

## THE TRAUMATIC RUPTURE OF THE ACHILLES' TENDON – AN ANALYSIS OF THE MODERN METHODS OF EVALUATION AND TREATMENT

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### Abstract

**Aims.** The main aim of this article is an analysis of both advantages and disadvantages of the modern solutions of treatment – percutaneous surgery, in comparison with the classic methods of treatments described in the surgery of Achilles' tendon.

**Patients and method.** The study was conducted on 23 patients admitted to the Orthopedics and Traumatology Clinic of Cluj-Napoca between January 2011-June 2012. Nineteen (19) patients were diagnosed with a complete rupture of the Achilles tendon and 4 patients with a partial rupture. The diagnosis of traumatic Achilles tendon ruptures was usually clinical, the Ultrasound (common or 3D) and the MRI confirmed the lesion and determined its location and extension. We analyzed the diagnostic methods, the elapsed time before surgery, the treatment options depending on lesion's location, technical difficulties, costs, postoperative care, the average healing time, complications.

**Results.** The Ultrasound was performed in 65.2% of the patients (15 patients) for confirming the extension of the lesion and it served for pre-operative planning. In most of the cases, the classical methods of Achilles tendon reconstruction were used (18 cases). The complications rate was about 8%. We diagnosed an iterative Achilles tendon rupture (the patient was initially treated using the percutaneous methods) and a delay in cicatrization.

**Conclusions.** The percutaneous surgical techniques are a viable alternative for the acute ruptures of Achilles tendon, the classic intervention has clear indications in lesions diagnosed late, in the recurrent tendon ruptures.

**Keywords:** Achilles tendon, rupture, percutaneous surgical techniques.

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### Introduction

The traumatic rupture of the Achilles' tendon is more and more frequently encountered in current orthopedic practice. It occurs round the age of 40, the majority of the patients ranging between 30 and 50 years, mainly in the male gender (approximately 84% of the cases) [1]. The lesions are almost always unilateral. The rupture of the Achilles' tendon is evidenced mostly in patients who occasionally perform physical activity, «the weekend sportsman», due to a precarious preparation for the physical effort. However, in the recent years the tendinous lesions

have been increasingly found among the elderly, without any connection to the sports activity.

The ruptures of the Achilles' tendon appear in 85% of the cases at the level of a hypovascular area, 2-7 cm proximal to its calcaneal insertion [1]. Undoubtedly, the traumatic factor is not solely responsible for the tendon rupture. A number of degenerative lesions of the tendon are also involved, among which we can mention: hyaline, mucoid degeneration with chondroid metaplasia of the tenocytes. The changes in the structures of the collagen fibers are related to the age and in the majority of subjects they do not determine any clinical symptoms.

The fatal role of the corticoids (either orally, or locally injected) and also of the antibiotics (fluoroquinolones) must however be mentioned. In medical literature, increased frequencies of tendon lesions

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have been described, determined by conditions such as hyperthyroidism, gout, renal insufficiency, atherosclerosis [1].

The ruptures of Achilles' tendon may be classified in total or partial, acute/traumatic or chronic.

### Objectives

The main aim of this article is an analysis of both advantages and disadvantages of the modern solutions of treatment – percutaneous surgery, in comparison with the classic methods of treatments described in the surgery of Achilles' tendon.

We also propose a presentation of the role of the imaging methods of diagnosis, MRI and ultrasonography – including tridimensional, in establishing the diagnosis of Achilles' tendon rupture.

### Materials and method

The study was conducted in patients admitted to the Clinic Department of Orthopedics and Traumatology II of Cluj-Napoca between 2011-2012. It is an analytical retrospective study.

In the patients studied, the following aspects were investigated: the use of the current diagnostic methods, MRI or ultrasound, their role and contribution to diagnosis and to the choice of a method of treatment over another, the time of hospitalization, type of treatment, technical issues, post-operative management, the mean time to scarring, complications.

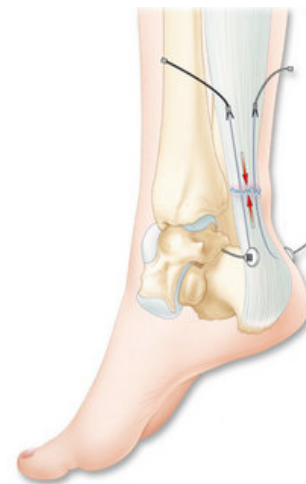
The study included 23 patients, hospitalized during the period January 2011-June 2012; 22 patients (95%) were men. The physical activity of the patients taken into this study was occasional, none of the patients practiced high performance sport in the past or at the time of study.

The average age of the patients was 39, ranging between 25 and 61 years.

In order to diagnose the lesion of Achilles' tendon, the objective clinical examination played the central role, using the Thompson test (lateral pressure of the calf does not trigger the plantar flexion of the foot), the existence of a visible and tangible depression on the trajectory of the Achilles tendon, the inability to stand on tiptoes on that foot, and even monopodal.

Among the imaging methods used in the process of diagnosing the lesions of Achilles' tendon, sonography and MRI must be mentioned. They were used for the confirmation of the lesion and in order to establish its location and its extension.

The treatment of the Achilles' tendon lesions included conservative or surgical treatment. The conservative treatment consisted in plaster immobilization, while surgical treatment aimed at reconstructing the Achilles' tendon using classical procedures, open or percutaneous techniques ("Tenolig" material and technique - fig. 1).



**Figure 1.** The principle of using the "Tenolig" - according to "FH Orthopedics".

In the following we will describe the technique used for the percutaneous treatment of Achilles tendon, according to the recommendations of the producer of the "Tenolig" system. The surgical interventions were performed under rachianesthesia, the patient being positioned in ventral decubitus, without using a tourniquet at the level of the limb. I repaired the two parts of the broken tendon, the proximal and distal by palpation (fig. 2). The entrance point is situated at about 6 cm proximal to the rupture area, postero-lateral and postero-medial. The exit point was located at about 4-5 cm distal to the tendon rupture, within the retromalleolar space. The introduction of the needle of the tenosynthesis material was made perpendicular on the tendon body, careful not to affect the sural nerve. The foot was held in an neutral position in order to ensure the suture system penetration correctly. After that, the foot was positioned in equinus in order to reduce the two fragments of the broken tendon. The sutures would be blocked by the provided buttons, thus maintaining the fragments of the tendon in contact.



**Figure 2.** Intra-operative reparation of the rupture of Achilles' tendon.

The patients were kept under post-operative follow-up for up to 6 months (medical examination at 4 weeks, 8 weeks, 4 months and 6 months), during which the following were assessed: the consolidation of the tendon lesion, complications related to the wound (infection, dehiscence) or mechanical complications (reruptures). The overall post operative functional status was evaluated, together with the recovery of the level of physical activity previous to the rupture of Achilles' tendon. The test used for the evaluation was the ATRS (Achilles Tendon Total Rupture Score).

### Results

Of the patients studied, 82% (19 patients) presented a complete rupture of Achilles' tendon, while 18% (4 patients) were diagnosed with a partial rupture. In 4.3% of cases (1 patient), the Achilles' tendon rupture was bilateral.

In 69% of the cases (16 patients), ultrasonography or MRI were performed for the confirmation of the diagnosis, while in the rest of the cases, the diagnosis was exclusively based on clinical examination. The ultrasonography of the Achilles' tendon was used in 64% of the cases (15 patients) in order to establish the Achilles' tendon rupture diagnosis. In 27% of the patients (4 patients) evaluated by ultrasound, the diagnosis was of partial rupture of Achilles' tendon, while the clinical signs had pleaded for a complete rupture. The subsequent MRI examination pointed to the near-complete nature of a rupture in one case.

In terms of the chosen treatment, surgery was the option in 95.6% of the cases (22 patients). The conservative treatment was used in one patient, due to the associated conditions. Among the patients who received surgical treatment (22 patients - 23 interventions), 78.2% (18 patients) benefited from a classical reconstruction of the Achilles' tendon, while 21.8% of the patients (5 patients) were treated using the percutaneous technique. The choice of a method instead of the other was made based on each surgeon's experience, the extent of tendon damage (in a large defect the open procedure was performed), how soon after rupture the patient was diagnosed, wound appearance (for better cosmetic outcome the percutaneous repair was chosen), previous activity level (the open technique was preferred for the patients with higher physical activity level) and financial considerations (the percutaneous technique is more expensive).

The average length of hospitalization was 7 days. The mean hospitalization time of the patients who benefited from a classic reconstruction was 7.53 days, while the mean hospitalization of the patients treated with the percutaneous technique was 6 days.

Postoperatively, the patients were immobilized in plaster splints or in orthosis (fig. 3) for a medium period of 7.78 weeks (varying between 4-8 weeks), the first three weeks with the foot at 120 degrees of plantar flexion, and then at 90 degrees. The consolidation of the lesion of

Achilles' tendon was exclusively clinically appreciated, using the tests mentioned above.



**Figure 3.** Adjustable orthosis - "Maxtrax Rom Air".

The complication rate was 8.6% in the case of surgically treated patients (2 cases): wound dehiscence in the case of a patient treated by classic surgery and a secondary rupture in a patient operated with the percutaneous technique.

No significant losses of the functional status were recorded, all the patients recovering the level of physical activity previous to the tendon lesion.

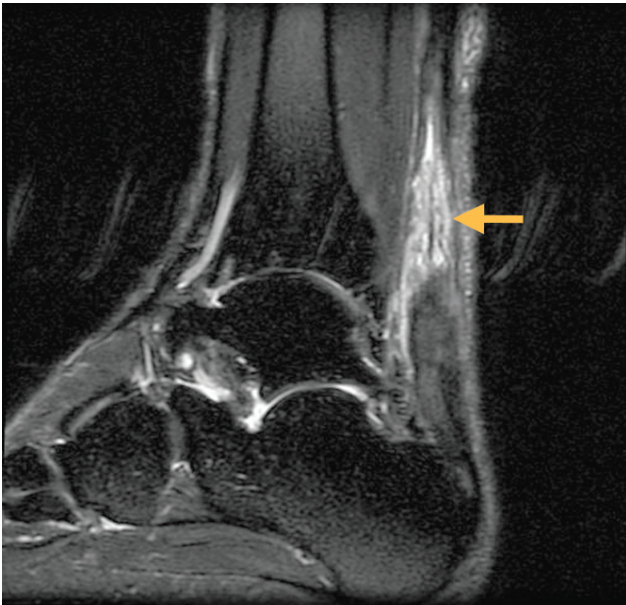
### Discussion

The traumatic rupture of the Achilles' tendon mainly affects the male gender, the causes being not fully described in the medical literature as yet. In cross section, the Achilles' tendon is considerably smaller in women than in men, and therefore a smaller force is generated at this level, which could be an explanation for the decreased prevalence of Achilles' tendon lesions in women [2].

In order to diagnose an Achilles' tendon lesion, the clinical examination plays a fundamental part, without any further laboratory explorations being necessary [1].

Nevertheless, the ultrasound confirmation of the rupture was required in about 2/3 of the patients included in this study. The sonography has the advantage of being a non-invasive technique, accessible and low cost. Even though the Achilles' tendon is easily explored using ultrasonography, the major disadvantage of this investigation is the misinterpretation of a complete rupture of Achilles' tendon as being partial, with major implications on the choice of the right method of treatment [1]. For the patients diagnosed with partial rupture of the Achilles tendon by the performed ultrasound test, we have opted for surgical treatment based on the physical examination (palpable gap and a positive Thompson test), because of the reduced risk of rerupture.

The MRI is superior to ultrasonography in terms of diagnosing the pathology of Achilles' tendon (fig. 4), it presents in a more accurate way the difference between a partial and a complete rupture, and it can also be successfully used in the degeneration tendinopathy diagnosis [3]. The tridimensional ultrasonography offers the possibility of an examination in real time, a superior differentiation between edema and hematoma, indicating more precisely the real area of the lesion, especially in the cases of repeated ruptures.



**Figure 4.** Rupture of Achilles' tendon evidenced by MRI, after Tonarelli.

Among the methods proposed so far, the surgical treatment is the preferred option in most of the cases (fig. 5). It is associated with better cicatrization of the tendinous lesion and significantly reduces the risk of rerupture in comparison with the non-surgical treatment, but has a higher rate of complications (dehiscence of the post operative wound, cutaneous or tendinous necrosis, infection etc.) [4,5,6].



**Figure 5.** Postoperative wound in a patient with Achilles rupture treated by classical surgery.

At present, the surgical treatment includes alongside the open reconstruction of Achilles' tendon through the known methods, the reconstruction of Achilles' tendon through percutaneous techniques, minimally invasive, which are becoming more often used, while the range of indications widens. These procedures are simple, secure, permitting early mobilization, entailing a lower prevalence of post operative complications in comparison with the open techniques [4,7], the rate of rerupture, incriminated by some authors, being included here as well. Our clinical study emphasized the reduction of the time spent in hospital by 21.4% in case of patients treated with the minimally invasive technique plus the decrease of the operative time, preservation of the vascularisation of the tendon, the possibility of early mobilization. The frequency of a sural nerve lesion is higher in the case of a technique imprecisely conducted [7].

The percutaneous techniques have as main goal the joining of the two parts of the Achilles' tendon resulted from the rupture, avoiding the extensive approach at the level of the tendon, the exposure of the tendinous sheath and thus the devascularization of the tendon, allowing the immediate post-operative mobilization, with flexion-extension foot movements. Preservation of the postfracture haematoma ensures a quick healing and a quality consolidation. The rapid mobilization allows the alignment of the collagen fibers and remakes the elasticity of the tendon. However, it is important to mention the fact that the post operative pain is significantly less in the case of percutaneous interventions.

Concerning the rate of the rerupture, the small control group of patients and the relatively short time of post-operative surveillance (6 months), does not allow us to formulate a clear conclusion. One patient presented a rerupture of the Achilles tendon in the percutaneous technique group which was associated with poor compliance to rehabilitation.

We should mention the fact that the extent of the indications of the percutaneous Achilles' tendon repair in the case of elite sportsmen has proved to be a viable option, allowing them to undertake their high level sport activities quickly and safely [8].

The post operative fixation in the functional orthosis has been associated with a decreased rate of post operative complications in comparison with the plaster immobilization, according to recent publications [4].

## Conclusions

Our results demonstrate that the percutaneous techniques of surgical treatment are a viable alternative in cases of recent ruptures of Achilles' tendon, and the classical surgical treatment should be chosen in the case of late diagnosis of rupture (diagnosed after more than 8 days) and in the recurrent ones.

The clinical examination is sufficient in case

of recent Achilles' tendon rupture, and no other supplementary imaging investigations are usually required. Ultrasonography can distinguish a near-complete rupture Achilles' tendon as partial, having an impact upon the therapeutic option.

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