Comparative Evaluation of Clinical and Functional Outcome of Open Surgical Versus Percutaneous Repair of Acute Tendo Achilles Rupture

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Abstract

Aim: 1. To evaluate the results 1 year after the management of Achilles tendon rupture, using standardized, validated assessment methods for symptoms and function in patients treated open surgical repair versus percutaneous surgical repair. 2. To evaluate the recovery of function 1 year after injury and to study how function relates to patient-reported outcomes, with regard to lower limb function, as well as general health and quality of life.

Material and Method: This was an Prospective Cohort study of 30 patients of acute ruptured Tendo Achilles who were treated with open surgical repair and percutaneous repair. Patients were randomly allocated into the two treatment group (group 1 patients were managed by open repair and group 2 patients were managed by percutaneous repair) according to their order of presentation (one by one). Cases were taken up according to inclusion and exclusion criteria. All patients underwent a rehabilitation program. Cases were followed and evaluated at 3 weeks, 6 weeks, 12 weeks, 6 month and 1 year interval. The results were evaluated clinically and functionally by Leppilahti scoring method.

Results: All the patients were followed up at 3 weeks, 6 weeks, 12 weeks, 6 months and 1 year interval. Mean time to return to work was 6 months in patients who underwent open surgical repair versus 4 months in patients who underwent percutaneous repair of acute ruptured Tendo Achilles. Lippelahti scores were excellent in 53.34% of open repair and 93% of percutaneous repair, good in 33.33% of open repair and 6.67% of percutaneous repair. Complications were significantly lower in percutaneous group.

Conclusion: Percutaneous repair provides function similar to that achieved with open repair, with a better cosmetic appearance, a lower rate of wound complications and is also cost effective.

Keywords: percutaneous repair, tendoachilis tendon tear, functional outcome

Introduction

The incidence of Achilles tendon rupture appears to be rising and approximately 75% of all ruptures occur during sporting activities [1]. Today, an Achilles tendon rupture is treated surgically, using either the standard open technique or the percutaneous technique, or non-surgically, with different mobilization alternatives. There is a wide variation of immobilization methods after both surgical and non-surgical treatment, including a cast and functional brace with or without weight-bearing and range-of-motion training. The main focus in the literature has been to compare the outcome of different treatment options in terms of re-rupture and surgical complications. A large number of medical reports and meta-analyses have been published in the field of Achilles tendon rupture, but there is still a lack of consensus on the best management. The aim of the present study is to evaluate the surgical treatment comparing the results obtained with Open and Percutaneous repair of acute rupture of Tendo Achilles.

Material And Method

The present study was conducted in department of orthopaedics, MLN Medical College and associated SRN hospital Allahabad from January 2014 to December 2015 in a consecutive series of patients who presented in the Outpatient department(OPD) and in the Emergency department with acute rupture of Tendo Achilles during the period of one year and who satisfied the inclusion criteria. This was an Prospective Cohort study and patients were randomly allocated into the two treatment group (group 1 patients were managed by open repair and group 2 patients were managed by percutaneous repair) according to their order of presentation( one by one).The prospect of treating the problem with conventional open repair or percutaneous repair was offered to the patients who accepted after detailed explanation. A total of forty patients of Acute Tendon Achilles rupture were admitted, out of which 5 patients were unfit for surgery and thirty five patient were managed operatively by percutaneous method or open method of repair. All the operatively managed patient were observed from admission to discharge. Each patient was called upon for follow up at 3 weeks, 6 weeks, 12 weeks, 6 month and 1 year duration but only 30 patients of Acute Tendo Achilles rupture were included in the study who turned up for at least 1 year duration. The cases were evaluated clinically...
findings were recorded in the Proforma. The results were evaluated clinically and functionally by Leppilahti scoring method.2 Out of these 30 patients, 15 patients had to undergo open repair during the course of study and 15 patients had to undergo percutaneous repair of acute rupture of Tendo Achilles.

Technique of percutaneous repair: (Fig 1,2,3) In the operating room with the patient under spinal or epidural or local anesthesia, and with the extremity prepared as for open surgery, the tendon defect was palpated and small stab wounds were made on each side of the Achilles tendon 2.5 cm proximal to the rupture defect. A small hemostat was used to free the underlying tendon sheath from the subcutaneous tissue; a No. 0 or a No. 1 nonabsorbable suture threaded passed on a straight needle from the lateral stab wound through the body of the tendon and exit in the medial stab wound (Fig., Step 1). With a straight needle on each end of the inserted suture, crisscross the needles within the body of the tendon and the skin was punctured just distal to the site of tendon rupture; the sites of needle puncture was enlarged with a scalpel (Fig., Steps 2), the suture was pulled completely through the stab wounds; the suture was snuged within the proximal portion of the ruptured tendon. With the lateral suture now threaded on a curved cutting needle, the suture was passed back through the last stab wound to exit at about the midportion of the distal stump of the ruptured tendon on the lateral side (Fig. Step 3). The hole was enlarged with a scalpel before pulling the suture through. A hemostat was used to free the subcutaneous tissue from the underlying tendon sheath (Fig., Step 4). A straight needle used, passed lateral suture through the body of the distal stump of the tendon; the puncture wound in the skin was enlarged as before (Fig., Steps 5 and 6). A curved cutting needle was used, passing the suture from this distalmost stab wound on the medial side, and exiting at the middle stab wound on the medial side of the ruptured tendon (Fig., Step 7). With the ankle maintained in equinusposition, tension to the suture was applied in a crisscross manner, and brought the tendon ends together; the sutures were tied in this position, and with a small hemostat, the knot was buried in the depths of the wound (Fig., Steps 8 and 9). The skin was sutured. A sterile dressing to the stab wounds was applied.

Technique of Open repair (krackow et al.)

With the patient prone, a posteromedial incision was made approximately 10 cm long about 1 cm medial to the tendon and ending proximal to where the shoe counter strikes the heel. Sharp dissection was done through the skin, subcutaneous tissues, and tendon sheath. The tendon sheath was reflected with the subcutaneous tissue to minimize subcutaneous dissection. The ruptured ends of the tendon were approximated with a 2-0 nonabsorbable suture. The repair was checked for stability after the sutures were tied. The peritenon and subcutaneous tissues were closed with 4-0 absorbable sutures. The skin was closed and a sterile dressing and a posterior splint or short-leg cast with the foot in gravity equines was applied.

Post operative care:

Postoperatively above knee Plaster of Paris slab was applied in full plantar flexion at ankle joint and ninety degree flexion at knee joint and a pillow kept below the knee joint.

• Antibiotic prophylaxis against infection (cefoparazone – sulbactum for 5 days) was given to all patient,
• Appropriate analgesia was given according to the degree of the pain.
• Wound dressing was done on third and fifth post operative day with full aseptic precautions.
• Stitches were removed on post operative day 12 and patients were discharged on above knee slab in 30 degree planter flexion at ankle joint and ninety degree flexion at knee joint with written advice to come for follow up after 3 weeks.

• At 3 weeks below knee slab was applied in neutral position at ankle joint, At 6 weeks the slab was removed and Walking orthosis given to the patient. The patient was advised partial weight bearing and physiotherapy (heel lift exercise).
• At 9 weeks the walking orthosis was removed and patient was advised to gradually increase weight bearing.

Rehabilitation was delayed for 2 week post surgery. Physiotherapy protocol as below

0– 3 weeks
1. An above knee slab in 30 degree planter flexion at ankle joint and ninety degree flexion at knee joint was applied.
2. Non-weight bearing for 3 weeks — no push off or toe-touch walking was allowed.
3. Toe curls, toe spreads were advised

Figure 1: Technique for percutaneous repair (refer to text for details of the steps)
3 - 6 weeks
1. A below knee slab was applied in neutral position at ankle joint.
2. Toe curls, toe spreads, straight leg raises, knee flexion/extension were advised.

6 - 9 weeks
1. Slab was removed and Walking orthosis was given to the patient.
2. Gradual partial weight bearing was advised.
3. Heel raise exercise advised to patient.
4. Slow increase in the intensity and ranges of isometrics of Achilles within the range of the boot.
5. Slow increase in the passive range of motion and stretch on the Achilles tendon

9 - 12 weeks
1. Gradual increase in weight bearing with heel lift as tolerated, gait training
2. Weaning into a regular shoe over a 2-4 week period.
3. Gradual increase in active/resistive exercises of the Achilles (i.e. submaximal isometrics, cautious isotonics.
4. Manual full passive range of motion of the Achilles — nothing forceful
5. Progress to cycling in shoe

3 - 6 months
1. Closed chain exercises: controlled squats, lunges, bilateral calf raise (progress to unilateral), toe raises, controlled slow eccentrics vs. body weight.
2. Cycling, VersaClimber, rowing machine, NordicTrack (gradually).

6 - 9 months
Jogging/running, jumping, and eccentric loading exercises, noncompetitive sporting activities, sports-simulated exercises

9 - 12 months
Return to physically demanding sport and/or work.

Results
The mean age in year for males was 36.14±9.33 years (27 to 46 year). The mean age in year for females was 38±7.71 years (30 to 46 years). Over all mean age in years was 37.07±8.52 years (29 to 46 year). Out of 30 patients, 21 (70%) patients were male and 9 (30%) patients were females. In this study the most common mode of injury was sports injury. Out of 30 patients 20 (66.67%) patients sustained tendo Achilles rupture due to sport activity. Remaining 10 patients sustained tendo Achilles rupture due to age related (senile) and corticosteroid injections. In present study 15 (50%) out of 30 patients with tendo Achilles rupture presented with in 7 days of injury. Remaining 15 patients (50%) presented at variable interval after 7 days but those presented before 6 weeks of injury. Patients treated with open method of repair were hospitalized for an average period of 15 days ranging from 12 to 18 days. Patients treated percutaneous method of repair were hospitalised for an average period of 7 days ranging from 5 to 9 days.

In present study Cases were followed and evaluated at 3 weeks, 6 weeks, 12 weeks, 6 months and 1 year. The results were evaluated clinically and functionally by Leppilahti scoring method. Leppilahti scoring done at 3 weeks, 6 weeks, 12 weeks 6 months and 1 year follow up. Mean leppilahti score for percutaneous and open repair of ruptured tendo Achilles are mention in table 1.

This improvement in mean leppilahti score at 3 weeks, 6 weeks, 12 weeks, 6 months and 1 year follow up was found to be statistically significant at p<0.05 suggesting that the percutaneous method of repair for acute rupture of tendo Achilles is better modality than open repair.

Complications
In this study the rate of complications are more with open repair of tendo Achilles as compare to percutaneous repair (Table 2). Two (13.33%) out of fifteen patient developed complications in form of superficial infection and sural nerve injury in percutaneous repair of acute rupture of tendo Achilles whereas eight (53.33%) out of fifteen patients developed complications in form of superficial and deep infection, skin maceration and exposed tendon in open repair of acute rupture of Tendo Achilles. Due to high complication rate in open method of repair as compared to percutaneous repair of acute Tendoachilles rupture average duration of delay in post operative rehabilitation physiotherapy was 2 weeks in open repair.

Discussion
Achilles tendon rupture has been related to a relatively hypovascular area of the tendon to be 2 to 6 cm above the tendon insertion into the calcaneus. The major blood supply of the tendon is through its
mesotendon, with the richest supply through the anterior mesentery. With increasing age, this anterior mesenteric supply becomes reduced. Age-dependent changes in collagen cross-linking result in increased stiffness and loss of viscoelasticity, predisposing to injury. Repetitive microtrauma to this area may make it impossible for the reparative process to keep pace, and a degenerative attrition may be responsible for many Achilles tendon ruptures.

The tendon of one athlete is able to withstand greater stress than that of another is related to a variety of factors, including long-term active and passive tendon tension, which results in more efficient collagen cross-linking, producing better viscoelastic properties, and tenocyte viability related to vascular nutrients, genetic factors, and hormonal environment, including growth factors, which have been shown to be important in determining scar characteristics. Another cause of Achilles tendon rupture is the failure of inhibiting mechanisms at the musculotendinous unit as a result of fatigue, with resultant eccentric overload. The cause of Achilles tendon rupture probably is a combination of a relatively hypovascular area and repetitive microtrauma that causes an inflammatory reparative process that is unable to keep up with the stresses because of decreased vascularity. A mechanical overload completes the rupture.

The decision to treat acute tendo Achilles rupture conservatively or operatively is somewhat controversial.

Indications of conservative treatment are:
1. A gap (between the ruptured end of tendo achilles) of less than 5 mm with maximum planter flexion
2. A gap of less than 10 mm with foot in neutral position.
3. More than 75% tendon apposition with foot in 20 degree planter flexion.

The rate of rerupture was higher with conservative treatment as compare to operative treatment. Of many studies conducted in this regard, 3 landmark studies Willitis K et al [5], Wong J et al [4] and Kocher et al [6] were showed that rerupture rate was significantly lower with operative (open surgical) treatment as compare to conservative treatment but to be associated with higher complication rate related to surgery like skin necrosis, adhesion, infection etc.

To obtain the benefits of operative (open surgical) treatment with minimum complications Ma and Griffith describe the percutaneous repair of acute ruptured tendo achilles. Of the many studies conducted to compare the outcome and complication rate of percutaneous versus open surgical repair of ruptured tendo Achilles, 3 landmark studies Carmont Mr et al [7], Cretnik A et al [9], Lim J et al [3], were showed comparable outcome and less complication rate associated with percutaneous repair as compare to open repair.

In the present scenario most common cause of tendo Achilles rupture is sports injury. It usually occurs in 30 to 40 year of age group. The goals of management of Achilles tendon ruptures are to minimize the morbidity of the injury, optimize return to full function, and prevent complications.

Percutaneous repair of acute rupture of tendo Achilles is a good method to achieve the outcomes of open surgical repair with less complication rate.

Limitations of the Study
1. Lack of control/comparison /blinding
2. Short duration of study
3. Small study group

Advantage of percutaneous Repair
1. Less time taking procedure.
2. Short learning curve.
3. Can be done in local anaesthesia as a day care surgery.
4. Less amount of blood loss.
5. Tourniquet is not required.
7. Early rehabilitation can be start.

Conclusion
The results of our study shows that rate of complications associated with open repair of Tendo Achilles were significantly low with Percutaneous repair. We observed more or less similar values of Range of Motion, calf muscle strength(subjective according to Lippelaitahi score), and single heel raising test between the groups however surgical stress to patients and surgical complications were less with shorter period of recovery in the patients of Percutaneous repair group. Mean time to return to work was longer for patients who had open versus percutaneous repair (6 months versus 4 months) because healing of ruptured Tendo Achilles was faster in Percutaneous repair due to lesser complications and physiotherapy could be implemented earliest. Cosmetic appearance is superior in the group of patients who had a percutaneous treatment. Percutaneous repair provides function similar to that achieved with open repair, with a better cosmetic appearance, a lower rate of wound complications and is also cost effective.
References