



Case Report

Mid-term functional outcome after distal Achilles tendon rupture anchoring screw repair in elderly osteopenia as a reliable technique: A case report

Teddy Heri Wardhana^{1*}, Mukhlis Aziz¹

1) Department of Orthopedics and Traumatology, Faculty of Medicine, Universitas Airlangga / Dr. Soetomo General Academic Hospital

ARTICLE INFO

Submitted : 19th October 2022
Accepted : 03rd December 2022
Published : 31st January 2023

Keywords:

Achilles Tendon Rupture; Anchoring Screw; Functional Outcome; Osteopenia

***Correspondence:**

teddy-heri-wardhana@fk.unair.ac.id

This is an Open access article under the CC-BY license



ABSTRACT

The management of distal Achilles tendon rupture is still controversial, especially in elderly patients, due to poor bone quality and tendon stump integrity. One of the proposed repair techniques is by using an anchoring screw. Here we report the mid-term follow-up of two patients with distal Achilles tendon rupture treated with an anchoring screw. Two elderly males in their sixties came to the outpatient clinic with similar complaints of intermittent pain, reddening, and ankle swelling after falling. Both patients were diagnosed with distal Achilles tendon rupture and were treated with open repair using a Krakow suture and anchoring screws. Functional outcome evaluation postoperatively found a good outcome. Previous studies have shown that repair with the anchoring technique is better biomechanically than with ordinary sutures. Repairs with this technique can withstand greater forces and loads before they fail. An anchoring screw repair technique for total distal Achilles tendon rupture repair provides good results in elderly with osteopenia.



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



INTRODUCTION

The largest and strongest tendon in a human, the Achilles, connects the gastrocnemius and soleus muscles to the calcaneal bone. The incidence of Achilles tendon rupture has increased from year to year. Most cases occur during sporting activities. Other factors, such as gender, medications, and intrinsic structural variations, increase the risk of rupture. Rupture in the elderly is challenging since biomechanical tendon changes are associated with aging, and bone quality may determine the treatment and outcome (Benjamin, Toumi, Ralphs, *et al.*, 2006).

The main objectives of treating an Achilles Tendon Rupture are to guarantee a speedy recovery and avoid complications. Surgeons more often perform operative action because nonoperative management often causes more complications. The complications of nonoperative management include stiffness due to prolonged immobilization, a greater possibility of re-rupture, and the addition of tendon length, which results in reduced tendon strength, especially in the elderly (Zurita Uroz, Paniagua, Kelly, *et al.*, 2022). The treatment becomes more challenging in distal tendon rupture since such a rupture will prevent an end-to-end direct repair. Previous studies have shown that repair with anchoring screws is better biomechanically than repair with ordinary sutures in a distal rupture in which bone quality at the site of tendon insertion is essential. Repairs with anchoring screws can withstand greater forces and loads than standard suture techniques before they fail (Boin, Dorweiler, McMellen, *et al.*, 2017).

Various scoring methods can measure the functional outcome; the most popular is the Foot & Ankle Outcome Score (FAOS). This method has been used universally and has a high validity rate to assess the return of

function on therapeutic management. That has been carried out by evaluating certain subscales (Nilsson-Helander, Thomee, Silbernager, *et al.*, 2007).

Considering the poor bone quality and the integrity of the tendon stumps in the elderly, distal Achilles tendon rupture treatment is challenging but feasible using anchoring screws. This report describes the functional outcome of distal Achilles tendon rupture treated with anchoring screw in elderly with osteopenia.

CASE REPORT

For the first case, a sixty-eight-year-old male came to the outpatient clinic after having their ankle intermittently reddens and swells. The patient had a history of sudden huge pain and swelling on his left ankle 2 years ago when playing badminton. Afterward, the patient went to a physiotherapist and underwent alternative therapy because the pain was tolerable, and the patient could still walk. One month after the incident, the patient went to an outpatient clinic and was diagnosed with Achilles tendon rupture and underwent surgery. The previous history of diabetes, cardiac conditions, hypertension, stroke, and other significant disease is denied. Previous surgery is also denied. On FAOS Score, the lowest score was obtained on the 'Sports and Recreational Activities' subscale, with a score of 15 indicating the category that had the most problems in patient 1. The highest score was obtained on the subscale 'Pain' with a score of 55, indicating the category that had the least problem in patient 1. We performed BMD on the patient, and it was found that the patient had a T-Score below -2.5 SD.

For the second case, a 60-year-old Male came to the outpatient clinic after slipping when walking down a stair. After the fall, the patient could not stand and complained of swelling and pain in the left ankle. The patient was

taken to the orthopedic outpatient clinic and diagnosed with Achilles tendon rupture. The patient then underwent surgery for repair. The previous history of diabetes, cardiac conditions, hypertension, stroke, and other significant disease is denied. Prior surgery is also denied. On FAOS Score, the lowest score was obtained on the 'Sports and Recreational Activities' subscale with a score of 27, indicating the category that had the most problems in patient 1. The highest score was obtained on the subscale 'Other symptoms' with a score of 64, indicating the category that had the least problem in patient 1. The patient also had a T-Score below -2.5 SD. Preoperative evaluation of bone density showed osteopenia in both patients. Both patients have similar physical examination results, treatment, and postoperative care. Upon physical examination, no abnormalities were found on other parts of the body. On the left ankle, a postoperative scar of ± 10 cm

was observed on the posterior ankle. Pain on palpation is not found, and the range of motion is within normal limits. The patients were diagnosed with tendon Achilles rupture. They were treated with open repair using Krakow suture and anchoring screws, as documented in picture 1 for the first case and picture 2 for the second case.

After 2-year of follow-up, the first patient said he could do the activity as usual. Pain is felt after prolonged and heavy activities and subsides when resting. Evaluation using FAOS is described in table 1. The highest score was obtained on the 'Activities of Daily Life' subscale with a score of 97.1, indicating the category with the least problems in patient 1. The lowest score was obtained on the subscale 'Sports and Recreational Activities' with a score of 65, indicating the category with the biggest problem in patient 1.

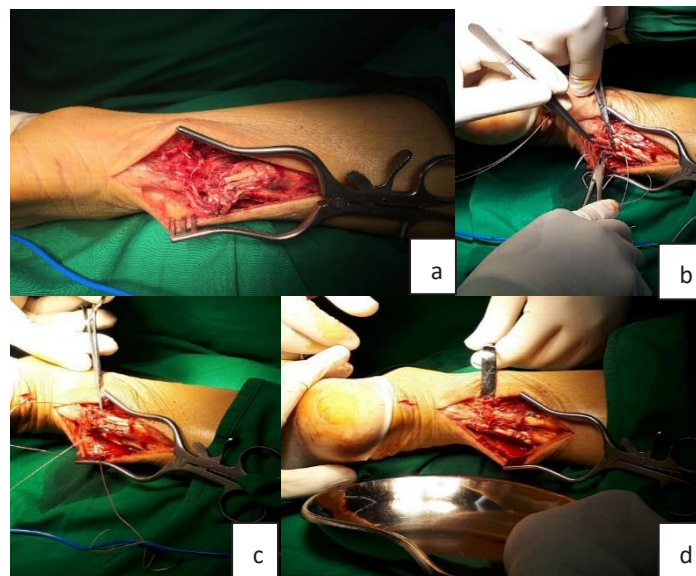


Figure 2. Clinical Photo during the operation on the 2nd patient. (a & b) complete rupture of Achilles tendon is clearly visible, (c & d) tendon repair with Krakow suture technique and anchoring screw, (e) appearance of Achilles tendon after repair

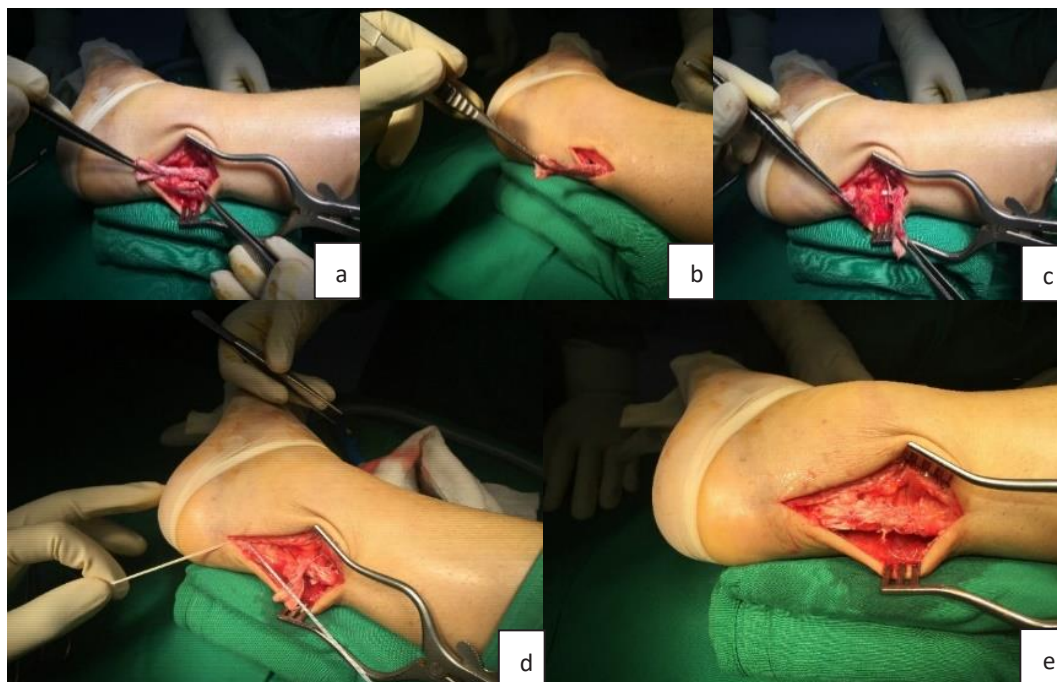


Figure 1. Clinical Photo During the Operation of 1st patient (a) Achilles tendon rupture is clearly visible during the operation, (b & c) repair of the tendon with Krackow suture technique and anchoring screw, (d) Presentation of Achilles tendon after repair.

Table 1. FAOS evaluation upon presentation and on 2 year follow up on both patient

	Patient 1			Patient 2		
	Initial	On 2 year follow up	Difference	Initial	On 2 year follow up	Difference
Pain	55	94.4	39.4	54	94.4	40.4
Other symptoms	53	96.4	43.4	64	100	36
Activities of Daily Living	46	97.1	51,1	51	98.5	47.5
Sports and Recreational Activity	15	65	50	27	85	58
Quality of Life	31	75	44	45	95.2	50.2



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



The second patient was followed up three years later and stated that the patient felt no more pain and could return to daily activities as before the rupture. The evaluation of the second patient using FAOS is detailed in table 1. The highest score was obtained on the 'Other symptoms' subscale with a score of 100, indicating no problem in patient 2. The lowest score was obtained on the subscale 'Sports and Recreational Activities' with a score of 85, indicating the category with the biggest problem in patient 2.

DISCUSSION

The three mechanisms that can cause Achilles tendon rupture are propulsion of the weight-bearing foot with knee extension, sudden ankle dorsoflexion, and excessive dorsiflexion of plantar flexion of the ankle. Maffulli et al. reported that 53% of patients experienced an Achilles tendon rupture with a push-off mechanism, as many as 17% with sudden ankle dorsiflexion, and 10% with excessive dorsiflexion of the ankle plantar flexion. Three to six centimeters proximal to the insertion of the calcaneal Achilles tendon is the most common site of rupture due to several factors: hypovascularity, a limited cross-sectional area, and a high eccentric load.

The first patient in the case reported experiencing pain and swelling after playing badminton two years ago, while the second patient had a history of slipping down the stairs. Sports activities such as jogging, running, jumping, and agility activities that involve explosive plyometric contractions in the first patient are the initial mechanism for rupture; a person experiencing this mechanism will experience a popping event which can be described as "kicked from behind" or like crackling in the calf. One of three frequent mechanisms of Achilles tendon rupture will be triggered by highly rapid aberrant loading or intense plyometric-based

exercise. Additionally, as was the situation with the second patient in this case report, severe loading of the Achilles tendon with subtalar joint inversion and eversion enhances the risk of damage. One of three frequent mechanisms of Achilles tendon rupture will be triggered by highly rapid aberrant loading or intense plyometric-based exercise. Additionally, as was the situation with the second patient in this case report, severe loading of the Achilles tendon with subtalar joint inversion and eversion enhances the risk of damage.

Following surgery, proper therapy will hasten recovery. According to a meta-analysis of studies conducted by Suchak et al., recurrence rates were lower in patients treated with a functional postoperative brace (2.5 percent) compared to plaster in a comparison of various rehabilitation programs following surgical and nonoperative care (3.8 percent). It is unclear exactly how these research differ from one another. Nevertheless, other ideas contend that they only affect a small number of patients or are caused by variations in surgical technique or the postoperative functional brace protocol. The literature on nonoperative management reveals three randomized controlled trials comparing casts for immobilization with accelerated rehabilitation performed by Jones et al. in 2012. Compared to eight of seventy patients (11.4%) in the cast for immobilization group, the recurrence rupture has happened in two of sixty patients (3.3%) in the fast rehabilitation group. According to the recommendations Jones et al. made to the AAOS, they "cannot recommend for or against immediate functional bracing in individuals with acute Achilles tendon rupture.

Previous studies have shown that repair with the anchoring technique is better biomechanically than with ordinary sutures. Repairs with this technique can withstand greater forces and loads before they fail. We



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



believe that this technique is biomechanically stronger for several reasons. First, this repair bypasses the tissue tear's short end and has primary fixation via an anchor attached to the calcaneus. It is even more useful in patients with Achilles tendinosis because the short end of the tissue tear is often degenerative and less suture-resistant than a healthy Achilles tendon. A study by Kim et al. investigated the biomechanical significance of accessible tendons in flexor tendon repair. They found an increase in repair strength with increasing reachable tendon length. Due to the short tearing end of the tissue, there is a limitation of the tendon that the suture can pass. Therefore the length of the tendon that can be reached is shorter, so the construction is weaker. Using a lag screw as fixation is also effective for cases with calcaneal avulsion due to its compression technique. Still, it requires a large fragment to attach to the Achilles tendon so that at least two screws are inserted with a washer.

Krackow sutures and anchoring were employed during the open method procedure on both patients. The key conclusion of the previous study was that an endoscopic approach might be used to apply a Krackow-type locking suture. However, a substantial percentage of the time (33%) no Krackow lock suture was established, only the end of the tendon that the suture "grasped". Grasping the end of the torn tendon with two Allis tissue forceps (Medicon, Tuttlingen, Germany) before passing the superficial suture to the forceps is a preventative measure for one suturing difficulty. Allis forceps are used to grasp the ruptured proximal stump tendon at its distal end through the medial and lateral portals of the wounds, and the suture is then passed through the proximal stump. Similar to this, a suture is inserted through the tip of the stump after forceps are used to grasp the distal

stump and terminate tendon rupture through the proximal medial and lateral portal wounds (Işık and Tahta, 2017).

Rest, elevation, pain management, and functional bracing are the first lines of treatment for Achilles tendon rupture. The possible advantages and disadvantages of surgical intervention are still up for debate. Studies have shown positive functional outcomes and patient satisfaction with both operational and nonoperative techniques. With a reported risk difference in a re-rupture rate ranging from 5% to 7%, several meta-analyses of randomized controlled trials (RCTs) have demonstrated that surgical treatment considerably lowers the risk of tendon re-rupture compared with nonoperative treatment (Ochen, Beks, Van Heijl, *et al.*, 2019).

We found out that both patients had a T-Score below -2.5 SD on BMD. This osteopenic condition may lead to failure of tendon reattachment. Studies suggest that the low bone density in some regions is consistent with the reports that suture anchors may be difficult to anchor securely within that region because of variable bone quality. (Meyer, Fucentense, Koller, *et al.*, 2004)(Barber, Feder, Burkhart, *et al.*, 1997) So, we emphasized the need for stronger, more gap-resistant repairs as more of the Achilles insertion becomes separated since the degenerative tendon tissue may not be able to withstand the stresses of regular everyday activities and may be susceptible to re-ruptures Tendon gap creation causes increased granulation tissue, slow healing, decreased strength at the site of repair, and may eventually have a negative impact on the clinical outcome. So, we proposed the importance of site gapping of less than 5 mm, because as little as 5mm of gapping might be considered an essential parameter for clinical failure, as reported by Lee et al (Lee, Goldsmith, Nicholas, *et al.*, 2008).

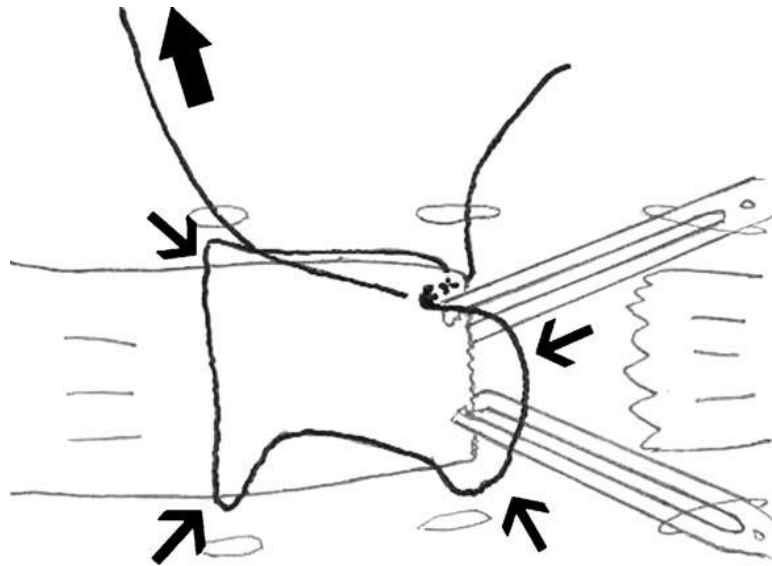


Figure 3. The ruptured tip of the proximal stump tendon is captured by Allis tissue forceps through the distal medial and lateral portal wounds before passing the suture through the superficial proximal stump to the forceps. This can prevent the suture from falling onto the end of the tendon rupture (Işık and Tahta, 2017)

The two patients in this case report showed that the FAOS score results on the assessment of five subscales, namely Pain, Other Symptoms, Daily Activities, Sports and Recreational Activities, and Quality of Life, with a score ranging from 0 to 100 with a score of 0 indicating the worst possible foot/ankle symptom and 100 indicates no foot/ankle symptoms. The first patient got the highest score on the ‘Activities of Daily Life’ subscale with a score of 97.1, indicating the category that had the least problems in the patient, while the lowest score on the ‘Sports and Recreational Activities’ subscale with a score of 65 indicated the category that had the biggest problems in the first patient. The second patient got the highest score on the ‘Other Symptoms’ subscale with a score of 100, indicating a category that had no problems in the second patient, while the lowest score on the ‘Sports and Recreational Activities’ subscale with a score of 85 indicated the category that had the most problems in patient 2. From the two

samples with the same background, gender, and age, it can be said that this technique is successful in degenerative Achilles tendon conditions considering that the age of both samples is elderly patients, and it is likely to be much better in more advanced tendon conditions (Callahan, Cleveland, Allen, *et al.*, 2021).

The first patient’s sports and recreational activities are more impaired than the second patient’s. We hypothesized that the factors contributing to these results are the difference in the time of the patient receiving the proper medication, as in the first patient, he sought medication one month after the incident, and in the second patient, he immediately sought medication after the injury. The first patient is immobilized for a longer time compared with the second patient. This may be critical for the different outcomes between these patients, as the onset of physical therapy is essential for the functional outcome of patients with Achilles



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



tendon rupture. Also, the harmful effect of prolonged immobilization is widely known (Vargas-Mena, Burgos-Elías and Pérez-González, 2013).

Roos et al., in 2001, stated that the FAOS score met the established validity and reliability criteria. FAOS is also helpful for the evaluation of patient-relevant outcomes concerning ankle reconstruction. However, to fully validate FAOS for foot and ankle problems, additional studies are needed over time in different populations (Roos, Brandsson and Karlsson, 2001).

CONCLUSION

Achilles tendon rupture incidence increases from year to year. Osteopenia is the most common risk factor of Achilles tendon rupture. This case's management needs to be concerned; surgical management is still promising in outcomes and minimal complication. Treatment with open Krakow suture and anchoring screws shows good outcomes measured with the FAOS scoring system.

REFERENCES

- Barber FA, Feder SM, Burkhart SS, Ahrens J. (1997). The relationship of suture anchor failure and bone density to proximal humerus location: A cadaveric study. *Arthrosc J Arthrosc Relat Surg*, Jun;13(3):340–5.
- Benjamin M, Toumi H, Ralphs JR, et al. (2006). Where tendons and ligaments meet bone: Attachment sites ('entheses') in relation to exercise and/or mechanical load. *J Anat*, 208(4), pp. 471–490.
- Boin MA, Dorweiler MA, McMellen CJ, et al. (2017). Suture-Only Repair Versus Suture Anchor–Augmented Repair for Achilles Tendon Ruptures With a Short Distal Stump: A Biomechanical Comparison. *Orthop J Sports Med*, 5(1).
- Callahan LF, Cleveland RJ, Allen KD, et al. (2021). Racial/Ethnic, Socioeconomic, and Geographic Disparities in the Epidemiology of Knee and Hip Osteoarthritis. *Rheum Dis Clin North Am*, 47(1), pp. 1–20.
- Işık Ç and Tahta M. (2017). Primary repair of achilles tendon avulsions: Presentation of a novel technique and its comparison with suture anchor repair. *J Orthop Surg*, pp. 1–6.
- Lee SJ, Goldsmith S, Nicholas SJ, McHugh M, Kremenic I, Ben-Avi S. (2008). Optimizing Achilles Tendon Repair: Effect of Epitendinous Suture Augmentation on the Strength of Achilles Tendon Repairs. *Foot Ankle Int*, Apr;29(4):427–32.
- Meyer DC, Fucentese SF, Koller B, Gerber C. (2004). Association of osteopenia of the humeral head with full-thickness rotator cuff tears. *J Shoulder Elb Surg*. May;13(3):333–7.
- Nilsson-Helander K, Thomee R, Silbernagel KG, et al. (2007). The Achilles tendon Total Rupture Score (ATRS): Development and validation. *Am J Sports Med*, pp. 421–426.
- Ochen, Y., Beks, R.B., Van Heijl, M., Hietbrink, F., Leenen, L.P.H., Van Der Velde, D., et al. (2019). Operative treatment versus nonoperative treatment of Achilles tendon ruptures: Systematic review and meta-analysis. *BMJ*, Vol. 364, Online).
- Roos, E. M., Brandsson, S. and Karlsson, J. (2001). Validation of the foot and ankle outcome score for ankle ligament reconstruction. *Foot Ankle Int*, 22(10), pp. 788–794.



Vargas-Mena, R., Burgos-Elías, V.M., Pérez-González, C.S. (2013). Effect of early versus late rehabilitation in patients with Achilles tendon tenorrhaphy. *Acta Ortop Mex*, 27(1):27–32.

Zurita Uroz, N. A., Paniagua, A., Kelly, F., *et al.* (2022). Pathophysiology, diagnosis and treatment of Achilles tendinopathy. *Revista Española de Artroscopia y Cirugía Articular English ed.*, 29(1).