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Percutaneous repair of the Achilles tendon rupture in athletic population

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ABSTRACT

Aims: This review was designed in order to study the percutaneous repair of Achilles tendon rupture in athletic population. We present a comprehensive description of clinical, functional outcomes, complications, with emphasis on patients' level, and time of return to sports.

Methods: We proceeded to a systematic search of Medline (PubMed), Cochrane, and Scopus databases using keywords "Achilles Tendon", "Percutaneous Repair", "Percutaneous suturing", "Subcutaneous repair", "Subcutaneous suturing", "Athletes", and "Athletic" to identify articles or abstracts written in English.

Results: Thirteen studies, including 670 patients, could be identified. A variety of percutaneous repair techniques were performed. Re-rupture rate was very low. The most frequent complication was sural nerve damage. Average functional outcomes were satisfying. Up to 91.4% continued practicing sports after surgery. Furthermore, 78–84% returned to the same or higher sports level. Average time of return was 18 weeks in 9 studies.

Conclusion: Percutaneous repair of Achilles tendon rupture is an excellent perspective for athletic population. Low re-rupture rate and impressive level of return to sports allow athletes to continue their recreational activities or careers.

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1. Introduction

Achilles tendon (AT) is one of the strongest tendons of the human body¹ and takes its name from Achilles, the famous warrior of the ancient Greek literature.

Rupture of this tendon occurs mainly during sports activities, more frequently in middle-aged men, especially

recreational sportsmen who play sports occasionally.² The incidence of the tendon's rupture has increased over the last decades, a fact that is attributed to the increased sports participation among the population.^{3–5}

Management of AT rupture is a controversial issue. Surgical and conservative treatments are the current alternatives. Conservative treatment involves early equinus cast application for 6–8 weeks in order to approximate the edges of the

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ruptured tendon together to promote healing. Operative treatment involves open or percutaneous surgical technique in order to repair the ruptured tendon. Although there is an argument whether surgical or non-surgical treatment is the best option, operation appears to be more suitable for athletes due to the faster return to previous activities and the lower re-rupture rate.⁶⁻⁸

Percutaneous suturing of the AT was first introduced by Ma and Griffith in 1977⁹ as an alternative for open repair, in order to avoid the procedure's complications. Since then, much progress has been made. Technological development brought modifications that improved the original technique,¹⁰⁻¹⁴ such as ultrasonography or endoscopy-assisted and mini-open technique, leading to better and more satisfying results.

Although there is no consensus over the ideal surgical procedure for athletes, several studies suggest that percutaneous repair offers better cosmetic results, reduced costs and yet comparable functional outcome and complication rate when compared to open repair.¹⁵⁻¹⁷

The purpose of this study is to present a review of the existing literature concerning the results of percutaneous repair of the AT rupture in athletic population with emphasis on the time and the level of return to sports activities.

2. Materials and methods

2.1. Literature search and studies' selection

Relevant studies were searched in Medline (PubMed), Cochrane, and Scopus databases using keywords "Achilles Tendon", "Percutaneous Repair", "Percutaneous suturing", "Subcutaneous repair", "Subcutaneous suturing", "Athletes", and "Athletic". Articles or abstracts published in English that reported clinical and functional results plus level and time of return to sports after percutaneous repair of the AT were included.

Reviews, cadaveric, non-human, biomechanical, in vitro, and studies that did not refer details concerning the level or time of return to sports were excluded.

After the initial assessment of 84 abstracts, we concluded to 13 articles. To obtain the information that we searched for, we analyzed 11 full articles and 2 abstracts.

2.2. Data extraction

We extracted the data from each study included. We isolated information about Sports level (pre-postoperative), time of return to sports, re-rupture rate, other complications (DVT, infection and delayed healing, adhesions, sural nerve damage), and functional outcomes (AOFAS, ATRS, Hannover scale, VISA-A scale, gastrocnemius muscle atrophy, ROM).

3. Results

Thirteen studies from 1990 to 2014 were assessed. The number of patients included in each study ranged from 12¹⁸ to 144,¹⁹ for a total of 670 repairs. Three studies^{11,12,19} were endoscopy-assisted, one study²⁰ was ultrasonography-assisted, and in one study,²¹ combined mini-open and percutaneous technique was performed.

Follow-up period was 1 year or above in 11 out of 12 studies. One study²² reported 6 months minimum follow-up. Eighty-one patients were reported as professional level athletes at their pre-injury state. The sex ratio was clearly in favor of males (M/F: 558/100). The ratio was not clarified for 12 patients.¹⁸ Mean age was between 30 and 40 years in 10 out of 13, above 40 in two^{22,23} and below 30 in one²¹ (Table 1).

3.1. Functional outcomes

The results of postoperative American Orthopedics Foot and Ankle Society (AOFAS) hindfoot clinical outcome score, which was used in 5 studies,^{12,20,24-26} were impressive (96.1 Average, 44-100 range).

Three studies^{20,23,27} used the Achilles tendon Total Rupture Score (ATRS); one of them used AOFAS score too.²⁰ Postoperative ATRS ranged from 84.3 to 91.4 with an average of 89. Postoperative Hannover and VISA-A scales were used in one study with scores of 94.5 and 93.1, respectively²¹ (Table 2).

Table 1 – Studies available in literature.

Study	Date of publication	Sample size	Professional athletes	Sex ratio (M\F)	Mean age (years)	Follow-up (months)
Gaiani et al. ²⁴	2012	80	10	52/28	34	12 (minimum)
Doral et al. ¹²	2009	62	7	58/4	32	46
Halasi et al. ¹⁹	2003	144	Not reported	123/21	38.3	12 (minimum)
Jallageas et al. ²⁵	2013	16	2	13/3	37	15
Vadala et al. ²¹	2014	36	36	33/3	29.7	28
Cretnik et al. ²⁶	2004	132	5	124/8	37	24 (minimum)
Lacoste et al. ²⁰	2014	75	4	60/15	39.9	20.7
Maffulli et al. ²⁷	2011	17	17	13/4	34.2	72
Bradley et al. ¹⁸	1990	12	Not reported	Not reported	36	21.6
Delponte ²²	2003	24	Not reported	19/5	51	6 (minimum)
Guillo et al. ²³	2013	23	Not reported	21/2	42.2	25.7
Chiu et al. ¹¹	2013	19	Not reported	18/1	38.7	24
Martinelli ²⁸	2000	30	Not reported	24/6	30.5	60

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