

## ADVANTAGES OF SURGICAL TREATMENT OF ACHILLES TENDON RUPTURE BY PERCUTANEOUS SUTURE AS OPPOSED TO NON-SURGICAL TREATMENT

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The Achilles tendon is the strongest tendon in the body, and its rupture appears to be the most common injury of the tendomuscular apparatus. This type of injury is more frequent in sportsmen, especially those who play tennis, gymnastics, skiing, handball, football, basketball and athletics. Also, the ruptures are common in people who engage in sports activities for recreation. They appear more often in males, in proportion of 3:1. It appears reciprocally in 25-30% of the cases. The rupture is easily diagnosed by means of clinical examination (Thompson's test) and ultrasonography.

The aim of the analysis was to point to the advantages of surgical treatment of a fresh Achilles tendon rupture as opposed to non-surgical treatment by plaster immobilization.

The examination was performed on 35 patients, of which 16 (45,71%) were treated operatively and 19 (54,29%) were treated nonoperatively. The average age of the patients was 38.8 years, that is 37.1 for those treated operatively and 40.2 for those treated nonoperatively. Among the examinees, there were 29(82,86%) men and 6 (17,14%) women. The operative treatment method consisted of percutaneous suturing, whereas the nonoperative treatment involved the circular above the knee plaster immobilization. All operatively treated patients underwent the surgical treatment in the first 48 hours from the time when the injury had occurred. Anesthesia was local and infiltrative.

The obtained results showed that there were no unhealed ruptures or re-ruptures. In the group of patients who did not undergo the surgery, there was 1 re-rupture and 1 unhealed rupture, after which the surgical treatment had to be performed in both cases. In the group of operated patients there were no infections, however, 1 thromboembolism occurred. Recovery of muscular strength of the tendon and the realization of the full range of movement required less time in the operated patients. The ultrasonographic findings in the operated patients showed better consolidation of the rupture site, with less scar tissue formation.

The conclusion, as a result of our experience, is that in the case of a fresh Achilles tendon rupture the priority must be given to surgical treatment by percutaneous suture, and each time when it is not possible to bring the ends of the tendon together. *Acta Medica Medianae* 2010; 49(1):34-38.

**Key words:** Achilles tendon, rupture, treatment, percutaneous suture

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### Introduction

The Achilles tendon is the strongest tendon in human body and its rupture ranks among the most common injuries of the tendon-muscular apparatus. The injury is especially frequent among the sportsmen, particularly in tennis, gymnastics, skiing, handball, soccer, basketball, athletics etc. Furthermore, ruptures occur among people who take up sport as leisure activity. They are more common among men than women, i.e. relating 3:1. For both sexes, it can occur in 25-30% of cases (1-3). Achilles tendon injuries are related to numerous risk factors (4).

Achilles tendon connects the triceps muscle to the heel bone at the back side of the lower leg, actively stretches the foot from below, raising the heel and the whole body on toes. During some physical strain, especially among sportsmen, it is prone to enormous stretching pressure, being disposed to infections and degenerative processes, thus being made more vulnerable. The weakest point of the Achilles tendon is at 2-5cm above the calcaneus junction. Tendon rupture is caused by some external force, as well as by some repeated microtraumas, degenerative or infectious processes, direct traumas etc.

Diagnosis is easily established by clinical examination (Thompson sign), or by ultrasound check-up (5,6).

Fresh Achilles tendon rupture treatment can be operative or non-operative.

Non-operative treatment implies the upper-knee circular plaster usage, the foot set with toes upright and the knee in flexion by about 10 degrees, lasting 6-8 weeks.

Nistor et al. published the medical study (1981) on 105 patients of closed Achilles tendon rupture, being treated operatively as well as non-operatively, showing that the results of both kinds of treatment were similar, therefore, they favored this method.

Operative treatment (7-10) implies the tendon-end connection by some surgical technique. This kind of medical treatment has certain advantages, reflected in anatomic tendon restitution and its length preservation, reduction of tendon scar tissue at the site of healing and the primary tendon healing in optimal time.

This type of medical treatment is basically favored among the young and active sportsmen. There are various operative techniques for fresh Achilles tendon treatment (within two weeks of rupture infliction, the rupture in the third week is considered obsolete). Operative approach is posteromedial, along the inner tendon edge, best recommended with elongated letter "S" incision. Back medial, as well as posteriolateral approach are seldom used.

### Aims

The aim of the paper was to emphasize the advantage of the operative treatment of the fresh Achilles tendon rupture over non-operative treatment by plaster immobilization.

### Patients and methods

The paper presents 35 patients medically treated at the Clinic for Orthopedics and Traumatology Niš in the period from 2004 to 2008. During the course of medical research, they were classified into two groups, i.e. the ones surgically treated (16 patients), and those treated by conservative methods (19 patients). Among the patients there were 29 men and 6 women. Before medical treatment in both groups, the ultrasound check-up of the injured region was performed by linear probe 7Mhz, 10 MHz or multifrequent one. Furthermore, the control ultrasound check-up was done, after the plaster had been removed. The operative treatment was performed by the method of percutaneous suture, while non-operative treatment was carried out by circular plaster immobilization. All operated patients were subjected to surgical treatment in the course of 48 hours from the moment of being injured. Anaesthesia was local infiltrative. The patient was put into ventral decubitus position with the foot in the plantar flexion by about 15 degrees (Figure 1), which is significant for torn tendon-ends to be connected.

Minimal incision is performed peritendinously distantly, after which the hook is made by medium-curved needle with the resorptive thread (Dexon, Vicryl) through the tendon and the tendon is sewn by the modified Bunnell stitch (Figure 2). When the thread's ends are stretched, the tendons' ends are connected, therefore, the thread is tied up. The knot remains subcutaneously. When this is performed, the defect at the site of tendon - rupture must not be palpated, the Thompson sign



Figure 1: Depiction of the patient with ventral decubitus and the foot in plantar flexion by about 15 degrees



Figure 2: Post-surgical stability in prone and supine-Bunnell stitch



Figure 3: Upper-knee circular plaster, the foot in equines position by approximately 15 degrees and the knee in soft flexion

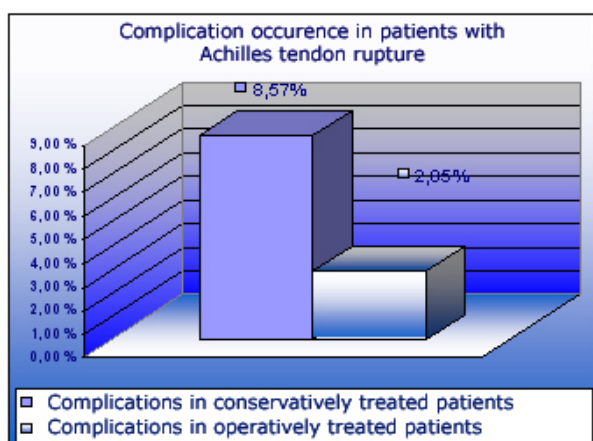
must be negative, which is a definite indicator that the foot stability in prone and supine has been reached and it is possible to make an active foot movement.

While the patient is still in surgery, the upper-knee circular plaster is placed, the foot is in equines position by about 15 degrees and the knee in soft flexion. After 2-3 weeks, the lower-knee plaster is set, while some surgeons keep the foot position in equinus for 2 weeks, after which the plaster for walking is made for additional 2 weeks. There are surgeons who immediately set the plaster intended for walking in the course of 4 weeks ( Figure 3).

Small wounds caused by incision heal soon and the suture is not necessary. Physical therapy follows. Under-heel support is recommended for the period of a couple of weeks as a reduction of stretching force. Walking is immediately allowed, at first partial support, after plaster removal, full support, while sport activity is permitted after 6 months.

## Results

The average age of the patients' was  $38,8 \pm 2,79$  years (23 - 57 years old), of which operatively treated  $37,1 \pm 3,98$  years, non-operatively treated  $40,2 \pm 2,39$  years old. The results showed that there were no re-ruptures and non-healing among the operatively treated patients. Among non-operatively treated patients, there was one rerupture and one non-healing rupture process, i.e. 8,57 % of the patients had complications, therefore, surgery had to be undertaken in both cases. Among the operated patients there was no infection, but there was one thromboembolic process - 2,85% of the patients, so, we can say that majority of patients did not have complications, which is statistically significant (Chi test  $p,0.1$  ) related to the total number of patients (Graph 1).



Graph 1. Complication occurrence in patients with Achilles tendon rupture

Ultrasound finding in the operatively treated patients showed faster consolidation of the place of rupture, with less scar tissue, i.e. it ranged to 8 weeks for operated patients, to 10 weeks for conservatively treated patients from the moment of injury. Those patients, treated non-operatively, had plaster immobilization from about  $47,26 \pm 1,69$

days, while the operated ones  $42,68 \pm 1,01$  days, that is to say, conservatively treated patients had plaster immobilization from 46 to 54 days, and the operated ones from 40 to 45 days.

## Discussion

Tendons are made up of very solid and impervious tissues. During physical pressure, especially during sports activities, they are prone to excessive strain. When the strain force is higher than the tendon level of endurance, the rupture occurs. Tendon rupture can be initiated in several ways. Powerful force that overburdens the tendon may provoke its rupture. Constant microtraumas, being the consequences of some wrong or excessive strain during some sport activity, make morphological alterations in connective and supportive tissue. If that morphologically altered tendon is under some strain, it results in its rupture.

Direct hits and open injuries may result in tendon rupture. Achilles tendon usually ruptures at its weakest point, i.e. 2-5 cm above the heel bone. It is actually the place where blood supply is the lowest (11-13). A typical site for rupture occurrence is muscular-tendon area, as tendon connection to the heel bone.

The rupture is usually caused by excessive force, i.e. by abrupt and excessive strain of the already strained tendon or by some sudden move of the foot previously bent downwards. By clinical and ultrasound medical check-up, the tendon rupture is identified.

Attention is directed to functional damage. Intensive pain can be felt above the ruptured area of Achilles tendon after a jump to the front part of the foot. The injured can even hear the sound of tendon rupture, which resembles the crack of a whip. A recess is formed in a tendon itself of 2-5 cm above the heel. With entirely ruptured tendon, as well as partially ruptured one, the injured person cannot step on toes of the injured leg. The foot cannot be bent downwards. Swelling is enlarged due to bleeding which gradually causes the bruise above the lower part of the leg and the foot. Thompson (squeeze) test is positive. The reliability is almost 100%, therefore, by its assistance, the rupture is easily identified and looks different from the injury of upper anklebone or muscle (13, 14).

Cretnik et al. made a prospective study in the period from 1991 to 1997 about the modified percutaneous method of Achilles tendon treatment, observing the patients for two years. They had 134 procedures in 124 men and 8 women, after the acute total rupture. Post-operative treatment implied plaster immobilization during the course of 6 weeks. Patients accepted the procedure well. One complete (0,7%) and four (3%) partial reruptures occurred. Six patients (4,5 %) experienced contraction of the anklebone. This corresponds to our results.

Retrospective analysis, presented by Hajj et.al. (15) was performed, compared to the open and percutaneous treatment of the ruptured Achilles tendon during the period of 14 years. 108 patients

were observed; 70 patients had undergone traditional operative treatment and 38 modified Ma and Griffith method of treatment. In the group treated by the open method, there were 4 cases of rerupture occurrence (5,7%), 4 had deep infections (4,7%), 2 cases with palpable stitch knots (2,9%) and one lesion of the surral nerve (1,4%). Complications after percutaneous treatment included one re-rupture (2,6%), five palpable stitch knots (13,2%), 4 transitory lesions of surral nerve (10,5%), but there was no infection. Statistically speaking, there was no significant difference between two groups. The authors favor the percutaneous treatment, experiencing it as better alternative to traditional techniques. The method employed in the study of Goschewski et al. (16), reduced the complication risk resulting in the operation, but simultaneously suggested faster post-operative mobilization and functional treatment. It was percutaneous treatment of Achilles tendon by using two Lengeman needles employed for co-adaptation of the ruptured tendon. Achilles tendon ruptures occurred during sport activities and were treated within 22 hours on average. In 98%, the cases were successfully treated.

Only one patient (2%) got the after- trauma – re-rupture, while other complications did not occur.

Tomak and Fleming came to the conclusion that percutaneous treatment of Achilles tendon was more successfully done than the one performed by open surgery. Some authors, including Weber

and Niemann (17,18,19) presented the results of non-operative, as well as operative treatment, which were equivalent. Complications were alike, with the exception of re-ruptures: 4 wounds in non-operatively treated group, and one successively appeared in the operatively treated group. Two re-rupture types occurred in non-operatively treated group:

1) Normally healed tendon suffered new trauma, by re-rupture in the healing zone, but having good result by continuing the non-operative treatment.

2) Tendon damage proximally located from the initial rupture at the muscular-tendinous junction, without trauma, as a result of operative treatment and augmentation.

Our experience indicates that the results are in accordance with previously performed researches in the field. Concerning our patients, in the operatively treated group, there was a small percentage (2,85%) of patients with complications, where the complications (thrombembolic ones) were the result of plaster immobilization application and not the surgery itself.

### Conclusion

At the occurrence of fresh Achilles tendon rupture, priority is to be given to surgical treatment by percutaneous suture, and if not possible, the complete reposition of the tendon's ends should be attained..

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## **PREDNOSTI HIRURŠKOG LEČENJA RUPTURE AHILOVE TETIVE PERKUTANOM SUTUROM U ODNOSU NA NEOPERATIVNO LEČENJE**

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Ahilova tetiva je najjača tetiva u ljudskom telu, a njena ruptura spada u najčešće povrede tetivno-mišićnog aparata. Povreda je naročito česta kod sportista, i to najčešće u tenisu, gimnastici, skijanju, rukometu, fudbalu, košarci i atletici. Takođe, česte su rupture kod ljudi koji se rekreativno bave sportom. Češće se javlja kod muškaraca, odnos je 3:1. Obostrano se sreće u oko 25-30% slučajeva. Dijagnoza rupture se lako postavlja kliničkim pregledom (Thompson-ov znak) i ultrazvučnim pregledom.

Cilj rada bio je da ukaže na prednost operativnog lečenja sveže rupture Ahilove tetive u odnosu na neoperativno lečenje gipsanom imobilizacijom.

Radom je obuhvaćeno 35 bolesnika, lečenih u periodu od 2004. do 2008. godine, od kojih je 16 (45,71%) lečeno operativno a, 19 (54,29%) neoperativno. Prosečna starost bolesnika je 38 godina. Među lečenima je bilo 29 (82,86%) muškaraca i 6 (17,14%) žena. Bolesnici su operativno lečeni metodom perkutane suture Ahilove tetive, a neoperativno natkolenom cirkularnom gipsanom imobilizacijom. Svi operisani bolesnici bili su podvrgnuti hirurškom lečenju u prvih 48 sati od povređivanja. Anestezija je bila lokalna infiltrativna.

Dobijeni rezultati su pokazali da u grupi operisanih nije bilo nesrastanja i reruptura. U grupi neoperisanih imali smo 1 rerupturu i 1 nesrastanje rupture, te je urađena hirurška intervencija. U grupi operisanih nije bilo infekcije, ali je zato bila 1 tromboembolija pluća. Oporavak mišićne snage tetive i dostizanje punog obima pokreta zahtevao je kraće vreme kod operisanih bolesnika. Ultrazvučni nalaz kod operisanih pokazao je bolju konsolidaciju mesta rupture Ahilove tetive sa manje ožiljnog tkiva.

Na osnovu našeg iskustva, zaključili smo da kod sveže rupture Ahilove tetive prednost treba dati hirurškom lečenju perkutanom suturom, uvek kada nije moguće neoperativno postići kompletan kontakt okrajaka tetive. *Acta Medica Medianae 2010; 49(2):34-38.*

***Ključne reči:*** Ahilova tetiva, ruptura, lečenje, perkutana sutura