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Percutaneous repair of Achilles tendon rupture: is it safe and reliable?

Perkütan Aşil tendon rüptürü tamiri: güvenli ve güvenilir mi?

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Abstract

Aim: Achilles tendon rupture is the most common tendon rupture and the best treatment for acute Achilles tendon ruptures remains controversial. Mini open or percutaneous repair techniques offer early recovery and return to daily life, but have some disadvantages such as sural nerve injury and re-rupture. The aim of this study is to determine the safety and reliability of percutaneous repair of Achilles tendon rupture with identifying and retracting the sural nerve on its anatomical location.

Materials and Methods: Twenty-four patients who had undergone percutaneous Achilles tendon repair between November 2013 and February 2017 were included in this study. Wound healing problems, complications, ankle range of motions, and American Foot and Ankle Society score in early postoperative period and at the last follow-up were assessed.

Results: The average follow up period was 23 months. At last follow up injured ankles had 47.9±3.1° plantar flexion and 20.1±2.6° dorsiflexion statistically similar to the uninjured side. The average AOFAS score was 91±9.6.

Conclusion: Percutaneous Achilles tendon repair is safer and more reliable method when the sural nerve was identified at its anatomical location.

Keywords: Achilles tendon rupture, surgical treatment, percutaneous repair, sural nerve.

Öz

Amaç: *Aşil tendon rüptürü en sık görülen tendon rüptürüdür ve akut Aşil tendon rüptürleri için en iyi tedavi tartışmalıdır. Mini açık veya perkütan onarım teknikleri erken iyileşme ve günlük yaşama erken dönme sağlar. Ancak sural sinir hasarı ve yeniden rüptür gibi bazı dezavantajları vardır. Bu çalışmanın amacı, akut Aşil tendon rüptürünün perkütan onarımının sural siniri anatomik konumunda bulup koruyarak yapılmasının güvenliğini ve güvenilirliğini belirlemektir.*

Gereç ve Yöntem: *Kasım 2013-Şubat 2017 tarihleri arasında perkütan Aşil tendonu onarımı yapılan 24 hasta çalışmaya dâhil edildi. Hastalarda postoperatif erken dönemde ve son kontrollerinde yara iyileşme problemleri, komplikasyonları, ayak bileği hareket açıklıkları ve Amerikan Ayak ve Ayak Bileği Derneği skorları (AOFAS) değerlendirildi.*

Bulgular: *Ortalama takip süresi 23 aydı. Hastaların son kontrollerinde etkilenen ayak bileklerinde 47,9 ± 3,1° plantar fleksiyon ve 20,1 ± 2,6° dorsifleksiyon olduğu görüldü. Ölçümler istatistiksel olarak sağlam tarafla benzerdi. Ortalama AOFAS skoru 91 ± 9,6 idi.*

Sonuç: *Perkütan Aşil tendon onarımı, sural sinir anatomik konumunda tanımlandığında daha güvenli ve güvenilir bir yöntemdir.*

Anahtar Sözcükler: *Aşil tendon rüptürü, cerrahi tedavi, perkütan onarım, sural sinir.*

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Introduction

Although Achilles tendon is the largest and the most powerful tendon in the human body, its rupture is not a rare injury and it is generally occurs between the ages 30 and 50 men (1, 2). The incidence in the USA is 5.5-9.9/100.000. Ruptures were occurred generally during sports activity and usually left side Achilles is involved (3-6).

Achilles tendon rupture is the most common tendon rupture that requires surgical intervention, but the best treatment for acute Achilles tendon ruptures remains controversial. Both conservative and surgical treatments are found to be successful. Conservative treatment has a high re-rupture rate, loss of strength and stiff ankle resulting from 6-8 weeks cast immobilization (7). Although open repair has lower risk of re-rupture, it is related to higher risk of wound healing problems, scars, and infections. Open repair, mini open repair and percutaneous repair techniques are trend methods used to avoid these complications in open repair. Mini open or percutaneous repair techniques offer early recovery and return to daily life (8-11). However, these minimally invasive methods have some disadvantages such as sural nerve injury and re-rupture (6, 7, 12, 13). Identifying the sural nerve on the lateral aspect of the tendon can prevent sural nerve injuries (3, 6). The aim of this study is to determine the safety and reliability of percutaneous repair of Achilles tendon rupture with identifying and retracting the sural nerve on its anatomical location.

Materials and Methods

After institutional review board approval and informed consent had been obtained, between November 2013 and February 2017 a retrospective analysis was carried out in a group of patients who underwent percutaneous repair of Achilles tendon rupture. The diagnosis was established by palpable tendon gap, positive Thompson test, and inability of plantar flexion. Ultrasonography was carried out if the diagnosis was skeptical. Twenty-four patients (22 men, 2 women) were included in this study and the average age was 38 years (27 to 49). We excluded patients who had open Achilles rupture, ruptures at the calcaneal insertion, ruptures at the musculotendinous junction, and ruptures with more than two weeks and previous surgery at Achilles tendon. None of the patients had a disease that affects tendon healing, or none of them were under medical treatments that delays tendon healing.

Surgical Procedure

Patients were placed prone position without a tourniquet. The repair was carried out according to Ma and Griffith's technique with identifying the sural nerve (Figure-1). Eight stab incisions were performed just lateral and medial to the Achilles, proximally and distally to the gap (15). Suturing was performed with Keith needle using looped No. 1 polydioxanone-suture. Proximal lateral incision has a high risk of sural nerve injury thus we identified the nerve at this point. The procedure began just distal to the gap at the medial of the tendon and then needle pass through diagonally distal stab incision then it passed through transversely and diagonally.

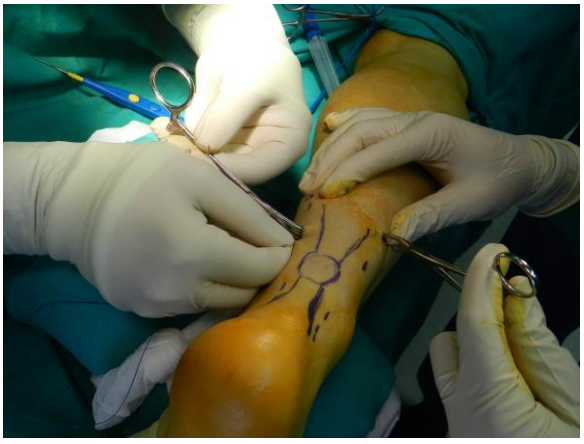

Figure-1. Percutaneous repair of Achilles tendon with identifying the sural nerve.

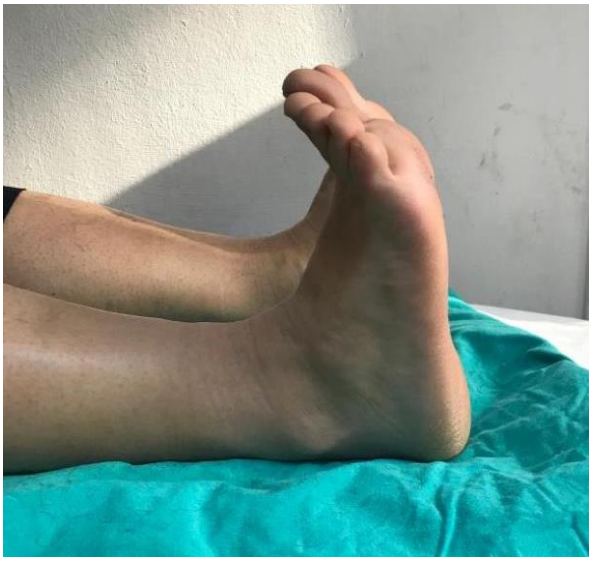

Figure-2. Dorsiflexion of the ankles at postoperative 2nd year.

Postoperatively dressing and casting were applied with maximum plantar flexion. After three weeks a walking boot with heel wedges was applied with 20 degrees of plantar flexion and was allowed weight-bearing with crutches as much as tolerated. After six weeks, the boot was locked at 0 degrees of plantar flexion and patients were encouraged to walk without crutches. Sportive activities were allowed in postoperative 6 months.

Wound healing problems, complications, ankle range of motions (ROM), return to the work, weight bearing time, Thompson test, and single-leg raise test were used for clinical evaluation. Also, American Foot and Ankle Society score (AOFAS) in the early postoperative period and at the last follow-up were assessed.

SPSS software package (version 18.0, SPSS, Chicago, IL) was used for statistical analysis. The Kolmogorov-Smirnov test was used to evaluate whether the distribution of continuous variables was normal. For parameters that showed normal distribution, we used the paired-sample t-test and for parameters that did not show normal distribution, we used the Mann-Whitney U-test.

Results

All injuries happened during sports activities of non-professional athletes. The main causes of injuries were football (13 pts.), basketball (6 pts.), tennis (3 pts.), and jogging (2 pts.). Mean patients' height at the time of the surgery was 176.4 cm (range: 166–188 cm), and mean weight was 87.9 kg (range: 68–105 kg). The mean time interval between rupture and tendon repair was one day (range: 0–3 days). The right leg was operated in 6 patients and the left in 18 patients. The average hospital stay was one day. Full weight-bearing without crutches was started at postoperative 8 weeks. Patients were encouraged to return daily activities, and at postoperative 3 months except one patient who had re-rupture, all patients were returned their occupational activities. This re-rupture was treated by open repair with flexor hallucis longus transfer.

One patient had superficial wound infection and treated by oral antibiotics, and the overall wound problem rate was 4%. With one re-rupture at 3 months, our re-rupture rate was 4%. No neurological injury was seen as a result of identifying the sural nerve at its anatomical location.

The average follow up period was 23 months (range 18-34). Ankle ROM recorded at postoperative 8 weeks and at last follow up were compared to contralateral ankle ROM. At postoperative 8 weeks plantar flexion of the injured ankle was 30.4±3.2° and dorsiflexion was 15.9±2.9° while plantar flexion was 48.4±3.7° dorsiflexion was 20.4±2.1° in the contralateral ankle. At last follow up injured ankles had 47.9±3.1° plantar flexion and 20.1±2.6° dorsiflexion. Uninjured sides measurements were 48.2±3.1° and 20.3±2.8° respectively (Figure-2). All of the patients had complete relief of pain and were satisfied with the ankle movement at the last follow-up. The average AOFAS score was 81±7.6 at postoperative 8 weeks, and 91±9.6 at last follow up visit. No complex regional pain syndrome and ankle stiffness were recorded (Table-1).

Table-1. Range of motion and AOFAS score comparison of injured and uninjured sides at 8 weeks and at last follow-up.

	Dorsiflexion		**Plantar Flexion**		**AOFAS**
	Early	Follow up	Early	Follow up	
Injured	15.9±2.9°	20.1±2.6°	30.4±3.2°	47.9±3.1°	81±7.6
Uninjured	20.4±2.1°	20.3±2.8°	48.4±3.7°	48.2±3.1°	91±9.6
p	0.0294	NS	0.0102	NS	0.0234

Discussion

Achilles tendon rupture treatment is still debate. The aim of the Achilles tendon ruptures treatment is to return physical activity to pre-injury level as soon as possible and eliminate morbidity of the injury without increasing the complication rates (6, 11, 15, 16). Percutaneous repair of Achilles tendon rupture has lower of wound healing problem, infection and has lower cost than open surgery. As a result, percutaneous surgery allows decrease in complications of both open surgery

and conservative treatment (4, 8, 11). The main complication of percutaneous surgery is sural nerve injury, but it can be prevent by identifying the nerve during surgery on the lateral aspect of the Achilles tendon (3, 8). In this study case series of 24 patients who were treated successfully with percutaneous Achilles tendon repair demonstrates low complication rate.

Ma and Griffith first described percutaneous technique and they repaired eighteen patients' acute tendon ruptures. They found no nerve injury, re-rupture or wound healing problem (14). But later studies showed that this procedure is not completely safe (3, 8, 17).

Mavrodontidis et al. performed 11 percutaneous Achilles tendon rupture and published long-term results. They faced only one sural nerve problem and it resolved 6 months postoperatively (3). In our study we did not confront any sural nerve problem, wound healing problem except one superficial infection. However we came across one re-rupture and the patient underwent revision surgery. To avoid re-rupture patients should be chosen properly. Patients who have connective tissue disease, or who have chronic rupture should undergo open surgery (18, 19). The one patient with re-rupture had no history of connective tissue disease.

When surgical treatment is chosen for Achilles tendon surgery, care should be taken to prevent sural nerve injury. Hockenbury and Johns showed that in their cadaver study, the sural nerve trapped by the proximal suture in three out of five specimen using percutaneous acute Achilles tendon repair (7, 20). In this study the proximal lateral incision made a bit more to see sural nerve and protect it. Mavrodontidis et al. had also similar proximal lateral incision a bit more to prevent sural nerve injury and they did not confront any sural nerve lesion like our results (3).

Returning time to work and daily activities is important in such serious tendon injury. With percutaneous repair techniques patients can return to work at 3-12 weeks from the injury. Özkaya et al. reported early return to work at 3 weeks with early rehabilitation, and average time to return to work reported was 9-12 weeks (1, 3, 4). Results of our study demonstrated similar results. The AOFAS score was 91±9.6 at last follow up visit, and these results were comparable to the results of previous studies (1, 3)

Major limitations of this study is retrospective design and the absence of a control group including different treatment method, but our belief in success of percutaneous Achilles tendon repair made it impossible to form a control group.

In conclusion, percutaneous Achilles tendon repair with identifying sural nerve at lateral superior aspect of the repair site found safe and reliable method. Paying attention to identify the sural nerve at its anatomical region ensures safe procedures. Low soft tissue problem rate (4%) and low re-rupture rate (4%) can be achieved by percutaneous repair. Low complication rates prove our belief in percutaneous repair of Achilles tendon ruptures.

Conflict of interest: The authors have not declared any conflict of interest in this study.

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