



Case Report

Reconstruction with Achilles Tendon Allograft as Salvage for an Infection after a V-Y Advancement Technique: A Case Report

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Citation: Paula SC, Daniel PP, Gemma G, Alberto GC. (2021) Reconstruction with Achilles Tendon Allograft as Salvage for an Infection after a V-Y Advancement Technique: A Case Report. Ann Case Report 6: 700. DOI: 10.29011/2574-7754.100700

Received Date: 31 March, 2021; **Accepted Date:** 26 May, 2021; **Published Date:** 02 June, 2021

Abstract

Introduction: Reconstruction with a V-Y plasty is the first treatment option in most cases of chronic Achilles tendon ruptures with defects of up to 5 cm. However, the options are limited in cases of major defects or postoperative complications like an infection. In those cases, other options such as tendon transpositions or reconstruction with an allograft should be considered. We report on a case of a 57-year-old man with a post-surgical infection after a reconstruction of Achilles tendon for a chronic rupture. The aim of this report is to illustrate the possibility of a rescue surgery using an Achilles tendon allograft in the context of a post-surgical infection.

Case presentation: We present our experience of rescue surgery after a P. aeruginosa post-surgical infection after a V-Y Achilles tendon plasty. A reconstruction with Achilles allograft was performed, followed by 8 weeks of antibiotic treatment. The patient completed a standard rehabilitation program for Achilles tendon ruptures. Thereafter, no local complications or new episodes of infection presented. At 12 months of surgery, the patient started practicing sport and the AOFAS score went from 69 prior to surgery to 90.

Conclusions: There is no consensus as to the treatment after an infection of V-Y plasties. Debridement and later formation of scar/neo-tendon can leave a significant functional limitation. Moreover, infection is not in itself a contraindication for allograft transplantation. In major tendon defects after infection, a reconstruction with Achilles tendon allograft is a rescue procedure that produces optimum results and a good functional recovery.

Keywords: Achilles Infection; Chronic Tendon Rupture; Salvage Surgery; Achilles Allograft; V-Y Plasty Failure

Introduction

An Achilles tendon rupture is the most frequent tendon rupture in the human body and the incidence rate has been on the rise since the 1980's [1]. Almost one quarter of all Achilles tendon ruptures initially go unnoticed [2]. A rupture that is diagnosed after 4-6 weeks is considered chronic [3]. Due to its simplicity, the cost as well as the good results, reconstruction with a V-Y plasty is the first treatment option in most cases of chronic Achilles tendon ruptures with defects of up to 5cm [3]. However, the options are limited in cases of major defects or postoperative complications like an infection. In those cases, other options such as tendon transpositions or reconstruction with an allograft should be considered.

The aim of this report is to present a clinical case of rescue surgery using an Achilles tendon allograft in the context of a post-surgical infection after reconstruction for a chronic rupture.

Case

A 57-year-old patient, non-smoker, active in sports (cycling, hiking), with a history of asthma undergoing long-term corticosteroid treatment was attended to at our hospital in October 2015. The patient reported having difficulty walking, and inability to practice sport or perform monopodal support for 5 years. The physical exam revealed a defect at the distal third of the Achilles tendon as well as positive Thomson and Matles tests. A simple x-ray showed an opaque image at the soft-tissue level. The MRI confirmed a 4cm Achilles tendon rupture (Figure 1). It was determined to be type II in the Myerson classification [3].



Figure 1: MRI showing 4.02cm initial Achilles tendon rupture.

Given the characteristics of the lesion, a V-Y plasty repair was performed. The standard postoperative protocol for the chronic Achilles tendon rupture repair, three weeks of immobilization with a splint in equinus position, was indicated. Subsequently, the splint was replaced with a removable boot with heel wedges, and weightbearing and progressive movement of the ankle was permitted. Progressive wedge removal and increasing ankle range-of-motion were encouraged. After 8 weeks, the boot was removed and proprioception and muscle strengthening activities were initiated. The patient followed our directions properly. However, he was unable complete the protocol as an acute infection arose at the surgical site in the first month after the surgery. It was initially treated with debridement and an empirical antibiotic therapy with amoxicillin + clavulanic acid gr/hrs). Due to the suboptimal evolution, it required a second round of surgical debridement. A defect of 10cm, due to a non-viable plasty and suture, was observed after thorough debridement. Cultures were positive for rifampicin-sensitive *S. aureus* and antibiotic treatment was changed to cloxacillin (2 grams every 6 hours). Subsequently, the patient went on to complete a total of 6 weeks of treatment with levofloxacin and rifampicin. After the second debridement, the patient continued to experience significant functional limitation relative to practicing sports and monopodal support.

Given the context of a young active patient and the need for sports activity for his respiratory pathology, a new intervention was indicated when the soft tissues had completely healed. The surgery was performed by a surgeon, expert in foot and ankle pathology, with extensive experience in the treatment of acute and chronic injuries of the Achilles tendon. Achilles tendon allograft transplantations have been done only for a few cases in our foot and ankle unit as it has specific indications as a salvage surgery.

The procedure was performed using an Achilles tendon allograft with a bony block distal fixation to the calcaneus by means of 2 screws (Figure 2). Prior to implantation, the plasty was immersed in a vancomycin solution as it decreases the infection

rate as stated in previously published studies. Proximal fixation was done in maximum plantar flexion with a modified Krackow suture (Figure 3). The patient completed an additional 6-week period of oral treatment with levofloxacin (750mg/24hrs) and rifampicin (600mg/24hrs). The patient completed a standard rehabilitation program for Achilles tendon ruptures, as described before. Weight-bearing was allowed from the third postoperative week. At 12 months of surgery, the patient started practicing sport without pain, was able to stand tiptoe on one foot (Figure 4), and presented a negative Matles test (Figure 5). The AOFAS score went from 69 prior to surgery to 90 at the first postoperative year. Thereafter, no local complication or new episodes of infection presented until last follow-up at two years postoperatively.



Figure 2: Coverage of the defect with Achilles tendon allograft, once debridement had been done. Distal fixation with calcaneal block and screws, which has shown greater resistance to traction forces.



Figure 3: Proximal fixation using a modified Krackow-type suture at maximum tension and in maximum plantar flexion.

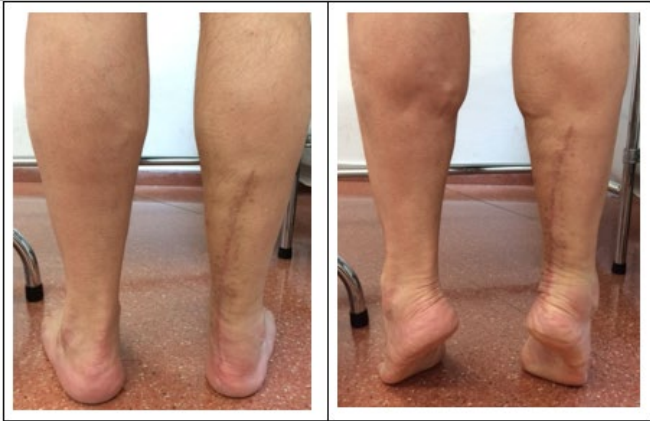


Figure 4: Patient able to stand tiptoe at first postoperative year.



Figure 5: Matles test at first postoperative year.

Discussion

The treatment aim for a chronic Achilles tendon rupture is to repair the defect and restore the length as well as the physiological tension of the tendon-muscle unit at the gastrocnemius-soleus level [3]. For minor chronic ruptures, there are several options depending on the characteristics of the defect. They include end-to-end sutures performed with a plantar tendon, a plasty with a peroneus hemi-tendon and tendon transpositions (peroneus brevis, flexor digitorum longus, flexor hallucis longus), among others [3]. Although the modified Bosworth's technique is also an extended type of plasty in the treatment of defects less than 4cm, the VY plasty appears to be the treatment of choice. Given the 4cm defect presented by the present patient, a VY advancement technique was chosen as the initial treatment.

In case of larger defects, tissue support may be required to cover the defect. It may be synthetic or auto or allografts. The longest series found in the literature corresponds to that of Ofili et al. [4] from 2016 with 14 cases of chronic ruptures (averaging 7cm). They were treated with Achilles tendon allograft with good results. All the patients were able to demonstrate monopodal support at an average of 27+/-11 weeks postoperatively and loading capability at 13.5 weeks. There was only one case with a

complication (7%) in form of delayed consolidation in the distal fixation with the calcaneal block. Although all patients have shown good results using Achilles grafts in chronic defects, literature is scarce regarding their use as rescue after infection. Infection after the reconstruction of the Achilles tendon is a devastating complication. It is a difficult entity to treat due to the superficial location of the tendon as well as to poor tendon vascularity. Infection rates of around 2 to 4% have been reported [5]. Tobacco use, steroid treatment, being female and diabetes have been found to increase the risk of wound complications after an Achilles tendon repair [5]. Based on previous literature, the patient presented steroid therapy as the only risk of wound complication in our case.

As stated by Winters B et al. [6], there is not such an "algorithm" for managing the infection after Achilles tendon repair. It is widely accepted that extensive debridement of the infected and non-viable tissue combined with antibiotic coverage is the most important way forward for the initial management. Cultures should be taken at the time of the debridement and antibiotic administration should be dictated by the result of culture and continued until the inflammatory markers and clinical symptoms normalize. However, some authors have described multiple and heterogeneous options as to how to handle the defect. They range from more conservative options such as debridement with functional rehabilitation alone [7] to local tendon transfer or free flaps. There is no strong evidence in favor of a specific treatment, and the management of this condition is usually left to the discretion of the surgeon and is based on their experience.

According to the literature, one of the most widespread options as rescue after a V-Y plasty infection is to perform only debridement of the wound and let it develop a neo-tendon [8]. In the study by Fourniols et al., only 4 (26.6%) of the 15 patients treated with debridement after infection managed to recover function equal to the contralateral limb and 100% presented amyotrophy of the gastrocnemius-soleus complex. This new disorganized tissue has been shown to have a lower capacity to transfer contractile forces as well as less traction force, supposing a loss of strength and functional limitation in around 74% of patients. Considering the case presented here of a young and active patient, that option was rejected.

The first case published, by Nellas et al., on an Achilles tendon transplant was in 1996. It is also the only case published on the use of transplantation after an infection. In this case, it was an acute rupture treated with end-to-end suturing in which infection with *P.aeruginosa* presented in the third postoperative week. It was treated with ciprofloxacin and surgical debridement and left a defect of 4.5cm. A later transplant was performed at the 5th week. It brought about good results with monopodal tips at the fifth month after surgery and a return to baseline physical and occupational activity [9]. Previously, Achilles allografts have

been used in other pathologies such as cruciate ligament lesions. Based on the observations of these previous studies, the use of this technique was extrapolated for the treatment of chronic Achilles ruptures. The allograft, once transplanted, does not work solely as an “inert” element capable of transmitting traction forces but seems to be used as a scaffold for myofibroblasts. Consequently, bio-mechanical and structural changes are produced at the level of the graft [10,11].

In our case, a decision was taken to carry out transplantation after an episode of infection. On the one hand, previous studies of prosthetic surgery such as those of Zimmerli W., Aboltins C. show that the implant/graft can be used in cases of infection by microorganisms sensitive to antibiotics for the biofilm produced by microorganisms [11,12]. On the other hand, the soaking of plasties in a vancomycin solution prior to implantation has been shown to reduce the risk of graft infection in a clinical trial carried out by Pérez, D. [13] The last aspect to consider when performing Achilles tendon transplantation is the anchorage. In our case, distal fixation with a bone block was chosen to obtain more solid fixation thereby allowing for a more solid restoration from the beginning and faster recovery when compared to distal fixation with suture [14]. Proximal fixation was performed using a modified Krackow-type suture at maximum tension and in maximum plantar flexion, extrapolating the technique used in cases of extensor apparatus transplantation [15].

Tendon reconstruction with V-Y plasty continues to be one of the options in chronic ruptures of less than 4-5cm. However, there is no consensus as to the treatment to be followed when we face rescue after an infection of these plasties. Infection is not in itself a contraindication for allograft transplantation. Debridement and later formation of scar/neo-tendon can leave a significant functional limitation. In major tendon defects after infection, Achilles tendon with calcaneal block fixation is a rescue procedure that produces optimum results and a good functional recovery.

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