Reviewer’s report

Title: Mechanical properties during healing of Achilles tendon ruptures predict final outcome. A Roentgen stereophotogrammetric analysis in 10 patients

Version: 3 Date: 31 March 2007
Reviewer: Juhana Leppilahti

Reviewer’s report:

General
The aim of the study is interesting. The question “how mechanical properties could predict clinical results at AT rupture surgery” is also relevant and interesting.

However, this study consists only of ten patients, and two were annu excluded before one year, leaving 8 patients. My opinion is, that 8 patients is only a pilot of system, data is insufficient to give any recommendations and answers to the aim.

At one year control repeat loadings were not measured and the pedal forces did not include 200N as in previous measures.

So
1) The average of the strain per force values did not correlate with clinical outcome as heel rise index.
2) The modulus gave correlation, but the modulus of elasticity showed a great variation.
3) Specific stiffness did not correlate significantly with clinical outcome as heel rise.

Thus the power of the study is not sufficient and give any recommendations.

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Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

Specific comments

Title of the study: This study do not show, that mechanical as strain/force and stiffness could predict the final outcome. Only modulus correlate.

Abstract:
Background: There are clinical studies, where healing of human AT ruptures and specially tendon elongation have been monitored with titan markers. (Mortensen et al, Kangas et al).
Methods: 10 patients is insufficient number.
Results: Included only the median strain per force, which however did not correlate significantly with clinical outcome.
Conclusion: Some of this belongs to results, for instance sentence: “Modulus of elasticity….. The centence "RSA has potential for comparing different treatments of AT ruptures” cannot be a conclusion, because this did not belong to a study protocol. The same concerns individual training and the influence of surgery on the outcome.

Background
First sentence is “ It is impossible to know when a patient with a healing tendon injury can first be recommended load-bearing, and how much load to start with.” There are studies concerning loading after AT rupture repair and the authors could refer to them.
“Postsurgical treatment has to rely on rules of thumb” There are a few randomized prospective studies concerning postsurgical treatment. See latest Cochrane from AT ruptures.
Does preinjury acticity (athlete, recreational athlete, nonathlete) play any role. Does previous tendon problems, tendinopathy play any role.

Methods
Demographic data is insufficient. What is time from injury to treatment? What was preinjury activity of the patients (competitive athletes, recreational athletes, nonathletes). Did any has previous AT problems, and treatment of these?
Surgical technique: What was the thickness of Vigryl? Use of one or two Kessler loops? Use of circumferential sutures? Postoperative treatment with 6 weeks of immobilization is today quite conservative
postoperative treatment. Today the trend is early motion. Why early motion was not used allowing free plantar flexion but restricting dorsiflexion to neutral?

“In this study weight bearing was allowed as tolerated.” What does this mean? How it was tolerated?

“Postoperatively the patients started training program.” What kind of program? Was it standardized program? How long a time?

The elongation was measured first time after six weeks. This is problem, because elongation occurs in every repaired Achilles tendon already within six weeks. (See Kangas et al 2007, Mortensen).

At one year examination there were 2 major problems: Why repeat loadings were not measured? Why the pedal forces did not include 200N as in previous measures?

US was used to measure the transverse area. What was the level? Was it the thickest level? The measure error?

Functional outcomes.

Functional results were not as good as usually reported in the literature. 50% of the results were unsuccessful (3 fair results, 2 poor results). The analysis of unsuccessful results are lacking. There was only one excellent result.

Strain per force values had a considerable variation, but did not correlate significantly with outcome. Also the modulus of elasticity showed a great variation. There was also variation in stiffness, but also this did not correlate significantly with outcome.

Why the elongation was not measured within the first 6 weeks. Previous studies of Mortensen et al, Kangas et al) have shown, that elongation is significant already during the first 6 weeks. 4 of eight AT shortened between 18 weeks and 1 year but have no correlation with mechanical property.

Discussion

Discussion is also too long and not compact. Measurement of hysteresis is not perhaps possible with RSA. This is however discussed.

Conclusion:

My conclusion is, that RSA can be used in this kind of study, but methods have so serious weaknesses that his study is insufficient to be published in this journal.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Discretionary Revisions (which the author can choose to ignore)

What next?: Reject because too small an advance to publish

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

'I declare that I have no competing interests'