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Research Article

Comparative Results of a New Minimally Invasive Repair Technique in Chronic Achilles Tendon Rupture

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Abstract

A prospective study was carried out in a general hospital, comparing the results in the management of inveterate Achilles tendon ruptures over a period of five years using a new minimally invasive technique.

A total of 74 tendons were repaired, of which 29 underwent minimally invasive surgery, with resection of the fibrous scar previously marked with ultrasound and suture of the tendon gap using the Amlang and Zwip technique. The results obtained were better than those obtained with open techniques in inveterate tears and similar to minimally invasive techniques in acute injuries in terms of postoperative complications, clinical measures, functionality and return to work.

The objective of this technique is to lead to an intrinsic repair of the tendon, resecting the fibrous scar of the defect and performing an end-to-end anastomosis under the concept of exacerbation of the inveterate injury. As advantages, this technique does not sacrifice other tendons, it is simple and inexpensive, and therefore, it can be used in any center.

Keywords: Tendon; Achilles; Chronic Rupture; Late Rupture; Minimally Invasive Repair

Introduction

Achilles tendon ruptures are considered late when they are diagnosed and treated with an evolution time greater than 2 weeks, and in turn, inveterate chronic ruptures, when they present an evolution of more than 4 weeks. [1] Fortunately, chronic presentation is rare, reaching 20% of all ruptures and 40% of all Achilles tendon surgeries. [2] In these cases, surgical treatment offers better results than conservative management, [3] however, the complications of treatment with the open technique are difficult to manage and may require major procedures. [4,5-6] For this reason, minimally invasive procedures have been developed for both acute and chronic injuries.

A surgical technique is presented that seeks to innovate in what has already been described as the rescue of late-onset and chronic lesions, treating them in a minimally invasive manner, trying to avoid the complications of open techniques and allowing early functional recovery.

Materials and Methods

A prospective clinical study was carried out in a general hospital, between June 2013 and May 2017, comparing different surgical techniques in the treatment of Achilles tendon ruptures.

The diagnosis of inveterate Achilles tendon injuries was made based on clinical history and physical examination. The presence of Thompson's sign and palpable GAP were evaluated. In case of diagnostic doubt, a soft tissue ultrasound was requested to identify lesions that were not evident on physical examination.

Patient demographics were obtained. According to the published scientific evidence, the patients were treated with open and minimally invasive repair techniques with the new minimally invasive technique presented in this work.

Late-onset Achilles tendon ruptures without evident palpable GAP underwent intra-pavilion preoperative ultrasound to locate the rupture area and identify the fibrosis to be respected.

After surgery, the patients treated with the presented technique were kept in equine immobilization for 4 weeks. Subsequently, a standardized physiotherapy rehabilitation protocol was carried out in 6 phases, used by the ankle and foot team of a specialized national trauma center since 2006. Those patients treated with other techniques had similar postoperative and rehabilitation management as indicated by their surgeons.

Controls were performed in all cases at 14, 45 and 90 days. The calf circumference was measured at 90 days, the ATRS scale (Achilles Tendon Total Rupture Score) was applied, and the tendon GAP was measured at 8 weeks with ultrasound. In addition, information related to the intervention was obtained, such as operating time, presence of postoperative complications, and time to return to work.

Surgical technique

A minimally invasive surgical technique without skin resection was used for the treatment of late and chronic Achilles tendon ruptures. All procedures were performed with the patient in prone position, with spinal anesthesia, Cefazolin 1 gr ev prophylaxis, blood emptying with a rubber band, and ischemia at 300 mmHg during surgery.

The technique used by the author (JG) consists of starting with the classical technique described by Amlang and Zwipp [7]. (Figure 1); then make a longitudinal incision to the tendon of 1.5 centimeters over the identified tendon scar, previously marked with ultrasound, resection of the lesional tendon gap and the release of adhesions to the peritenon in both ends to allow the sliding of these. Subsequently, the tendon ends are faced with a maximum plantar flexion maneuver, the knots are closed with the Amslang and Zwipp technique with a double strand of Fiberwire® 1/0 (Figure 2). Then the equinus recovered from the injured foot is compared with the healthy contralateral one (Figure 3), and finally the cellular plane is closed with 3/0 Vicryl and the skin with 3/0 Nylon with separate stitches.

Figure 1: Repair of the Achilles tendon according to the classic Amlang and Zwipp technique.

The open technique used in this study for the surgical management of a group of patients with inveterate Achilles tendon injuries corresponds to the classical technique widely described in the literature. As well as the Amslag Zwipp technique used in acute injuries.

Figure 2: Coping of the tendon ends with maximum plantar flexion maneuver.

Figure 3: Recovery of the equinus of the injured foot with respect to the healthy contralateral.

Results and Discussion

During the study period, 74 Achilles tendon ruptures were identified in 72 patients who were treated surgically. 67 men and 5 women with a mean age of presentation of 41 years. 56 (77%) were due to an amateur sports accident.

36 ruptures had an acute presentation, all with Thompson's sign and a palpable gap. The remaining 38 lesions presented late and chronically, in which the gap was not palpable, so preoperative ultrasound was performed. Of these patients, 9 cases were operated with the open technique and 29 with the minimally invasive technique. The latter were operated with the new minimally invasive technique described with exacerbation.

In this last group the average age was 44.2 years. The time from injury to surgery was 32 days. All patients had a compatible history and physical examination: pain, functional disability defined as the inability to climb stairs or stand on tiptoes, tendon edema, weak

plantarflexion, and difficulty walking. Using ultrasound, the height of the lesion was identified and the fibrosis to be resected was measured, which was an average of 2.4 cm (Figure 4 and 5). The average surgical time with this technique was 54 minutes.

Figure 4: The size of the lesion was identified by ultrasound.

Figure 5: Using ultrasound, the fibrosis to be resected was measured.

The minimum follow-up was 26 months, all the patients showed subjective and objective signs of improvement according to the criteria established by Mann., *et al*. [10] 1 patient presented early surgical wound infection, none reported functional limitation. All the patients were satisfied with the results, with adequate strength of the triceps surae, achieving standing on tiptoe. 1 patient presented signs of tendinosis during rehabilitation, which delayed the return to work. All managed to return to their pre-injury work activity in an average of 3.5 months and reported no functional compromise during their daily activities. The average ATRS score was 86.12 points. The average twin circumference was 31 cm in the operated limb and 34 cm in the healthy twin (9% deficit). The mean coping loss of the ends to the ultrasound measurement gave a scar gap of 3.5 mm at 8 weeks (Figure 6).

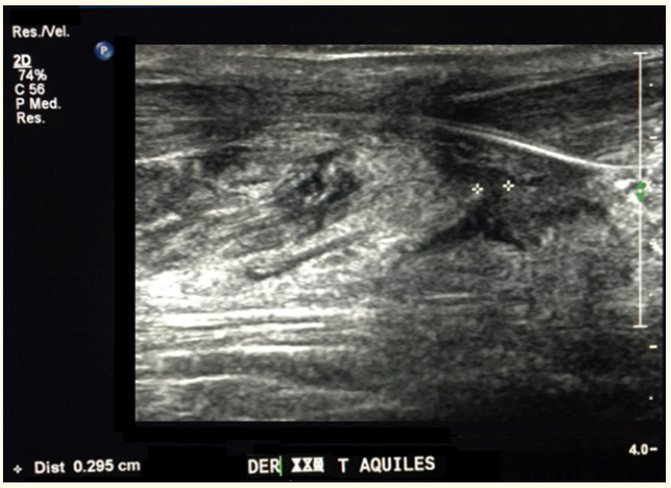

Figure 6: Measurement of the loss of coping of the ends under ultrasound vision.

In the group operated with the open technique, the average surgical time was 90 minutes. 2 patients presented postoperative complications, one of them evolved with a venous ulcer and the other with dehiscence of the surgical wound, both managed in the healing polyclinic, achieving definitive closure at 3.5 weeks. The average return to work time was 4.3 months. 1 patient reported persistent edema of the evening scar in which deep vein thrombosis was ruled out. The ATRS score is 79.43 points.

In the group of acute lesions with minimally invasive surgery according to the Amlang and Zwipp technique, 1 patient presented a granuloma associated with a foreign body and another sural neuropraxia. One patient presented a re-rupture of the Achilles 8 weeks after surgery, due to an accidental fall, with a 9-mm tendon gap measured under ultrasound and managed conservatively. The average surgical time was 32 minutes. The ATRS score is 89.43 points, the average twin perimeter of 30.7 cm compared to 33 cm in a healthy twin (7% deficit). Return to work was achieved at an average of 3.2 months and the scar gap was measured in 8 patients with an average of 3.2 mm.

Discussion

Many techniques have been described to repair late and chronic Achilles tendon injuries. [9] If the rupture remains untreated for more than 4 weeks, the difficulty in restoring tendon integrity and function increases [11].

Many techniques successfully replace the tendon defect but do not lead to intrinsic repair [12], an example of this is tendon transfers [13,14]. It has previously been reported that only primary tendon repair can restore the normal elasticity and strength of the Achilles tendon [15].

There are advantages of the results obtained with the minimally invasive techniques compared to the open technique in late and chronic Achilles tears, in terms of complications of the surgical wound, diastasis of the tendon gap, functional evaluation according to the ATRS score and earlier return to work.

The results obtained when comparing the described technique of minimally invasive repair in inveterate tears versus acute lesions treated minimally invasively, are similar in terms of complications, return to work, ATRS score, and triceps sural atrophy. This result could be attributed to the search for exacerbation of the lesion in the mini-invasive technique of inveterate lesions.

The decision on which surgical technique to use in a chronic Achilles tendon rupture is based on four main parameters: 1) The distance of the ends; 2) the age of the patient; 3) the age of the injury, and 4) the level of activity.

The technique presented has a series of characteristics and advantages that make it an alternative in the treatment of inveterate lesions. It includes resection of the fibrous scar of the defect (not advisable over 3 centimeters), end-to-end anastomosis of the tendon ends with the aim of joining healthy tissue, without sacrificing other tissues. The described technique corresponds to a simple and low-cost technique, and therefore, it could be used in any trauma center.

Conclusion

The described surgical technique is a valid option in the rescue of Achilles tendon ruptures of late diagnosis or inveterate up to 3 cm fibrous gap. The results obtained are similar to percutaneous techniques in acute care and with fewer complications than open techniques. We can recommend and spread the use of the technique due to its low cost and it is easily reproducible.

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Conflict of Interest

During the preparation of this study we have not received financing, influences or conflicts of interest with companies.

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