Treatment of acute Achilles tendon ruptures: a systematic overview and meta-analysis


Authors’ objectives
To compare the surgical and conservative treatment of acute Achilles tendon rupture with respect to tendon re-rupture and infection.

Searching
MEDLINE, Grateful Med and The Cochrane Library were searched from 1969 to August 2001. Reference lists of all eligible studies were reviewed. The Science Citation Index was searched for studies that were frequently cited. Additional studies were sought by: manually searching the tables of contents of two major orthopaedic journals (Journal of Bone and Joint Surgery, American and British volumes) from 1996 to April 1999; a bibliographic review of major text books in orthopaedics; a title review of presentations and posters in the programmes of three major orthopaedic meetings from 1996 to 1999; and contact with experts. Studies published in any language were considered.

Study selection

Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion in the review.

Specific interventions included in the review
Studies that compared surgical repair with non-operative treatment were eligible. The surgical techniques used in the included studies were modified Kessler suture, Bunnell suture, simple surgical repair and absorbable suture and absorbable repair. For conservative treatment, a plaster cast (above knee or below knee) was applied. The total time in the plaster cast ranged from 6 to 8 weeks for both surgical repair and conservative treatment.

Participants included in the review
Studies of people with an acute closed spontaneous rupture of the Achilles tendon were eligible. Most of the participants were men in their fourth decade who sustained the rupture during a sports activity. The time from rupture to treatment ranged from zero to 21 days.

Outcomes assessed in the review
Studies that assessed re-rupture of the Achilles tendon were eligible for inclusion in the review. The other outcomes assessed in the review were wound infections, return to normal functioning and minor complaints.

How were decisions on the relevance of primary studies made?
The eligibility criteria were applied to the titles and abstracts and potentially eligible studies were retrieved. Reviewers, who were blinded to the author, institution, journal and results, applied the eligibility criteria to the ‘Methods’ section. Any disagreements were resolved by consensus. The level of agreement between the reviewers was assessed using the kappa statistic.

Assessment of study quality
Validity was assessed using a 21-point assessment scale (see Other Publications of Related Interest no. 1). This graded the reporting of studies for eligibility criteria, adequacy of randomisation, description of therapies, assessment of outcomes and statistical analysis. Two reviewers assessed validity and any disagreements were resolved by consensus. The level of agreement between the reviewers was assessed using the interclass correlation coefficient.

Data extraction
Two reviewers extracted information on the following: the author, inclusion and exclusion criteria, the number of patients in each treatment group, method of randomisation, other outcome measures, proportion followed-up and characteristics of the study population. The latter included age, gender, cause of injury, number with positive Thompson test, leg involved, time to treatment, number with predisposing factors and number with previous rupture. Any disagreements were resolved by consensus, and the level of agreement was assessed using the kappa statistic. The
first or corresponding author of each study was contacted to verify the accuracy of the current summary of their study and to provide additional information (three of the five authors responded).

**Methods of synthesis**

**How were the studies combined?**
The pooled relative risks (RRs) and 95% confidence intervals (CIs) were calculated using the random-effects model of DerSimonian and Laird (see Other Publications of Related Interest no. 2). The studies were weighted by the inverse of the variance.

**How were differences between studies investigated?**
Statistical homogeneity was tested using the Breslow-Day statistic (see Other Publications of Related Interest no. 3) with a significance threshold of $p$ less than 0.1. The following potential sources of clinical heterogeneity were determined in advance and explored: surgical technique (protocol simple versus Kessler versus Bunnell stitches); post-operative rehabilitation (cast versus boot); methodological features (quality score); studies published in full or as abstracts and language of journal (English versus other).

**Results of the review**
Six RCTs (448 patients) were included.

The quality scores in the five RCTs that reported adequate information ranged from 57 to 72; the maximum possible score was 100. Inter-reviewer agreement (kappa) on study selection was 0.81 (95% CI: 0.75, 0.88). The interclass correlation coefficient for inter-reviewer agreement on the assessment of study validity was 0.85 (95% CI: 0.70, 0.97).

**Re-rupture** (six RCTs, 448 patients): Surgical repair significantly reduced the re-rupture rates when compared with conservative treatment. The re-rupture rates were 3.1% for surgery versus 13% with conservative treatment; the RR was 0.32 (95% CI: 0.14, 0.71, $p=0.005$). No heterogeneity was detected ($p=0.41$). The number-needed-to-treat was 14 (95% CI: 8, 27). The results were similar across study quality, surgical techniques, post-operative rehabilitation protocols, publication type and language of publication.

**Infection rates** (five RCTS, 421 patients): The infection rates in surgically-treated patients ranged from 4% to more than 20%. The RR of infection with surgical repair was 4.6 (95% CI: 1.20, 17.8, $p=0.03$). No significant heterogeneity was detected ($p=0.34$). The number-needed-to-harm was 16 (95% CI: 17, 59).

**Return to normal function and spontaneous complaints**: There was no significant difference between surgical repair and conservative treatment in the proportion of patients returning to normal activity or the rates of spontaneous complaints. The proportion returning to normal activity was 71% with surgery versus 63% with conservative treatment; the RR was 1.04 (95% CI: 0.86, 1.27, $p=0.68$). No significant heterogeneity was detected ($p=0.42$). The rates of spontaneous complaints were 19 and 25% with surgery and conservative treatment, respectively; the RR was 0.83 (95% CI: 0.43, 1.57, $p=0.56$). No significant heterogeneity was detected ($p=0.54$).

**Authors’ conclusions**
Compared with conservative treatment, surgical treatment significantly reduced the risk of Achilles tendon re-rupture, but increased the risk of infection. There was no significant difference between the treatments in terms of the proportion of patients returning to normal activity or the rates of spontaneous complaints.

**CRD commentary**
This well-conducted review was clearly written and presented. More than one reviewer was involved at each stage of the review process, thus minimising bias. The aims of the review were stated and the inclusion criteria were defined in terms of the intervention, participants, outcomes and study design. The search was extensive, attempts were made to locate unpublished material, and the methods used to select the studies were described. Only RCTs were included and validity was formally assessed using validated criteria. Relevant data were tabulated and details of the methods used to extract the data were reported. Statistical heterogeneity was assessed and a meta-analysis appropriately performed. Potential sources of heterogeneity were explored. The evidence presented appears to support the authors’ conclusions.
Implications of the review for practice and research

Practice: The authors stated that, although the review suggested a benefit for surgical repair, the wide confidence intervals around the estimates of risk reduction suggested that more evidence was required before a strong recommendation could be made for surgical treatment. They further stated that there was still uncertainty about the optimal treatment for acute Achilles tendon rupture, and that recommendations in surgical textbooks should reflect this uncertainty.

Research: The authors stated that a large trial was needed to establish the risks and benefits of surgical repair.

Bibliographic details

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Other publications of related interest

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Subject indexing assigned by NLM

MeSH
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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.