

Bosworth Technique for Repair of Chronic Achilles Tendon Rupture: A Prospective Study

BijayendraNathChaturvedi¹ Sunny Kumar² N K Singh³

^{1.} Dr Bijayendra Nath Chaturvedi, Senior Resident, Deptt of Orthopaedics, NMCH, Patna

^{2.} Dr Sunny kumar, Senior Resident, Deptt of Orthopaedics, NMCH, Patna

^{3.} Dr N K Singh, Associate Professor, NMCH, Patna

Corresponding Author: Dr BijayendraNathChaturvedi MBBS (Hons.)Gold Medalist, MS (Ortho) , Senior Resident, NMCH, Patna.

ABSTRACT

Background :- The Achilles tendon is the strongest tendon in the human body. Retraction and atrophy of the tendon ends, scar tissue between the tendon ends makes primary repair of the chronic Achilles tendon tear difficult. Tendon transfer is associated with less Strength of the graft, need for additional incisions for harvesting the graft, wound breakdown and infections. Achilles tendon is used to reconstruct the gap to overcome the above complications.

The aim of the study was to evaluate the clinical and functional outcomes of chronic Achilles tendon ruptures treated with Bosworth technique.

Materials and Methods :-

This is a prospective observational study. Sixty-seven patients with chronic complete tendoachilles rupture treated surgically With Bosworth technique were included. The clinical outcome was assessed using Leppilahti scoring system.

Results:- The mean follow up was 36.4 months. Excellent to good results were reported in 60 patients (89.5%), 5 patients had fair and 2 Patients had poor results according to Leppilahti scoring system. No major complications or re-rupture of the tendon were Noted.

Conclusion:-The reconstruction of chronic Achilles tendon ruptures with Bosworth technique is associated with good clinical and functional outcomes.

Keywords:-Achilles Tendon Rupture, Chronic Rupture, Bosworth Technique.

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I. BACKGROUND

The Achilles tendon is the strongest tendon in the human Body, formed by fusion of gastrocnemius and soleus muscle With a tensile strength of 50-100 N/mm¹. In spite of its Strength; it is one of the most common tendons ruptured in Middle aged men between 30-40 years during sports Activities (75%)². Misdiagnosis of acute cases as in more Than 20% of cases³and delay in presentation to hospital is Leading to a chronic rupture. A chronic rupture is defined as A rupture with a delay in diagnosis or treatment for more Than four weeks from the time of injury.⁴Retraction and atrophy of the tendon ends, scar tissue Between the tendon ends makes primary repair of the Chronic Achilles tendon tear difficult.⁵ Various surgical Procedures to fill the gap between retracted ends have beenDescribed which include primary repair and augmentation With fascia advancement, tendon transfer, free tissue Transfer, synthetic graft or allograft.⁶⁻¹² Tendon transfer is Associated with less strength of the graft, need for additional Incisions for harvesting the graft, wound breakdown and Infections.¹³ Use of Achilles tendon to reconstruct the gap Overcomes the above complications.The aim of this study was to evaluate the clinical and Functional outcomes of chronic Achilles tendon ruptures Treated with Bosworth technique.¹⁴

II. MATERIALS AND METHODS

This is a single centeredprospective observational study Performed from January 2016 to August 2022 Sixty-seven patients with chronic Complete tendoachilles rupture who were admitted and Treated surgically and gave informed consent and meeting the inclusion criteria was included in the study.

Inclusion Criteria

1. Patients with chronic tendoachilles rupture >4 weeks
2. Complete ruptures
3. Age >20 years

Exclusion Criteria

1. Age < 20 years
2. Acute ruptures
3. Partial ruptures
4. Medically unfit patients
5. conservatively managed patients.

The patients were evaluated clinically, and all the Necessary clinical details were recorded comprising of age And sex of the patient, occupation of the patient, medical History, mode of injury, time interval between injury and Treatment. Complete clinical examination was done looking For limping, flat footed gait, presence of palpable gap in the Posterior heel. Thompson test and Tip toe walking helps in the diagnosis.

Radiographic evaluation of the ankle X-ray lateral view was done to look for any bony avulsions, calcification of the tendon. High resolution Ultrasound helps in confirming the diagnosis. MRI was ordered in some patients in those where diagnosis was equivocal. Preoperatively routine MRI was not performed because of added financial burden on the patient. All the routine investigations were done preoperatively with complete medical and anaesthetic fitness of patient for surgery.

Surgical Technique

The surgery was performed under regional or general anaesthesia. After tourniquet application to the thigh, patients were placed prone on the operating table and the ruptured tendon was approached through a posterior midline incision from the calcaneus to the proximal one third of the calf. Sural nerve and short saphenous vein were secured and isolated. Ruptured tendon was exposed, and scar tissue was excised between the ends. A 1.5 cm wide tendon strip was cut and freed from the central portion and was 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. Wound was closed and a long-leg cast, holding the Knee in flexion and the foot in plantar flexion is applied. Post operatively drain removal was done on 2nd Postoperative day and suture removal was done on 10-12th Postoperative day through a window in the cast and long leg Non-weight bearing cast with ankle in 200 plantar flexion and the knee in 300 Flexion was applied for three weeks and a Short leg cast with ankle in 200 plantar flexion was applied For 3 weeks. A walking short leg cast in a neutral position Was applied for three weeks and completely freed from cast From then. Rehabilitation program for weight bearing, Muscle strengthening exercises and range of motion was Begun. Evaluation The clinical outcome was assessed using the clinical scoring Method described by Leppilahti et al.¹⁵

The scoring Included subjective factors such as pain, stiffness, muscle Weakness and footwear restrictions; subjective outcomes as Well as objective factors such as the active range of ankle Motion and isokinetic calf muscle strength. The maximum Number of points achievable was 100. The results were Classified as excellent (>90 points), good (75–89 points), fair (60–74 points) or poor (<60 points). The patients were Asked to give answers to a non-validated subjective symptoms questionnaire.

Leppilahti Scoring System

Clinical Factor Points

III. RESULTS

Sixty-seven patients underwent surgery during the study Period. There were 39 males and 28 females. The average Age was 44.3 years (Range: 22-69 years). The cause for the Rupture of tendoachilles was trauma in 37 patients, Spontaneous in 27 patients, post steroidal injection in two And cause could not be identified in one patient. The delay Between the injury and operation varied widely from 4 Weeks to 22 weeks (mean 7.4 weeks). The mean follow up Was 36.4 months (range: 18-54 months). Of the 67 patients, Excellent to good results were reported in 60 patients (89.5%), 5 patients had fair and 2 patients had poor results According to Leppilahti scoring system. No major Complication or re rupture of the tendon was noted. Minor Complications like superficial skin infection was reported in two (2.9%) which was treated with local dressings and Systemic antibiotics. One patient (1.4%) had deep infection Requiring debridement, dressings and systemic antibiotics. Delayed wound healing was seen in three (4.4%) patients, Scar hypertrophy in two (2.9%) patients.

IV. DISCUSSION

Chronic Achilles tendon ruptures are difficult to treat. Retraction of the tendon ends, scar tissue between the tendon ends, less vascularity makes the repair difficult. Strength of the repair should be sufficient for early Rehabilitation and to attain the preinjury status early. Reconstruction using the Achilles tendon is associated with increased strength of repair. Multiple incisions for harvesting the donor graft, increased operative time, and soft tissue edema can lead to complications like delayed wound healing and skin infection. In our study Leppilahti scoring system was used to assess the clinical outcome. The mean followup was 36.4 months. 89.5% of the patients showed good to excellent outcome with scores 75 and above. Our results were comparable to results done with other techniques using semitendinosus, flexor hallucis longus, tibialis posterior and peroneus brevis.⁶⁻¹² Wapner et al¹⁶ reported good functional results after the dynamic repair of chronic Achilles tendon ruptures with flexor hallucis longus tendons. The main disadvantage of this technique is that the tendon is very thin in diameter, and it alone will not be adequate. Mann et al.¹⁷ used the FDL to bridge the gap in chronic Achilles tendon ruptures. This technique is not suitable when the gap between the ends is more than 5 cm. Yousuf M Khira et al¹⁸ reported good functional outcomes with reconstruction of chronic Achilles tendon rupture by V-Y gastrocnemius flap and peroneus brevis transfer but the complication in this study is 23%. The incidence of AT re-rupture after reconstruction in acute or chronic cases in the literature is 1.4-3.7%.¹⁹⁻²³ There was no case of re-rupture in our study. The tensile strength of the Achilles tendon is strong enough to prevent the re-rupture. The limitation of this study is lack of control group and long term follow up. Since this study is not randomized results cannot be taken as conclusive.

V. CONCLUSION

Reconstruction of the chronic Achilles tendon ruptures with Bosworth technique is associated with good clinical and functional outcomes.

REFERENCES

- [1]. Viidik A. Tensile strength properties of Achilles tendon systems in trained and untrained rabbits. *Acta Orthop Scand* 1969;40(2):261-272.
- [2]. Abraham E, Pankovich AM. Neglected rupture of the Achilles tendon. Treatment by V-Y tendinous flap. *J Bone Joint Surg Am* 1975;57(2):253-255.
- [3]. Lee KB, Park YH, Yoom TR, et al. Reconstruction of Neglected Achilles tendon rupture using the flexor hallucis longus tendon. *Knee Surg Sports Traumatol Arthrosc* 2008;17(3):316-320.
- [4]. Park YS, Sung KS. Surgical reconstruction of chronic Achilles tendon ruptures using various methods. *Orthopedic* 2012;35(2):e213-e218.
- [5]. Maffulli N, Via AG, Oliva F. Chronic Achilles tendon Disorders: tendinopathy and chronic rupture. *Clin Sports Med* 2015;34(4):607-624.
- [6]. 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.
- [7]. 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
- [8]. 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.
- [9]. Lapidus LJ, Ray BA, Hamberg P. Medial Achilles Tendon island flap—a novel technique to treat Ruptures and neglected ruptures of the Achilles Tendon. *Int Orthop* 2012;36(8):1629-1634.
- [10]. 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.
- [11]. 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.
- [12]. Lee DK. Achilles tendon repair with acellular tissue Graft augmentation in neglected ruptures. *J Foot Ankle Surg* 2007;46(6):451-455.
- [13]. Maffulli N, Leadbetter WB. Free gracilis tendon graft In neglected tears of the Achilles tendon. *Clin J Sport Med* 2005;15(2):56-61.
- [14]. Bosworth DM. Repair of defects in the tendon Achilles. *J Bone Joint Surg Am* 1956;38-A(1):111-114.
- [15]. Leppilahti J, Forsman K, Puranen J, et al. Outcome And prognostic factors of Achilles rupture using a new Scoring method. *Clin Orthop Relat Res* 1998;346:152-161.
- [16]. Wapner KL, Pavlock GS, Hecht PJ, et al. Repair of Chronic Achilles tendon rupture with flexor hallucis Longus tendon transfer. *Foot Ankle* 1993;14(8):443-449.
- [17]. Mann RA, Holmes GB, Seale KS, et al. Chronic rupture Of the Achilles tendon: a new technique of repair. *J Bone Joint Surg Am* 1991;73(2):214-219.
- [18]. Khira YM, Gheith MAA. Reconstruction of chronic Achilles tendon Rupture by V-Y gastrocnemius flap And peroneus brevis transfer. *Clin Res Foot Ankle* 2016;4:202.
- [19]. Rahm S, Spross C, Gerber F, et al. Operative Treatment of chronic irreparable Achilles tendon Rupture with large flexor hallucis longus tendon Transfer. *Foot and Ankle Int* 2013;34(8):1100-1110.
- [20]. Wang CC, Lin LC, Hsu CK, et al. Anatomic Reconstruction of neglected Achilles tendon rupture With autogenous peroneal longus tendon by Endo Button fixation. *J Trauma* 2009;67(5):1109-1112.
- [21]. Coull R, Flavin R, Stephens MM. Flexor hallucis Longus tendon transfer: evaluation of postoperative Morbidity. *Foot Ankle Int* 2003;24(12):931-934.
- [22]. Maffulli N, Waterston SW, Squair J, et al. Changing Incidence of Achilles tendon rupture in Scotland: a 15-Year study. *Clin J Sport Med* 1999;9(3):157-160.
- [23]. Myerson MS. Achilles tendon ruptures. *Instr Course*.