FOLLOW-UP RESULTS OF ACHILLES TENDON RUPTURE TREATMENT BY THE METHOD OF MODIFIED PERCUTANEOUS SUTURE

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SUMMARY—Achilles tendon ruptures are treated by various surgical methods as well as by conservative procedures. Recent surgical methods are aimed at surgical trauma reduction, however, there are few literature reports on the follow-up results of such treatment. Unlike percutaneous technique, we used a smaller incision to visualize approximation of the ruptured tendon ends. The aim of the study was to evaluate follow-up results after Achilles tendon rupture treatment by the technique of modified percutaneous suture. One minor incision of approximately 1–1.5 cm was made laterally at the rupture location, while the suture was placed at both ends percutaneously. All patients operated on by this method at Department of Plastic Surgery, Karlovac General Hospital, during a 2-year period (Jan 1, 2001 – Dec 31, 2002) were analysed. Minimal follow-up of six months was necessary to satisfy the inclusion criteria. Results were evaluated by the Tilttatt scoring system. Eleven patients were operated on, age range 29-42, (mean 36.6) years and follow-up 7-16 (mean 11.2) months. According to the Tilttatt scoring system scale, nine (81.8%) patients met the criteria for ‘excellent result’ and two (18.2%) patients were in the ‘good result’ group. This technique was found to provide excellent results in our sample, thus we prefer it to other methods. The sample was rather small, thus a larger series with a longer follow-up should be assessed in a future study.

Key words: Achilles tendon — rupture; Achilles tendon — surgery; Rupture — surgery; Surgical procedures

Introduction

Achilles tendon ruptures occur relatively commonly during sports activities, especially in male population (30 to 50 years of age). They usually occur between the second and sixth centimeter of the tendon attachment to the calcaneus, as a consequence of anatomic and biomechanical reasons. The ruptures are usually complete, rarely partial, and the tendon sheath can be either undamaged or ruptured. These ruptures are treated by various surgical methods as well as by conservative procedures. Most authors prefer operative treatment, however, a number of other methods have been suggested in the literature. These more recent surgical methods that have been ever more commonly used, tend to reduce surgical trauma, however, information on follow-up results of such a treatment currently available in the literature is scarce. Minimal invasiveness is preferred in order to minimize the rehabilitation period, the number of complications, and the cost of treatment. Unlike percutaneous technique, we decided to use a smaller incision to visualize the approximation of the ruptured tendon ends. The described method bridges the gap between the open surgical repair and the conservative treatment of Achilles tendon ruptures, at the same time also being a modification of the complete percutaneous technique of ruptured Achilles tendon ends approximation. The modification consists of the use of such a minor skin incision that enables exact visualization of the tendon ends approximation, at the level of tendon rupture, usually nearby the lateral tendon edge.

The aim of the study was to analyze follow-up results of the treatment of Achilles tendon ruptures by the tech- 

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nique of modified percutaneous suture. Considering different approaches in the treatment of this injury and scarce information on late follow-up results of this particular method, our intention was to contribute to its evaluation.

Patients and Methods

The Achilles tendon rupture is diagnosed on the basis of clinical history, clinical examination and ultrasound of the Achilles tendon area. Clinical findings are typical, so the diagnosis is usually easily established, although sometimes swelling and hamatomas may pose a problem. Thompson, O'Brien and Simmond's tests are used on clinical examination in ambiguous cases.

Complete Achilles tendon rupture was confirmed intraoperatively in all of the 11 patients included in the study. The operation is performed by two surgeons. The patient is in the prone position, with his below-knee area mobile. The patient is given local anesthesia, 15-20 ml 1% of Xylocain. The anesthetic is administered subcutaneously into the rhomboid in the operative field, nearby the tendon rupture location, and into the peritendinous space.

The operative technique consists of a 1- to 1.5-cm long vertical skin incision parasagittally laterally from the rupture location. Visualization of the proximal and distal tendon ends is thus achieved. A modified Bunnell's suture using Vicryl or Dexon thread is placed through the mini-incision into the proximal tendon end percutaneously with four mini-incisions, so that the incision is made over the top of the needle by a No. 11 scalpel (Fig. 1). The procedure is identical for the distal end, and the suture exit is on the same side as the suture entrance (Fig. 2).

After approximation of the tendon ends, the site of incision is closed by individual sutures in two layers. The leg is immobilized above the knee, the knee is in the position of semi-flexion, while the ankle is in plantar flexion.

Patient cooperation with the physiotherapist plays a major role in the postoperative period. The aim is successful performance of the rehabilitation program, as follows:

• after the operative procedure, on the same day, the patient is mobilized and walking using crutches, without weight bearing on the operated leg;
• the patient is discharged from the hospital on postoperative day 3 and is instructed to do the learned physical therapy exercises at home;
• during the first 3 weeks after surgery, immobilization by the above knee plaster with knee joint semiflexion and plantar flexion of the foot at 10-15° angle;
• week 3-5: immobilization by a below knee plaster in a neutral foot position;
• week 5-6: foot immobilization at 90° angle;
• between weeks 6 and 8 of the procedure, the immobilization is removed and active physical therapy is initiated. Walking with crutches is allowed, with gradual increase in the ankle movement diameter;

Fig. 1. Modified Bunnell’s suture

Fig. 2. Suture placement: the procedure of tendon ends approximation

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- 3 months after the procedure, swimming, bike riding and jogging are allowed; and
- 6 months after the procedure full sports activities are allowed.

Results were evaluated according to the Tillot scoring system (Table 1). Minimal follow-up of six months was necessary to satisfy the criteria for the study. Tillot scoring system is composed of subjective and objective criteria for patient classification as excellent, very good, good, satisfactory and poor results.

Results

During a two-year period (January 1, 2001 – December 31, 2002), a total of 11 patients were operated on using this technique, eight (72.7%) male and three (27.3%) female, age range 29-42 (mean 36.6) years and follow-up of 7-16 (mean 11.2) months. According to the evaluation of results by the Tillot scoring system scale, nine (81.8%) patients satisfied the criteria for 'excellent result', whereas two (18.2%) patients were in the 'good result' group. Patients with no subjective problems, objectively without local complications such as infection, necrosis or edema, and without any signs of limited ankle function were included in the excellent result group (n=9). After physical therapy, plantar flexion and dorsiflexion were identical on both feet. In this group, the volume in the below-knee middle third was identical on the operated and nonoperated leg at 7 or more months after the procedure (Figs. 3 and 4).

Two patients were categorized in the group of 'good results'. Subjectively, they were without troubles, whereas objectively one patient developed edema in the early postoperative period and did not involve in sports as intensively as prior to the injury. The other had temporary hypoesthesia and occasional localized pain in the area of sural nerve innervation. There were no complications such as shortening or lengthening of Achilles tendon or rerupture at the site of reconstruction.

Discussion

Numerous publications have reported data on a high percentage, even up to disturbing 29%, of complications associated with the open method of treatment for Achilles tendon rupture. More commonly reported complications are infections, skin necrosis, sural nerve injuries and reruptures. Some authors prefer the conservative approach to treatment, pointing out the ambivalence procedure and avoidance of operative complications as advantages of this method. Certa et al. in a prospective randomized trial of surgical versus conservative treatment in 111 patients found no difference in the incidence of complications or reruptures in the two groups. Yet they find that conservative management of Achilles tendon rupture may be indicated in older patients. Other authors report on a high percentage of reruptures, significantly worse functional results, and residual shortening of Achilles tendon. With the conservative treatment of total Achilles tendon rupture, retraction of the m. triceps surae occurs, result-
ing in poor contact and a gap between the ruptured ends. The introduction of the percutaneous treatment tech-
nique significantly decreased the number of postoperative complications, mainly tendon infections and reruptures, with improved functional results". The aim of the modified percutaneous technique is an exact approximation of tendon ends, maintenance of m.
triceps tenus, and sparing the surrounding structures (cu-
tis, subcutis, tendon sheath, and the tendon itself) from any additional trauma and ischemia. The possibility of technical error during the procedure is reduced by the modification of the percutaneous method with minimal skin incision and visualization of end approximation.

The opportunity of conducting the procedure under local anaesthesia further simplifies the preparation for the surgical procedure and expands the indications.

Neither should economic parameters be neglected, considering that the average hospitalization time is also reduced. Physical therapy plays a major role in the final result of Achilles tendon rupture management, as it signif-
ificantly contributes to improvement of functional results and patient ability to resume daily activities.

The modified percutaneous suture technique during the operation was chosen to make use of the advantages of both the complete percutaneous technique and the conservative treatment of Achilles tendon rup-
tures. Complications of Achilles tendon repair include the complications of any surgical procedure, together with deep venous thrombosis, pulmonary embolism, wound infection, wound necrosis, and rerupture. These complications are observed in particular in individuals known to have been treated with quinolone antibiotics or corticos-
teroids. Reruptures and bilateral ruptures are rare, but may be difficult to treat. Incision and subsequent su-
ture of the skin, subcutaneous tissue and tendon sheath are undoubtedly associated with a significant risk of com-
lications such as deep wound infection, skin necrosis, tenosynovial adhesions, sural nerve injuries, etc. Most authors report in favor of the operative treatment of Achil-
les tendon ruptures, but classic operative approaches have a high complication percentage. The method described herewith implies minimal operative trauma and exposure, and warrants good approximation of the ruptured tendon ends. Our findings, although based on a relatively small sample with a mean follow-up of 11.2 months, indispu-
tably show that the method results in good final outcome, and also indicate it to be an approach with certain advan-
tages over other treatment options.

Conclusion

The applied technique of Achilles tendon rupture su-
ture yielded excellent results in our patient sample, thus we prefer it to other techniques. On the other hand, the sample was rather small, therefore a larger series with a longer follow-up should be included in a future investiga-
tion. Our experience and data found in worldwide refer-
ences both justify the use of this method in the manage-
ment of traumatic Achilles tendon ruptures. The indica-
tions for operative procedure have been significantly wid-
ened, while the preoperative preparation of patients and their hospital stay are shortened and simplified by the possibility of conducting the procedure under local anaes-
thesia.

References


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Table 1. Graden scoring system for Achilles tendon rupture

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<tr>
<th>Graden</th>
<th>Description</th>
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<tr>
<td>Excellent</td>
<td>The patient is as capable to perform his work and sport activities as before the injury, no pain. Motion of the ankle is suitable.</td>
</tr>
<tr>
<td>Good</td>
<td>The patient is satisfied, but does not involve in sports as intensively as prior to the injury, occasional localized pain.</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>The patient is no longer involved in sports, uncertainty while walking on much ground, the tendon is still hard enough.</td>
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<tr>
<td>Poor</td>
<td>Pain, limping, standing on one leg or running impossible, a swelling is present.</td>
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