Reviewer's report

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

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Reviewer: Marco V Narici

Reviewer's report:

General

This is an interesting and innovative paper, however minor revisions is required. Specific comments and recommendations on the paper are given below:

The use of RSA for measuring tendon deformation in vivo is a very interesting and practical application. However, I think that more information is required about how exactly elongations were obtained. For example, it seems as though single scans were taken at different points in time as the tendon was loaded - between the scans the tendon will need to be re-loaded and the experimental set-up changed. What is the reference frame that they use to standardise limb position, because potentially there is quite a lot of room for error here if the limb is not positioned in exactly the same position as the previous scans(s).

- There's only two data points 25N and 200N for the first three measurements (6, 12 and 18 weeks), I wonder why the Authors haven't included more data point as they did after one year. In this way they assume the tendon force-elongation relation is linear, which it is clearly is not. The problem is that following injury the shape of this curve may change markedly (as we saw from out data with SCI patients) and with this approach they won't see this. So any estimate of tendon stiffness must be considered as a very gross estimate. Further, there's no description of how stiffness, modulus, or CSA have been measured in the methods, but from the discussion I see that the Authors have expressed stiffness as N/strain, which is an inappropriate mix of variables.

- The influence of antagonistic coactivation and joint rotation have been neglected. Joint rotation is perhaps less important, but more importantly this is related to what I mention above about how they ensure exactly the same limb position relative to the scanner for the acquisition of repeated static scans. Coactivation is perhaps more important as this could be potentially altered following a period of immobilization.

- For the first three measurement time points (6, 12 and 18 weeks) the Authors state that each load (25 and 200N) was tested twice and that this was to establish reproducibility and to precondition the tendon, which seems a good approach, but this was not done during measurements taken after 1 year, so there was no preconditioning. This seems particularly relevant because on page 13 they discuss the persistence of an elongation after loading.

- The Authors state they have positioned beads at two locations - 1) at the rupture site and 2) above the injury site within a "healthy" portion of the tendon. There should be a clearer distinction between the elongation in both locations, it's not always clear which site they are referring to. A detailed comparison of the mechanical properties at these two different location would be very interesting.

- Why were two beads used in each location and not just one?

- CSA seems to increase up until 18 weeks and then decrease after 1 year, is this due to some inflammation? - this is not discussed in the results or discussion

- They use kg in the results (e.g., p. 11) , but N in the methods - need to be consistent for clarity.

- It seems strange how they report median strain, in the abstract for example.
What next?: Accept after minor essential revisions

Level of interest: An article of importance in its field

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