ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 08 | August - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

OUTCOME ANALYSIS OF SURGICAL TREATED TENDO ACHILLES INJURY BY VARIOUS METHODS- A COMPARATIVE STUDY

Orthopaedics

Venkat R Associate Professor, Department Of Orthopaedics, S.V. Medical College, Tirupati, Andhra Pradesh, India.

Vidhyasagar K* Junior Resident, Department Of Orthopaedics, S.V. Medical College, Tirupati, Andhra Pradesh, India. *Corresponding Author

Venkatesh D L

Asadi Madhu Sudhana

ABSTRACT

Background The injury of the Achilles tendon is a disabling condition, which is difficult to treat if there is a gap or defect between the two ends of the disrupted tendon. Patients with a rupture of the Achilles tendon should be operated on without delay. The aim of the study was to evaluate the functional outcome of various methods of repair done for Tendo Achilles injuries. **Materials And Methods** This is a comparative study with longitudinal follow-up of Twenty-four patients who were treated for Tendo Achilles injuries and included in this study during this period. The clinical outcome was assessed using AOFAS and Leppilahti scoring system. **Results** The mean follow-up was 21 months. Based on the AOFAS Scoring study 14 patients presented with acute open Tendo Achilles injury treated with Kessler and Krackow suturing of which 9(64.2%) patients showed excellent results, 4(28.5%) of good results, and 1(4.1%) fair results. Based on the scoring system used by Leppilahti for 10 patients with chronic Tendo Achilles treated by the Bosworth technique shows 70% of excellent results, 20% of good results, and 10% of fair results. **Conclusion** The Krackow technique showed good ankle function restoration and was associated with low complication rates. Reconstruction of chronic Achilles tendon ruptures with the Bosworth technique is associated with good clinical and functional outcomes.

KEYWORDS

Achilles tendon rupture, Bosworth technique, Kessler suturing, Krackow suturing.

BACKGROUND

The injury of the Achilles tendon is a disabling condition, which is difficult to treat if there is a gap or defect between the two ends of the disrupted tendon. Such a gap may result from several factors acting single or in combination: open laceration followed by infection; delay in diagnosis, allowing retraction and degeneration of the tendon, fraying of the ends, etc.[1]

Retraction and atrophy of the tendon end, and scar tissue between the tendon ends make primary repair of the chronic Achilles tendon tear difficult.[2] Various surgical procedures to fill the gap between retracted ends have been described which include primary repair and augmentation with fascia advancement, tendon transfer, free tissue transfer, and synthetic graft or allograft.[3-9] Tendon transfer is associated with less strength of the graft, the need for additional incisions for harvesting the graft, wound breakdown, and infections.[10]

The gap between two ends of the injured tendon due to contracture of the calf muscles occurs very rapidly, within three or four days, so they may experience difficulty regaining coaptation of the ruptured ends of the tendon. TA region is a poorly vascularized area that may cause problems in healing. The therapy for patients who present early is rather simple. However, if the patient is not treated properly in the initial instance, problems such as skin necrosis over the TA region and tendon re-rupture may occur. Then the patient has to undergo more extensive procedures. Tendo Achilles injury can be treated in a variety of ways. As a result, this research is conducted to assess the functional outcome of Tendo Achilles injuries using a variety of methodologies.

OBJECTIVES

To study the functional outcome of various methods of repair done for Tendo Achilles injuries by Kessler, Krackow suture, and Bosworth technique.

MATERIALS AND METHODS

The present study is conducted in the Department Of Orthopaedics, S. V. Medical college hospital, Tirupati, Andhra Pradesh from Nov 2019 to July 2021. 24 patients were treated for Tendo Achilles injuries and included in this study during this period. This is a comparative study with longitudinal follow-up of patients throughout the study period.

Inclusion Criteria

1. Age more than 18 years.
2. Both sexes are included.
3. Acute Tendo Achilles injuries of both open and closed types.
4. Chronic Tendo Achilles injuries are also included in the study.
5. Consent to participate in this study.

Exclusion Criteria

1. Age less than 18 years
2. Medically co-morbid patients.
3. Patients lost in follow-up.
4. The Patient is not fit for surgery
5. The patient was not given consent to participate in the study.

Selection Of Patients And Data Recording

Once the patient was admitted to the hospital a detailed case record is prepared. Personal information including name, age, sex, occupation address, and contact phone number are noted. All the patients are personally interviewed for a mode of injury and duration after injury and other co-morbid conditions for which they are taking treatment. A general and complete clinical examination was done looking for limping, flat-footed gait, and the presence of a palpable gap in the posterior heel. Thompson test and Tip toe walking help in the diagnosis.

Standard radiographs of an anteroposterior and lateral view of the ankle joint, an MRI of the ankle to find any calcification and defect in the TA region, Ultrasound of the ankle were taken. Basic laboratory investigations like HB, RFT, LFT, and blood grouping were carried out. The patients were selected according to the protocol mentioned in the inclusion and exclusion criteria.

Surgical Technique

Kessler Suturing

The incision is avoided directly over the Achilles tendon because it may produce tendon adhesion and scar contracture. The both lesser saphenous vein and the sural nerve were preserved by making a longitudinal incision 1 cm medial to the Achilles tendon. Dissection is carried on the way down to the Achilles paratenon, and between the Achilles tendon and the paratenon, a full-thickness flap was produced. The tendon rupture was identified, and the edges were debrided to a minimum. The Kessler approach was used to repair the tendon, which included a number five non-absorbable suture and a running epi tendinous absorbable 2.0 suture. In every case, the paratenon was meticulously repaired. Closure of the subcutaneous tissue and skin, as well as the insertion of a plaster cast at a 20-degree plantar flexion, completed the procedure.

Krackow Suturing

Patient in prone position, make a posteromedial incision of 10cm long about 1cm medial to the tendon. The paratenon was incised longitudinally in line with the skin incision. The repair was performed with a nonabsorbable suture with a Krackow suture technique with 4 strands connecting the tendon stumps. The foot is placed in approximately 10° of plantarflexion, and the sutures are tied. The paratenon is repaired with a braided absorbable suture.

Bosworth Technique

The surgery is performed under regional or general anesthesia. A tourniquet is applied over the thigh, The patient is placed in a prone position on the operating table and the ruptured tendon is approached through a posterior midline incision from the calcaneus to the proximal one-third of the calf. The Sural nerve and short saphenous vein were secured and isolated. The Ruptured tendon is exposed, and scar tissue is excised between the ends. A 1.5 cm wide tendon strip was cut and freed from the central portion and is left attached just proximal to the site of rupture. The tendon strip was turned distally and passed through the proximal tendon and anchored then passed through the distal end of the tendon and sutured back to the main tendon. The Wound was closed and a long-leg cast, holding the knee in flexion and the foot in plantar flexion.

Rehabilitation

Effective post-operative care following open repair of the TA is very important to prevent re-rupture and to bring about good ankle movements. In our institute, an above-knee cast with the foot in twenty-degree plantar flexion and the knee in 45-degree flexion is maintained for 3 weeks. At the end of 2 weeks, the sutures are removed. The previous above-knee cast is converted into a below-knee cast which is maintained for another 3 weeks. At the end of 6 weeks, the cast is discarded, and gradual weight bearing is initiated with the patient wearing footwear with high heels and intrinsic foot exercises are started. The physiotherapy is continued till good ankle movements are achieved.

Evaluation Method

The functional evaluation was done by Scoring system used by the American orthopedic foot and ankle society (AOFAS) Ankle - Hindfoot scale with a maximum score of 100 points (90–100 points= excellent, 75–89 points =good, 50–74 points = fair, and < 50 points= poor).[11]

Pain (40 points)	
None	40
Mild, occasional	30
Moderate, daily	20
Severe, almost always present	0
Function (50 points)	
Activity limitations, support requirement	
No limitations, no support	10
No limitation of daily activities, limitation of recreational activities, no support	7
Limited daily and recreational activities, cane	4
Severe limitation of daily and recreational activities, walker, crutches, wheelchair, brace	0
Maximum walking distance, blocks	
Greater than 6	5
4-6	4
1-3	2
Less than 1	0
Walking surfaces	
No difficulty on any surface	5
Some difficulty on uneven terrain, stairs, inclines, ladders	3
Severe difficulty on uneven terrain, stairs, inclines, ladders	0
Gait abnormality	
None, slight	8
Obvious	4
Marked	0
Sagittal motion (flexion plus extension)	
Normal or mild restriction (30° or more)	8
Moderate restriction (15°-29°)	4
Severe restriction (less than 15)	0
Hindfoot motion (inversion plus eversion)	
Normal or mild restriction (75%-100% normal)	6
Moderate restriction (25%-74% normal)	3
Marked restriction (less than 25% normal)	0
Ankle-hindfoot stability (anteroposterior,varus-valgus)	
Stable	8
Definitely unstable	0
Alignment (10 points)	
Good, plantigrade foot, midfoot well aligned	10
Fair, plantigrade foot, some degree of midfoot malalignment observed, no symptoms	5
Poor, nonplantigrade foot, severe malalignment, symptoms	0

Another scoring system described by Leppilahti et al.[11] in 1998, the Leppilahti scoring system includes subjective factors such as pain, stiffness, muscle weakness, footwear restrictions; subjective outcomes along with an active range of ankle motion and isokinetic muscle strength. The maximum score of the scoring system is 100 and results can further be graded as excellent (90 points), good (75–89 points), fair (60–74 points), or poor (<60 points).

Pain	
None	15
Mild, no limitations on recreational activities	10
Moderate, limitations on recreational, but not daily activities	5
Severe, limitations on recreational and daily activities	0
Stiffness	
None	15
Mild, occasional, no limitations on recreational activities	10
Moderate, limitations on recreational, but not daily activities	5
Severe, limitations on recreational and daily activities	0
Calf muscle weakness (subjective)	
None	15
Mild, no limitations on recreational activities	10
Moderate, limitations on recreational, but not daily activities	5
Severe, limitations on recreational and daily activities	0
Footwear restrictions	
None	10
Mild, most shoes tolerated	5
Moderate, unable to tolerate fashionable shoes, modified shoes tolerated	0
Active range of motion (ROM) difference between ankles	
Normal (<6°)	15
Mild (6°–10°)	0
Moderate (11°–15°)	5
Severe (>15°)	0
Subjective result	
Very satisfied	15
Satisfied with minor reservations	10
Satisfied with major reservations	5
dissatisfied	0
Isokinetic muscle strength (score)	
Excellent	15
Good	10
Fair	5
Poor	0

RESULTS

Though some incidents of Achilles tendon injury occurred in young and elderly age groups most of the cases were spread over mid and late adulthood. 20 (83.3%) cases in the present study occurred between 31-60 years of age group. 19 (79.1%) cases occurred in males and 5 (20.8%) in females. A male-to-female ratio of approximately 4:1 was observed. 37.5% (9 cases) of cases involved Indian closet and cut injury. 20.8% (5 cases) due to RTA and fall. The remaining 41.6% (10 cases) of Tendo Achilles injury is due to degenerative. In the present study, Most of the 12 cases of surgery were done less than 48 hours. 10 cases were done after 2 weeks. 6 cases underwent Kessler suturing. 7 Cases underwent Krackow suturing and 1 case had both Kessler and Krackow suturing. The remaining 10 cases underwent the Bosworth technique. Two patients developed superficial wound infection at two weeks of postoperative and were treated with IV antibiotics (Inj. cefoperazone sulbactam 1.5gm iv bd) for one week and regular dressings of wound done. Pus culture and sensitivity were sent report showed negative and wound healed after 2weeks. Another patient had developed skin necrosis after one week. Then necrotic tissue was removed, and a skin graft was applied. After that wound was healthy, No other infection was noted.

Based on the AOFAS Scoring study 14 patients presented with acute open Tendo Achilles injury treated with Kessler and Krackow suturing of which 9(64.2%) patients showed excellent results, 4(28.5%) good results and 1(4.1%) fair due to irregular follow up and fair compliance to rehabilitative physiotherapy.

Based on the scoring system used by Leppilahti to analyze the functional outcome in patients with chronic Tendo Achilles treated by the Bosworth technique, the results are as follows. The present study shows 70% of excellent results, 20% of good results, and 10% of fair results. The patient with fair results had a superficial wound infection.

DISCUSSION

From Nov 2019 to July 2021, Twenty four patients with Tendo Achilles injury were treated, after fulfilling inclusion and exclusion criteria. Out of these 24 cases, 14 cases of open acute injury, 10 cases of chronic injury.

Kessler and Krackow suturing was done in acute open TA injury within less than 48hrs in most of the patients after admission The follow-up period is relatively short; and finally, the sample size is small. Further studies with larger size samples and longer follow-up periods were needed to enable investigation of the Tendo Achilles rupture and to validate the present therapeutic effects of the Krackow suturing.

Bosworth technique is done in chronic injuries that presented after two weeks with a gap between ruptured tendons more than 5cm. The tensile strength of the Achilles tendon was strong enough to prevent the re-rupture. The limitations of this study are the lack of a control group and long-term follow-up. Further studies by large sample size, randomization of various techniques, and long-term follow-up can give conclusive results.

Our results were comparable to results done with other techniques using semitendinosus, flexor hallucis longus, tibialis posterior, and peroneus brevis.[3-9]

Studies conducted by CHUN GUANG LI et al.[12], ERIC J STRAUSS et al.[13], and MD MOHIUDDIN ASLAM et al.[14] showed excellent results of 70-75% while compared to our studies.

One patient developed poor results due to irregular follow-up in the study conducted by MD MOHIUDDIN ASLAM et al[14]. Other studies showed no such poor results. In our study, all patients had regular follow up. So poor results are not recorded in our study.

Studies conducted by SUDHANA A et al. [15] showed 76.1% excellent results, 13.4% good, 7.4% fair, and 2.9% poor results. A study conducted by PAVAN KUMAR A et al. [16] showed 79.4% excellent results, 10.2% good, 5.1% fair, and 2.5% poor results. Studies conducted by BORAH DN et al. [17],

There is currently no final consensus for the best method to repair Achilles Tendon rupture, with options ranging from non-operative treatment to open surgical repair[18]. Although non-operative treatment is an alternative option, surgical repair is often preferred in healthy and active populations. At present, there are many open methods for repairing Achilles Tendon ruptures, such as Kessler et al.[19-21]. The study by Watson et al.[22] has described in comparative biomechanical studies that Krackow sutures were significantly stronger than Kessler and Bunnell sutures. Therefore, Krackow is currently the preferred method for open repair of Achilles tendon ruptures[22,23]. However, irrespective of the technique, the surgical incision site is located in a relatively ischemic area. The incidence of complications such as infection and skin necrosis is high[24,25].

The present study had comparable excellent to good outcome results with various studies in the literature. The results of complications such as infection and necrosis are comparable with the various studies. There was no incidence of re-rupture of the tendon. This study has also shown that surgical intervention reduces the period of immobilization, and hence could be a method of choice in the working population making the patient return to work at the earliest.

CONCLUSION

The Krackow technique showed good ankle function restoration and was associated with low complication rates. Reconstruction of chronic Achilles tendon ruptures with the Bosworth technique is associated with good clinical and functional outcomes.

REFERENCE

1. Mahmud SW, Megahed AH, Sheshtawy OE. Repair of Calcaneal Tendon-An improved technique. J Bone Joint Surgery [Br]. 1992; 74(B):114-17.
2. Maffulli N, Via AG, Oliva F. Chronic Achilles tendon disorders: tendinopathy and chronic rupture. Clin Sports Med 2015;34(4):607-624.
3. Yeoman TF, Brown MJ, Pillai A. Early post-operative results of neglected tendo-Achilles rupture reconstruction using short flexor hallucis longus tendon transfer: a prospective review. Foot (Edinb) 2012;22(3):219-223.
4. Us AK, Bilgin SS, Aydin T, et al. Repair of neglected Achilles tendon ruptures: procedures and functional results. Arch Orthop Trauma Surg 1997;116(6- 7):408-411.
5. Sarzaeem MM, Lemraski MM, Safdari F. Chronic Achilles tendon rupture reconstruction using a free semitendinosus tendon graft transfer. Knee Surg Sports Traumatol Arthrosc 2012;20(7):1386-1391.
6. Lapidus LJ, Ray BA, Hamberg P. Medial Achilles tendon island flap--a novel technique to treat reruptures and neglected ruptures of the Achilles tendon. Int Orthop 2012;36(8):1629-1634.
7. Jennings AG, Sefton GK. Chronic rupture of tendo Achilles. Long-term results of operative management using polyester tape. J Bone Joint Surg Br 2002;84(3):361-363.
8. Maffulli N, Del Buono A, Spiezia F, et al. Less-invasive semitendinosus tendon graft augmentation for the reconstruction of chronic tears of the Achilles tendon. Am J Sports Med 2013;41(4):865-871.
9. Lee DK. Achilles tendon repair with acellular tissue graft augmentation in neglected ruptures. J Foot Ankle Surg 2007;46(6):451-455.
10. Maffulli N, Leadbetter WB. Free gracilis tendon graft in neglected tears of the Achilles tendon. Clin J Sport Med 2005;15(2):56-61.
11. Spennacchio P, Vascellari A, Cucchi D, Canata GL, Randelli P. Outcome evaluation after Achilles tendon ruptures. A review of the literature. Joints. 2016;4(1):52-61.
12. Chun-Guang Li, Bing Li, and Yun-Feng Yan Management of acute Achilles tendon rupture with tendon-bundle technique Journal of International Medical Research 2017, Vol. 45(1).
13. Eric J. Strauss et al., Operative treatment of acute Achilles tendon ruptures: An institutional review of clinical outcomes, Injury, Int. J. Care Injured (2006) volume 38, issue 7 p832-838.
14. Md Mohiuddin Aslam, Muhammed Shahiduzzaman, Md Zakir Hossain. Functional outcome of open Tendo-Achilles injury: A study in Dhaka medical college hospital, Dhaka, Bangladesh. International Journal of Orthopaedics Research. 2019; 1(3): 28-31.
15. Sudhana, Asadi & Kareti, Mahesh. (2018). Surgical Management of Chronic Achilles Tendon Ruptures with Bosworth Technique- A Prospective Study. Journal of Evidence-Based Medicine and Healthcare. 5. 3654-3657.
16. Pavan Kumar, A., Shashikiran, R. & Raghuram, C. A novel modification of Bosworth's technique to repair zone I Achilles tendon ruptures. J Orthopaed Traumatol 14, 59–65 (2013).
17. Borah DN, Rai S, Frank HC, Dutta A (2020) Repair of chronic Achilles tendon rupture using Bosworth's technique. J Orthop Trauma Rehabil.
18. Fischer S, Colcuc C, Gramlich Y, Stein T, Abdulaziz A, von Welck S, Hofmann R (2020) Prospective randomized clinical trial of open operative, minimally invasive and conservative treatments of acute Achilles tendon tear.
19. McCoy BW, Haddad SL (2010) The strength of Achilles tendon repair: a comparison of three suture techniques in human cadaver tendons. Foot Ankle Int 31(8):701–705.
20. Krackow KA, Thomas SC, Jones LC (1986) A new stitch for ligament-tendon fixation. J Bone Jt Surg Am 68(5):764–766.
21. Gebauer M, Beil FT, Beckmann J, Sárváry AM, Ueblacker P, Ruecker AH, Holste J, Meenen NM (2007) Mechanical evaluation of different techniques for Achilles tendon repair. Arch Orthop Trauma Surg 127(9):795–799.
22. Watson TW, Jurist KA, Yang KH (1995) The strength of Achilles tendon repair: an in vitro study of the biomechanical behaviour in human cadaver tendons. Foot Ankle Int 16(4):191–195.
23. Krackow KA, Thomas SC, Jones LC (1988) Ligament-tendon fixation: analysis of a new stitch and Comparison with standard techniques. Orthopaedics 11(6):909–917.
24. Hsu AR, Jones CP, Cohen BE, Davis WH, Ellington JK, Anderson RB (2015) Clinical outcomes and complications of percutaneous Achilles repair system versus open technique for acute Achilles tendon ruptures. Foot Ankle Int 36(11):1279–1286.
25. Haji A, Sahai A, Symes A, Vyas JK (2004) Percutaneous versus open tendo Achilles repair. Foot Ankle Int 25(4):215–218.