

## ORIGINAL RESEARCH

# Repair Of Chronic Achilles Tendon Rupture Using Krackow Suture Technique

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**Abstract:**

**Background and Objectives:** Achilles Tendon Ruptures are common tendon injuries that occur due to sudden dorsiflexion of a plantar flexed foot, most commonly associated with sporting events. Diagnosis can be made clinically with weakness of plantar flexion with a positive Thompson's test. MRI studies may be indicated for surgical management of chronic injuries. Treatment may be nonoperative or operative depending on patient age, patient activity demands and chronicity of injury. A large number of ruptures of the Achilles tendon occurs in the watershed hypo-vascular region of the tendon which is approximately 2–6 cm proximal to the insertion of tendon at calcaneum. Chronic Achilles tendon rupture in the watershed area makes end to end repair of tendon less feasible and the neglected distal stump is often inapt for repair. A number of surgical techniques have been described for repair of chronic Achilles tendon. Our study was conducted with the objective of determining the efficacy and functional outcome of Krackow technique.

**Keywords:** Achilles Tendon, Thompson's test, Krackow technique, Chronic Achilles tendon rupture

**Etiology**

**Mechanism:** Usually, traumatic injury during a sporting event may occur with sudden forced plantar flexion violent dorsiflexion in a plantar flexed foot.

**Patho anatomy:** rupture usually occurs 4-6 cm above the calcaneal insertion in hypovascular region.

**ANATOMY:** Achilles tendon largest tendon in body formed by the confluence of soleus muscle tendon medial and lateral gastrocnemius tendons, blood supply from posterior tibial artery.

**Physical exam**

**Inspection:** increased resting ankle dorsiflexion in prone position with knees bent, calf atrophy may be apparent in chronic cases.

**Palpation:** palpable gap

**Motion:** weakness to ankle plantar flexion, increased passive dorsiflexion.

**Provocative test:** Thompson test

lack of plantar flexion when calf is squeezed.

**IMAGING:** Radiographs

**Indications:** used to rule out other pathology

**Ultrasound:**

**Indications:** may be useful to determine complete vs. partial ruptures

**MRI**

**Indications:** equivocal physical exam findings

**chronic ruptures**

**Findings:** will show acute rupture with retracted tendon edges

**Materials and Methods:**

**Patients:** The study was conducted in the Department of Orthopaedics, Shadan Institute of Medical Sciences and Research Centre. A total of five patients (three male, two female) were included in the study and informed and written consents were taken. Patients were followed up for a period of 1 year. All the patients had a positive Thompson's test (plantar flexion of foot could not be elicited on squeezing the calf). All the patients underwent an USG to document the tear.

The study was conducted in a total of five patients with chronic tear of Achilles tendon and the Krackow technique was used for repair in all the patients. All the patients were followed up for a period of 1 year.

**Results:** Four out of the five patients showed excellent functional outcome at the end of 1 year follow up. A good functional outcome was seen in one of the patients. All the patients were able to resume work 6 months postoperatively.

**Conclusion:** The Krackow technique is an excellent surgical procedure for repair of chronic Achilles tendon rupture in the watershed zone of the tendon. Surgical repair using this technique associated with an early return to protected full weight-bearing ambulation and an active early rehabilitation programme provides not only excellent functional results, patient

satisfaction and a zero-re-rupture rate, but also much less morbidity in the first 3 months and a quicker overall recovery compared with non-operative treatment.

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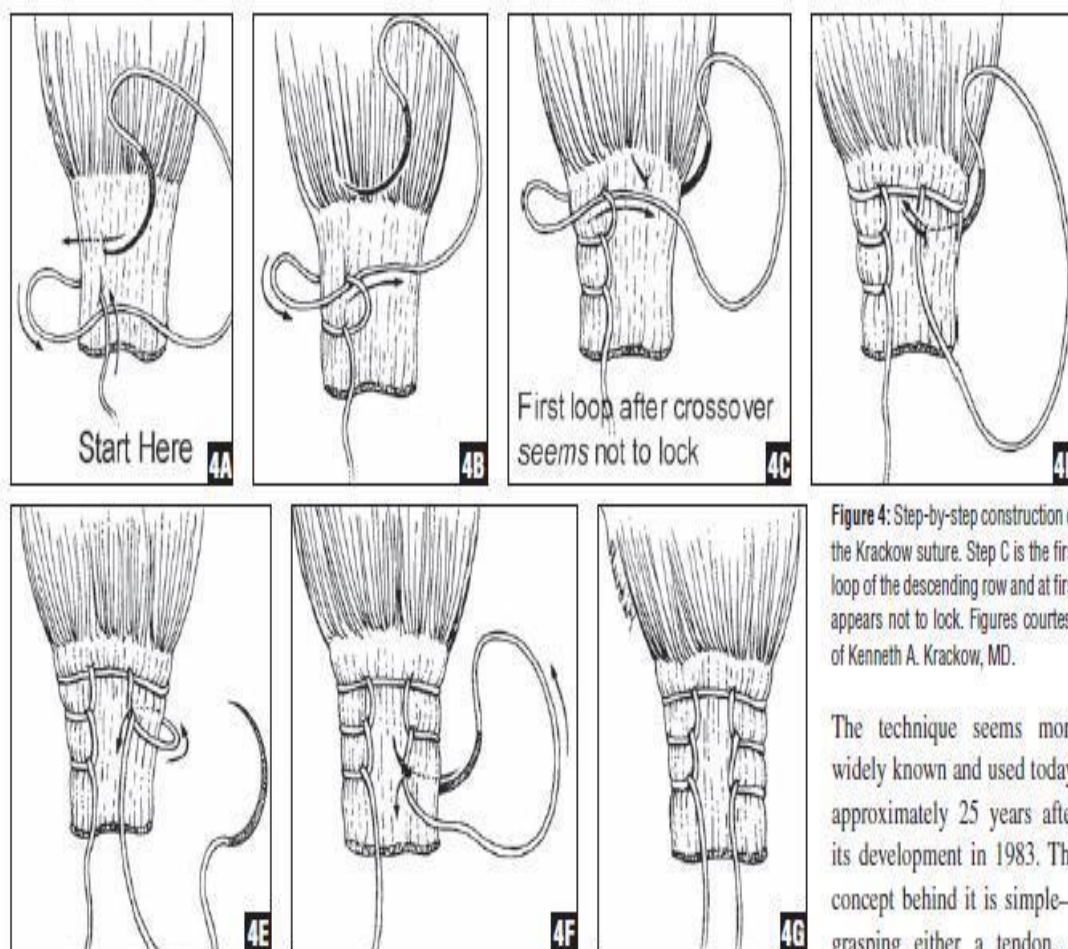
### Introduction

The Achilles tendon despite being the strongest and largest tendon in the human body is most frequently ruptured. The cases of rupture of Achilles tendon have seen a substantial rise in yesteryears with approximately 75% of the ruptures associated with recreational and sporting activities. Ruptures though commonly seen in middle aged men (30–50 years) can also occur in the elderly with underlying tendinopathies. The zone II of Achilles tendon (2–6 cm from the calcaneal insertion) which is also the watershed area of the tendon is often involved in ruptures. Acute rupture of the tendon is easily diagnosed clinically although a considerable number of cases are neglected and tend to become chronic. Histological studies have shown that the earliest evidence of chronic healing of tendon is demonstrated at 4 weeks and as such chronic rupture is defined by most authors as rupture of the Achilles tendon that is diagnosed 4–6 weeks after injury. A palpable gap between the tendon ends is elicited during physical examination with the patient

complaining of pain, ankle stiffness, inability to raise the heel or climb stairs, decreased plantar flexion strength and fatigue. Chronic rupture of Achilles tendon in zone II poses a wide variety of problems as often the neglected distal stump is not suitable for surgical repair. Also, the wide separation of tendon ends make end to end anastomosis less feasible. Various surgical techniques for repair of the zone II ruptures using tendon transfer, auto graft or synthetic ligament have been described. A number of grafts such as one or more Achilles tendon strips, the fascia lata, local tendon strips such as that of peroneus brevis (PB) or flexor hallucis longus (FHL) have been utilized in some surgical procedures. Synthetic materials such as dacron polyester, polyglycol threads, carbon fiber composites have been used as scaffolding for the repair process. The prime objective of our study is to determine the efficacy of Krackow's procedure in chronic Achilles tendon tear.

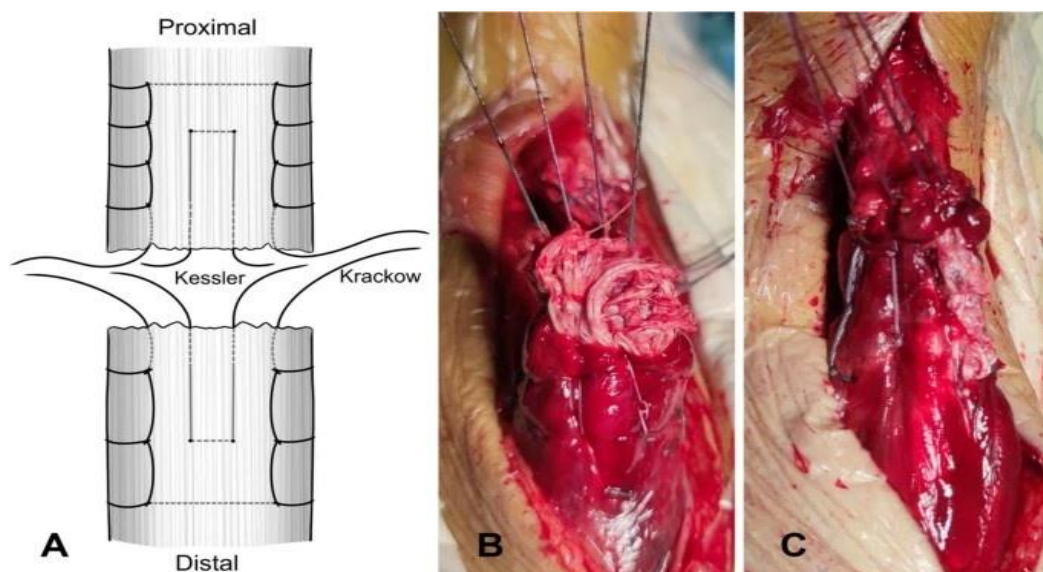
1. **Inclusion criteria:** chronic rupture of Achilles tendon.

2. **Exclusion criteria:** compound injuries

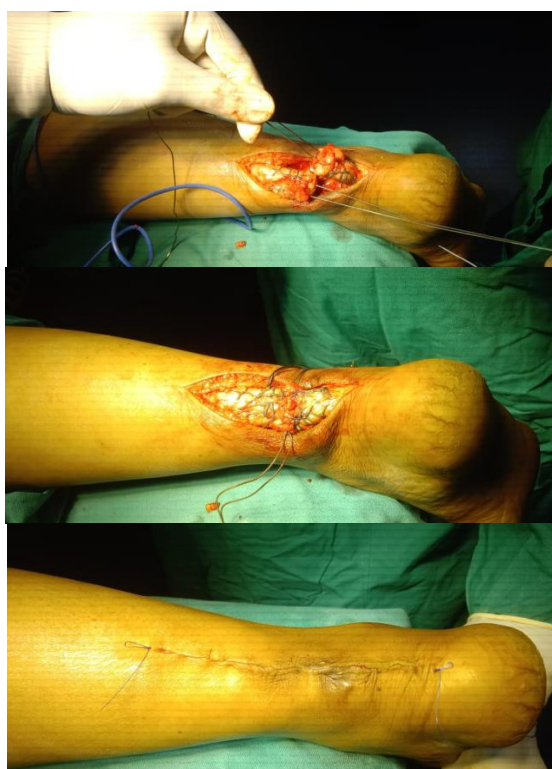


**Figure 4:** Step-by-step construction of the Krackow suture. Step C is the first loop of the descending row and at first appears not to lock. Figures courtesy of Kenneth A. Krackow, MD.

The technique seems more widely known and used today, approximately 25 years after its development in 1983. The concept behind it is simple—grasping either a tendon, a



General or spinal anesthesia was given to the patient followed by prone positioning. Pneumatic tourniquet was applied on the thigh of the operated site. A posterior longitudinal midline incision was given which extended from calcaneal tuberosity to proximal one third of leg and the ruptured tendon was exposed subsequently. This was followed by excision of scar tissue at the end of tendons. Surgery included end-to-end repair with the Krackow technique (locking-loop 4A - 4G). All the patients received a standardized progressive postoperative rehabilitation program. 4). The wound was closed (Figure 5) and a long knee cast was applied with knee in flexion and ankle in plantarflexion.



## Results

Five Patients (three male; two female) were included in the study. All the patients had chronic rupture of Achilles tendon and were operated by Krackow's technique described above. Out of the five patients, three had rupture of Achilles tendon of left side and two had rupture of the tendon of right side. All the

patients were followed up for a period of 1 year. The functional outcome at 6 months and 1 year follow up assessed as well as preoperative and postoperative range of ankle motion is documented. Four out of the five patients had excellent outcome; one had good outcome at the end of 1 year. All the patients resumed work at the end of 6 months postoperatively and all

had normal walking and stair climbing. There was a significant improvement in ankle range of motion post-operatively. Only one patient complained of moderate ankle stiffness at the end of 1 year. Complications in our series included superficial infection seen in one of the cases that was controlled

with injectable antibiotics and regular dressings. No case of re-rupture was reported in our study.

Ankle active plantar flexion and dorsiflexion.

- 1.Preoperative active ankle plantar flexion
- 2.Postoperative active ankle plantar flexion at 1 year
- 3.Dorsiflexion at 1 year follow up

Case Number	1	2	3
Case 1	15 degrees	35 degrees	25 degrees
Case 2	22 degrees	40 degrees	30 degrees
Case 3	20 degrees	45 degrees	30 degrees
Case 4	15 degrees	30 degrees	25 degrees
Case 5	20 degrees	30 degrees	30 degrees

## Discussion

The rupture of Achilles tendon is on the rise and can be attributed to increased sports participation in the recent decades. In 2002, Schepesis et al. observed that the rupture of Achilles tendon is observed in the fourth to fifth decades of life with male to female ratio ranging from 2:1 to 12:1. Activities such as running, sprinting, jumping and agility exercises are the usual mechanism leading to rupture. In our study, all the five cases of rupture had history of ankle trauma which is consistent with the study conducted by Suchak AA et al. in 2005 Ahmed et al. in 2017. Other factors such as chronic degenerative changes in the ankle may also predispose to ruptures. In a study conducted by Maffulli et al. in 1998 and White et al. in 2007, two drugs namely corticosteroids and fluoroquinolones were implicated in delayed healing and necrosis at the site of tendon. 11,20 As high as 25% of cases of Achilles tendon ruptures can be missed on initial presentation owing to lack of pain and an intact active plantar flexion attributable to partial ruptures, recruitment of plantar flexors, and an intact plantaris muscle. 21

A delayed repair or reconstruction is indicated if the posterior heel pain and the functional impairment is disabling. A multitude of Achilles tendon repair options have been described in literature that is mainly guided by the size of defect. Percutaneous suture methods, Bunnell and modified Kessler techniques can be utilized if the defect is not major. 22 In case of a major gap between the ends of the tendons ruptured, bridging of the gap either by tissue or synthetic material is warranted. For this, Lindholm technique and V-Y repair are popularly done. 13,14,23 For a gap of less than 6 cm, peroneus brevis tendon graft is indicated but if the gap is more than 6 cm a semitendinosus transfer is recommended. Classically, V-Y plasty is appropriate for a loss of 3–5 cm loss.

Our study utilized the Krackow's technique for repair of neglected Achilles tendon tear and achieved good functional outcomes as 4/5 had excellent results and 1 patient had good functional outcome. Results are in cohesion with studies conducted by Ahmed et al., 18 Agarwal et al. No dreaded postoperative complication were seen in our study although a number of studies have reported variable rates of infection, wound

dehiscence. As it involves flap turn-down, there is a potential issue of subcutaneous volume effect in the turn-down area that can lead to cutaneous traction in the area causing hindrance in closure of incision. Our study did not utilize any tendon grafts and thereby no tendon function was compromised. In his study on repair of Achilles tendon rupture using flexor hallucis longus tendon graft on eight patients, Wapner et al. observed that the tendon was very thin in diameter and as such inadequate. Likewise tendon transfers using peroneus brevis and flexor digitorum longus poses concerns of loss of eversion strength and weakened flexion of toes respectively.

## Conclusion

Our results showed that the Krackow technique and a rehabilitation protocol aiming early motion enabled physiological tendon healing.

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