



Original Article

Chronic Achilles Tendon Rupture Reconstruction using the Abraham Pankovich Method

Md. Somirul Islam¹, Saikat Ghosh², Raju Prasad Dey³, Khaled Ibne Anowar⁴, Biplab Mozumder⁵,
Awatif Ibne Matin⁶, Md. Didarul Meher⁷

Abstract

Background: Achilles tendon is one of the most commonly ruptured tendons of the lower extremity. The treatment of chronically ruptured Achilles tendon is difficult due to several seasons. The optimal treatment of chronic Achilles tendon rupture is surgical repair with using various techniques. **Objective:** The aim of this study was to investigate the clinical and functional outcomes of chronic Achilles tendon rupture reconstruction via the Abraham Pankovich method. **Methodology:** This was a prospective study of patients with chronic Achilles tendon rupture hospitalized in Department of Orthopaedics and Traumatology, Chittagong Medical College Hospital (CMCH) between January 2018 and May 2019. Patients who were not able to perform a single-limb heel rise were chosen. Ankle functional capacity was assessed using Hooker scale in all patients. The patients were evaluated on the basis of their capability to stand on tip toe on the affected limb and the time required to return to pre-injury daily activities. **Results:** It has been evaluated 10 patients with chronic Achilles tendon rupture. The mean follow-up time was 9 months (range, 6-12 months). The mean time to return to work and daily activity was 3 months. At the last follow-up visit, no patient had any limitation in the activities of daily living and the active and passive ankle range of motion was good. All patients were able to perform single-leg heel rises at the end of follow-up and the Hooker scores were excellent for 7 patients and satisfactory for 3 patients. **Conclusion:** The reconstruction of chronic Achilles tendon ruptures via Abraham Pankovich technique is associated with good clinical and functional outcomes. [Journal of Science Foundation, July 2020;18(2):37-42]

Keywords: Achilles tendon rupture; Chronic rupture; Abraham Pankovich technique

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¹Associate Professor, Department of Orthopedic Surgery, Chittagong Medical College, Chattogram, Bangladesh

²Resident, MS in Orthopedic Surgery, Phase-B Student, Department of Orthopedic Surgery, Chittagong Medical College & Hospital, Chattogram, Bangladesh

³Resident, MS in Orthopedic Surgery, Phase-B Student, Department of Orthopedic Surgery, Chittagong Medical College & Hospital, Chattogram, Bangladesh

⁴Assistant Registrar, Department of Orthopedic Surgery, Chittagong Medical College & Hospital, Chattogram, Bangladesh

⁵Resident, MS in Orthopedic Surgery, Phase-B Student, Department of Orthopedic Surgery, Chattogram Medical College & Hospital, Chattogram, Bangladesh

⁶Resident, D-Ortho Post-Graduate Student, Department of Orthopedic Surgery, Chittagong Medical College & Hospital, Chattogram, Bangladesh

⁷Resident, D-Ortho Post-Graduate Student, Department of Orthopedic Surgery, Chittagong Medical College & Hospital, Chattogram, Bangladesh

Correspondence: Dr. Md. Somirul Islam, Associate Professor, Department of Orthopedic Surgery, Chittagong Medical College, Chattogram, Bangladesh; **Email:** somirul10@yahoo.com; **Cell No.:** +8801711155895

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Introduction

The Achilles Tendon (TA) is one of the most commonly ruptured tendons of the lower extremity (Movin et al., 2005; Maffulli and Ajis, 2008; Flint et al., 2014). About 20.0% of all TA ruptures are initially misdiagnosed, and these make up about 40% of all surgically repaired TA. TA ruptures may be misdiagnosed because patients maintains plantar flexion with the deep flexor muscles, or by fibrous ingrowth and the gap defect fills with fibrous tissue. Chronic TA ruptures are defined as those of >4 weeks duration without treatment (Carden et al., 1987; Mendicino and Reed, 1996; Maffulli, 1996; Pintore et al., 2001).

The diagnosis of chronic Achilles tendon rupture is more difficult than in acute ruptures. A tendon gap, which is usually palpable in acute rupture, may be absent because of a scar tissue bridge. Active plantar flexion of the foot is usually preserved because of the action of tibialis posterior, the peroneal tendons, and the long toe flexors tendons. Calf muscle weakness, Achilles tendon elongation and a limp can be observed. Specific clinical test can be used to evaluate the Achilles tendon. The calf squeeze test also known as the Simmonds (in the British Isles) or the Thompson's (in North America) test, is performed with the patient prone and the ankle clear of the edge of the examination table. The affected leg should be compared with the contralateral healthy leg. The examiner squeezes the fleshy part of the calf, causing the deformation of the soleus and resulting in plantar flexion of the foot if the Achilles tendon is intact.

The knee flexion test is performed with the patient prone. The patient is asked to actively flex the knee to 90°. During this movement, the foot on the affected side falls into neutral or dorsiflexion, and a rupture of the Achilles tendon can be diagnosed. A false positive test may occur when there is neurologic weakness of the Achilles tendon. Imaging is useful for the diagnosis of Achilles tendon chronic ruptures. Plain lateral radiographs may reveal an irregular configuration of the fat-filled triangle of Kager. Ultrasonography usually shows an acoustic vacuum with thick irregular edges. T1-weighted MRI shows disruption of signal within the tendon substance, whereas T2-weighted images show generalized high signal intensity. However, clinical examination is the gold standard (Wapner et al., 1993; Young et al., 2005). The symptoms of chronic Achilles tendon rupture include pain, decreased strength, fatigue, and ankle stiffness. During physical examination, a palpable gap between the rupture ends can be observed. Chronic Achilles tendon rupture often occurs 2 to 6 cm proximal to the stumps, but it sometimes can also be observed at the stumps (Peterson et al., 2014). Usually, small gaps (less than or equal to 2mm) of chronic Achilles tendon rupture can be directly closed in an end-to-end manner. However, there is still no standard treatment for chronic Achilles tendon rupture with large gaps (Ahmad et al., 2016).

It is difficult to treat a chronically ruptured Achilles tendon because there usually is a gap between the ends of the tendon, scarring, retraction of calf muscles and loss of contractility of the triceps surae (Sarzaem et al., 2012). These problems make the treatment of chronic Achilles tendon ruptures different from that of acute ruptures. The optimal treatment of chronic Achilles tendon rupture is surgical repair and various techniques have been described. Operative techniques to repair chronic Achilles ruptures include primary repair and augmentation with fascia advancement, tendon transfer, free tissue transfer, synthetic grafts or allografts (Park and Sung, 2018; Lapidus et al., 2012). We investigated the clinical and functional outcomes of chronic Achilles tendon rupture reconstruction via the Abraham Pankovich Method.

Methodology

We retrospectively analyzed 10 patients (8 males, 2 females; 6 right, 4 left; mean age, 35.2 years; range, 22 - 42 years) who underwent Abraham Pankovich technique for chronic Achilles tendon rupture repair during the period between January 2018 and May 2019. Inclusive criteria were as follows: firstly, there is history of trauma at Achilles tendon; secondly, the interval from rupture to surgery was more than 4 weeks; thirdly, patients were not able to perform a single-limb heel rise; Exclusion criteria were as follows: firstly, open Achilles tendon rupture; secondly, the history of local infection near the Achilles tendon rupture; thirdly, concomitant diseases with fracture, blood vessels rupture, or nerve rupture; fourthly, the patients who could not accept regular follow-up. The main preoperative physical signs included the following: firstly, there is localized tenderness; secondly, when the patient lied prone with the knee bent at 90°, the static position of ankle dorsiflexion was different between the normal and injury ankles; thirdly, with further squeezing the

calf on both sides, passive plantar flexion should be present on the healthy side but absent on the injured side and matles test fourthly, patients were not able to perform a single-limb heel rise with the injured lower extremity. X-ray test was the routine before operation and it could rule out the chance of fracture. In 3 cases, acute Achilles tendon rupture had been neglected after the first injury. The other 7 cases with correct first-time diagnosis had Achilles tendon rupture after failure of conservative treatment. Of all the involved patients 4 cases had left Achilles tendon rupture and the other 6 cases had right Achilles tendon rupture.

Surgical Technique: With the patient prone and under tourniquet control, a lazy “S” incision was made from the lateral aspect of the Achilles tendon insertion to the midpart of the calf (Figure IA)

- The sural nerve was identified and retracted.
- The deep fascia was incised in line with the skin incision.
- The scar tissue from the tendon ends was resected.
- The length of the tendon defect was measured with the knee in 30 degrees of flexion and the ankle in 20 degrees of plantar flexion.
- An inverted-V incision was made through the aponeurosis with the apex over its central part. The arms of the incision were made at least one and a half times longer than the tendon defect to allow approximation in a Y configuration (Fig. 1B).
- The flap was pulled distally and approximate the ends of the ruptured tendon with interrupted nonabsorbable sutures.
- The proximal part of the incision was closed in a Y configuration (Fig. 1C).
- The peritenon was sutured with interrupted nonabsorbable sutures.
- The deep fascia and subcutaneous tissue were closed in a routine manner and a long leg cast was applied with the knee in 30 degrees of flexion and the ankle in 20 degrees of plantar flexion.

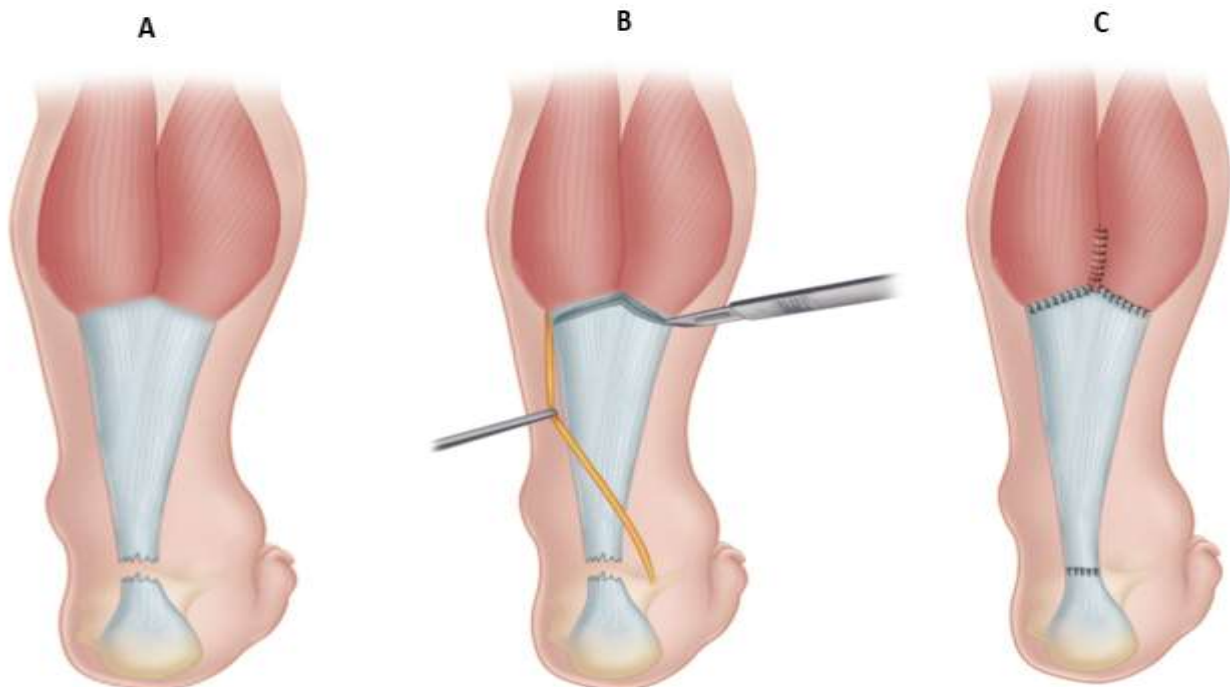


Figure I: V-Y repair of neglected rupture of Achilles tendon. A: Incision, B: Design of V flap, C: Y repair and end-to-end anastomosis

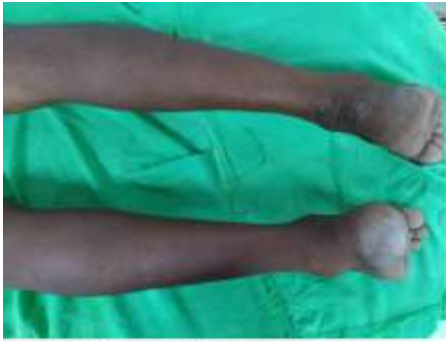


Fig. 2: Pre-operative state of patient



Fig. 3: Maties test



Fig. 4: Marking incision landmark



Fig. 5: Exposing tendon



Fig. 6: Tendon repair done



Fig. 7: Healed wound

Postoperative Treatment: The post-operative protocol we followed was:

1. Wound dressing was refreshed through a window over the cast 2 days after surgery.
2. Two weeks after surgery, the sutures were removed.
3. At 6 to 8 weeks, the long leg cast is removed, a short leg cast is applied and worn for 1 month, and weight bearing is allowed.
4. After cast removal, a 3- to 5-cm heel lift is used for 1 month and progressive stretching exercises are begun immediately.

Results

All patients were followed up. One patient had superficial incision infection, which was healed after debridement, dressing change, and oral antibiotics. All patients were able to perform a single-limb heel rise and had returned to their preinjury level of activity. The clinical and functional outcomes of the patients are presented in Table 2. The mean follow-up was 6 months (range, 5-8 months), the mean interval between injury and surgical reconstruction was 42 days (range, 30 - 60 days) and the mean ruptured gap was 4 cm (range, 3 - 6 cm). The mean time for patients to return to daily activity was 3.2 months (range, 2 - 5 months). No patient had any limitation in the activities of daily living. The active and passive ankle range of motion was good. No patient could perform affected-side heel rise preoperatively, but all patients were able to do so at the end of follow-up. The Hooker scores were excellent for 7 patients and satisfactory for 3 patients. All tendons healed without complications. No infections, nerve injuries, or re-ruptures occurred inter- or postoperatively.

Table 1: The Hooker Assessment Scale

Excellent	Satisfactory	Poor
None of patients had symptoms	Patients were free from symptoms but there was weakness of the calf detected or excessive passive dorsiflexion of the ankle.	In addition to the findings of satisfactory, the patients experienced symptoms either of weakness of the ankle or foot or of a limp or pain.

Table 2: Clinical Outcomes of Patients

Patients	Returned to pre-injury daily activities (months)	Stand on tiptoe	Plantar Flexion (°)	Dorsiflexion (°)	Satisfaction (Hooker classification)
1	2	Normal	30	15	Excellent
2	3	Normal	40	20	Satisfactory
3	4	Normal	28	15	Excellent
4	3	Normal	35	15	Excellent
5	5	Normal	32	20	Excellent
6	3.5	Normal	30	15	Excellent
7	2	Normal	45	20	Satisfactory
8	2	Normal	30	20	Excellent
9	4	Normal	35	15	Satisfactory
10	3	Normal	32	20	Excellent

Discussion

The treatment of chronic Achilles tendon rupture is a challenge for most orthopedic surgeons (Park and Sung, 2012). It is different from the acute Achilles tendon rupture in pathophysiology. Chronic Achilles tendon ruptures with large gaps may lead to ankle dysfunction (Movin et al., 2005; Maffulli and Ajis, 2008; Flint et al., 2014). If the gap of rupture is bridged by scar tissue, ankle weakness and gait disturbances may occur due to severely infiltrated fat composition. After Achilles tendon rupture occurred, the strength of plantar flexion is reduced (Mendicino and Reed, 1996), and the patients are not able to perform a single-limb heel rise with the injured lower extremity. The sign is the vital indication for reconstruction surgery. In the current study, the Thompson test was used to diagnose the Achilles tendon rupture. When the patient lied prone with the knee bent at 90°, Thompson test could get higher positive rate than the knee being straight. Surgical reconstruction could restore full strength of the Achilles tendon and thus improve the activity level of patients (Morrow et al., 2014). However, the reconstruction and augmentation of chronic Achilles tendon rupture are complex, and they might affect the choice of procedures.

Many surgical procedures have been described for reconstruction of the chronic Achilles tendon rupture, each with some advantages and disadvantages (Maffulli and Ajis, 2008). In addition, despite many repair techniques having been described, there is no evidence-based guideline for deciding on the type of operative management for neglected Achilles ruptures (Hadi et al., 2013).

In our study, at a midterm follow-up (mean, 6 months), re- construction of the chronic Achilles tendon ruptures via the Abraham Pankovich method provided tendon healing and good clinical and functional outcomes. All of our patients had returned to their pre-injury daily activity level in 3 months. There was no functional deficit and the results were satisfactory in all patients.

Reconstruction of the chronically ruptured Achilles tendon may have some complications (Pintore et al., 2001), such as adhesions, wound breakdown and infection (Maffulli, 1996). Tendon adhesions are encountered more frequently in patients who had conservative treatment than in those who underwent reconstructive surgery, and a 2.6 to 45% complication rate has been reported (Carden et al., 1987). In our study, we did not encounter any major complication (deep vein thrombosis, re-rupture and deep infections) or minor complication (hematoma and superficial wound infection).

Our study was limited by the small patient population because chronic Achilles tendon rupture is rare. In addition, we did not evaluate the strength of the plantar flexion of the affected foot compared to the normal side. Another limitation of our study is that surgical procedures were performed by multiple surgeons. Also, we did not have isokinetic strength analysis of the patients.

Conclusion

In conclusion, based on the findings of the current study we recommend reconstruction of the chronic Achilles tendon ruptures via the Abraham Pankovich technique which is associated with good clinical and functional outcomes.

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