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Minimally Invasive Achilles Tendon Repair Using Simple, Low-Cost Tools for Neglected Achilles Tendon Ruptures: A Report of Five Cases

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Abstract: Achilles tendon (AT) rupture frequently occurs among individuals engaging in physical activities, and this condition often leads to significant functional impairment. The traditional open surgical approach for AT repair is associated with complications such as wound healing problems and infection. Mini open repair and percutaneous technique have emerged as minimally invasive alternatives that offer several advantages including reduced risk of complications, shorter recovery time, and improved cosmetic outcomes. However, these techniques require several additional implants and devices that often are expensive and not available in certain areas. To overcome these conditions, we propose a minimally invasive AT repair using abbocath needle instead of more sophisticated devices. We included five patients with neglected Achilles tendon ruptures; four patients were males. The age ranged between 38 to 53 years of age. All patients underwent minimally invasive AT repair. All patients were immobilized for two weeks using Foreslab. The results showed that after two weeks, all patients started partial weight bearing and passive range of motion (ROM) exercises. Four weeks after the surgery, patients started gradual full weight bearing and active ROM exercises. After three months, patients had returned to daily activities without complications. In conclusion, minimally invasive AT repair can be performed using simple, low-cost tools, and this technique provides satisfactory results. This procedure can be a solution in situations where there are limited facilities and budgets.
Keywords: Achilles tendon; rupture; repair; minimal invasive; percutaneous

INTRODUCTION

The Achilles tendon or calcaneus tendon is the largest and thickest tendon in the body and has an important role in the lower extremities because of its multifunctional anatomy and physiology. It transfers power from the gastrocnemius and soleus muscles to the heel and foot, which is important for effective walking and running. The Achilles tendon has a high incidence of rupture, with some studies reporting 8.3 ruptures per 100,000 people. These injuries usually occur in the third to fifth decade of life and are most prevalent in patients who participate in recreational sports.[1-3]

Achilles tendon rupture most commonly presents with sudden onset of pain along with localized swelling/bruising and an occasional audible "pop" sound. Functional impairment damage to the Achilles tendon includes difficulty walking, inability to stand on the toes, and weak ankle plantar flexion.[1]

Nonoperative interventions involving immobilization have lower wound-related risks but higher potential for rupture, deep vein thrombosis, pulmonary embolism and infection due to the longer healing process. In contrast, surgical intervention with either open repair technique, mini-open repair technique or percutaneous technique poses risks of infection, wound complications and iatrogenic nerve injury. It is important to take an optimal approach to avoid complications.[1,4]

The open repair technique is still chosen as a gold standard to repair a ruptured Achilles tendon especially for the active individual such as athletes because it provides a better view ability to directly visualize the ruptured tendon for safer suturing and low risk of re-ruptures, however, it has higher risks of infection and has a longer duration of healing due to larger incision. In addition, larger incisions may lead to more significant scarring, which may be a cosmetic concern for some patients.[5]

The other options for the management of Achilles tendon rupture are mini-open repair and the percutaneous technique that require a smaller skin incision over the rupture site. This technique also provides superior cosmetic results due to its less invasive nature and transverse incision. In addition, the financial implications of the procedure are considered more favorable, mainly due to the significantly shorter hospital stay and operating time associated with the percutaneous approach but it requires a higher skill of the operator to minimize the risk of re-rupture and nerve injury.[6]

In this case report, the mini-open repair technique was chosen as the management for Achilles tendon rupture repair considering the cost and availability of equipment. However, this technique requires several additional implants and devices, which are often expensive and not available in certain areas. To overcome these conditions, we propose a minimally invasive Achilles tendon repair using abbocath needle instead of other sophisticated devices. To the best of our knowledge, there have been no previous studies of percutaneous Achilles tendon repair using the abbocath needle. We hope that by performing this modified technique, surgeons will gain better insight into the use of simple tools to perform this type of surgery.

CASE REPORT

Five patients with an age range of 38-53 years, consisting of four males and one female, presented with complaints of acute severe ankle pain and difficulty in walking. On physical examination, inspection revealed a more dorsiflexed ankle on the side of the lesion, palpation revealed a palpable gap and weakness in plantarflexion of the ankle, and a positive result on Thompson's test.

The patients were then given several options for management of the rupture, and they chose mini-open repair as management based on the advantages and disadvantages described. The five patients were then operated using the mini-open repair technique. Initially, in the gap area, a transverse incision of 2-3 cm was made and non-absorbable percutaneous sutures of approximately 1-1.5 cm was inserted from the proximal and distal crests with a passing needle using a large abbocath. Subsequently the suture was then removed with a hook to allow the two tendon crests to

continue to be pulled together, and knots were tied at the edges. The stumps were then secured with absorbable continuous suturing. All patients were immobilized with Foreslab for two weeks.

Two weeks after surgery, patients began partial weight bearing and passive range of motion (ROM) exercises. Four weeks after surgery, patients began full weight bearing and active ROM exercises. At three months, patients had returned to daily activities without complications such as re-rupture or infection.

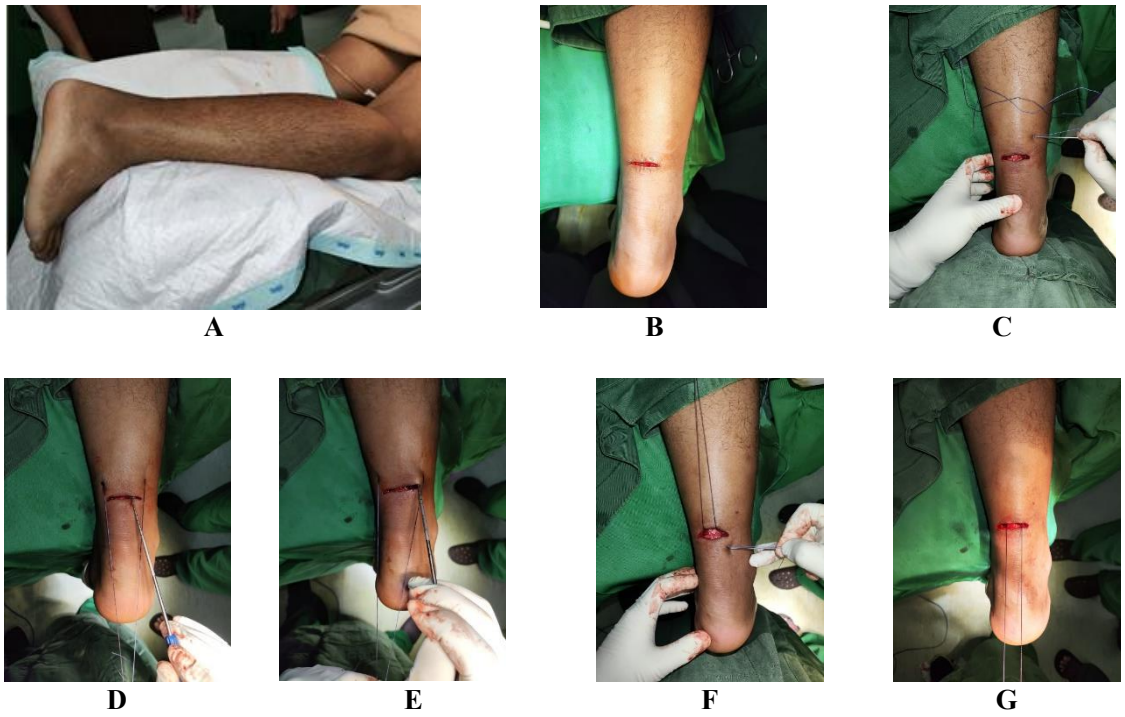

Figure 1. A, Patient was placed in prone position; B, Transverse incision 2-3 cm; C, D, E, F, A non-absorable percutaneous thread was inserted; G, Knots were made

DISCUSSION

The Achilles tendon (calcaneal tendon) is the major tendon that produces plantar flexion of the ankle and is located in the superficial posterior muscle compartment of the lower leg. The muscle consists of the medial and lateral heads of the gastrocnemius and soleus muscles attaching them to the posterior surface of calcaneus bone. The larger and stronger medial head of the gastrocnemius originates from the supracondylar ridge and adductor tubercle of the popliteal surface of the femur, while the lateral head originates from the lateral epicondyle. Both heads share the popliteal ligament.[7] Due to its function as the largest tendon, the rupture of Achilles tendon could affect many parts of human activities. Rupture of the Achilles tendon is a common tendon injury that occurs as a result of sudden dorsiflexion of a plantarflexed foot and is most often associated with sport event.[8,9]

The open repair technique is a surgical procedure in which an incision is made over the site of the tear to visualize the tendon, then the torn ends are sutured together with strong stitches using non-absorbable sutures to ensure that the tendon is properly aligned and secured. This technique gives better visualization to the surgeon because of the bigger incision that made. Open repair techniques are recommended for patients who require strong and reliable results, such as athletes or those involved in physically demanding activities.[10,11]

Mini open repair is a technique for treating Achilles tendon ruptures that combines open repair with a minimally invasive approach. This procedure reduces the risk of complications by using a smaller incision than open repair. The smaller incision minimizes the risk of wound complications and infection, and the recovery time is faster due to the smaller incision.[6]

Open repair technique is the most used technique to repair Achilles tendon rupture. It is mostly used because it allows the surgeon to visualize directly to the Achilles tendon but there are some reported complications such as necrosis, infection and in some cases could lead to death. Mini open repair of Achilles tendon comes as an alternative of the most used technique, open repair, to repair Achilles tendon rupture because it is less invasive and has lower wound complications compared to the open repair technique.[12,13] In this study, all five patients who underwent mini-open repair had good results. The patients were able to perform light movements after two weeks, and three months postoperatively, the patients were able to perform activities as usual, so the results were almost similar between mini open repair and open repair techniques. This result was supported by meta-analysis by Yang et al that compared the functional outcomes and complications associated with mini open versus open repair of acute Achilles tendon rupture, and the result was no significant difference in outcomes between both techniques. However, in a study conducted by Tyler et al, mini open repair provided a significantly better outcome than open repair in patients with higher American Orthopaedic Foot and Ankle (AOFA) score (90.30 vs. 85.27). Other study by Kristin et al using PROMIS score showing that there was no difference in outcome and complications, albeit, mini open repair patients showed better result in pain.[12]

The risk of sural nerve injury, a common concern with percutaneous repair, is minimized with the mini-open technique. The nerve is not injured due to the controlled approach and specialized instruments used in the mini-open repair. In this study, we used the abbocath as a guide because of the limited tools we had and the results were the same. The patients experienced no complications such as nerve damage, re-rupture, or infections. This technique also provides a better cosmetics result due to a smaller incision and shorter hospitalized time which is good for the young and active individual especially athletes to start their activities.[14]

CONCLUSION

Minimally invasive Achilles tendon repair can be performed using simple and low-cost tools that can still provide satisfactory results. This procedure can be a solution in situations with limited facilities and budgets.

Conflict of Interest

The authors affirm no conflict of interest in this study.

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