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# Spontaneous Achilles Tendon Rupture During Farm Work Repaired by Partially Threaded Malleolar Screw and Plantaris Autograft in a Limited-Resource Hospital: A Rare Case Report

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## ABSTRACT

**Introduction:** Achilles tendon rupture is a common musculoskeletal injury, most frequently affecting athletes and typically occurring at the mid-substance of the tendon. Insertional avulsion rupture is rare, particularly in non-athletic populations, and its management may be challenging in limited-resource settings.

**Case Presentation:** A 55-year-old male farmer presented with sudden onset of severe left ankle pain following forced dorsiflexion while working in a rice field. Clinical examination revealed a positive Thompson test. Intraoperative findings confirmed an insertional avulsion rupture of the Achilles tendon with degenerative changes. Due to limited availability of standard

fixation devices, surgical repair was performed using a partially threaded malleolar screw with washer for tendon-to-bone fixation, augmented with an autologous plantaris tendon graft. At three months of follow-up, the patient was able to ambulate with minimal assistance, reported no pain, and demonstrated restoration of tendon continuity with a negative Thompson test.

**Conclusion:** This case illustrates a rare presentation of insertional Achilles tendon rupture in a non-athletic occupational setting. The use of a partially threaded malleolar screw combined with plantaris tendon autograft may represent a practical and effective alternative for Achilles tendon reconstruction in healthcare facilities with limited resources.

**Keywords:** Achilles tendon rupture; insertional avulsion; plantaris tendon graft; malleolar screw; limited-resource setting

## INTRODUCTION

The Achilles tendon is recognized as the strongest and largest tendon in the human musculoskeletal system. An Achilles tendon rupture refers to a structural disruption of the tendon fibers caused by acute or chronic injury, which subsequently results in reduced ankle stability and impaired postural balance. This injury most frequently involves the proximal or distal third of the tendon. Epidemiological studies have reported an incidence of Achilles tendon rupture of up to 40 cases per 100,000 individuals. Clinical reports indicate that this condition predominantly affects individuals aged between 40 and 50 years and is commonly encountered among athletes. Several risk factors have been identified, including prolonged or repetitive physical activity, obesity, increasing age, exposure to corticosteroids or fluoroquinolone antibiotics, and suboptimal running biomechanics, all of which may contribute to an increased risk of Achilles tendon rupture.[1] The Achilles tendon constitutes the largest tendon in the human body. Rupture of the Achilles tendon is defined as a structural interruption of the tendon fibers caused by either acute or chronic injury, resulting in compromised ankle stability and impaired balance control. This condition most commonly affects the proximal or distal third of the tendon. Epidemiological data indicate that the incidence of Achilles tendon rupture may reach up to 40 cases per 100,000 individuals. Clinical observations demonstrate that Achilles tendon injuries predominantly occur in individuals aged 40–50 years and are frequently encountered among athletic populations. Prolonged physical activity, obesity, advancing age, exposure to corticosteroids or fluoroquinolone antibiotics, and suboptimal running biomechanics have been identified as significant risk factors that increase susceptibility to Achilles tendon rupture.[2,3] Balance and proprioceptive impairments also occur as a consequence of the loss of tendon proprioceptor function, leading to decreased postural control and an increased risk of falls.[2,4]

The primary cause of Achilles tendon rupture is a sudden dorsiflexion movement of the foot while it is in a plantar flexed position. This mechanism commonly occurs in athletes, particularly runners and long jump athletes, during sudden stopping or abrupt changes in direction.[1]

Furthermore, the occurrence of Achilles tendon rupture can be associated with multiple contributing factors, including exposure to medications such as corticosteroids and fluoroquinolone antibiotics, pre-existing tendinopathy, diabetes mellitus, and chronic renal disease.[4]

Based on anatomical location, Achilles tendon rupture can be classified into three categories, namely mid substance rupture, musculotendinous junction rupture, and insertional rupture at the calcaneal insertion. Mid-substance rupture represents the most frequent pattern of Achilles tendon injury and typically involves the central segment of the tendon, located approximately 2–8 cm proximal to its calcaneal insertion. In contrast, rupture at the musculotendinous junction is an uncommon presentation, occurring at the interface between the gastrocnemius–soleus muscle complex and the Achilles tendon, and is most often precipitated by an acute stretching mechanism. Insertional rupture is the least common type and occurs at the site of tendon insertion into the calcaneus, and is usually associated with chronic degenerative processes or tendinopathy in elderly individuals.[5,6] Fundamentally, Achilles tendon rupture occurs due to tendon discontinuity resulting from a sudden dorsiflexion movement. This mechanism is frequently observed in athletes, with an incidence of 81,9% among reported cases.[7] This condition occurs as a result of rapid mobilization that leads to tendon failure. Achilles tendon rupture is not limited to athletes, but may also occur in farmers who perform heavy physical activities such as lifting loads, walking on uneven terrain, or jumping from agricultural equipment, as observed in this case. The injury mechanism involves sudden dorsiflexion of the foot while in plantar flexion, combined with risk factors such as advanced age and chronic tendinopathy.[7,8] The tendon rupture was identified at its insertion into the calcaneus, which reinforces our assumption that the injury was precipitated by sudden dorsiflexion accompanied by degenerative alterations of the distal Achilles tendon. In general, grafting procedures for Achilles tendon rupture commonly use synthetic grafts to restore tendon continuity. However, in this case, due to limitations in the availability of synthetic grafts, the decision was made to perform reconstruction using an autologous plantaris tendon graft harvested from the patient and fixation with a partially threaded malleolar screw.

## CASE PRESENTATION

A 55 year old man Tn J presented to the emergency department with a chief complaint of pain in the left ankle. The pain was experienced two hours prior to hospital admission. The onset of pain was sudden, with a reported visual analog scale score of 8 out of 10. Prior to symptom onset, the patient had been working in a rice field and stepped into muddy ground. Subsequently, while attempting to lift his foot from the mud, he experienced a sudden onset of severe pain in the left ankle. Concurrent with the pain, the patient reported hearing a popping sound in the left ankle. The patient was unable to move his foot. Clinical examination using the Thompson test on the left ankle revealed a positive result. This was the first occurrence of such symptoms, and the patient had no history of similar conditions. There was no family history of comparable traumatic events. The patient was subsequently scheduled for Achilles tendon repair using a plantaris tendon graft and implantation of a partially threaded malleolar screw with washer.

During the operation, trimming of the ruptured tendon ends was performed to achieve a clean margin (Figure 1). This was followed by drilling through the tendon (Figure 2) to allow placement of a partially threaded malleolar screw with washer (Figure 3). Subsequently, the proximal calcaneus is drilled (Figure 4) and the previous attached screw on the Achilles tendon was inserted into the bone (Figure 5). Ruptured achilles tendon then sutured and a plantaris tendon graft was harvested to reinforce the achilles tendon (Figure 6). The plantaris graft was rotated around sutured achilles tendon (Figure 7), distal end of plantaris tendon was widened and sutured directly over the ruptured achilles tendon (figure 8).

At the three month follow up, the patient was able to walk and reported no pain. However, the patient was still advised to use a single walking stick, and the Thompson test result was negative.

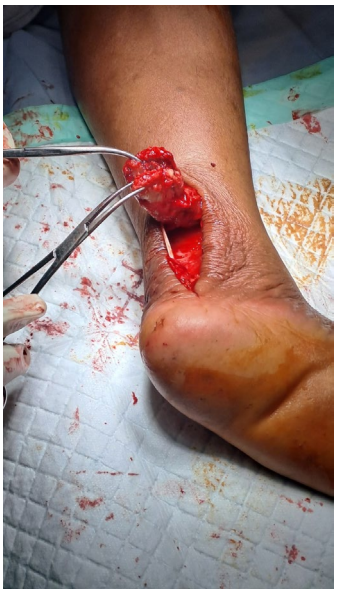

Image 1: Achilles Tendon

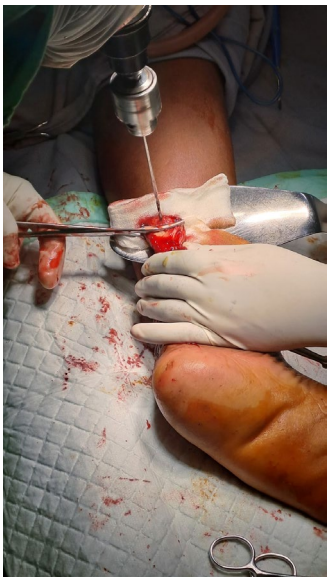

Image 2: Drilling into the Achilles Tendon

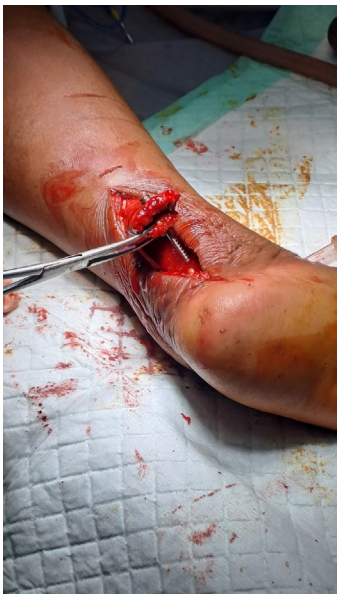

Image 3: Insertion of a Screw into the Achilles Tendon

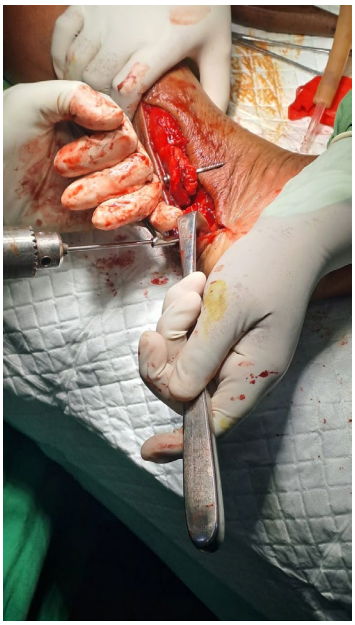

Image 4: Drilling into the Calcaneus Bone

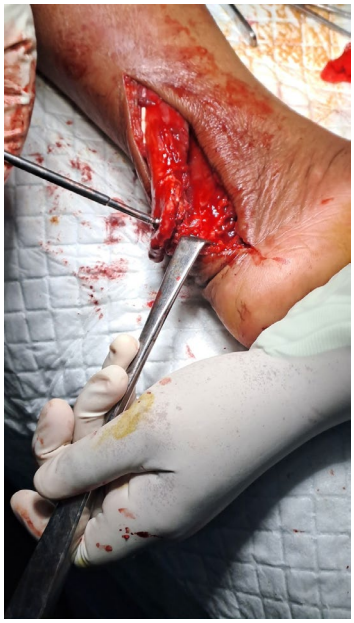

Image 5: Screw Fixation into Calcaneus Bone

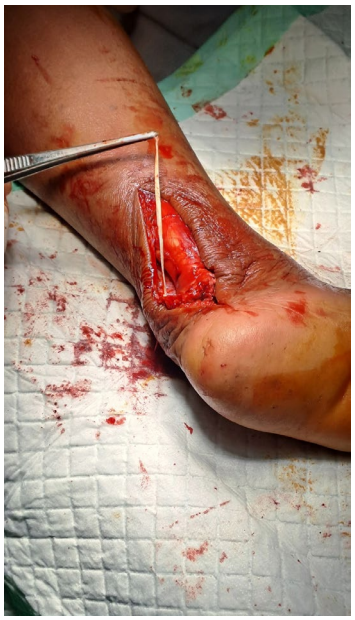

Image 6: Harvesting Plantaris Tendon

Image 7: Augmentation with a Plantaris Graft

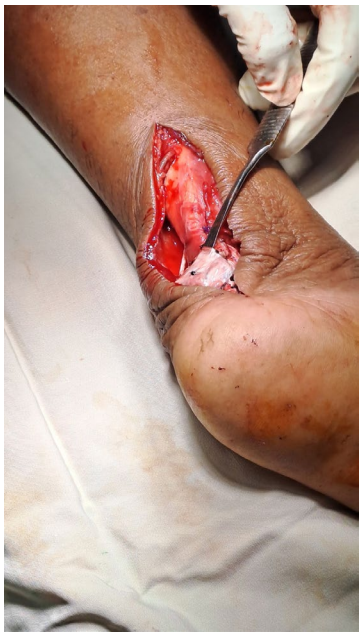

Image 8: The Broadened Plantaris Tendon Sutured Over the Rupture Site

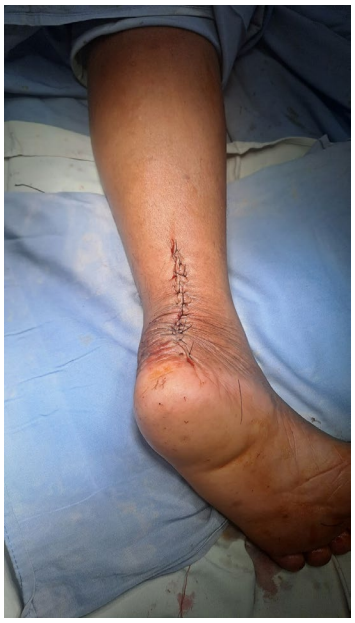

Image 9: The Surgical Wound was Closed

## DISCUSSION

Achilles tendon rupture is a multifactorial condition. Precipitating factors include sudden and forceful dorsiflexion and plantar flexion movements of the foot, as well as acute direct trauma, which may be exacerbated by predisposing factors such as age, degenerative processes, metabolic diseases, occupational demands, and the use of certain medications.[9] In general, the prevalence of Achilles tendon rupture most commonly involves the mid substance region, accounting for approximately 95% of cases, followed by the musculotendinous junction type at 2.3% and the calcaneal insertional avulsion type at 2.7%.[10]

The classification of Achilles tendon rupture according to Kuwada 1990 consists of four types.[11] Type 1 is defined as a partial rupture involving less than 50 percent of the tendon and is generally managed with conservative treatment. Type 2 represents a complete rupture with a defect measuring less than 3 cm, for which primary repair using end to end anastomosis is recommended. Type 3 represents the complete rupture of the tendon with 3 to 6 cm defect that usually needs synthetic graft. Defect 6 cm or more with complete rupture described as type 4 which is generally managed with grafting procedures accompanied by gastrocnemius muscle resection.

Based on current evidence, suture anchors and interference screws are the most recommended fixation devices for insertional type Achilles tendon rupture. Suture anchors provide strong fixation between the tendon and bone with minimal trauma to surrounding tissues and have been shown to produce favorable functional outcomes, shorter operative times, and lower complication rates, particularly in cases without large bony fragments.[12,13] Interference screws, on the other hand, offer superior biomechanical fixation strength, especially in tendon transfer procedures such as flexor hallucis longus transfer to the calcaneus, making them more suitable for chronic insertional ruptures or cases with large tendon gaps and allowing for faster tendon to bone integration.[14,15] In clinical practice, a combination of suture anchors and interference screws is often employed to enhance fixation stability while simultaneously accelerating the healing process.

In this case, the use of suture anchors and interference screws could not be implemented due to resource limitations at the healthcare facility. Therefore, a partially threaded malleolar screw was selected as an alternative fixation method. The choice of this technique was also based on patient specific characteristics, namely advanced age, which significantly increases the risk of tendinopathy, tendinitis, and deterioration of musculoskeletal tissue quality. In the elderly population, degenerative processes lead to reduced tendon vascularity and decreased tissue elasticity, thereby lowering the tendon healing capacity. In addition, osteoporosis, which is commonly observed in older individuals, results in decreased bone mineral density, particularly at the implant fixation site, potentially compromising implant anchoring strength. These conditions

necessitate adaptation of Achilles tendon reconstruction techniques to maintain adequate biomechanical stability while minimizing the risk of implant failure.[16]

In this case, the partially threaded malleolar screw was used as an anchoring device while simultaneously providing compression at the Achilles tendon insertion site. Biomechanically, the threads on the distal portion of the screw allow compression between the tendon and the bone surface, while the non threaded segment facilitates drawing the tendon tissue toward the bone, thereby improving biological contact that is essential for the tendon to bone healing process.[16] Although not a standard option for insertional Achilles tendon rupture, a partially threaded malleolar screw can still provide adequate stability, particularly in the presence of suboptimal bone quality and limited resources. As an adjunct, augmentation was performed using an autologous plantaris tendon graft, a technique that has been shown to provide effective reinforcement in Achilles tendon reconstruction.[17] The plantaris tendon is a small tendon that runs parallel to the Achilles tendon and typically inserts on the posteromedial aspect of the calcaneus. In certain anatomical variations, this tendon may merge with the Achilles tendon before reaching the calcaneus. The advantages of using the plantaris tendon as an autologous graft include minimal donor site morbidity, high biocompatibility, ease of harvesting, and the ability to enhance the tensile strength of the repair, particularly in tendons that have undergone degenerative changes.[18]

In elderly patients with osteoporosis, the use of a plantaris tendon graft becomes particularly important because reduced bone quality may diminish the pull out strength of the implant. With soft tissue augmentation, mechanical loads are not borne solely by bony fixation, thereby minimizing the risk of implant failure such as cut out or loosening.[16] The combination of a partially threaded malleolar screw and plantaris tendon graft augmentation is also relevant when considering the mechanical load transmitted to the calcaneus in elderly patients. Bone with low mineral density is at increased risk of structural failure when subjected to excessive implant related stress. By providing adequate compression through the partially threaded malleolar screw and reinforcing the tendon structure with a graft, reconstruction stability can be achieved without imposing excessive stress on

the bone. This approach emphasizes that Achilles tendon reconstruction in elderly patients should take into account tendon degenerative changes, bone quality, resource limitations of healthcare facilities, and the need for biomechanical stability in order to achieve optimal functional outcomes.[18,19]

In general, in healthcare facilities with limited resources, a partially threaded malleolar screw may be considered an alternative fixation method for Achilles tendon avulsion at the calcaneal tuberosity. Although anchor screws remain the preferred option because they provide effective footprint compression and a wide tendon to calcaneus contact area, and interference screws are known to offer very high pull out strength, the use of a partially threaded malleolar screw can still yield clinically meaningful outcomes by maintaining tendon sutures and supporting the healing process.

## CONCLUSION

Achilles tendon rupture commonly occurs in patients aged 40 to 50 years and is frequently observed in athletes. Our patient was 55 years old. Epidemiologically, Achilles tendon rupture is generally caused by sports related injuries such as football and basketball, with a reported prevalence of 66 to 82 percent. In this case, the patient sustained the rupture while working in a rice field. In general, Achilles tendon rupture most commonly occurs at the mid substance location, with a prevalence of 95 percent, followed by the musculotendinous junction type at 2.3 percent and the calcaneal insertional avulsion type at 2.7 percent. In this patient, the rupture occurred at the calcaneal insertional avulsion site, which represents the least common location. In this case, fixation of the Achilles tendon is generally recommended using an interference screw combined with a suture anchor; however, due to limited resources, a partially threaded malleolar screw was used as an alternative. In addition, a plantaris tendon graft was performed in this case and is recommended in Achilles tendon rupture associated with degenerative processes.

## CLINICAL IMPORTANCE

This case report may provide insights into the management of Achilles tendon rupture, particularly in healthcare settings with limited resources.

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