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Research Article

Reconstruction of The Achilles Tendon Using the Minimally Invasive Technique with Reinforcement of the peroneus brevis Tendon

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Abstract

Aim: To evaluate the minimally invasive technique to repair Achilles tendon lesions using reinforcement of the peroneus brevis tendon, and to present the clinical and functional results, such as the degree of satisfaction and the complications encountered. Method: A retrospective study of 14 selected patients presenting with traumatic or degenerative lesion of the Achilles tendon, subjected to repair by means of the minimally invasive technique with reinforcement of the peroneus brevis tendon. Result: In a sample of 14 patients, two of whom had bilateral lesions, 53% were on the left side and 47% on the right side; the average age was 47 (35 - 65) and 80% were male. Traumatic rupture was the most common mechanism found, in 73% of the patients. The clinical and functional results obtained using the post-operative AOFAS questionnaire, after an average period of 18 months (12-24 months), was 86.6 (70 - 97). There were no delayed complications in relation to the donor area or receiving area in any of the patients. Conclusion: minimally invasive surgery of the Achilles tendon with reinforcement of the peroneus brevis tendon was found to be effective and to have a low level of complications; it was simple and resulted in a high level of patient satisfaction.

Keywords: Achilles Tendon/Surgery; Tendon Lesions; Minimally Invasive Surgery

Introduction

Lesions of the musculotendinous unit are amongst the most common lesions treated by orthopedic surgeons. The most frequent cause of partial or complete rupture of a muscle or tendon is the eccentric overload of the musculotendinous unit [1]. Of all the tendo
ns, it is the Achilles in the lower member which ruptures most frequently [2] occurring with a frequency of between 5.5 and 10 per 100 people [3] in the North American population. Though they can occur at any age, these lesions are more common between the third and fourth decades of life, and occur predominantly in males and on the left side [1].

Options for treatment consist of non-surgical treatment, the more conservative method, and surgery, which can be performed using two methods, either open surgery or a minimally invasive technique [4]. Many studies have suggested that the minimally invasive technique results in high levels of re-rupture (9.8-12.6%) [12,13,18] and long periods of immobilization using a splint [17], leading to a stiffening of the ankle and muscle weakness. Using this technique, high rates of sural nerve lesion have also been observed (3-18%), leading to persistent paresthesia [6,11,14-16].

The open technique is associated with a lower rate of re-rupture and an earlier resumption of normal activity, but is also associated with a high risk of complications, including adhesion, infection, the formation of keloid and patient dissatisfaction with the surgical scar [7,10]. The percutaneous technique, on the other hand, was found to confer a high degree of satisfaction, affording the wound a more acceptable cosmetic appearance [8,14].

Until 2006, when Amlang et al. introduced the percutaneous technique, open surgery was the only surgical technique available for the repair of the Achilles tendon. Thereafter, it became the technique of choice for treatment of acute Achilles tendon lesions [5]. The aim of the present study was to evaluate the functional results of patients subjected to minimally invasive reconstruction surgery of the Achilles tendon, using the peroneus brevis tendon as reinforcement, as well as its clinical aspects, patient satisfaction and complications.

Surgical Technique Employed:

The patient was placed in a ventral decubitus position, under spinal anesthesia, a tourniquet being placed around the thigh. Prior to the surgery, the Achilles tendon lesion and the 2.5 cm incisions that were to be made (figure. 1), 1 cm from the Achilles tendon insertion (figure. 2), were delimited. The peroneus brevis tendon was identified and isolated, then a 2 cm incision was made in the region of the base of the fifth metatarsal (figure. 3) where the insertion of the short peroneal tendon can be seen, performing a tenotomy, with subsequent separation of the retinaculum and in this way drew the latter towards the proximal incision. The peroneus brevis tendon is passed below the base of the Achilles tendon and another 2.5 cm incision is made close to the Achilles tendon.

The sural nerve is isolated, then the peroneus brevis tendon is drawn towards the proximal region performing anchored stitches enfolding the short peroneal tendon and Achilles tendon using nylon 2.0. Another suture, similar to the previous one, is made in the distal portion, once again enfolding both the tendons. Vicryl 2.0 was used for the subcutaneous sutures, while the suture of the skin was carried out using monocryl 3.0 (figures 4 and 5).

A well-padded plaster of Paris boot was fitted in post-operative with fifteen degrees of equinus, the orthosis (Robofoot/walking-boot) having been substituted after three weeks, walking being permitted with the use of crutches. The operative wound was evaluated on a weekly basis. Physiotherapy began four weeks after surgery with isometric exercises for the calf muscle. In week six, the immobilization was removed and physiotherapy was maintained for strengthening and proprioception was carried out for a further two months.

Materials and Methods

This was a retrospective study, approved by the ethics committee (approval no. 53974016.4.0000.5374) in which 14 patients diagnosed with a rupture of the Achilles tendon were selected and subsequently


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5

submitted for tendon reconstruction surgery using the tendon of the peroneus brevis muscle as reinforcement in the reconstruction of the Achilles tendon by means of a minimally intensive technique, whether traumatic or degenerative. The following factors were analyzed: age, sex, tobacco use, the lesion mechanism and the side affected, in the period between 2014 and 2015. Patients under 18 years of age were excluded, as were those suffering from diabetes mellitus or maculopathies. The average follow-up period was one year, and all patients were operated by the same surgeon.

For the clinical and functional analysis, a questionnaire devised by the American Orthopedic Foot and Ankle Society (AOFAS) was employed, which analyzes data on pain, limitation of activities, need for support, distance and gait abnormalities, sagittal and ankle-hind foot mobility, stability of ankle and hind foot and their alignment, as well as the degree of patient satisfaction and complications.

Results

Of the 14 patients selected, two had suffered bilateral lesions while the other 12 had suffered unilateral lesions. As for the side most affected, the frequency was 53% left side and 47% right side. The average age was 47 (35 - 65). The sample consisted of 80% males, 71% non-smokers and the most common rupture mechanism resulted from trauma in 73% of the patients, linked to the following practices: running 14%, physical effort (pushing a car) 7%, practicing sports (soccer) 29%, stepping in a hole 21%, spontaneous rupture 14%, chronic tendinitis 7% and direct trauma 7%. For the remaining 23%, the cause was degenerative (fig. 6). The average follow-up time was 18 months [12-24].

The clinical and functional results obtained through the AOFAS post-op questionnaire [21], after an average follow-up period of 18 [12-24] months, were 86.6 points (ranging from 70 to 97). Three patients subjected to reconstruction of the Achilles tendon using minimally invasive techniques, with the use of reinforcement of the short peroneal tendon, were satisfied, albeit with some minimal restrictions, one of

		Age	Sex	Smoker?	Lesion mechanism					
1	R	50	M	No	Soccer	Trauma	No		87	Fully satisfied
2	R	37	M	No	Chronic tendinitis		No		90	Fully satisfied
	L		M				No		90	Satisfied, with minimal restrictions – sural neuroma resolved with physio
3	R	41	F	No	Running	Trauma	No		94	Fully satisfied
4	L	49	M	Yes	Running	Trauma	No		85	Satisfied, with minimal restrictions – insecure about resuming physical activity
5	R	52	M	No	Stepped in a hole	Trauma	No		87	Fully satisfied
	L				Chronic tendinitis		No		75	Fully satisfied
6	L	55	M	No	Soccer	Trauma	No		90	Fully satisfied
7	R	35	M	Yes	Soccer	Trauma	No		90	Fully satisfied
8	L	47	M	No	Soccer	Trauma	No		86	Fully satisfied
9	L	35	M	No	Leg trauma	Trauma	No		88	Fully satisfied
10	L	65	M	Yes	Spontaneous rupture		No		70	Satisfied, with minimal restrictions – began walking 15 days after surgery
11	R	62	F	No	Stepped in a hole	Trauma	No		80	Fully satisfied
12	L	47	F	Yes	Pushing a car	Trauma	No		85	Fully satisfied
13	R	41	M	No	Stepped in a hole	Trauma	No		93	Fully satisfied
14	L	39	M	No	Spontaneous rupture		No		97	Fully satisfied
Avg.		46.7								

patient records, figure. 6

which was due to a sural neuroma which was resolved with physiotherapy, another who was insecure about resuming physical activity and another began walking 15 days after surgery. There were no delayed complications in respect of the donor and receiver areas in any of the patients.

Discussion

The age group and practicing of sports [19] in this study was consistent with the literature. In the last two decades, the preferred method for treating Achilles tendon lesions has been surgical, as this has been associated with a lower rate of re-rupture when compared with more conservative treatment [9,10,11].

According to the literature, with percutaneous treatment, a higher rate of re-rupture and lesions in the sural nerve occur, when compared to the open surgery technique [20]. In our study, the re-rupture percentage was zero, different from the complications described in other studies conducted, as we used as reinforcement the short peroneal tendon in these tendon reconstructions. There were no infections or other complications with the surgical wound.

In the present study, of the complications mentioned, impairment of the sural nerve was observed in one of the patients, which was resolved with physiotherapy, however we obtained two cases of patients with insecurity about resuming their activities, as they commenced early weight-bearing, leading to hyper-elongation with a weakening of the operated Achilles tendon. This demonstrates the importance of immediate post-operative rehabilitation and observance of the medical directions, carried out correctly, thereby reducing the abovementioned complaints.

The limitations of this study included the small sample of patients, limiting the power of the statistical analysis and the two patients who did not correctly follow post-op instructions. However, after reviewing the literature on the subject, we were able to ascertain that the number of clinical studies using the minimally invasive technique with reinforcement of the short peroneal tendon, are few.

Conclusion

The technique of minimally invasive surgery of the Achilles tendon with reinforcement of the peroneus brevis tendon, was found to be effective and have a low level of complications; it is simple and patient satisfaction was high.

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