

Nonoperative treatment of Achilles tendon rupture

196 consecutive patients with a 7% re-rupture rate

Jonas Ingvar, Magnus Tägil and Magnus Eneroth

Department of Orthopedics, Lund University Hospital, SE-221 85 Lund, Sweden
Correspondence JI: jonas@ingvar.com
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Background The best treatment for acute Achilles tendon rupture is unknown.

Patients and methods We assessed the outcome of nonoperative treatment in 196 consecutive individuals with an acute total Achilles tendon rupture who were followed until healing. The mean duration of treatment in cast or orthosis was 8 weeks. After 4 years, a questionnaire was sent to all patients who were still alive (182) to supplement and confirm the retrospective data. The questionnaire was completed by 176/182 patients (97%).

Results The re-rupture frequency was 7% (n = 14). 7 patients suffered other complications (7 deep venous thrombosis and 1 pulmonary embolism). At follow-up, 62% of the patients reported full recovery.

Interpretation The low re-rupture rate after nonoperative treatment challenges the claim in recent studies that acute rupture of the Achilles tendon should be operated.

The optimal treatment for acute rupture of the Achilles tendon is still controversial. There have been only 5 prospective randomized trials comparing nonoperative and operative treatment (Nistor 1981, Cetti et al. 1993, Thermann et al. 1995, Majewski et al. 2000, Moller et al. 2001), all of them reaching somewhat different conclusions. In systematic review articles and metaanalyses, the conclusion is often that surgical treatment has a substantially lower risk of re-rupture compared to nonoperative treatment, but the risk of infection and other complications of surgical repair is increased (Wills et

al. 1986, Cetti et al. 1993, Lo et al. 1997, Popovic and Lemaire 1999, Bhandari et al. 2002, Kocher et al. 2002, Wong et al. 2002, Khan et al. 2004). Based on the benefits and risks, surgical treatment is generally recommended, although with some misgivings (Bhandari et al. 2002, Khan et al. 2004, Wong et al. 2002). However, this recommendation is based on an average re-rupture rate of about 13% in patients treated nonoperatively, compared to about 2% after surgical treatment. At our hospital, nonoperative treatment has been the method of choice for decades. In this retrospective cohort study, we evaluated the rate of re-rupture and other complications in consecutive patients presenting with acute total Achilles tendon rupture who were treated nonoperatively.

Patients and methods

At the Department of Orthopedics in Lund University Hospital, Sweden, every patient visit and every operation is recorded in a computerized medical record database under a given diagnosis number; Achilles tendon rupture has a unique code number. A computer search of the medical database and the operation log from 1996 through 2000 was performed and 292 individuals were identified with acute total Achilles tendon rupture. The medical charts of all patients were reviewed. The following patients were excluded: 1) those who only had a partial rupture and were treated accordingly, but were incorrectly recorded as having a total Achilles tendon rupture (n = 48), 2) patients who did not

receive their initial or final treatment at Lund University Hospital ($n = 11$ and $n = 12$, respectively), 3) patients who did not receive any active treatment due to the general condition of their health ($n = 2$), and 4) patients who received surgical treatment ($n = 23$). The latter were followed in the same way as those treated nonoperatively (see heading below).

In the remaining 196 patients, medical charts were analyzed and data extracted according to a standardized protocol, on average 4 (1.2–6.6) years after the injury. 14 patients were deceased at follow-up, 1 death being related to the tendon rupture. This patient committed suicide after the insurance system refused to accept his bilateral Achilles tendon rupture as a side-effect of quinolone treatment. A questionnaire was sent to the remaining 182 patients to confirm the data from the medical charts and to obtain a subjective evaluation of their functional status. The individuals were asked to answer a questionnaire regarding their medical condition at the time of injury, whether they had had a re-rupture, deep venous thrombosis or pulmonary embolism during or after treatment, and whether their present function had been affected (daily, sometimes or never) by the previous Achilles tendon rupture trauma. 176/182 patients (97%) answered the questionnaire, in 37 cases after being interviewed by telephone. In 6 cases, we failed to make contact.

The information collected in the questionnaire and telephone interviews confirmed the data found in the medical charts and generated some previously unknown data. 2 more patients had suffered a re-rupture, 1 of these including a deep venous thrombosis during immobilization. 2 other patients had had a deep venous thrombosis. All other complications were already noted in the charts. In 20 patients, information regarding complications was based on the medical charts only (14 deceased and 6 non-responding). This study was approved by the local research ethics committee at the Faculty of Medicine, Lund University.

Nonoperative treatment

The standard nonoperative treatment at our department during the inclusion period was a cast for 8 weeks ($n = 165$). During the last years orthosis was used, either cast followed by orthosis ($n = 29$) or

orthosis alone ($n = 2$). The ankle was immobilized in plantar flexion for 4 weeks (mean 28 days, SD 6) and in neutral position for another 4 weeks (mean 30 days, SD 7). If an orthosis was used, plantar flexion was allowed during weeks 5–8. In all patients, weight bearing was advised from day 1.

All patients except one were prescribed a heel-raise of 2.5 cm for 4 weeks after removal of the cast/orthosis. A physiotherapist at the department instructed all but 3 patients, both orally and in writing, how to ambulate and exercise during and after the immobilization period. All patients were also referred to a local physiotherapist for follow-up of exercise.

Operative treatment

The indication for surgical treatment was either a late diagnosis (18–376 days; $n = 14$) or that the patient demanded surgery ($n = 9$). Patients who underwent surgery had the same treatment—in cast or orthosis for 8 weeks—as those treated nonoperatively.

None of the 23 surgically treated patients were diagnosed with a re-rupture, deep venous thrombosis or pulmonary emboli. 5 patients had a postoperative wound infection with delayed wound healing, and 1 had a permanent sural nerve injury.

No statistical comparison between the nonoperative and operative groups was made due to the strong selection bias. However, at the follow-up after 4.2 (1.4–6.8) years, the operated group reported a similar subjective recovery level as the nonoperatively treated group.

Demographics

The mean age at diagnosis for the patients treated nonoperatively was 46 (24–85) years. 170 patients (87%) were male. In most patients, diagnosis and start of treatment was on the same day as injury ($n = 150$, 71%). In 25 cases treatment started 1 day after injury, in 10 cases it started between 2 and 7 days after injury, and in 11 patients between 8 and 31 days after injury. 3 patients had diabetes, 10 had immunosuppressive medication and 1 had ongoing treatment with quinolones at the time of the rupture. The cause of the rupture was sports-related in 113 (77%) of the 146 cases in which the etiology was known: in 39 cases due to badminton, in 27 cases due to soccer, and in 47 cases due to

other sporting activities at time of the rupture. 32 patients related the trauma to an activity other than sport, and in 1 case with bilateral Achilles tendon rupture the etiology was quinolone treatment.

Statistics

Values are given as mean and range. Differences between or within groups were calculated using the Mann-Whitney two-tailed test, the chi-square test or Fisher's exact test.

Results

14 of 196 patients had a re-rupture (7%). The mean time to re-rupture after removal of plaster or orthosis was 51 (0–140) days. 4 re-ruptures occurred within 13 days of removing the ankle immobilizing treatment, and the remaining 10 re-ruptures were evenly spread up to 140 days. All 14 patients had started the initial treatment in plaster and 3 switched to orthosis after 4 weeks. The mean age at re-rupture was 44 (31–73) years, and all patients but 1 were men. 2 patients had previously ruptured the contralateral Achilles tendon.

None of the following parameters could be correlated to an increased risk of re-rupture: sex, type of immobilization (cast or orthosis), start of treatment < 2 days or \geq 2 days from injury, etiology of rupture, and immunosuppressive treatment. 6 of the patients with a re-rupture underwent surgical treatment followed by a new 8-week period in cast or orthosis. The remaining 8 patients received non-operative treatment once again.

7 patients had a diagnosed deep venous thrombosis and 1 of them also had a diagnosed pulmonary embolism. 1 patient had both a re-rupture and a deep venous thrombosis. At follow-up after 4 (1.4–6.8) years, 62% (109/176) of those who responded reported full recovery. 12% (22/176) reported that they considered that the Achilles tendon rupture had restrained their daily lives and 38% (67/176) considered that they were sometimes restrained by the rupture. There was no difference between age groups regarding subjective recovery. There was a similar recovery level in patients with re-rupture, with 3/14 reporting daily restraints, and 5/14 reporting restraints sometimes.

Discussion

To our knowledge, the present report describes the largest study to date of consecutive patients with acute total Achilles tendon ruptures that were treated nonoperatively. We believe that in our study of 196 cases, all consecutive patients with acute total Achilles tendon ruptures have been included and that all major complications associated with the Achilles tendon rupture have been reported. All our patients were followed until clinical healing, and our follow-up—with 97% of the patients answering the questionnaire—has minimized bias by selection. The re-rupture rate was only 7%, which is lower than in published reviews and meta-analyses (Wills et al. 1986, Cetti et al. 1993, Lo et al. 1997, Popovic and Lemaire 1999, Bhandari et al. 2002, Kocher et al. 2002, Khan et al. 2004). According to the current Cochrane review (4 trials, 356 patients) patients treated operatively had a pooled re-rupture incidence of 3.5%, which can be compared with 13% in the nonoperative group (relative risk (RR) 0.27, 95% CI 0.11–0.64). The rate of complications other than re-rupture was much higher: 34% (operative) and 2.7% (non-operative) including infection, adhesions and disturbed skin sensibility (RR 11, 95% CI 4.8–23). The authors concluded that there is evidence that open operative treatment of acute Achilles tendon ruptures significantly reduces the risk of re-rupture compared to nonoperative treatment, but has the drawback of a significantly higher risk of other complications, including wound infection (Khan et al. 2004).

If one compares the re-rupture rate in our non-operatively treated patients to an equivalent group in a recently published randomized study favoring surgical treatment (Moller et al. 2001), our rate is considerably lower (7% as opposed to 21%). The reason for this large variation is not known, and one can only speculate. The risk of re-rupture in patients with Achilles tendon rupture, in operated as well as nonoperated patients, is probably related to the quality of the rehabilitation—both during and also, and perhaps even more importantly, after removal of the plaster or the orthosis. The quality of the rehabilitation in a nonoperatively treated patient material experiencing a re-rupture frequency of greater than 20% (Moller et al. 2001) must be questioned. The treatment strategy we

used was similar to the ones often recommended in nonoperatively treated cases (Cetti et al. 1993, Moller et al. 2001). One difference was that we allowed immediate weight bearing in the plaster/orthosis. This might increase the strength of the healed tendon, or at least let it regain its strength quicker (Palmes et al. 2002) as the fibroblasts and collagen fibres filling the tendon gap orient themselves along the long axis of the tendon as a result of mechanical stress. It is possible that other variations in the nonoperative treatment regime, such as degree of plantar flexion in the cast, the use of heel-raise, and variations in information and instructions of the physiotherapist may explain the differences found, at least to some extent. In our study, one single physiotherapist instructed the patients regarding their rehabilitation and exercise during the study period.

Promising results have been demonstrated in other studies with functional bracing in patients who were treated nonoperatively (Saleh et al. 1992, Eames et al. 1997, McComis et al. 1997, Roberts et al. 2001, Petersen et al. 2002), an indication that nonoperative treatment of Achilles tendon rupture can be improved further. Functional bracing constitutes a more physiological mechanical environment for a healing tendon than cast treatment, and it was started in the last patients of our study. Perhaps the results of nonoperative Achilles tendon rupture treatment can be improved even more, which would justify a conservative strategy in the future even more. The fact that only 62% of patients in our series reported full subjective recovery at follow-up, four years after the injury, indicates that a healed tendon is not necessarily equivalent to patient satisfaction. Further prospective studies, and preferably randomized ones, are required to evaluate the functional outcome to a greater degree.

If nonoperative treatment of Achilles tendon ruptures has a re-rupture rate of 7%, as in our study, surgical intervention as a primary treatment is questionable when taking cost and surgical complications into consideration. We question whether it is reasonable to let all of our 50 patients who present annually with Achilles tendon rupture undergo surgery, with all its risks and costs, just in order to avoid re-rupture in a few patients. Perhaps the surgical resources could be better used for more

effective procedures, and maybe it would even be possible to further lower the re-rupture rate of non-operationally treated ruptures.

No competing interests declared.

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