neglected or delayed after 4 weeks without intervention (3). This makes surgical intervention more difficult due to large tendon defects and degeneration within the Achilles tendon. Large Achilles tendon defects have been reportedly repaired surgically with the Fascia Lata (4), Achilles tendon rotational flaps (5), Achilles tendon allografts (5-7), and Allograft-Autograft combinations (8). Tendon allografts have also been reported for use in various other repairs including ACL and patellar tendon repairs (5). Repair of these Achilles tendons are difficult due to the lack of remaining viable tendon and limited techniques available to repair a large defect. The advantage of the allograft bone block is the length of the graft thereby allowing it to reconstruct large defects (Figure 1). The bone block requires fixation to the native calcaneus.

The use of Achilles tendon allograft has shown good results in the reconstruction of anterior cruciate ligament tears, patellar tendon ruptures, and biceps tendon ruptures. (4-7) However, its use in the reconstruction of chronic disease of the Achilles tendon is not well reported. We believe this method allows repair without sacrificing surrounding structures and allows healing in more highly vascularized areas than the “watershed area” in the native tendon, therefore increasing healing potential. The option also preserves the caudal rotation of native Achilles tendons while replacing diseased tendon with new, healthy tendon. This option should be considered only for patients with severe tendinopathy requiring significant removal of diseased tissue leaving a gap over 5 cm. (9) **We describe the long-term outcomes of surgery performed on a patient with allograft Achilles tendon reconstruction with bone block.**

## Patient History

A 52 year old male had previously undergone an Achilles tendon debridement for Achilles tendinosis. Once resolved, he underwent a Flexor Hallucis Longus (FHL) tendon transfer due to the lack of integrity of the remaining Achilles tendon. His plantar flexion strength and range of motion were significantly reduced and painful. An MRI revealed severe degeneration of the remaining Achilles tendon (Figure 2). Intra-operatively, there was extensive scarring and fibrotic tissue from his previous Achilles tendon surgeries (Figure 3). There were degenerative changes to both the Achilles tendon and the transferred FHL tendon. This degeneration extended from the Achilles tendon insertion, to 15 cm proximal to the insertion (Figure 4). The distal 15cm of the Achilles tendon was removed. The Achilles tendon allograft with calcaneal bone block was utilized as described above.



Figure 1.



Figure 2.



Figure 3.



Figure 4.



Figure 5.



Figure 6.



Figure 7.



Figure 8.

## Case Report

### Intervention:

A linear incision is made to the level of the paratenon. The incision continues distally to visualize the posterior aspect of the calcaneus for an osteotomy distal to the insertion of the tendon. All the tendinopathic Achilles tendon is then sharply resected (Figure 5). After debridement, at least some portion of the native tendon should remain at the proximal graft attachment site to allow for adequate strength of suture repair.

The posterior superior aspect of the calcaneus is resected in a distal-posterior to proximal-anterior direction under fluoroscopic guidance. The width can range from 1.2 to 2.5 cm at its insertion (Figure 6). After performing an initial resection, the bone can then be placed on the posterior aspect of the calcaneus and viewed under fluoroscopy to recheck position. After the appropriate contouring, the bone is fixated using 2 to 4.5 mm cannulated screws running perpendicular to the osteotomy site (Figure 7). The foot is then plantarflexed and the proximal Achilles tendon is attached to the remaining proximal portion with an end-to-end repair (Figure 8).

Patients are left in the splint, non-weight-bearing with elevation until the incision is healed, usually 3 weeks. A short-legged cast is then placed as close to neutral as possible and allowed to progress weight bearing as tolerated for the next 3 to 4 weeks. The patient is then placed in a walking boot with commencement of progressive physical therapy at 6 to 8 weeks. Passive range of motion is added as tolerated.

### Patient Progress & Outcome:

The patient had an uneventful immediate post-operative period. At 12-year follow up, the patient’s VAS score is 0/10. He is able to do activities of daily living including playing golf. His ankle, midfoot and hindfoot joints are pain free and intact. The skin is well coapted (Figure 9). MMT demonstrates 5/5 strength to ankle plantarflexion. Range of motion reveals 10 degree of passive and 15 degrees of active dorsiflexion of the ankle (Figure 10). Calf size is equal to the contralateral leg. Radiographic examination reveal intact hardware with incorporation of the allograft (Figure 11). The patient remains ambulatory in a tennis shoe.



Figure 9.



Figure 10.



Figure 11.

## Discussion

Chronic Achilles tendon ruptures with large gaps between the tendon ends can cause significant dysfunction for patients. While accommodative bracing may provide exterior ankle support, it does not allow for a return to full function. Surgical reconstruction offers the potential to restore patients to their full strength and activity level. (10)

Although only a few reports exist on reconstruction using Achilles tendon allograft, all of them demonstrate good results. (5,6,11,12) The introduction of an Achilles tendon allograft is based on the success of anterior cruciate ligament reconstruction of the knee. The advantages of Achilles tendon allograft are that fixation and suture can be done by various methods because the tendon length is sufficiently long and an ideal outcome can be anticipated after final healing because the shape and thickness are the same with those of the original tissue. However, these reports have short-term follow-up.

The flexor hallucis longus tendon is frequently used to augment the ruptured gap for reconstruction of neglected chronic ruptures. The flexor hallucis longus is the plantar flexor and is stronger than the peroneus brevis and flexor digitorum longus. (13) Its axis of contractile force more closely resembles that of the Achilles tendon, and it works in phase with the gastrocnemius-soleus complex. Because it also has the advantage of being transferred without neurovascular interference due to proximity with the Achilles tendon, the transfer can be implemented to fortify muscle strength with other reconstruction techniques. (14)

With more patients seen at longer-term follow-up, we demonstrate that our surgical treatment protocol to achieve Achilles healing is predictable in restoring function and strength, alleviating pain, and providing high rates of satisfaction. On final follow-up, the patient did not experience tendon weakness or rupture. Allograft Achilles tendon may be a viable option for patients with chronic Achilles tendinosis with a large defect.

## References

- Maffulli N, Ajulu A. Management of Chronic Ruptures of the Achilles Tendon. *J Bone Joint Surg.* 2008; 90:1348-60.
- Wagdy J, Luciani JP, Philippe B, Bivert G, Guez C, Hagen B, Bore J. Chronic Achilles tendon rupture reconstruction using a modified flaps of flexor hallucis longus transfer [published online ahead of print August 21, 2009]. *Int Orthop.* 2010; 34(8):1187-1192.
- Inglis AE, Scott W, Scully M, Scully T, P. Ruptures of the tendons of the Achilles: an objective assessment of surgical and non-surgical treatment. *J Bone Joint Surg.* 1976; 58A:990-993.
- Duhamel P, Mathieu L, Brachet M, Compe S, Rigal S, Boy E. Reconstruction of the Achilles Tendon with a Composite Anterolateral Thigh Free Flap with Vascularized Fascia Lata: A Case Report. *J Bone Joint Surg.* 2010;79:2798-803.
- Nelson Z, J, Loder R, G, Verheijen S, J. Reconstruction of an Achilles Tendon Defect Utilizing an Achilles Tendon Allograft. *J Foot Ankle Surg.* 1996;35:144-148.
- Lepow G, M, Green J, B. Reconstruction of a Neglected Achilles Tendon Rupture with an Achilles Tendon Allograft: A Case Report. *J Foot Ankle Surg.* 2006;45:351-355.
- Hansen U, Hone M, Kubok J, Zambrano J, Bore J. Achilles Tendon Reconstruction after Small Freeoscrotaneous Flap Using Achilles Tendon Allograft with Attached Calcaneal Bone Block. *J Foot Ankle Surg.* 2010; 49:86-92.
- Bedi J, C, Swenson E, P, Rankin D, Aebi S. Composite Achilles Reconstruction for Massive Soft Tissue Loss: Allograft, Autograft, and Use of a Temporary Cement Spacer. *J Orthop Trauma.* 2010; 24:e78-e80.
- Konada GT. Classification of tendons Achilles rupture with consideration of surgical repair techniques. *J Foot Surg.* 1990;29:361-365.
- Cetti R, Christensen SE, Ejsend R, Jensen NM, Jorgensen U. Operative versus nonoperative treatment of Achilles tendon rupture: a prospective randomized study and review of the literature. *Am J Sports Med.* 1992;20:371-374.
- Kocabay Y, Niyand J, Hanab A, Cabon D. Reconstruction of neglected Achilles tendon defect with peroneus brevis tendon allograft: a case report. *J Foot Ankle Surg.* 2006; 45(1):42-46.
- Yam JC, Nicholas R. Reconstruction of a total Achilles tendon and soft tissue defect using an Achilles allograft combined with a rectus muscle free flap. *Plast Reconstr Surg.* 2001; 107(7):1807-1811.
- Silver RL, de la Gaca J, Rang M. The myth of muscle balance. A study of relative strengths and excursions of normal muscles about the foot and ankle. *J Bone Joint Surg Br.* 1985; 67(3):432-437.
- Hahn F, Meyer P, Malwald C, Zanetti M, Vienne P. Treatment of chronic Achilles tendinopathy and ruptures with flexor hallucis tendon transfer: clinical outcome and MRI findings. *Foot Ankle Int.* 2008; 29(8):794-802.